

**INDIVIDUAL AND COMMUNITY LEVEL  
SOCIOECONOMIC ASSOCIATES  
INFLUENCING  
UTILIZATION OF SKILLED BIRTH  
ATTENDANCE  
IN PAKISTAN  
A MULTILEVEL ANALYSIS**



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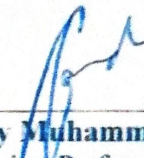


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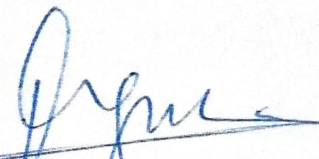
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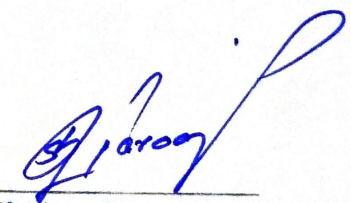
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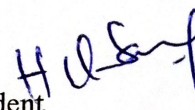
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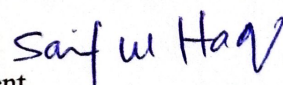
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*My parents: Fatima&Shamsyar and my wife Ambareen*

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## ABSTRACT

Skilled birth attendance is one of the major public health challenges under the domain of mother and child health in the context of Pakistan. Several studies have been conducted in Pakistan identifying the underlying reasons that lead to the low Skilled Birth Attendance rate at individual level yet there remains gap in terms of approaching this subject by involving contextual factors in the analysis. This study attempts to bridge this gap by including community level factors along with individual factors that might be correlated with utilization of Skilled Birth Attendance in Pakistan.

Data is taken from the Pakistan Demographic and Health Survey 2017-18. A weighted sample size of 6803 is selected from the source and analyzed subsequently to produce the desired results. The dependent variable is Uptake of Skilled birth attendance which is dichotomous in nature i.e., Skilled attendance and Unskilled attendance. Explanatory variables at individual level include Employment status of women, Educational level of women, Wealth status, Exposure to Media, Means of transport, Women autonomy to decide and Birth order. Community level variables comprises of Community female literacy level, Community poverty level, Community perception of distance to health facility and Place of residence. For statistical analysis Mixed effect logistic regression is used.

The results of this study indicate that the percentage of unskilled birth attendance is 28% and skilled attendance is 72% in the case of Pakistan. The individual level factor such as *Birth order*, *Wealth status*, Educational level, *exposure to media* and *women autonomy to decide* show statistically significant impact on the uptake of Skilled Birth Attendance. Similarly contextual factors such as *Community perception of distance to health facility as a problem* and *Community literacy level* reflect significant influence

on the odds SBA uptake at the time of delivery. The ICC score (54%) calculated in the random effect part of the analysis confirms the influence of contextual factors and buttress the application of multilevel analysis technique.

The utilization of skilled birth attendance services during delivery is influenced by both the individual and contextual factors. Public health policies should be designed by considering individual as well as community level associates to increase the uptake of Skilled Birth Attendance in Pakistan

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## LIST OF ACRONYMS

SBA	Skilled Birth Attendance
PDHS	Pakistan Demographic and Health Survey
DiSBA	Disparity in Skill Birth Attendance
NIPS	National Institute of Population studies
UNICEF	United Nations Children Fund
WHO	World Health Organization
UNFPA	United Nations Population Fund
MMR	Maternal Mortality Rate
SDGs	Sustainable Development Goals
PSU	Primary Sampling Unit
ANC	Antenatal Care
VIF	Variation Inflation Factor
ICC	Intraclass Correlation Coefficient
OR	Odd Ratio
RC	Reference Category

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Maternal health, according to the existing definition, means the health of women during pregnancy, childbirth and postpartum period. Safe motherhood is important not only for the life of mother but also equally crucial for the survival of the new-born. The death of mothers due to pregnancy complication puts the life of child at the risk of dying before reaching second birthday (UNFPA, 2019).

Maternal mortality remains the greatest global health challenge for many developing countries even after significant achievements in maternal health over the last two and half decades. The key intervention to ensure better maternal health and reducing maternal mortality during delivery majorly comes in the form of Skilled Birth Attendance. Literature suggest a significant inverse correlation of maternal mortality ratio with antenatal care coverage, skilled birth attendance, access to improved water and sanitation and literacy rate (Girum & Wasie). The importance of continued attention to reduce maternal mortality and new-born health has translated into critical SDG 3.1.1 and 3.1.2 progress indicators. More specifically, the global public health players are committed to enhance the uptake of SBA under SDG 3.1.2. The signatories of SDGs, including Pakistan, are committed to bring the MMR down to 70 deaths per 1000,000 live births. This can only be done with focussed and consistent health strategies designed according to the contextual realities of every country.

During childbearing phase, women require a continuum of care to guarantee optimum health outcome for them and their new-borns. This continuum begins with the women and her family followed by health care system from primary to advanced level

depending upon the intensity of the complication. An effective and efficient delivery of continuum of care warrants a well-established and functioning health care system. In such system, besides various contributing factors, Skilled birth assistance (SBA) holds a centre stage. Studies conducted in Africa and South Asia show that these two regions need to improve their continuum of care in order to reduce the high rate of maternal death in these regions (K. Singh, Story, Moran, & journal, 2016).

The World Health Organization defines SBA as “an accredited health professional – such as midwife, doctor or nurse who has been trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and new-borns”(Harvey et al., 2007). However, this definition contextually varies because many developing countries also deploy other technically trained human resource such as Lady Health Visitors to handle pregnancies and child deliveries (Upvall, Sochael, & Gonsalves, 2002).

SBA has a direct bearing on maternal mortality and estimated 810 women die every day due to complication resulting from pregnancy and child birth (K. S. Dickson & H. Amu, 2017). This concept has captured a centre stage in the public health domain and today the global health community uses proportion child birth attended by skilled attendant as proxy indicator for maternal deaths (Adegoke & Van Den Broek, 2009). However, the concept of SBA is not just the availability of the competent human resource, but it also includes an enabling environment to complete the process. Enabling environment consists of supportive regulation, infrastructure, communication, referral, supplies and other necessary inputs for skilled attendance to perform the task (Munabi-Babigumira, Glenton, Lewin, Fretheim, & Nabudere, 2017).

The trend of maternal mortality in developing countries is high with 75% maternal death occurring due to obstetric causes. Moreover, almost 77% of such death occur at the time of childbirth or soon after delivery (WHO, 2015). The rate of maternal mortality is highest in Sub Saharan Africa (67%) followed by South Asian countries (21%)(WHO, 2019b) Most of these deaths are preventable and can be avoid through the provision of skilled service during delivery because they stem from public health challenges that can be controlled with effective and timely interventions.

Several socioeconomic, demographic, and other proximal factors are associated with the utilization of SBA service. They key socioeconomic and demographic associates include Education, Wealth status, exposure to mass media, place of residence, age of women, distance to health facility and parity. Moreover, various nationally representative surveys, such as DHS, show that Education of mothers has a significant impact on the utilization of SBA. Other factors such as, religious beliefs and cultural also influence the uptake of SBA but such associations have not been found statistically significant(Mukabana & Emali, 2019). The presence of Skilled birth attendants during delivery is also affected by certain supply side factors particularly in the rural settings of the developing countries. Studies conducted in this context suggest that The availability of skilled professionals and all-weather roads significantly affect the uptake of skilled attendance during delivery (Ghosh, Siddiqui, Barik, Bhaumik, & journal, 2015).

Most of the developing countries have huge urban and rural divide and literature abound with evidence the lack of SBA is more prevalent in rural areas than the urban (Chauhan & Rai, 2015). In the south Asian countries there is a 33% point gap between urban rural areas in terms of the coverage of births attended by skilled professionals



(Pulok, Sabah, Uddin, Enemark, & childbirth, 2016). The primary reason for this gap in SBA uptake is because most of the rural areas are deprived of necessary resources. Access to emergency healthcare, education and mass media is common challenge faced by rural communities in the developing world. In addition, constraints such as lack of infrastructure, human and financial resource, coupled with ethnicity, cultural and social norms pose challenge to SBA utilization in rural areas.

## **1.2 Background**

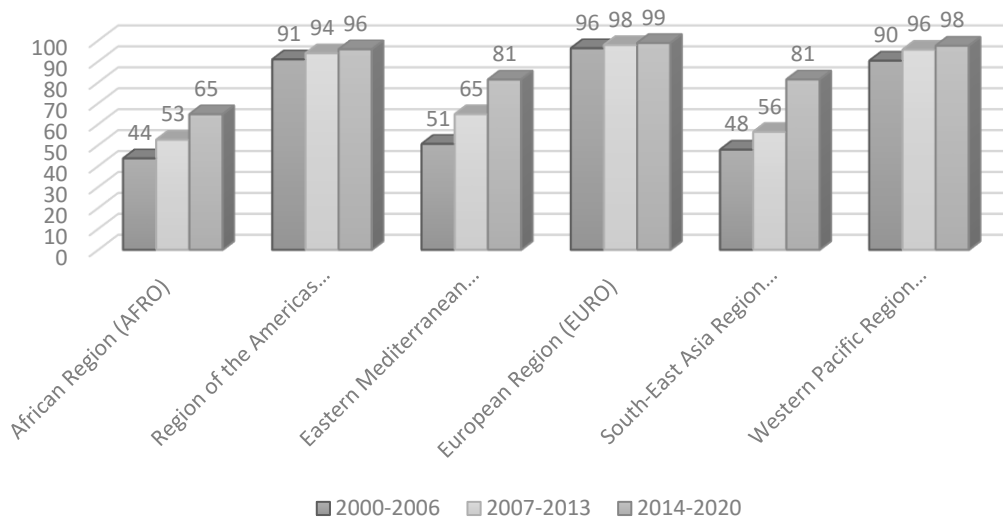
### **1.2.1 Global trend of SBA**

SBA is a serious global health issue causing millions of maternal and new-born mortality and morbidity. Worldwide, 34% births happened without SBA and that translates in to 45million births without skilled attendant(Yakoob et al., 2011). An estimated 62% of maternal death in Sub Saharan Africa were reported in 2013 and majority of such cases could have been controlled had there been skilled birth attendants, better access to antenatal care and appropriate care during postpartum period (N. S. Mugo, K. E. Agho, A. B. Zwi, & M. J. Dibley, 2016). In most of the developing countries the trend of using of SBA is greater in Urban areas as compared to Rural areas. According to a study in Nigeria, 23% of the women utilize SBA whereas, 73% rely on unskilled assistance (B. L. Solanke & Rahman, 2018). The rural-urban differential in healthcare utilization is primarily because of the concentration of infrastructure and personnel in urban areas (Tey & Lai, 2013).

Currently, the global health strategies to reduced MMR are greatly focussed on increasing access to the SBA, yet south Asia remains the lowest in SBA coverage. Bangladesh is among the lowest performing countries in South Asia in terms of access to effective SBA services with only 13.1% births being administered by trained

professionals (Kamal, Hassan, & Kabir, 2015). Similarly, the practice of SBA in other South and Southeast Asian countries is also not very promising. However, Sri Lanka is an exception among the developing southeast Asian countries, where, 99% of births occur in hospitals (Senanayake et al., 2011). The trend of availing skilled professional for delivery services is very low in most of the developing countries resulting in high maternal and new-born mortality rate. In low- and middle-income countries a significant proportion of women still deliver at home either without or with support of unskilled health providers (Ngatho S Mugo, Kingsley E Agho, Anthony B Zwi, & Michael J Dibley, 2016). The primary reason for low trend in SBA in developing countries is complex and cannot be attributed to one factor. Multiple factors such as, abject poverty stemming from the lack of poor governance, frail infrastructure, poor educational and health system, and weak judicial system contribute to low uptake of SBA in these countries. Global statistics on maternal and new born indicate that almost 290,000 women died of complication resulting from complications during pregnancy and child birth in 2017 (UNICEF, 2020). The availability of SBA not only ensures new-born lives but also saves mothers from preventable treatable complications.

Over the decades, there has been a significant improvement in the uptake of SBA globally. Asian and African countries have consistently moved up in SBA utilization from 2000-2020, yet these regions still lag far behind from the American and European nations (Figure 1.0). The overall increasing trend of SBA across the globe has been possible due to the continued and sincere efforts of the global health community. Initiatives like, Safe Motherhood program, Every Newborn Action Plan and the Millennium Development Goals have collectively played a critical role in improving Mother and Child health. More recently SDGs has unlocked a new policy window to



Source: Births attended by skilled health personnel (%) - Joint UNICEF/WHO database

**Fig 1.1:** Global SBA Trend

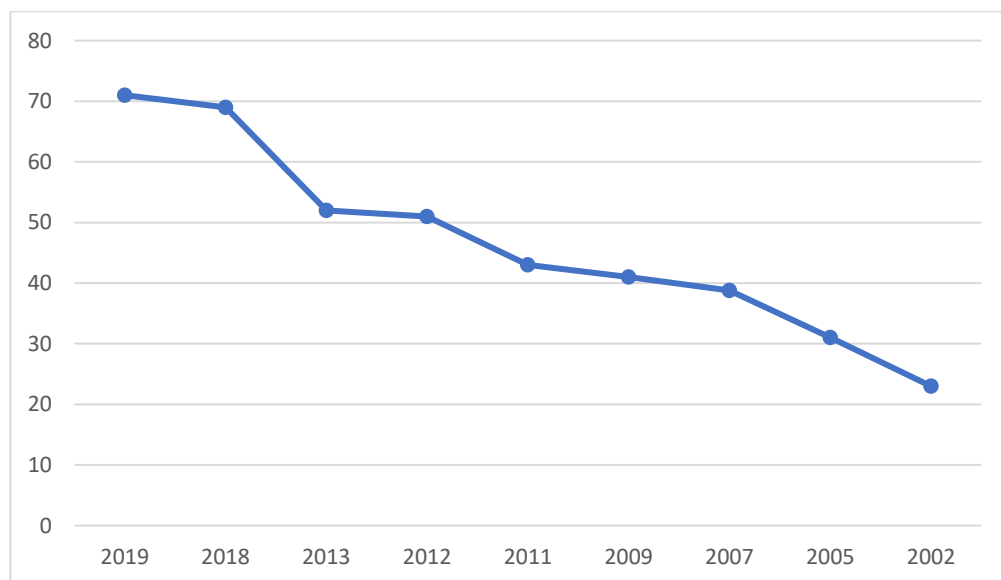
ensure Mother and child health globally.

### 1.2.2 SBA in the regional context

Pakistan is country of 220million inhabitants with diverse cultural, ethnic and religious background. The national level statistics indicated that 31% of deliveries still occur without the assistance of any skilled attendants. Pakistan is among six countries that contribute 50% of global maternal death(Mir et al., 2015). Majority of the population lives in rural areas and hence are deprived of good health and education services,

besides other basic health necessities. The social inequalities that exist between rich and poor, in the local context, is reflected in the health outcomes as the socially better off population has more likely access SBA than its poor counterpart.

According to the census of 2017 conducted by government of Pakistan, 74% of the country's population lives in rural areas with only 36% living in urban areas (PBS, 2017). The lack of basic health facilities and services, particularly those pertaining to mother and child health, poses a toughest challenge to the rural dwellers. The rate of SBA in Pakistan differs across provinces with Baluchistan having the lowest rate of only 18% of births being delivered by professional (Pongpanich, Ghaffar, Ghaffar, & Mehmood, 2016). It is a well-documented fact that majority of maternal death are due to pregnancy related complication which could be easily prevented with measures such as skilled assistance at the time of child birth (W.H.O, 2002).



Source: Births attended by skilled health personnel (%) - Joint UNICEF/WHO database

Fig 1. 1: SBA Trend in Pakistan

Government of Pakistan as a signatory to different international commitments i.e. Safe Motherhood Conference 1987 and MDGs succeeded by the SDGs, has launched a number of initiatives to improve the maternal health outcome. Maternal, Newborn and Child Health program was implemented in 2005 with an aim to improve SBA uptake by recruiting new cadre of Community Mid Wives. These initiatives have led to significant and consistent improvement in the uptake of SBA in Pakistan as show in fig 1.1.

### **1.3 Significance of the study**

Maternal and child mortality are the two toughest public health challenges facing the developing nations. According to WHO 94% of the maternal death occur in less developed countries owing to severe bleeding at time of delivery, high blood pressure during child birth, infection after child birth and other complications during delivery (WHO, 2019a). Most of these deaths can be prevented if skilled assistance provided on efficient and timely manner. In Pakistan 31% deliveries take place without t skilled assistance, leaving both mother and child lives at risk (National Institute of Population Studies - NIPS/Pakistan & ICF, 2019). Literature reveals various socioeconomic factors that hamper the uptake of SBA services particularly in developing countries. This study, therefore, looks into different socioeconomic associates at individual as well community level in the context of Pakistan. The evidence produced by this study shall shed light on the importance of the community level associates, in addition to individual attributes, that affect the utilization of SBA in case of Pakistan. The major takeaway from this study for the prospective researcher is the establishment of association between SBA and the community level factors because this perspective is least explored in case of Pakistan.

#### **1.4 Conceptual Framework**

This study borrows its conceptual framework from Anderson Behavioural Model (BM) of health services utilization (Mezmur, Navaneetham, Letamo, & Bariagaber, 2017). The model is relevant for this study because it specifies need in relation to predisposition and enabling factor at multiple level thereby allowing hierarchical analysis of micro and macro level associates this study has embarked on to analyse in the context of Skilled delivery in Pakistan. BM is a multilevel model and includes individual as well contextual factors associated with health service utilization.

The construct and variables of this model have been tailored based on relevant literature. Figure 1.2 shows the pathway of the individual and neighbourhood variables that explain the uptake of skilled assistance during delivery

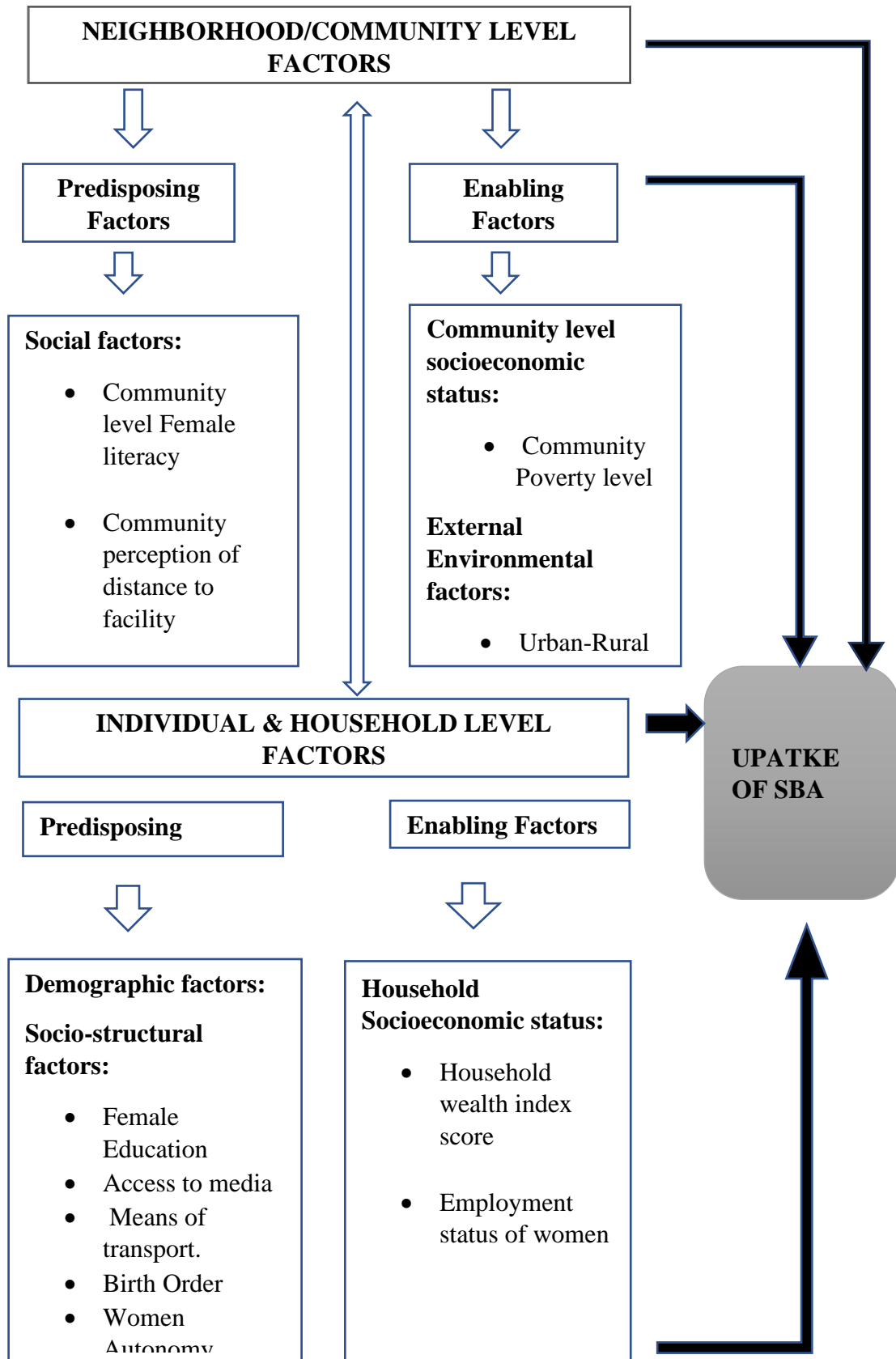


Figure 1.3: Adopted from Anderson Behavioral Model of Health service utilization.

### **1.5 Research question.**

After reviewing the literature and identifying the research gap, this study came up with the following questions.

- To what extent the individual level socioeconomic variables are associated with the uptake of skilled birth attendance in Pakistan?
- How community contextual factors such as perception of distance to health facility, community poverty level, community literacy level and place of residence affects the utilization of skilled assistance during delivery.

### **1.6 Objective**

Numerous studies at global level have been conducted to measure factors affecting SBA at individual and community level, yet no comprehensive research work has been conducted in Pakistan. The purpose of this study is, therefore, to bridge this academic gulf and provide a new perspective on the determinants of SBA. The specific objective of the study is:

To analyse how disposing and enabling factors, both at individual and community levels, influence the utilization of skilled birth attendance during delivery.

The outcome of this study will help understand the impact of various socioeconomic factors affecting utilization of Skilled birth attendance. The outcomes will have a policy implication and inform prospective plan of actions by public and public health agencies to improve maternal health and achieve SDGs.



## 1.7 Hypotheses

The following hypotheses are tested in this study.

- Individual level socioeconomic factor such as; *mother education, media exposure, means of transport, wealth status and birth order* have significant impact on the uptake of skilled assistance during delivery.
- Women autonomy has a positive influence on the uptake of skilled birth attendance.
- Contextual attributes such as *Community literacy level and community perception of distance to health facility* influence the utilization of skilled assistance during delivery.
- *Community poverty level and place of residence (Urban/Rural)* influence the utilization of skilled birth attendance.

## 1.8 Operationalization of Key terms

**Community/Neighbourhood:** neighbourhood and community are used interchangeably in this study. Collins dictionary defines Community “as group of people who live in particular geographical space”(Collins, 2019). However, in this study, community refers to the Cluster or PSU given in the DHS survey report.

**Socioeconomic:** The term “socioeconomic” encompasses a long list of social and economic factors, however, for this study, this term implies, Education, Wealth Index , , exposure to media, employment status and place of residence.

## 1.9 Conclusion

Skilled birth attendance is one the prime indicator of maternal health utilization and is influenced by a host of socioeconomic and demographic factors. The key

socioeconomic and demographic associates of SBA include, education, place of residence, age, economic status, and exposure to media both at individual as well community level. Other proximal correlates of SBA are cultural norms, ethnicity, birth order and religion. A good deal of studies have been conducted internationally on this issue yet at national level, there still exists a gap. Therefore, this study will help in ascertaining the impact of individual and neighbourhood level socioeconomic associates of skilled birth utilization in Pakistan.

### **1.10 Organization of the study**

This study is comprised of 3 chapters; Chapter 1 outlines the introduction, national and international overview of SBA uptake, Literature review is given Chapter 2 and Chapter 3 discusses Data and Methodology. Data analysis is covered in Chapter 4 & Chapter 5. Discussion and conclusion are covered in Chapter 6 and Chapter 7 respectively.

## CHAPTER 2

### LITERATURE REVIEW

Skilled birth attendance (SBA) is one of the key global health indicators. The absence of SBA leaves both mother and new-born lives at risk resulting in morbidity and mortality. The lack of SBA is a major health challenge in developing countries. This chapter discusses a diverse pool of literature ranging from theoretical foundation, demographic & socioeconomic associates, and other proximal factors impacting the uptake of SBA.

#### **2.1 Theoretical approach to understand the associates of Skilled Birth Attendance**

Literatures gives different frameworks to understand the underlying correlates of the SBA particularly in case of multilevel analysis. The three relevant theoretical frameworks for this study are Disparity in Skilled Birth Attendance theory (DiSBA) (Afulani & Moyer, 2016), framework by Anderson & Newman and Ecological Theory (Shahabuddin et al., 2017). All of these approaches play a vital role in understanding the underlying proximal and distal correlates of SBA. However, Anderson & Newman Framework lends major contribution to shape this study.

**Disparity in SBA theory (DiSBA):** Despite the global health initiatives targeted at increased skill birth attendance to meet the universal healthcare objective, there remains a significant disparity in the uptake of SBA owing to socioeconomic status (SES) and other demographic actors. The DiSBA theory assist researchers to understand the clear pathways of how SES affect SBA. The core premise of this theory is that the maternal health seeking behaviour including SBA is based on three proximal factors: *perceived*

*need for care; perceive need for accessibility of the service; and perceived quality of the care* (Afulani & Moyer, 2016).

Perceived need care is influenced by women's current and prior health status, health knowledge about pregnancy, socioeconomic factor. Similarly, perceived accessibility is affected by physical accessibility and socioeconomic factors associated with it. Lastly, perceived quality of care depends on individual experiences about care provision. Although perceived quality of care is affected by structure, processes and outcome of care, yet the interpersonal encounter overweighs all these factors in shaping the perceived quality of care.

**Anderson and Newman Framework of health service utilization:** Health service utilization by individuals, including SBA, cannot be studied in isolation because number of factors pool up to influence the individual health seeking behaviour. According to the Ander & Newman framework, the societal determinants of utilization impact the individual determinants directly and through health services system (R. Andersen & Newman, 2005). Studies in behavioural sciences suggest that individual behaviour is a function of characteristics of individual himself, attributes of the environment where individual lives and interaction between individual and the societal forces (Moore, 1969). This framework, therefore, offers a promising pathway to analyse SBA seeking behaviour of the population of interest both in terms of individual as well as societal perspective. The key components in this theory are; Need, Predisposing and Enabling factors which affect the utilization of health care services. (K. S. Dickson & H. Amu, 2017).

Need factor is the most crucial among in this combination. There are two types of needs identified and tested by researchers. The perceived need refers to "how people view

their own general health and functional status as well as how they experience pain and illness and whether they are concerned enough about their health to seek professional help”. Similarly Evaluated need refers to professional judgment about people’s health condition and their need for health care. (R. M. Andersen, 1995).

Predisposing factors includes all the socio-cultural conditions of individual that prevail before the onset of illness. Social structure, health beliefs and Demographic factors. Enabling factors comprises of Family factor, community factors and other genetic/psychological conditions.

**Social Ecological Model:** Social Ecological Model (SEM) has recently gathered much attention among the public health researchers. This model takes on more holistic approach by including multi-level factors which affect health seeking behaviour of the population. SEM is a theory-based framework which involved the complex interplay of multilevel of social system and interaction between individual and environment within the system (Shahabuddin et al., 2017). SBA, as a health seeking behaviour, can be better understood once the multilevel social factors are taken into account. Literature reveal that besides the individual level factors, community level variable such as *community literacy level* exerts significant influence on the likelihood of using SBA service (B. L. Solanke & Rahman, 2018). Human being is social animal and is usually influenced by the immediate environmental factors. These factors play a vital role in shaping the health seeking behaviour of the individuals.

Studies suggest that the development of poor maternal health care seeking behaviour stem from multiple factors and exposures in women’s life (Ekpenyong, Bond, & Matheson, 2019). Access to quality maternal health care service, access to finance, place of residence, level of education, economic conditions, and sociocultural norms;

all these factors at individual as well community level play a central role in determining the behaviour of the population to avail SBA services.

## **2.2 Associates of Skilled Birth Attendance**

There are numerous factors associated with the utilization of SBA across the globe. It is evident from literature that Studies conducted in different countries show that various socioeconomic, demographic, physical accessibility and community related factors influence women's decision to avail the services of skilled professional during delivery (Mekonnen, Lerebo, Gebrehiwot, & Abadura, 2015). However, it is pertinent to understand that these factors influence our variable interest not only at individual level but at community level too. It is therefore, important to develop and employ a wider lens of analysis to capture the aggregate effect of various factors on our variable of interest.

**Demographic Associates:** Literature review shows that the social and demographical associates are intertwined and there are few exceptions where these two aspects are independent. The demographical associates include age, gender, ethnicity, place of residence (urban or rural). Age of women is crucial in determining the utilization pattern of SBA. According to a study conducted in Bangladesh, women aged 26-34 are more likely to avail SBA service as against women 15-25 and above 35 years of age (Al Kibria, Ghosh, Hossen, Barsha, Sharmeen, & Uddin, 2017). However, the correlation of age with SBA service varies from country to country. A study in Kenya suggests that the proportion of women delivering under SBA was highest among women aged 20-24 (90%) followed by 25-29 (80%) and it was lowest among women aged 40-44 (Gitonga, 2017).

At community level, place of residence, concentration of media exposure, concentration of antenatal care and concentration of educated women have been found significantly associated with institutional delivery in case of developing country such as Bangladesh (T. M. Huda, M. Chowdhury, S. El Arifeen, & M. J. Dibley, 2019)

The uptake of SBA is affected by antenatal care (ANC) visits during pregnancy. The DHS survey conducted in Pakistan in 2017-18 reveals that women who had four or more ANC visit are three times more likely to be attended by skilled attendant (National Institute of Population Studies - NIPS/Pakistan & ICF, 2019).

Certain other factors such as; older maternal age, large family size and maternal occupation favour the uptake of SBA (Pongpanich et al., 2016).

**Socioeconomic Associates:** Socioeconomic factors play a vital role in shaping the health seeking behaviour of the population and therefore, warrant special attention in the field of public health research. They key social and economic factors associated with SBA, according to literature, are; Education, place of residence, employment/income generation and wealth status. Other proximal variables affecting SBA include religion, culture and social norms of the area.

Education is one of the core associates of maternal health seeking behaviour. Jewkes in a paper argues that education confers social empowerment via social networks, self-confidence, and an ability to use information and resource available in society (Jewkes, 2002). Social empowerment and ability to use information gives women exposure toward SBA utilization. Studies show that higher education level is consistently associated with high use of SBA(Afulani & Moyer, 2016). In some developing countries, even a low level of education brings in a huge attitudinal difference toward

SBA. Education of both the parents is equally critical in influencing utilization of SBA. Literature reveals that there is positive association between mother's education and utilization of SBA (Sk, Sk, Anand, & Biswas, 2017). Similarly, husband's education level also positively affects the uptake SBA (Al Kibria, Ghosh, Hossen, Barsha, Sharmeen, & Uddin, 2017). The positive association between parent's education and utilization of SBA is result of increased awareness and knowledge about the significance of the SBA at that the time delivery. Furthermore, education influence SBA through the stream of better employment opportunities, because high education level ultimately leads to highly paid jobs resulting in quality health care utilization. The positive and significant association of women educational status with the utilization of SBA is evident from other similar studies (Ameyaw & Dickson, 2020)

Economic empowerment of women has been found positively associated with the used of SBA in many countries. Women empowerment is associated with better health outcomes and includes women decision making in household matters and control over economic resource (Kwagala, Nankinga, Wandera, Ndugga, & Kabagenyi, 2016). SBA is also positively correlated with wealth status of the household, as suggested by literature. A study conducted across 46 countries in 2013 concludes that the coverage of SBA shows pro-rich pattern in all the selected countries (Wong, Restrepo-Méndez, Barros, & Victora, 2017). The PDHS report shows that wealth quintile is an important factor associated with skilled delivery assistance, with remarkable gap between births at lowest quintile (46%) and those in the highest quintile '93%' (National Institute of Population Studies - NIPS/Pakistan & ICF, 2019). Women empowered to take their own health decisions are more likely to give birth at health facility in the presence of



skilled professional as compared to those who do not have such autonomy (Ameyaw, Tanle, Kissah-Korsah, & Amo-Adjei, 2016).

Place of residence also plays a pivotal role in determining the utilization of SBA. In developing countries like Pakistan, the rural and urban divide is prominent and in fact the major chunk of the Pakistan's population lives in rural areas. It has generally been observed that urbanization leads to increased uptake of SBA. The observed rural-urban differential in healthcare utilization is primarily because of the concentration of infrastructure and personnel in urban areas (Tey & Lai, 2013). Moreover, rural areas also lack in other social interventions and infrastructures such schools and other awareness opportunities. This also push the rural communities away from availing SBA services even when such facilities are present. In Pakistan 83% and 63% of the deliveries are handled by skilled birth attendants in urban and rural areas, PDHS 2018 reports (National Institute of Population Studies - NIPS/Pakistan & ICF, 2019). The fact that urbanites utilize the SBA service more than rural communities is corroborated by another study conducted in Ethiopia. The study reveals that in Ethiopia, 43% women use skilled birth attendance as compared to 13% of rural women (Tadese & Ali, 2014). In a similar conducted in south east Ethiopia indicates that women living in urban areas are 4.74 times more likely to be assisted by skilled assistant as compared to rural respondents (Ayele, Melku, & Belda, 2019).

Means of transport has very crucial role in the utilization of SBA in the developing countries. In most of the developing countries people live in rural areas with compromised transport system due low social and economic status. The longer distance to health facility and absence of proper transport system leads to challenging circumstances both for the providers and the service seekers. Distance to health facility

with its associated cost and time along with poor transport system by extension influence the decision to deliver through a skilled attendant at the facility or not (Gitonga, 2017). Frail transport system coupled with low socioeconomic status always leads to relying on traditional birth and unskilled birth attendants resulting in complications. Access to transport is an important factor in ensuring utilization of SBA and lack of such facility is one of the common barriers to SBA in Low income countries (Lerberg, Sundby, Jammeh, & Fretheim, 2014). Some studies conducted in rural setting of developing countries have revealed that some women even deliver babies enroute because of poor road conditions, distance to health facility and inadequate transportation service (Onta et al., 2014). The fear of travelling often leads to availing services of unskilled attendants at home resulting in complication. Similarly, other studies conducted in Bangladesh and China substantiate this assertion that distance to health facility and poor transport act as barrier to the uptake of SBA (Edmonds, Paul, & Sibley, 2012). Moreover, in some places the combined effect of high transport cost and long distances greatly influence the utilization of skilled assistance at time of delivery. The cost of transport and estimated distance to the health facility are inversely related women preference to visit health facility to avail the services of health professionals (Ngowi, Kamazima, Kibusi, Gesase, & Bali, 2017).

Impact of exposure to media is an important correlate of SBA in developing countries. Review of literature reveals that the health promoting effects of mass media are transmitted through awareness and increased knowledge about maternal health care utilization (Asp, Pettersson, Sandberg, Kabakyenga, & Agardh, 2014). Similarly, birth order also has remarkable impact on the skilled birth attendance of women. In Pakistan, 81% of the first birth are attended by skilled professional and 54% of sixth or high order

birth are reported to be delivered by skilled attendant (National Institute of Population Studies - NIPS/Pakistan & ICF, 2019). A similar study conducted in Ghana suggest that parity, where women with two births, three births and four births are less likely to utilize SBA than first birth, substantiating the assertion that birth order has correlation with skilled birth attendance service.

Mass media campaign increase awareness about maternal and child health by broadcasting necessary information related to pregnancy, delivery complications and postnatal care. Various studies suggest that media can bring about healthy behavioural changes by regularly broadcasting public service announcement and commercials that give information about the significance of skilled assistance during delivery and promoting social action by generating connectedness within families and communities (Fatema, K & Lariscy, 2020). The importance of media exposure, among other socioeconomic factors, as a key determinant of SBA has also been highlighted in other comparable literature (Karim & Rezaul, 2020).

**Other associates:** Certain other factors responsible for influencing the uptake of SBA include birth order and Gender Based Violence (GBV). Gender-based violence, also termed as Intimate partner violence (IPV) and its association with SBA has been studied by different researchers with mixed results. A study done in Nigeria concludes that women how have ever experienced emotional violence, which is a form of GBV, are 27% less likely to utilized skilled assistance during delivery (B. L. Solanke, 2014). In developing countries, the impact of IPV on SBA and antenatal care is high but understudied. For example, a research conducted in Nepal shows a negative relation between ANC and IPV(J. K. Singh, Evans-Lacko, Acharya, Kadel, & Gautam, 2018). It is evident from research that women who had at least four ANC visit are more likely

to avail SBA service thus complementing the fact that decreased ANC visit due to IPV lead to less utilization of SBA.

### **2.3 Literature Gaps in Pakistan's context**

Review of the literature shows a number studies on maternal health seeking behaviour that have been conducted in the context of Pakistan (Agha & Carton, 2011; Pongpanich et al., 2016). However, these studies have either have been conducted at subnational level without considering national aspects or have concentrated on institutional delivery services (Agha & Carton, 2011; Pongpanich et al., 2016). Furthermore, earlier studies in Pakistan have analysed household characteristics only without considering community attributes. These gaps, therefore, necessitate a comprehensive analysis of socioeconomic factors associated with SBA at individual and community level by using nationally representative data. Inclusion of community level factors not only give a new insight to factors associated with SBA at individual and community level but also give a new dimension of analysis for the prospective researchers.

## CHAPTER 3

### DATA AND METHODOLOGY

This study warrants a well-balanced methodology to achieve the research objective as well as to identify different channels through which the socioeconomic associates shape the outcome variable.

#### 3.1 Data source and sample size

The data used in this study comes from Pakistan Demographic and Health Survey 2017-18 conducted by National Institute of Population Studies (NIPS) with technical support from Inner City Fund (ICF) and Pakistan bureau of Statistics (PBS). PDHS 2018 is a nationally representative data collected from four provinces in addition to GB and AJK; ICT and FATA using stratified two stage sample design. Sixteen sample strata were created by dividing each of the eight regions in to urban and rural areas. In the first stage 540 clusters were randomly selected. The second stage involved a systematic sampling of households where, 28 household per cluster were selected. By employing equal probability systematic selection process, a sample size of 16240 were selected. However, due to some inherent challenges in data collection 15661 household were included in the survey.

Sample size of 6711 of married women with at least one live born child from 458 PUSs is selected for this study. To avoid biasedness in the data analysis *women with no children* and *women belonging to AJK and Gilgit Baltistan* have been dropped from the secondary data source.

#### 3.2 Rationale for Multilevel analysis

Multilevel analysis is modelling technique that take contextual factors into account to identify the neighbourhood effects on outcome variables. This type of analysis is used

when the data has nested nature, or the data structure follows hierarchical pattern. Multi-level analysis is important because not all the variation in outcome variables are explained by individual level exposure factors; the variation may also be caused by community/contextual level factors e.g. community level education or community level poverty. Various contemporary studies suggest that contextual factors the key players in the shaping outcome variables including health outcome such as maternal health care utilization. For example a research in Africa shows that poor mothers living in communities with high literacy rate are more likely to use maternal health service than their counterparts who live in low educated communities (McTavish, Moore, Harper, & Lynch, 2010).

Contextual factors are usually hidden in large scale multistage surveys such as DHS. The data collected by DHS follows stage sampling. The first stage ascertains clusters and in the second stage systematic sampling is done for household. The multistage sampling nature of DHS, therefore, lends itself to multi-level technique to capture the true effect of individual and as well contextual/community/neighbourhood level variables.

### **3.3 Variables**

#### **3.3.1 Outcome variable**

The outcome variable dichotomous in nature with responses; whether a woman had given birth in the presence of skilled attendants or not. Yes =1 and No=0.

#### **3.3.2 Exposure variables**

Exposure variables in this study have two layers. The first layer consists of individual/household level variable whereas, the second layer discusses community

level variable. The construction and measurement methods of these variable are discussed below in detail.

### **3.3.3 Individual Level variables.**

#### **a) Maternal Education level.**

Educational level of mother is one of the strong associates of SBA and it positively affects health seeking behaviour individual. Education level of mothers have been constructed using PDHS 2017-18, with four categories i.e. no education, primary, secondary and higher.

#### **c) Employment Status of respondent.**

Employment status of the respondent is a categorical variable with either women employed or unemployed. For this study, the variable has been borrowed from PDHS after recoding it as per the research requirement.

#### **d) Exposure to media.**

Access to mass media such as newspaper, TV and radio has very significant role in impacting the uptake of SBA. The variable is categorical in nature with respondent either exposed or not exposed to media. It has been constructed by taking in to account the different modes of media components such as frequency of listening to Radio, frequency of reading newspaper and frequency of watching TV.

#### **e) Wealth Index.**

The wealth index given in the PDHS has been re-coded by creating three categories i.e; poor, moderate and rich. Economic status of individual has very strong correlation with health seeking behaviour including SBA. Inclusion of this variable, therefore, substantiate this assertion with respect to Pakistan.

f) **Birth Order.**

There is evidence that parity or birth order has a correlation with the utilization of SBA. For the purpose of this study the variable has been categorized into 1 birth, 2 births, 3 births and 4 or higher births.

g) **Means of Transport.**

Means of transport has a very strong correlation with SBA use, especially in the rural setting of the developing countries, because rural settings are generally lack standard health care service. Means of transport, therefore, has a significance in drawing correlation with SBA. Four categories have been constructed out of the data given in PDHS 2017-18 and these include, *no transport*, *transport by Bicycle*, *transport by Motorcycle or Scooter* and the last category is *Car or truck*.

h) **Women Participation in decision making.**

Health decision-making of women and its positive impact on health seeking behaviour has been studied in numerous research studies. Based on the existing literature this variable has included in this research. The variable “healthcare decision of women” has been constructed as binary variable, i.e; “Male dominated” “Not male dominated” using the data in PDHS 2017-18.

### **3.3.4 Community level variables.**

Several contextual associates have been clumped together from the secondary data source to analyse the socioeconomic and demographic factor that influence SBA in a given community. The DHS community indicator were generated by aggregating individual level survey responses to the Primary sampling unit (PSU). The method of combining individual data to formulate group variable is an established practice to measure higher level constructs.(Snijders, Bosker, & Modeling, 1999).



To capture the behaviour of variables at higher level, variables are created at community level. Since DHS data is hierarchical in nature, the community level formulation of variable is comparable to the DHS cluster or PSU. The construction of community variables and their measurement is explained below.

**a). Community level female Literacy.**

This indicator offers a comprehensive information about female literacy level in a given community. This variable was created by aggregating the selected attributes at cluster level followed by segregation into appropriate categories. In case of female literacy, female “*who can read and write a sentence*” has been selected at PSU level and then categorizing in to “low” “medium” and “high” proportion of literacy in a community.

**b). Community Level Poverty.**

The behaviour of individual is impacted by the common characteristics prevailing in a given community. Studies indicate that high concentration of wealthier households in a community positively affects the utilization of SBA and consequently availing SBA becomes a norm such community (T. M. Huda, M. Chowdhury, S. El Arifeen, & M. J. J. P. o. Dibley, 2019). Likewise, if a community has high concentration of poverty resident in such community have low tendency to utilize SBA service. For this research, community level poverty has been created by aggregating the individual respondent data at PSU level and then categorizing it in to “low”, “medium” and “higher” level of poverty in a community.

**c). Community perception of distance to facility.**

Distance to health facility is one of the key factors affecting the update of SBA particularly in the low-income countries. Studies show 75% of deliveries were conducted by skilled assistants where the distance to health facility was 1-3km as

compared to 30% deliveries conducted by skilled professionals in areas where women live at a distance of at least 4km from the health facility (Saaka & Akuamoah-Boateng, 2020). In this study community perception about distance to health facility means *the proportion of respondents who perceive distance to health facility as big problem*.

**d) Place of residence.**

There is huge disparity in the health seeking behaviour among respondent who live in rural or urban settings. Rural areas have more challenges in terms of accessing quality healthcare services and by extension women living in rural areas or less likely to avail SBA service than their urban counterparts. Rural women in general have least tendency to avail SBA, at least in the developing countries because of resource constrains, poor health infrastructure, distance to health facilities and poor transportation system. In the context of Pakistan this variable has high significance as major chunk of the population reside in the rural areas. For this study place of residence (Rural/Urban) has been directly derived from DHS data set without any modification as this variable represent community level response for the respondents.

### **3.4 Methodology**

#### **3.4.1 Unit of analysis**

Unit of analysis, in multilevel analysis, are generally individuals nested within aggregated units at higher level (Berelie, Tesfa, & Bayko, 2019). Therefore, individual is treated as unit of analysis in this study.

#### **3.4.2 Estimation technique**

This study employs multilevel analysis taking individual and community level into account in order to measure the effect of the two-level exposure variables on the dichotomous outcome variable; whether respondents utilize skilled birth attendance =1

and “not utilised skilled assistance =0. Given the nature of the outcome variable and type of analysis proposed, this study resorts to Multilevel Logistic regression method.

The following steps are followed;

**I. Null model.**

Null model is established as the first step of the estimation process. It contains only intercept and none of the predictor variables as given below;

a. If there is no predictor at individual level

$$\text{logit}(Y_{ij}) = \left[ \frac{\theta_{ij}}{1-\theta_{ij}} \right] = \beta_{0j} + r_{ij} \quad (3.1)$$

b. Similarly, if there is no predictor at community level

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad (3.2)$$

Substituting equation 2 in 1

$$\text{logit}(Y_{ij}) = \left[ \frac{\theta_{ij}}{1-\theta_{ij}} \right] = \gamma_{00} + u_{0j} + r_{ij} \quad (3.3.)$$

Where;

$\theta_{ij}$  = probability of utilizing skilled birth attendance.

$Y_{ij}$  = dependent variable (whether respondents utilize skilled assistance during delivery = 1)

$\beta_{0j}$  = mean outcome for community j

$r_{ij}$  = level 1 random error; assumed to be normally distributed

$\gamma_{00}$  = grand mean

$u_{0j}$  = is the random effect associated with community j; normally distributed.

Null model is used to see if the grouping variable at level 2 significantly affects the intercept (mean) of the dependent variable at level 1. It also serves as benchmark to compare with other models.

Next, we calculated interclass correlation (ICC) because the equation 3 doesn't explain the variance in Y.

$$ICC_{logit} = \rho = \pi_{00}/(\pi_{00} + \frac{\pi^2}{3}) \quad (3.4)$$

ICC is the variance in outcome variable explained by level 2 (community). A significant ICC justifies the application of multilevel analysis. In other words, if ICC is more than 50% then there exists a moderate community level impact and thus application of multilevel modelling is justified. However, if it close to "0" then ICC is insignificant, hence no multilevel modelling is needed.

## II. Individual level model (Level 1)

$$logit(Y_{ij}) = \left[ \frac{\theta_{ij}}{1-\theta_{ij}} \right] = \beta_{0j} + \beta_{1j}X_{ij} + r_{ij} \quad (3.5)$$

Where;

$Y_{ij}$  = dependent variable measured for  $i$ th level-1 unit nested within the  $j$ th level-2 unit

$X_{ij}$  = value on the level-1 predictor (individual level predictor in  $j$  community)

$\beta_{0j}$  = intercept for the  $j$ th level-2 unit,

$\beta_{1j}$  = regression coefficient associated with  $X_{ij}$  for the  $j$ th

level-2 unit and

$r_{ij}$  = random error associated with the  $i$ th level-1 unit nested within the  $j$ th level-2 unit.

## III. Community level model (Level 2)

At community level, the coefficient of level 1 serve as dependent variable;

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_j + U_{0j}. \quad (3.6)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}Z_j + U_{1j}. \quad (3.7)$$

Where,

$\beta_{0j}$  = intercept for  $j$ th community

$\beta_{1j}$  = slope for  $j$ th community

$Z_j$  = Level 2 predictor in  $j$ th community

$\gamma_{00}$  = Over all mean intercept adjusted for Z

$\gamma_{10}$  = Over all mean intercept adjusted for Z

$\gamma_{01}$  = Regression coefficient of Z relative to level 1 intercept

$\gamma_{01}$  = Regression coefficient of Z relative to level 1 slope

$U_{0j}$  and  $U_{1j}$  are random effects of  $j$ th level 2 unit adjusted for  $X_{ij}$ .

#### IV. Combined model (Individual and Community level)

$$\text{logit}(Y_{ij}) = \left[ \frac{\theta_{ij}}{1-\theta_{ij}} \right] = \gamma_{00} + \gamma_{10}X_{ij} + \gamma_{01}Z_j + \gamma_{11}Z_jX_{ij} + U_{1j}X_{ij} + U_{0j} + r_{ij} \quad (3.8)$$

By substituting equation (6) and (7) in equation (5) we get Combined models. This model includes all the level 1 and level 2 predictors ( $X_{ij}$  and  $Z_j$ ), cross level term ( $Z_jX_{ij}$ ) and the combined error term ( $U_{1j}X_{ij} + U_{0j} + r_{ij}$ ). It is also called to mixed model as it is composed of fixed and random effects.

Equation (8) shows only one variable for each level, however, this model will be extended by including all the variables of interest while performing data analysis in the STATA 15.0.

Variance Inflation factor (VIF) analysis is run to check multicollinearity in the model. If the mean VIF score is <5 the variables are presumed having no multicollinearity, however, if the VIF is between 5-10, multicollinearity exists, and the model is needs readjustment. Similarly, to verify if the fitted models have statistical significance this study employs Wald  $X^2$  test. If the  $P < 0.05$ , models are considered to have statistical significance and if the  $p > 0.05$  the models are not significant.

For the analysis and comparison of odd ratio of the three models i.e Model 1, Model 2, and Model 3, reference categories are used. In STATA software, the first category is selected as reference category by default and the values for this category are naturally omitted by the software. Odd ratio of the reference category is assigned value 1 as base level and based on this value the rest of categories for each variable are analysed and discussed. Additionally, comparison of odd ratio is drawn by the percentage increase or decrease in the categories of the variable. Given the base level as 1, odd ratio is converted to percentage increase or decrease using relationship:

$$(OR-1) \times 100 \dots\dots\dots (A)$$

Where, OR = Odd ratio,

1 = is the base level value of the reference category.

If  $OR > 1$ ; = there is a percentage increase &

if  $OR < 1$ , there is a percentage decrease.

### **3.5 Ethical Approval**

The secondary data taken from DHS is being used in this research. No ethical approval is need at this stage as the DHS data has already been approved by the government of Pakistan.

## **CHAPTER 4**

### **DATA ANALYSIS**

#### **Descriptive analysis of Skilled Birth Attendance and its associated individual and community level factors**

This chapter describes the results of data analyses to establish the hypothesized link between uptake of SBA and its determinants both at individual and community level. The chapter has two parts. The first part describes descriptive results for the uptake of SBA and its associates, and the second part discusses the results logistic regression by employing multilevel technique.

#### **4.1 Background characteristics of the sample size.**

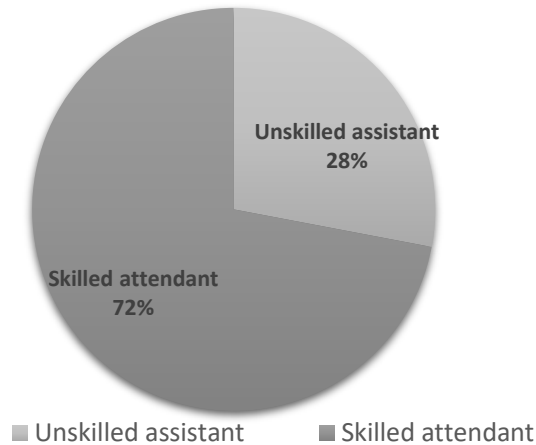
From the selected sample size, 85% women are unemployed, 23% of the women fall within age bracket of 15-24, 55% fall within 25-34, 19% fall within 35 and above. Mothers educational level has been categorized in to four levels. 47% of the mothers have no education, 16% have primary education, 22% and 13% have secondary and higher education respectively. Data regarding exposure to media shows that 50.5% women have exposure media which includes newspaper, listening to radio and watching television. In terms of birth order, 20% women have one birth, 21% have 2 births, 17% women have 3 births and women with fourth births are 41.8%. In the selected sample size, regarding the means of transport, 37% are without transport, 5.9% have bicycle, 47.9% have facility of Motorcycle/scooter and 9.1% of the respondent have the facility of car/truck. The background of the study population further reveals that 54.5% of the women are male dominated whereas, 45.5 are not male dominated and have the freedom to take their own decisions. In terms of wealth status, 40.8%, 20.4% and 38.6% are categorized as poor, moderate, and rich respectively. Similarly,



the background characteristics of the population under study show that 57.5% women think that distance is not a problem for their health seeking behaviour and 47% of respondent consider distance as big problem. The concentration of population in rural areas is higher (66%) than in urban areas. The percentage of literacy at community level reflects that 25.9 live in communities with low proportion of literacy, 34% in communities with medium proportion of literacy and 39% live in communities with high proportion of literacy. Similarly, the community level poverty distribution shows that 44.4% women live in communities with low proportion of poverty, 20.3% in communities with moderated poverty level and 32.2% reside in communities with high proportion of poverty. Detail about the background characteristics is given in the appendix-A.

#### **4.2 Skilled Birth Attendance**

WHO defines skill birth attendance as” child delivery attended by accredited professional such as Doctor, Nurse, Midwife who has been trained to proficiency in skills needed to manage normal pregnancies, child birth and the immediate postnatal period and identification, management and referral of complication in women and new born. (Organization, 2004). Finding of this study show that the 28% of the deliveries are still happen without skilled attendants.



**Fig 4.1:** Percentage distribution of SBA

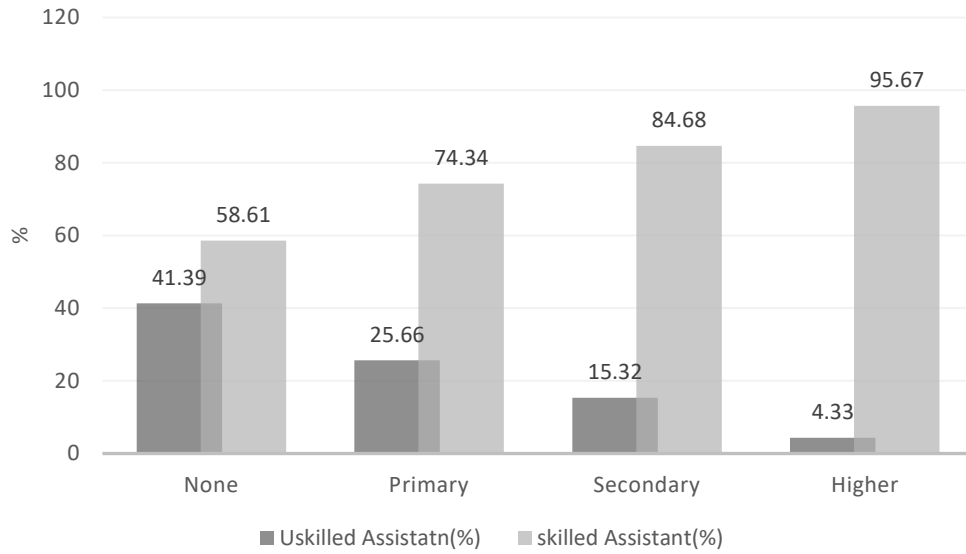
### **4.3 Factors affecting Skilled Birth Attendance.**

Various socioeconomic demographic and cultural agents at individual and community level affect the uptake of SBA in the developing countries like Pakistan (Kitui, Lewis, Davey, & childbirth, 2013). To substantiate this assertion the current study explores the attribution of these factors by analysing the relevant secondary data from PDHS 2107.

### **4.4 Univariate analysis of Individual level factors**

#### **4.4.1 Skilled Birth Attendance by Mother's Educational Level.**

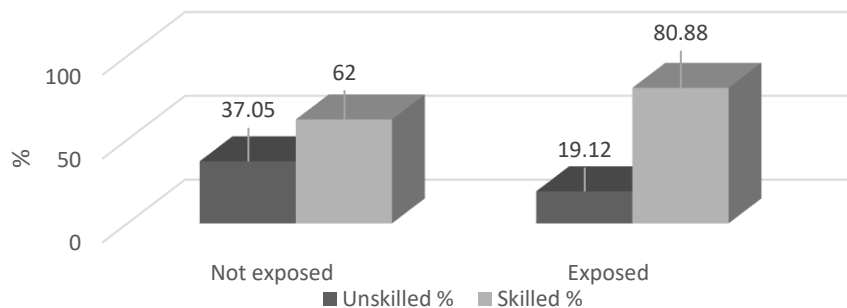
This study reveals that there a positive and strong correlation between uptake of SBA and mother's educational level. The uptake of SBA increases from 58.6% to 74.3%, 84.6% and 95.6% as mother's educational level increase from none to primary, secondary and higher, respectively. This finding is in conformity with other studies that show that a positive and strong correlation between educational level and the utilization of SBA (Gitimu et al., 2015).



**Fig 4.2:** Percentage of Skilled and Unskilled Attendance by Mothers Educational Level.

#### 4.4.2 Skilled Birth Attendance by Media exposure

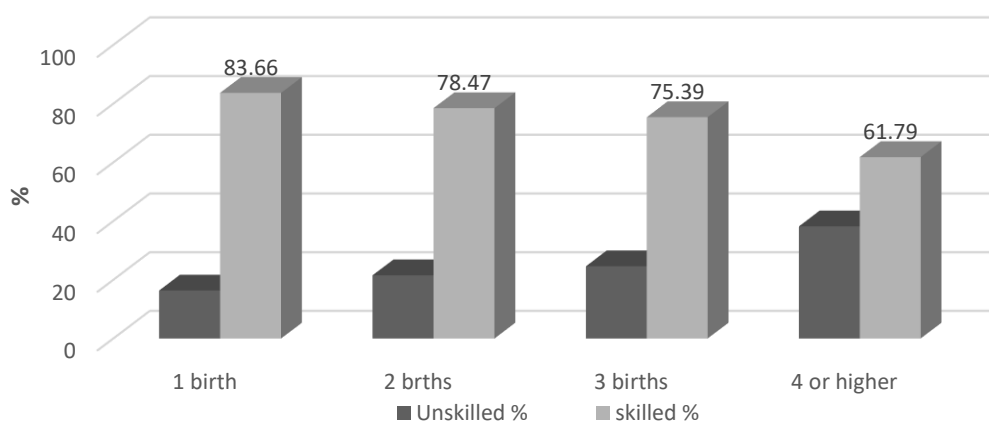
Result of the current study show that exposure to media has strong influence on the tendency of SBA. The percentage of availing SBA service is 62% and 88.8% for women who are not exposed to media sources and those have exposure to media respectively (Fig;4.3). These findings are in agreement with other comparable literature(Al Kibria, Ghosh, Hossen, Barsha, Sharmeen, Uddin, et al., 2017).



**Fig.4.3:** Percentage of Skilled and Unskilled attendant by Media exposure

### 4.4.3 Birth order and Skilled Birth Attendance

In this study birth order has been divided into four categories i.e., women having 1 birth, 2 births, 3 births and 4 births or higher. Results indicate that uptake of SBA shows a decreasing trend as the order of birth increases.



**Fig 4.4:** Percentage of SBA by Birth Order

The inverse relation between uptake of SBA and birth order could be due to the perception of experience on the part of Multiparous women and such women are more likely to avail unskilled birth attendants as well (Amoakoh-Coleman et al., 2015).

### 4.4.4 Percentage of Skilled Birth Attendance by Means of transport

Transport is one of the key factors impacting utilization of SBA. Different means of transport are used in different geographic settings and the availability of each mode has different effects on the uptake of SBA. In this study, the association between various means of transport and uptake of SBA has produced mixed results, i.e. the proportion of respondents having no transport is 68% whereas, for those with bicycles is 60%. The reason for this difference is that a bicycle is not a feasible option to transport a pregnant

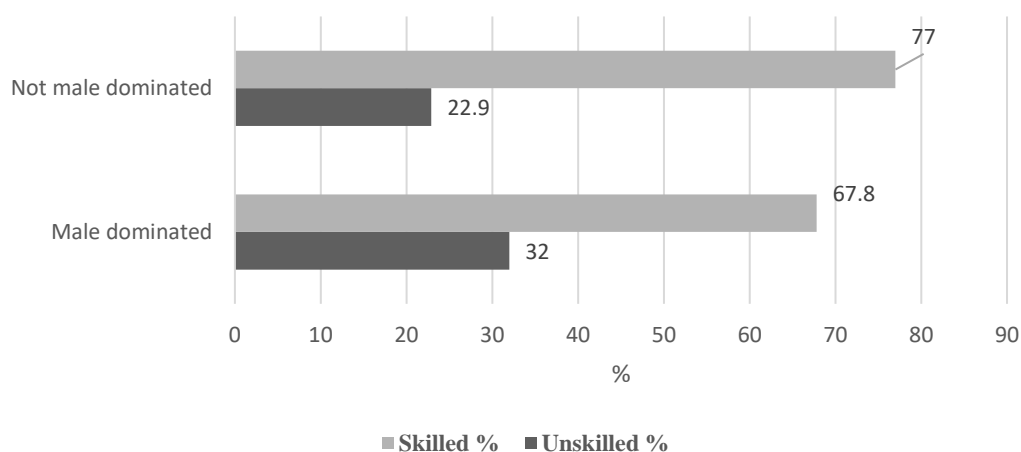
woman as it entails high health risk (Ayele et al., 2019). Similarly, for respondents who own or can avail facility of Car/truck and Motorcycle/scooter the proportion of utilizing SBA is 85.1% and 73.8% respectively (**Table4.1**).

**Table 4.1:** Percentage of Skilled and Unskilled Attendance by Means of Transport.

Means of Transport	Unskilled (%)	Skilled (%)
No Transport	31.79	68
Cycle	39.3	60.6
Motorcycle/Scooter	26.1	73.8
Car/Truck	14.87	85.1
<i>Pearson chi2(3) = 86.6936 Pr = 0.000</i>		

#### 4.4.5 Proportion of utilizing Skilled Birth Attendance by Male dominated vs Not-male dominated women.

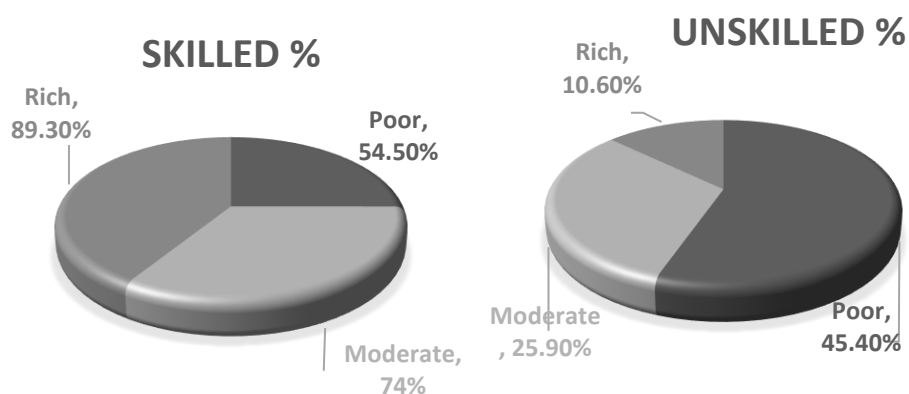
The descriptive results of the current study depict that the SBA uptake is 70% in women who are not dominated by their male partners as against 67% uptake of SBA in women who are dominated by their partners (Fig 4.5).



**Fig 4.5:** Percentage of SBA by Female Autonomy

#### 4.4.6 Percentage distribution of Skilled Birth Attendance by household wealth

The bivariate analysis in this study shows that there is a strong positive association between the wealth household wealth status and uptake of SBA. The proportion of rich, moderate and poor households using SBA service is 89.3%, 74% and 54.7% respectively whereas in case of unskilled attendance, rich households are less likely to avail unskilled attendant i.e.10.6% as compared their poor counterparts i.e. 45% (Fig 4.6).



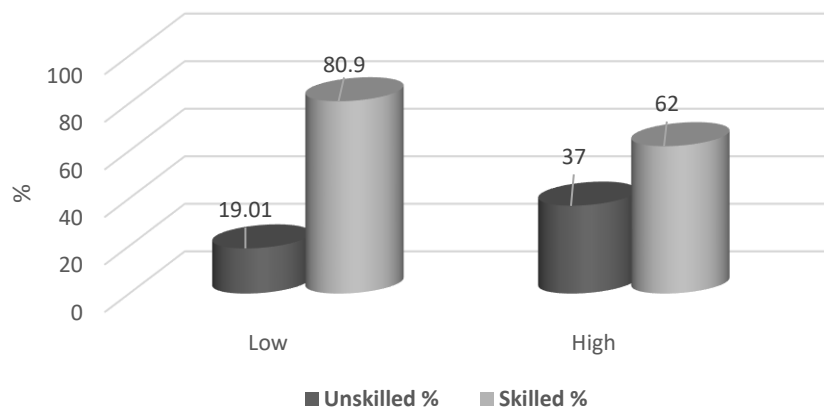
**Fig: 4.6:** Percentage of Skilled and Unskilled attendance by wealth status.

Households in rich quintiles have enough resources and by extension have access to quality health service, SBA being one of them. Relevant literature show that the rate of SBA is lowest for households in the lowe wealth quintile and vice versa (Yaya, Bishwajit, & Shah, 2016).

## 4.5 Univariate analysis Community level factors

### 4.5.1 Community perception of distance to health facility

The findings of this study reflect a negative association between proportion of women who perceive distance to health facility as a big problem and SBA. The percentage of SBA is 80.9% for the proportion respondents who do not perceive distance to health facility a big problem and 62% for those who perceive it to be a big problem. Similarly, availing unskilled attendant is low i.e; 19% for the proportion of respondent who do not perceive distance to health facility a big problem (Fig 4.7)

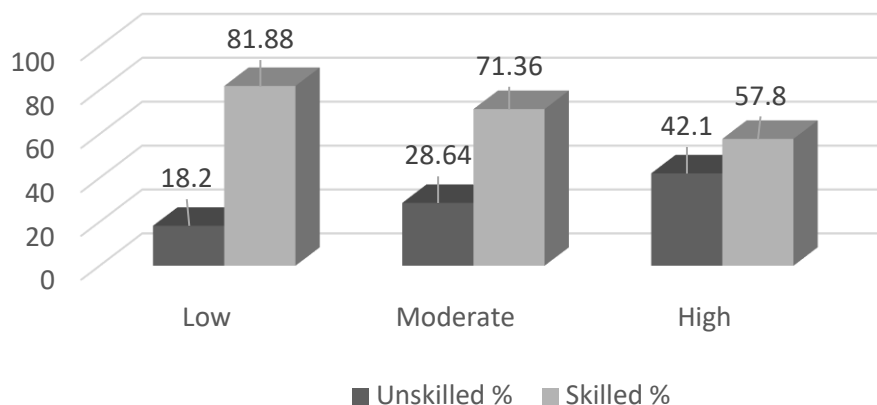


**Fig: 4.7.** Percentage of SBA by Community perception of distance to facility

### 4.5.2 Community Poverty level and Skilled Birth Attendance

The percentage of respondent living in a community with low proportion of poverty are more likely to avail SBA services than those who live in a community with high proportion of poverty (B. L. Solanke, Rahman, & childbirth, 2018). Findings of this study show that uptake of SBA is 81.88% in less poor community in comparison to 57.8% of SBA in communities with high proportion of poverty. Similarly, the

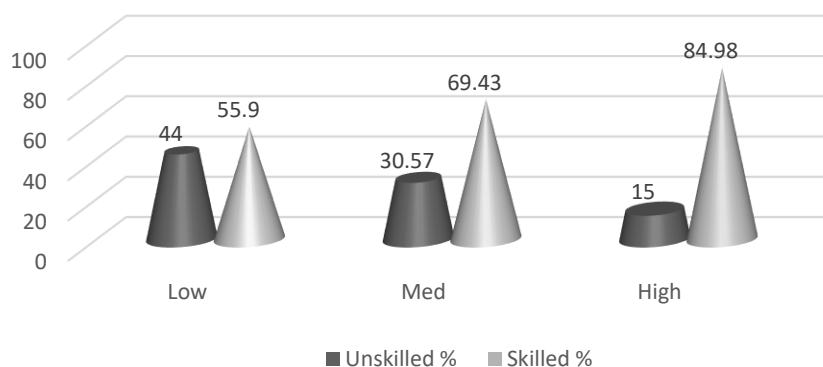
percentage of SBA in low less poor community is 18.2% as compared to 42.1% with high community poverty level (Fig4.9).



**Fig.4.8:** Percentage of SBA by Community level Poverty

#### 4.5.3 Community Literacy level and Skilled Birth Attendance

The community female literacy level has a significant influence on the health seeking behaviour of the individual living in that community. Women living in Community with high proportion literacy are more likely to utilize services of SBA than those who live in community with low proportion of literacy (Tanvir M Huda et al., 2019). The univariate analyses of the data in this study also reflect similar trends. In a community with high proportion of female literacy the percentage of SBA is 84.9% and as the proportion of literacy drops the percentage of SBA also drops accordingly (Fig 4.9)

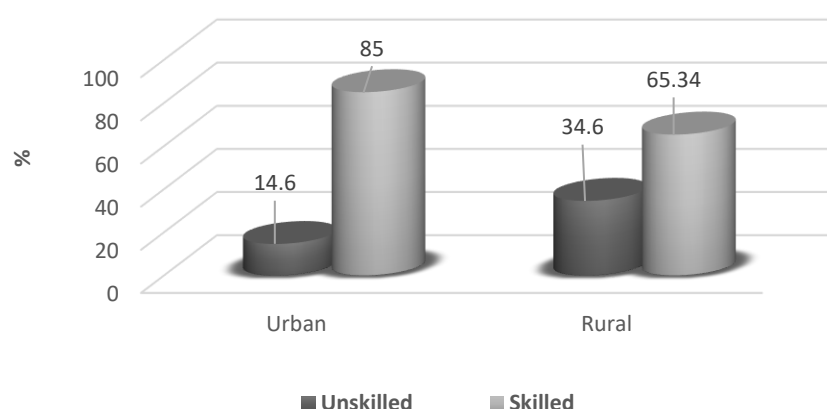


**Fig 4.9:** Community literacy rate and SBA



#### 4.5.4 Percentage distribution of Skilled Birth Attendance by Place of residence

The urban and rural divide of population in Pakistan is 32.5% and 67% (PBS 2018). Rural population faces a number of health challenges, and the uptake of SBA is one of them. Place of residence i.e., Urban or Rural was, therefore, added in this study as determining factor of SBA.



**Fig 4.10:** Percentage of SBA by place of residence

According to this study in rural areas 65.34% births are attended by SBA whereas, in Urban setting it is 85% (Fig 4.10). Urban areas have better health facilities, efficient transport system and adequate health professionals to cater the health needs of the population.

#### 4.6 Conclusion

This chapter described the descriptive statistics of the association between percentage of Skilled Birth Attendance (SBA) uptake and its socioeconomic determinants at individual and community level. SBA was calculated by using data for respondents who had at least one birth while data pertaining to women who had no birth were dropped. The output of univariate analyses was well in agreement with the findings of

the relevant literature. At individual level SBA was positively associated with educational level of mothers, media exposure and individual wealth status. The results further showed that respondents who own car or truck have more tendency to avail SBA services than motorcycle/scooter or no transport. The association between SBA and birth order was interesting yet in conformity with other literature. Results reflect that as the birth order increases the tendency to avail SBA service recedes primarily because of the perception of experience of pregnancy. The descriptive results also address the community level variables and show that there is positive association between uptake of SBA and proportion of poverty i.e, high proportion of poverty leads to low uptake to SBA and vice versa. Moreover, at the community level, the findings indicate that the percentage of SBA is high for respondents who consider distance to facility not a problem than those who perceive distance to health facility a problem. Similarly, the community literacy rate is positively associated with SBA, i.e; SBA is high in a community where the proportion of female literacy is high than those where the proportion is low. Likewise, respondents who fall in high proportion of poverty are less likely to utilize SBA services as compared to the those who are in the low proportion of poverty.

## CHAPTER 5

### DATA ANALYSIS

#### **Bivariate and Multivariate analyses of Skilled Birth Attendance and its individual and community level associates**

This chapter inform the reader about the results of logistic regression both in terms of bivariate and multivariate perspective. This chapter has been split up to two sections. The first part discusses results of the bivariate analyses, and the second part of the chapter describes the results of the multivariate analysis. The multivariate analyses include application of multilevel modelling and employs multilevel logistic regression technique for this purpose.

#### **5.1 Bivariate Analysis**

Unadjusted logistic regression is run in the first phase, and it allows us to analyse association between the outcome variable and a single exposure variable. In this study this technique is used to check the relation between SBA and each individual dependent variable. SBA has been constructed as binary variable i.e, respondents availing SBA service indicated as Yes=1, and respondents not availing the service is indicated as No=0. The coefficients measure the strength of each categorical variable in relation to the percentage of SBA. Signs of the coefficient reflect positive or inverse relationship of each variable with SBA. Moreover, the bivariate outcomes are well aligned with the univariate results which attests to the consistency of the result in univariate and bivariate analyses.

Table 5 presents proportion of SBA and bivariate association with our variable of interest. Employment status is negatively and significantly associated with the uptake

of SBA ( $\beta = -0.4016$ ; C.I = -0.620, 0.183). Unemployed women were more likely to avail SBA than the employed women.

Mothers' education level and uptake of SBA are positively associated with high statistical significance. The proportion of SBA service increases progressively with an increase in the mothers' educational level i.e. primary: ( $\beta= 0.715$ , C.I=0.476 - 0.954) and secondary: ( $\beta=1.361$ , C.I= 1.077, 1.646). Similarly, media exposure was positively and significantly associated with the percentage usage of SBA with respondent exposed to media more likely to avail SBA services than those not exposed to media (80.9% vs 62.9%). Birth order and the proportion of SBA was negatively and associated with high statistical significance. The percentage usage of SBA decreased with increase in the number of births i.e; 1birth (%SBA=83.6), 2 births (%SBA=78.8%,  $\beta= -0.339$ , C.I=0.595, -0.083), 3births (%SBA =75.3,  $\beta=-0.513$ , C.I=-0.771, -0.254) and 4 birth (%SBA=61.7,  $\beta= -1.152$ , C.I= -1.378 , -0.925).

**Table 5.1:** Odds ratio of unadjusted binary logistic regression showing fixed effects on the likelihood of skilled assistance during delivery.

<b>Characteristics</b>	<b>SBA %</b>	<b>Coefficient</b>	<b>Confidence Interval (CI)</b> <b>95%</b>
<b>Employment Status</b>			
• Unemployed <sup>RC</sup>	73	-	-
• Employed	64	0.4016***	-0.620 0.183
<b>Mothers Education</b>			
• None <sup>RC</sup>	58.6	-	-
• Primary	74.3	0.715***	0.476 0.954
• Secondary	84.6	1.361***	1.077 1.646
• Higher	95.6	2.746***	2.302 3.190
<b>Exposure to Media</b>			
• Not Exposed <sup>RC</sup>	62.9	-	-
• Exposed	80.8	0.912***	0.712 1.112
<b>Birth Order</b>			
• 1 birth <sup>RC</sup>	83.6	-	-
• 2 births	78.4	-0.339***	-0.595 -0.083
• 3 births	75.3	-0.513***	-0.771 -0.254
• 4 or higher	61.7	-1.152***	-1.378 -0.925
<b>Means of transport.</b>			
• None <sup>RC</sup>	68.2	-	-
• Bicycle	60.6	-0.331**	-0.647 -0.015
• Motorcycle/scooter	73.8	0.274***	0.079 0.470
• Car/Truck	85.1	0.981***	0.626 1.335
<b>Health care decisions</b>			
• Male dominated <sup>RC</sup>	67.8	-	-
• Not Male dominated	77.0	0.4628***	0.297 0.628

(Continued) Table 5.1: Odds ratio of unadjusted binary logistic regression showing fixed effects on the likelihood of skilled assistance during delivery.

Characteristics	SBA %	Coefficient	Confidence Interval (CI) 95%
<b>Wealth status</b>			
• Poor <sup>RC</sup>	54.5	-	-
• Moderate	74.0	0.865***	0.623 1.106
• Rich	89.3	1.942***	1.669 2.215
<b>Community Perception of distance</b>			
• Low <sup>RC</sup>	80.9	-	-
• High	62.0	-0.957***	-1.231 -0.683
<b>Community Poverty</b>			
• Low <sup>RC</sup>	81.8	-	-
• Moderate	71.3	-0.594***	-0.918 -0.272
• High	57.8	-1.192***	-1.515 -.8669
<b>Community Literacy</b>			
• Low <sup>RC</sup>	55.9	-	-
• Medium	69.4	0.582***	0.258 0.905
• High	84.9	1.494***	1.139 1.848
<b>Place of Residence</b>			
• Urban <sup>RC</sup>	85.2	-	-
• Rural	65.3	-1.119***	-1.402 -0.836
1. RC: Reference Category			
2. *** $p < .01$ , ** $p < .05$ , * $p < 0.1$			

The unadjusted logistic regression between SBA and means of transport showed mixed results (Table 5.1). The proportion of SBA for respondent with no transport is (68%), those with bicycle is (62%) is negative, whereas it is positive and significant for respondents with motorcycle/scooter and those with Car/Truck. However, the

proportion of SBA is highest (85%) for the respondents who have car or truck as a means of transport (table 5.1).

Male dominated women are less likely to avail SBA service than those who are not dominated by male in terms their decision on health seeking behavior i.e. 68.8% vs 77% (Table 5.1). Similarly, household wealth status is positively and significantly correlated with the assistance during delivery with uptake of SBA consistently increasing as the wealth status moves up from poor to moderate and rich (SBA=54%,: SBA=74%,  $\beta = 0.865$ , C.I =0.623, 1.106: SBA= 89%,  $\beta = 1.942$ , C.I = 1.669, 2.215).The community perception of distance to health facility is negative and statistically significant with the proportion of respondents who perceive distance to health facility 80.9% as against 62% for the proportion who perceive it distance to health facility a big problem. The association between community poverty level and the assistance during delivery is negative and statistically significant. Respondents living in Community with low proportion poverty are more likely to avail SBA services (80.9%) than the respondents who reside in community with high proportion of poverty (SBA=62%,

$\beta = -0.957$ , C.I= -1.231, -0.683). The relationship between community literacy level and assistance during deliver is positive and significant with highest proportion of SBA (84.9%) among respondent in communities with highest proportion of women who can read or write a complete sentence (Table 5.1). Likewise, the percentage of assistance during delivery was higher in urban areas (85.2%).

## **5.2 Multi-Level Logistic regression results**

### **5.2.1 Variance Inflation Factor**

Variance inflation factor (VIF) test is run before fitting the multilevel logistic models. VIF is calculated to ascertain presence of multicollinearity among the independent variables in a regression model. VIF test is mandatory to measure whether variables qualify to be included in the multilevel regression analysis. As a convention, if the VIF score is less than 5, the variables qualify to be part of the regression equation and the score is between 5 and 10, then the regression equation will not be correctly estimated (Akinwande, Dikko, & Samson, 2015). In this study the mean VIF score is 2.8 which indicates that there is no multicollinearity among independent variables. Moreover, this value also suggests that the existing variables are capable of correctly estimating the regression coefficients.

Results of the multilevel logistic regression are presented in two layers. The first part presents fixed effect, and the second part discusses random effect of the mixed effect model. Three models were constructed to capture the effect of 8 individual level and 4 community level dependent variables on the uptake of SBA.

### **5.2.2 Fixed Effects**

Fixed effects describe results of binary logistic regression showing fixed effects on the skilled birth assistance. Results are displayed in table 5.2 below.

The Wald  $X^2$  is a litmus test to confirm that if the fitted models have statistical significance. From the results it is clear that the fitted models were statistically significant as evidenced by the  $p < 0.000$  (Table 5.2). Table 5.2 further describes the results of multivariate analysis for 3 models which are described in detail in the



following paragraphs. The rest of the odd ratio of categories are then compared with the reference odd ratio.

**Table 5.2:** Odds ratio of adjusted binary logistic regression showing fixed effects on the likelihood of skilled assistance during delivery.

<b>Characteristics predicting Skilled Birth Assistance (SBA)</b>	<b>Model 1</b> (Wald $X^2$ =248: $p < 0.000$ )		<b>Model 2</b> (Wal $X^2$ =157: $p < 0.00$ )		<b>Model 3</b> (Wald $X^2$ =245 $p < 0.00$ )	
	OR	95% CI	OR	95% CI	OR	95% CI
<b>Employment status</b>						
• Unemployed <sup>RC</sup>	-	-	-	-	-	-
• Employed	0.920*	0.71, 1.19			0.89	0.69,1.16
<b>Mothers' Education</b>						
• None <sup>RC</sup>	-	-	-	-	-	-
• Primary	1.6**	1.29, 2.18			1.8**	1.36,2.32
• Secondary	2.0**	1.52, 2.65			2.3**	1.75,3.06
• Higher	6.9**	4.43,10.97			8.7**	5.52,13.8
<b>Exposure to media</b>						
• Not Exposed <sup>RC</sup>	-	-	-	-	-	-
• Exposed	1.19*	0.98,1.45			1.27*	1.04,1.55
<b>Birth Order</b>						
• 1 birth <sup>RC</sup>						
• 2 births	0.62**	0.46,0.82			0.6*	0.45,0.80
• 3 births	0.51**	0.38, 0.68			0.5**	0.37,0.66
• 4 or Higher	0.37**	0.28,0.490			0.3**	0.28,0.47
<b>Means of Transport</b>						
• None <sup>RC</sup>						
• Bicycle	0.93*	0.66,1.33			0.91	0.64,1.29
• Motorcycle	0.98*	0.80,1.20			1.01	0.82,1.24
• Car/Truck	1.252*	0.89,1.75			1.4**	0.99,1.95
<b>Health care decision</b>						
• Male dominated <sup>RC</sup>	-	-	-	-	-	-
• Not male dominated	1.42**	1.17,1.71			1.35*	1.11,1.63

(Continued) Table 5.2: Odds ratio of adjusted binary logistic regression showing fixed effects on the likelihood of skilled assistance during delivery.

Characteristics predicting Skilled Birth Assistance	Model 1 (Wald X <sup>2</sup> =248: p<0.00)		Model 2 (Wal X <sup>2</sup> = 157.65: p<0.00)		Model 3 (Wald X <sup>2</sup> =245.1: p<0.00)	
	OR	95%CI	OR	95%CI	OR	95%CI
<b>Wealth status</b>						
• Poor <sup>RC</sup>	-	-	-	-	-	-
• Moderate	2.3*	1.78,3.02	-	-	2.0**	1.53, 2.63
• Rich	5.2*	3.70,7.32	-	-	3.8**	2.70, 5.44
<b>Proportion of Community literacy level</b>						
• Low <sup>RC</sup>	-	-				
• Medium	-	-	2.60**	1.65, 4.10	1.57*	1.02, 2.42
• High	-	-	6.66**	3.72,11.91	1.93**	1.11, 3.36
<b>Place of Residence</b>						
• Urban <sup>RC</sup>	-	-	-	-	-	-
• Rural	-	-	0.643**	0.42, 0.96	0.84	0.57, 1.25
<b>Community Poverty Level</b>						
• Low <sup>RC</sup>	-	-	-	-	-	-
• Moderate	-	-	0.916	0.544,1.541	1.48	0.89, 2.45
• High			0.648	0.377,1.112	1.26	0.74, 2.13
<b>Community perception of distance to health facility</b>						
• Low <sup>RC</sup>	-	-	-	-	-	-
• High	-	-	0.321**	0.217,0.475	0.367*	0.25, 0.53
1. ** <i>p</i> <.01, * <i>p</i> <.05, 2. RC = Reference Category 3. RC is omitted naturally by STATA.						

**Model 1:** In this model (Wald  $X^2 = 248$ ;  $p < 0.000$ ) seven individual level variables have been analyzed. In case of employment status of women and its relationship with SBA, employed women were 8% less likely to avail SBA services as compared to the unemployed women (OR= 0.92, C.I =0.711, 1.190). Results for association between mothers' education and SBA were positive and statistically significant. Table 5.2 show that the mothers with primary education are 68% (OR=1.680, C.I = 1.290, 2.188) more likely to utilize skilled assistance during delivery than those with no education. The percentage of utilization increases as the level of moves to higher level with. Similarly, exposure to media show a positive and significant association with assistance during delivery. Respondent who are exposed to media are 19% more likely to avail SBA services than the those who are not exposed to media (OR = 1.194, C.I = 0.982,1.453). In case of birth order, the uptake of SBA decreases with an increase in the number children born to a respondent and the association is statistically significant. Results suggest that respondents with 2 births are 38% (OR=0.62, C.I =0.469,0.820) less likely to avail services of skilled assistance during delivery than those who have 1 birth. Similarly, the respondents with 3 births and 4 birth or higher are 49% and 62% less likely to utilize the services of skilled assistance, respectively.

Means of transport and uptake of SBA show mixed outcome yet the outcomes are significant in statistical terms. Respondents who have facility of bicycle are 7% (OR = 0.93 C. I = 0.64,1.32) less likely to use skilled assistance during delivery than those with no transport facility and respondents with motorcycle/scooter are 2% less likely to avail the SBA services. Women who have facility of car/truck are the one who have the highest tendency of using SBA service. Outcome of the regression analysis for this

category reveal that respondents with car/truck are 25% (OR = 1.25, C.I= 0.893,1.755) more likely to use the skilled assistance during delivery.

The outcome of the logistic regression between women ability to freely decide on owns health and the tendency to utilize skilled assistance is positive and significant. Women who are not male dominated are 42% (OR = 1.42, C.I = 1.178,1.711) more likely to utilize the services of skilled assistance than those who are male dominated. Finally in the model, the results pertaining to regression analysis between wealth status and the SBA uptake, respondents in higher wealth quintile have higher tendency to use skilled assistance than those who are in poor wealth quintiles (Table 5.2).

**Model 2:** This model was constructed to capture the effect of community variables on the utilization of skilled assistance during delivery and hence take into account individual variables. Four community level variables i.e. community female literacy, place of residence, community poverty level and community perception of distance to health facility were studied and results are given in table 5.2.

The community female literacy level is positively and significantly associated with the SBA uptake. Results indicate that women living in communities with high proportion of women who can read or write a complete sentence are more likely to use skilled assistance while delivering a baby (OR = 6.665 C.I = 3.727,11.91) than those who reside in communities where the proportion of women who can read or write a complete sentence is low (OR = 2.602, C.I = 1.650,4.104). Similarly, proportion of respondents who belong to rural settings have lesser tendency (OR= 0.034, C.I= 0.427,0.967) to use skilled birth assistance in comparison to the proportion of respondent living in urban areas. Outcome of the regression for community level poverty and the usage of SBA

indicate the proportion of respondent living in communities with high proportion of women in poorest wealth group are 36% (OR = 0.64, C.I= 0.377,1.112) less likely to use the SBA services as compared to 9% less likely for those who are living in communities where poverty is not very high. However, these results were not statistically significant.

In case of the outcome of regression analysis pertaining to *perception of distance to health facility*, statistically significant results are achieved. It is observed that the in communities where the perception of distance to health facility is high, respondents are 67% (OR= 0.321, C.I = 0.217,0.475) less likely to use skilled assistance during delivery as compared to communities where the perception is low.

**Model 3.** Model 3 is a saturated with both individual and community level variables in the multilevel logistic regression analysis. Referring to table 5.2, it can be observed that in case of employment status of, respondents who are employed are 16% (OR=0.839, C.I =0.69, 1.16) less likely to benefit from SBA services but the inference was not statistically significant. Regression result relating to mother's education show that education level was positively and significantly associated with the utilization of SBA. As the level of mother's education increases from primary to secondary and higher, the likelihood of using skilled assistance during delivery also increases from OR= 1.7, OR=2.3 and OR= 8.7 respectively. This outcome of Model 3 substantiates the results obtained in Model 1. Similarly, the association between SBA uptake and respondent's exposure to media also show positive and significant results. Respondents who are exposed to media are 27% (OR = 1.27 C.I = 1.04, 1.55) more likely to opt for skilled assistance for their delivery cases. The likelihood of using skilled attendants show similar in the saturated model. For example, the tendency to utilize skilled assistance

for respondent who have 2 births is 38% less likely than those who have 1 birth. Similarly, women who have 3 births and 4 or higher births are 50% (OR 0.50, C.I = 0.376,0.661) and 64% (OR = 0.36, C.I = 0.284,0.478) less likely to benefit from SBA services (Table 5.2). The outcome of logistic regression in case of means of transport show that respondents who own facility of car or truck have higher likelihood (OR = 0.91, C.I =0.643,1.297) of choosing SBA services and this likelihood is statistically significant as depicted in table 5.2, whereas regression result of the other two categories i.e, motorcycle and bicycle are not significant. Also, the likelihood of using skilled assistance in case of women who are not male dominated in their decision making is higher than those who are male dominated, i.e. women who are not male dominated have 35% (OR=1.35) higher chances of using SBA service than women who are male dominated.

Current model further reveals that, two community variables i.e. *community literacy level* and *community perception of distance to health facility* exercise a strong and statistically significant influence on the uptake of SBA. The likelihood of using skilled assistance is higher by 93% (OR = 1.935) for respondent who reside in communities with high proportion of literacy in comparison to respondent living in communities where literacy is low (OR= 1.575). Similarly, community perception of distance to health facility reflects a significant influence on the odds of skilled assistance. Respondent living in communities where the perception of distance to health facility being considered a problem is high, the tendency to utilize the service of skilled assistance is 36% (OR = 0.367, C.I =0.253, 0.534) less likely than those who live in a community where the perception is low.

Community poverty level and place of residence do not offer significant results. Table 5.2 reveals that respondent in communities with high proportion of women living in poorest wealth quintile are 26% (OR = 1.260, C.I =0.743, 2.135) less likely to opt for skilled assistance than the respondent in the communities where low proportion of women live poor wealth quintile. Likewise, the respondents living rural areas are 16% (OR= 0.84, C.I =0.574, 1.258) less likely to avail services of skilled assistance during delivery than those who are in urban areas. However, none of the two community level variables are statically significant (Table 5.2).

### **5.3 Random Effect**

Random effect results derived from multilevel logistic regression analysis show the impact of community level variable on the utilization of skilled birth attendance and the results are given in table 5.3 as given below.

The result of Log Likelihood Ratio Test (LR test) indicate that all the models reflect a good fit having a highly significant LR test (i.e.:  $p < 0.001$ ). The ICC result (54.4%) corresponding to Null Model, where the individual and community level predictors are excluded, suggests that uptake of SBA was significantly similar among women in a community. In other words, 54.4% of the total variability in the uptake of SBA is attributed to contextual phenomena. In the Model 1, where only individual level predictors are added to the equation, the ICC drops to 0.374 and thus reflect the fact that the increased level of variation in the use of SBA is induced by contextual factors. Similarly Model 2 show that the 38% of the total variation in utilization of SBA is caused by community factors (ICC= 0.38), which again is a significant contribution of community factors in determining SBA. In Model 3, which is full model and includes both individual and community level predictors, more than one third (35%) of the

variation in the utilization of skilled assistance caused by community level variables (ICC= 0.353).

**Table 5.3:** Random Effect showing influence of community characteristics on use of skilled assistance during delivery

<b>Parameter</b>	<b>Empty Model</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>Community level variance (SE)</b>	3.99 (0.561)	1.96 (0.288)	2.03 (0.30)	1.79 (0.266)
<b>Log likelihood</b>	-3521	-3233	-3406	-3207
<b>L.R Test</b>	X <sup>2</sup> =1265: p<0.001	X <sup>2</sup> =576: p<0.001	X <sup>2</sup> =605: p<0.001	X <sup>2</sup> =513: p<0.001
<b>ICC</b>	0.548	0.374	0.382	0.353



## CHAPTER 6

### DISCUSSION

Assistance during delivery is thought to be an important public health intervention area in guaranteeing safe motherhood. Access to skilled birth attendants saves mother and new-born from severe health problems and even death resulting from pregnancy and delivery related complications. Studies reveal that 31% deliveries in Pakistan are still conducted by unskilled attendants making it one of the major public health challenges for the country (PDHS 2018). The outcome of the current study reflects almost similar trend i.e.28% and the 2% deviation is due to the sample size in the present study (n=6711) which is smaller than the sample size selected by PDHS.

Literature is abounded in evidence that the uptake of SBA is affected by both the individual and contextual factors. To corroborate this assertion in case of Pakistan, several important background attributes at individual and community level are selected i.e.: employment status, education of mother, exposure to media, birth order means of transport, healthcare decision, wealth status, proportion of community literacy level, place of residence, community poverty level and community perception of distance to health facility. Referring to the results of the present study, mother's education level is positively correlated the utilization of SBA. The rate of SBA uptake is 58.6% to 74.3%, 84.6% and 95.6% for no-education, primary, secondary, and higher (Fig.4.2). Educated women are better informed about maternal health complication in relation to the unskilled birth attendants. Awareness through education helps women avail SBA services which in return contributes to the reduction of maternal and new-born death. Similar trend can be observed in other relevant literature where the rate of SBA utilization increases with increase in educational level. (Biswas, Ananna, Bhowmik, &

Analysis, 2020). Other similar studies indicate that education of mothers contribute to the increased access to SBA as educated mothers are more aware and concerned about the complications related to delivery time and are more likely to access modern health care (Bhowmik, Biswas, & Ananna, 2020). Similarly, media exposure and household wealth show a positive relationship with the utilization of SBA. Women with greater exposure to media are more likely to opt for SBA services i.e., 80%, as against those who are less exposed to media i.e., 68%. This finding is aligned with similar studies which show that women who have better access to mass media are 24-54% more likely to avail SBA service than those who don't have such access (Fatema & Lariscy, 2020). This study further reveals that wealthy households show greater tendency to use SBA compared to households who fall in the lower wealth quintiles. These findings are in agreement with other studies conducted on the same research subject (Nabeen, Jannat, Akanda, & Salam, 2018). The present study further reveals that as the birth order goes up from one child, the inclination of women toward availing skilled assistance during delivery drops. Studies show that women with two births, three birth and four are found be less likely to avail SBA service than those with one birth (K. S. Dickson & H. J. A. i. P. H. Amu, 2017). This behavior can partly be explained by the fact primiparous women might be conscious of the first pregnancy and therefore try to avoid any complication during delivery. With increase in birth order the same women build confidence and this results in less utilization of SBA (P. Singh, Singh, Singh, & Childbirth, 2021). The declining behavior of SBA is not unique to Pakistan as similar results have been found by researchers in various studies conducted in Africa where the trend of SBA decrease with increase in the birth order (K. S. Dickson & H. J. A. i. P. H. Amu, 2017). In case of means of transport, respondent having bicycle as means of transport are less likely to opt for skilled birth assistance than those who have no

transport at all. Using bicycle to transport pregnant women to the facility is not feasible option, therefore, women prefer to stay home than to put their health at risk by riding bicycle. However, motorized mode such as Car/Truck and motorcycle have significantly positive impact on the uptake of SBA. These findings are corroborated by the outcome of other relevant literature(Sacks et al., 2016). Moreover, distance to health facility and availability of transport service has significant impact on the likelihood of women delivery through skilled birth attendant at the facility (Sacks et al., 2016). Health seeking behaviour is also impacted by the female autonomy in decision making process. Literature show that women who are autonomous in health-decision making are more likely to avail skilled assistance at facility than those who are not autonomous (Ameyaw et al., 2016). This study indicates that women whose decision are influenced by man are less likely to avail SBA services than women have are not influenced by man (Fig.4.5). In patriarchal societies the role of men is central in shaping the decisions of the family including health seeking decisions of women. In such societies the cultural and traditional edicts come in direct conflict with public health recommendations and due to this conflict the uptake of SBA is compromised (Aborigo, Reidpath, Oduro, Allotey, & childbirth, 2018).

The descriptive results corresponding to community characteristics i.e., Community perception of distance to health facility, Community poverty level, Community literacy level and place of residence also disclose trends that are in congruence with relevant literature inventory. A negative relationship is found between SBA services and the proportion of women who perceive distance to health facility a problem. On the other hand, where the perception, that distance is not a problem, is low the usage of SBA services is high (Fig.4.7). Association of this nature between SBA and perception of

distance to health facility is also supported by contemporary literature (B. L. Solanke et al., 2018). Similarly, the findings also suggest that the community literacy level and community poverty level affect the utilization skilled assistance during delivery. Proportion of women living in a community with low proportion of literacy are less likely to avail SBA services as against those who live in communities with high proportion of literacy (Fig.4.9). Likewise, respondent living in communities with low proportion of poverty are more likely to choose skilled assistance during delivery in comparison to the percentage of respondents who live in communities with high proportion of poverty (Fig.4.8). This relationship between community poverty level and SBA is supported by other comparable studies (Bediako, Boateng, Owusu, & Dickson, 2021). Lastly, association between place of residence (Urban/Rural) and the use of SBA service show that respondent living in urban areas use SBA services more than their rural counter parts (Fig.4.10). Similar studies conducted by other researchers show the same results (Noh et al., 2019). The main reason for high percentage of SBA usage in urban setting might be due to the availability of and access to the health care resources.

Results of the unadjusted logistic regression indicate that individual and community level socioeconomic and demographic factors have statistically significant association with the uptake of SBA. Educated women, women with exposure to media, women not dominated by their male counterpart and those living in upper wealth quintile are more likely to avail skilled assistance during delivery (Table 5.1). Education and access to media equips women with information regarding health-related complications and thus convince them to utilize skilled assistance during delivery. Moreover, women who are not male dominated get empowered to make their own decisions and avail health

services which might not be possible in a patriarchal social setting. These findings are in agreement with other studies found in the literature (Acharya, Bell, Simkhada, Van Teijlingen, & Regmi, 2010; Aziato, Odai, Omenyo, & childbirth, 2016; Worku, Yalew, Afework, & rights, 2013).

The association between women employment status and SBA uptake is rather unique with employed women less likely to benefit from SBA services than the unemployed women (Table 5.1). The reason for this relationship could be the high proportion (i.e; 66%) of respondents belonging to rural areas. Women working in rural settings are generally unskilled, less educated and engaged in the informal sector of the economy prefer to deliver at home (Jafree, Zakar, Mustafa, Fischer, & childbirth, 2018). The finding in relation to women employment status and uptake of SBA is also supported by other comparative literature (Sarker et al., 2016). Results pertaining to *means of transport* complement the descriptive results. Respondents who own or access to car/truck or motorcycle are more likely to choose SBA services than those who are without such facilities. These findings are not distinctive to Pakistan as there are other studies that show identical results and thus support the outcomes of this research (L. B. Solanke et al., 2020).

The unadjusted analysis in relation to community level characteristics show that the community attributes are statistically significantly associated with the usage of skilled assistance during delivery. For instance, the trend of using SBA services is high in communities with high literacy level, those living in urban communities, communities with low poverty level and communities where the perception of distance to health facility is not considered a problem (Table.5.1). A parallel can be drawn between these evidences and the results of the previous studies (Chaka, 2020).

The outcome of the multivariate analyses, with exception of few communities and individual level variables, substantiates the results obtained at the univariate and bivariate stages of this study. The of Mothers educational level, Birth order, Means of transport, Media exposure and Women autonomy show statistically significant association with the uptake of SBA (Table 5.2). Likewise, the contextual attributes i.e., Community female literacy rate and Community perception of distance to health facility manifest a strong and statistically significant influence on the dependent variable (Table 5.2). These outcomes are supported by studies conducted by researches in similar setting with identical exposure variables. (Nair, Ariana, & Webster, 2012). Unlike the unadjusted regression analysis, results of the two contextual factors such i.e., community poverty level and place of residence are found to be statistically non-significant in terms of their effect on the uptake of SBA.

#### **6.1 Review of Hypotheses.**

- Individual level socioeconomic factor such as *mother education, media exposure, means of transport, wealth status* and *birth order* have significant impact on the uptake of skilled assistance during delivery. ---**ACCEPTED**
- Women autonomy has a positive influence on the uptake of skilled birth attendance. -- **ACCEPTED**
- Contextual attributes such as *Community literacy level* and *community perception of distance to health facility* influence the utilization of skilled assistance during delivery. -----**ACCEPTED**
- *Community poverty level* and *place of residence* (Urban/Rural) influence the utilization of skilled birth attendance. -----**REJECTED**

## CHAPTER 7

### CONCLUSION AND RECOMMENDATIONS

#### 7.1 Conclusion

This study is aimed to provide empirical evidence that the utilization of skilled birth attendance is impacted by individual level factors such as mothers educational level, women autonomy, wealth status, means of transport, exposure to media, birth order and employment status, and community level attributes such as community literacy level, community poverty level, place of residence and community perception of distance to health facility. The results of the study suggest that except for the *employment status of women* and certain categories of *means of transport*, all the individual level factors have a significant impact on the utilization of skilled birth attendance in the context of Pakistan. Likewise, with exception of two community level factors, i.e., *community poverty* and *place of residence*, the rest of the contextual factors reflect a statistically significant influence on the uptake of SBA. Additionally, the ICC score consistently remains substantial in the subsequent model. This consistency provides the necessary evidence that there is a sizeable impact of contextual factors on the utilization of skilled birth attendance in case of Pakistan.

#### 7.2 Policy recommendations

The central argument of this study is to approach public health challenges with a better yet scientifically appropriate method. By employing Multilevel analysis to a large survey data that is inherently nested within a larger contextual phenomenon, this research offers an all-inclusive methodology to understand the individual as well contextual attributes impacting skilled birth attendance in Pakistan. Evidence generated

in the study suggest that alongside the individual characteristics, community factors such as *community literacy* level and *community perception of distance to health facility* exert a considerable influence on the uptake of SBA. Nonetheless, there is a dearth of policies which could draw guidance from such scientific approaches to address the issue of SBA uptake in Pakistan. It is in this context the following recommendations are being put forward.

- Evidence suggests that the lag in the uptake of SBA is because of low educational level, less media exposure and unavailability of transport system. Therefore, policies should be devised, and implementation be ensured at district level, tehsil level and union council level. This could be achieved by building new infrastructure and enhancing the existing ones. Public health channel available through public broadcasting facilities should be introduced to provide appropriate contents on mother child health.
- Women autonomy to take their own health decision appears to be an important and significant determinant of SBA utilization in Pakistan according to this study. It is, therefore, pertinent that women autonomy needs to be promoted. This can be accomplished by mobilizing male community members through campaigns to motivate women in taking their own decision regarding their reproductive health. Additionally, women health committees formed at different levels i.e., Tehsil/Taluka, union council and district level.
- Public health issue, like all other social issues, are complex in nature with multiple layers nested within each other. The current study reveals that public health challenge such as *uptake of SBA* is determined by not only individual factors but also some higher-level factors within which the individual



characteristics are nested. Policy makers need to realize the importance of contextual phenomena in determining health outcomes of the population and should factor-in this dimension while designing policies.

### **7.3 Strength and Limitation of the study**

The major strength of this study is that it involves two level multilevel logistic regression and captures the true effect size of both individual and community level covariates that impact the utilization of SBA. Multilevel modelling is more accurate and scientifically appropriate choice when it comes to measuring nested data such as PDHS used in this analysis.

One of the main limitation this study comes with is the cross-sectional nature of the DHS data. This type of data does not allow researchers to establish a cause-and-effect relationship between dependent and exposure variables. The best this type of data can provide is the correlation among variable that may exist at particular point in time.

## REFERENCES

- Aborigo, R. A., Reidpath, D. D., Oduro, A. R., Allotey, P. J. B. p., & childbirth. (2018). Male involvement in maternal health: perspectives of opinion leaders. *18*(1), 1-10.
- Acharya, D. R., Bell, J. S., Simkhada, P., Van Teijlingen, E. R., & Regmi, P. R. J. R. h. (2010). Women's autonomy in household decision-making: a demographic study in Nepal. *7*(1), 1-12.
- Adegoke, A., & Van Den Broek, N. (2009). Skilled birth attendance-lessons learnt. *BJOG: An International Journal of Obstetrics & Gynaecology*, *116*, 33-40.
- Afulani, P. A., & Moyer, C. (2016). Explaining Disparities in Use of Skilled Birth Attendants in Developing Countries: A Conceptual Framework. *PLoS One*, *11*(4), e0154110. doi:10.1371/journal.pone.0154110
- Agha, S., & Carton, T. W. (2011). Determinants of institutional delivery in rural Jhang, Pakistan. *International Journal for Equity in Health*, *10*(1), 31. doi:10.1186/1475-9276-10-31
- Akinwande, M. O., Dikko, H. G., & Samson, A. J. O. J. o. S. (2015). Variance inflation factor: as a condition for the inclusion of suppressor variable (s) in regression analysis. *5*(07), 754.
- Al Kibria, G. M., Ghosh, S., Hossen, S., Barsha, R. A. A., Sharmeen, A., & Uddin, S. I. (2017). Factors affecting deliveries attended by skilled birth attendants in Bangladesh. *Maternal health, neonatology and perinatology*, *3*(1), 7.
- Al Kibria, G. M., Ghosh, S., Hossen, S., Barsha, R. A. A., Sharmeen, A., Uddin, S. I. J. M. H., Neonatology, & Perinatology. (2017). Factors affecting deliveries attended by skilled birth attendants in Bangladesh. *3*(1), 1-9.
- Ameyaw, E. K., & Dickson, K. S. J. B. p. h. (2020). Skilled birth attendance in Sierra Leone, Niger, and Mali: analysis of demographic and health surveys. *20*(1), 1-10.
- Ameyaw, E. K., Tanle, A., Kissah-Korsah, K., & Amo-Adjei, J. J. I. j. o. r. m. (2016). Women's health decision-making autonomy and skilled birth attendance in Ghana. *2016*.
- Amoakoh-Coleman, M., Ansah, E. K., Agyepong, I. A., Grobbee, D. E., Kayode, G. A., & Klipstein-Grobusch, K. J. B. o. (2015). Predictors of skilled attendance at delivery among antenatal clinic attendants in Ghana: a cross-sectional study of population data. *5*(5), e007810.
- Andersen, R., & Newman, J. F. (2005). Societal and Individual Determinants of Medical Care Utilization in the United States. *The Milbank Quarterly*, *83*(4), 10.1111/j.1468-0009.2005.00428.x. doi:10.1111/j.1468-0009.2005.00428.x

- Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: does it matter? *Journal of health and social behavior*, 1-10.
- Asp, G., Pettersson, K. O., Sandberg, J., Kabakyenga, J., & Agardh, A. (2014). Associations between mass media exposure and birth preparedness among women in southwestern Uganda: a community-based survey. *Global health action*, 7(1), 22904. doi:10.3402/gha.v7.22904
- Ayele, G. S., Melku, A. T., & Belda, S. S. J. B. p. h. (2019). Utilization of skilled birth attendant at birth and associated factors among women who gave birth in the last 24 months preceding the survey in Gura Dhamole Woreda, Bale zone, southeast Ethiopia. *19*(1), 1-14.
- Aziato, L., Odai, P. N., Omenyo, C. N. J. B. p., & childbirth. (2016). Religious beliefs and practices in pregnancy and labour: an inductive qualitative study among post-partum women in Ghana. *16*(1), 1-10.
- Bediako, V. B., Boateng, E. N., Owusu, B. A., & Dickson, K. S. J. P. o. (2021). Multilevel geospatial analysis of factors associated with unskilled birth attendance in Ghana. *16*(6), e0253603.
- Berelie, Y., Tesfa, E., & Bayko, T. (2019). Utilization of Postnatal Care Services after home delivery in Ethiopia: A Multilevel Logistic Regression Analysis.
- Bhowmik, J., Biswas, R. K., & Ananna, N. J. P. o. (2020). Women's education and coverage of skilled birth attendance: An assessment of Sustainable Development Goal 3.1 in the South and Southeast Asian Region. *15*(4), e0231489.
- Biswas, R. K., Ananna, N., Bhowmik, J. J. S. f. D. S., & Analysis, P. (2020). Effect of women's education on skilled birth attendants in south and south east asia: A cross-country assessment on sustainable development goal 3.1. 253.
- Chaka, E. E. J. B. R. I. (2020). Examining Individual-and Community-Level Factors Affecting Skilled Delivery Care among Women Who Received Adequate Antenatal Care in Ethiopia: Using Multilevel Analysis. *2020*.
- Chauhan, B., & Rai, A. (2015). Skilled Birth Attendance across Geographical Regions in India: Rural-Urban Differentials, 1992-2006. *Social Science Spectrum, ISSN 2454-2806, 1*, 114-126.
- Collins. (Ed.) (2019) Collins.
- Dickson, K. S., & Amu, H. (2017). Determinants of Skilled Birth Attendance in the Northern Parts of Ghana. *Advances in Public Health, 2017*, 8. doi:10.1155/2017/9102808
- Dickson, K. S., & Amu, H. J. A. i. P. H. (2017). Determinants of skilled birth attendance in the northern parts of Ghana. *2017*.

- Edmonds, J. K., Paul, M., & Sibley, L. (2012). Determinants of place of birth decisions in uncomplicated childbirth in Bangladesh: an empirical study. *Midwifery*, 28(5), 554-560.
- Ekpenyong, M. S., Bond, C., & Matheson, D. (2019). Challenges of maternal and prenatal care in Nigeria.
- Fatema, K., & Lariscy, J. T. J. S.-P. H. (2020). Mass media exposure and maternal healthcare utilization in South Asia. *II*, 100614.
- Ghosh, S., Siddiqui, M. Z., Barik, A., Bhaumik, S. J. M., & journal, c. h. (2015). Determinants of skilled delivery assistance in a rural population: findings from an HDSS site of rural west Bengal, India. *19*(11), 2470-2479.
- Girum, T., & Wasie, A. Correlates of maternal mortality in developing countries: an ecological study in 82 countries. *Matern Health Neonatol Perinatol*. 2017; 3. In.
- Gitimu, A., Herr, C., Oruko, H., Karijo, E., Gichuki, R., Ofware, P., . . . childbirth. (2015). Determinants of use of skilled birth attendant at delivery in Makueni, Kenya: a cross sectional study. *15*(1), 1-7.
- Gitonga, E. (2017). Skilled birth attendance among women in Tharaka-Nithi County, Kenya. *Advances in Public Health*, 2017.
- Harvey, S. A., Blandón, Y. C. W., McCaw-Binns, A., Sandino, I., Urbina, L., Rodríguez, C., . . . Djibrina, S. (2007). Are skilled birth attendants really skilled? A measurement method, some disturbing results and a potential way forward. *Bulletin of the World Health Organization*, 85, 783-790.
- Huda, T. M., Chowdhury, M., El Arifeen, S., & Dibley, M. J. (2019). Individual and community level factors associated with health facility delivery: A cross sectional multilevel analysis in Bangladesh. *PloS one*, 14(2).
- Huda, T. M., Chowdhury, M., El Arifeen, S., & Dibley, M. J. J. P. o. (2019). Individual and community level factors associated with health facility delivery: A cross sectional multilevel analysis in Bangladesh. *14*(2), e0211113.
- Jafree, S. R., Zakar, R., Mustafa, M., Fischer, F. J. B. p., & childbirth. (2018). Mothers employed in paid work and their predictors for home delivery in Pakistan. *18*(1), 1-9.
- Jewkes, R. (2002). Intimate partner violence: causes and prevention. *The lancet*, 359(9315), 1423-1429.
- Kamal, S. M., Hassan, C. H., & Kabir, M. (2015). Inequality of the use of skilled birth assistance among rural women in Bangladesh: facts and factors. *Asia Pacific Journal of Public Health*, 27(2), NP1321-NP1332.

- Karim, A. N., & Rezaul, M. J. C. W. s. H. R. (2020). Skilled Birth Attendant and Its Determinants among the Tribal Women of Bangladesh. *16*(2), 127-136.
- Kitui, J., Lewis, S., Davey, G. J. B. p., & childbirth. (2013). Factors influencing place of delivery for women in Kenya: an analysis of the Kenya demographic and health survey, 2008/2009. *13*(1), 1-10.
- Kwagala, B., Nankinga, O., Wandera, S. O., Ndugga, P., & Kabagenyi, A. (2016). Empowerment, intimate partner violence and skilled birth attendance among women in rural Uganda. *Reproductive health*, *13*(1), 53-53.  
doi:10.1186/s12978-016-0167-3
- Lerberg, P. M., Sundby, J., Jammeh, A., & Fretheim, A. (2014). Barriers to skilled birth attendance: a survey among mothers in rural Gambia. *African journal of reproductive health*, *18*(1), 35-43.
- McTavish, S., Moore, S., Harper, S., & Lynch, J. (2010). National female literacy, individual socio-economic status, and maternal health care use in sub-Saharan Africa. *Social science & medicine*, *71*(11), 1958-1963.
- Mekonnen, Z. A., Lerebo, W. T., Gebrehiwot, T. G., & Abadura, S. A. (2015). Multilevel analysis of individual and community level factors associated with institutional delivery in Ethiopia. *BMC research notes*, *8*(1), 376.
- Mezmur, M., Navaneetham, K., Letamo, G., & Bariagaber, H. J. P. O. (2017). Individual, household and contextual factors associated with skilled delivery care in Ethiopia: evidence from Ethiopian demographic and health surveys. *12*(9), e0184688.
- Mir, A. M., Shaikh, M. S., Qomariyah, S. N., Rashida, G., Khan, M., & Masood, I. (2015). Using community informants to estimate maternal mortality in a rural district in Pakistan: a feasibility study. *Journal of pregnancy*, 2015.
- Moore, W. (1969). *The Handbook of Social Psychology*.
- Mugo, N. S., Agho, K. E., Zwi, A. B., & Dibley, M. J. (2016). Factors associated with different types of birth attendants for home deliveries: an analysis of the cross-sectional 2010 South Sudan household survey. *Global health action*, *9*(1), 29693.
- Mugo, N. S., Agho, K. E., Zwi, A. B., & Dibley, M. J. (2016). Factors associated with different types of birth attendants for home deliveries: an analysis of the cross-sectional 2010 South Sudan household survey. *Glob Health Action*, *9*, 29693.  
doi:10.3402/gha.v9.29693
- Mukabana, B., & Emali, V. (2019). CULTURAL AND RELIGIOUS FACTORS AS PREDICTORS OF UPTAKE OF SKILLED BIRTH SERVICES IN LURAMBI SUB COUNTY, KENYA -A CROSS SECTIONAL STUDY. *International Journal of Advanced Research*, *7*, 2320-5407.  
doi:10.21474/IJAR01/8660

- Munabi-Babigumira, S., Glenton, C., Lewin, S., Fretheim, A., & Nabudere, H. (2017). Factors that influence the provision of intrapartum and postnatal care by skilled birth attendants in low-and middle-income countries: a qualitative evidence synthesis. *Cochrane Database of Systematic Reviews*(11).
- Nabeen, A., Jannat, N. E., Akanda, M., & Salam, A. J. D. U. J. S. (2018). Utilization of Antenatal Care, Skilled Birth Assistant and Institutional Delivery in Bangladesh. *66*(1), 21-27.
- Nair, M., Ariana, P., & Webster, P. (2012). What influences the decision to undergo institutional delivery by skilled birth attendants? A cohort study in rural Andhra Pradesh, India.
- National Institute of Population Studies - NIPS/Pakistan, & ICF. (2019). *Pakistan Demographic and Health Survey 2017-18*. Retrieved from Islamabad, Pakistan: <http://dhsprogram.com/pubs/pdf/FR354/FR354.pdf>
- Ngowi, A. F., Kamazima, S. R., Kibusi, S., Gesase, A., & Bali, T. J. R. h. (2017). Women's determinant factors for preferred place of delivery in Dodoma region Tanzania: a cross sectional study. *14*(1), 1-8.
- Noh, J.-W., Kim, Y.-m., Akram, N., Yoo, K.-B., Cheon, J., Lee, L. J., . . . health, p. (2019). Impact of socio-economic factors and health information sources on place of birth in Sindh Province, Pakistan: a secondary analysis of cross-sectional survey data. *16*(6), 932.
- Onta, S., Choulagai, B., Shrestha, B., Subedi, N., Bhandari, G. P., & Krettek, A. (2014). Perceptions of users and providers on barriers to utilizing skilled birth care in mid-and far-western Nepal: a qualitative study. *Global health action*, *7*(1), 24580.
- Organization, W. H. (2004). *Making pregnancy safer: the critical role of the skilled attendant: a joint statement by WHO, ICM and FIGO*: World health organization.
- PBS. (2017). Provisional Summary Results of 6th Population and Housing Census of Pakistan 2017.
- Pongpanich, S., Ghaffar, A., Ghaffar, N., & Mehmood, T. (2016). Skilled birth attendance in Balochistan, Pakistan. *Asian Biomedicine*, *10*(1), 25-34.
- Pulok, M. H., Sabah, M. N.-U., Uddin, J., Enemark, U. J. B. p., & childbirth. (2016). Progress in the utilization of antenatal and delivery care services in Bangladesh: where does the equity gap lie? , *16*(1), 1-16.
- Saaka, M., & Akuamoah-Boateng, J. J. S. (2020). Prevalence and Determinants of Rural-Urban Utilization of Skilled Delivery Services in Northern Ghana. *2020*.

- Sacks, E., Vail, D., Austin-Evelyn, K., Greeson, D., Atuyambe, L. M., Macwan'gi, M., . . . planning. (2016). Factors influencing modes of transport and travel time for obstetric care: a mixed methods study in Zambia and Uganda. *31*(3), 293-301.
- Sarker, B. K., Rahman, M., Rahman, T., Hossain, J., Reichenbach, L., & Mitra, D. K. J. P. o. (2016). Reasons for preference of home delivery with traditional birth attendants (TBAs) in rural Bangladesh: a qualitative exploration. *11*(1), e0146161.
- Senanayake, H., Goonewardene, M., Ranatunga, A., Hattotuwa, R., Amarasekera, S., & Amarasinghe, I. (2011). Achieving millennium development goals 4 and 5 in Sri Lanka. *BJOG: An International Journal of Obstetrics & Gynaecology*, *118*, 78-87.
- Shahabuddin, A., Nöstlinger, C., Delvaux, T., Sarker, M., Delamou, A., Bardají, A., . . . De Brouwere, V. (2017). Exploring Maternal Health Care-Seeking Behavior of Married Adolescent Girls in Bangladesh: A Social-Ecological Approach. *PLoS One*, *12*(1), e0169109-e0169109. doi:10.1371/journal.pone.0169109
- Singh, J. K., Evans-Lacko, S., Acharya, D., Kadel, R., & Gautam, S. (2018). Intimate partner violence during pregnancy and use of antenatal care among rural women in southern Terai of Nepal. *Women and birth*, *31*(2), 96-102.
- Singh, K., Story, W. T., Moran, A. C. J. M., & journal, c. h. (2016). Assessing the continuum of care pathway for maternal health in South Asia and sub-Saharan Africa. *20*(2), 281-289.
- Singh, P., Singh, K. K., Singh, P. J. B. P., & Childbirth. (2021). Maternal health care service utilization among young married women in India, 1992–2016: trends and determinants. *21*(1), 1-13.
- Sk, M. I. K., Sk, M. F., Anand, A., & Biswas, A. B. (2017). Utilization of skilled birth attendant in the south Asian region: a comparative study of India, Bangladesh, and Nepal. *Eur J Pharm Med Res*, *4*, 305-311.
- Snijders, T., Bosker, R. J. M. A. A. I. t. B., & Modeling, A. M. (1999). Multilevel theories, multistage sampling, and multilevel models. 6-13.
- Solanke, B. L. (2014). Association between intimate partner violence and utilisation of maternal health services in Nigeria. *African Population Studies*, *28*, 933-945.
- Solanke, B. L., & Rahman, S. A. (2018). Multilevel analysis of factors associated with assistance during delivery in rural Nigeria: implications for reducing rural-urban inequity in skilled care at delivery. *BMC Pregnancy and Childbirth*, *18*(1), 438. doi:10.1186/s12884-018-2074-9

- Solanke, B. L., Rahman, S. A. J. B. p., & childbirth. (2018). Multilevel analysis of factors associated with assistance during delivery in rural Nigeria: implications for reducing rural-urban inequity in skilled care at delivery. *18*(1), 1-15.
- Solanke, L. B., Oluwatope, O. B., Adebayo, Y. R., Oyeleye, O. J., Ilesanmi, B. B., & Oni, T. O. (2020). Household means of transportation and place of child delivery in Nigeria.
- Tadese, F., & Ali, A. (2014). Determinants of use of skilled birth attendance among mothers who gave birth in the past 12 months in Raya Alamata District, North East Ethiopia. *Clinics in Mother and Child Health, 11*, 164.
- Tey, N.-P., & Lai, S.-I. (2013). Correlates of and barriers to the utilization of health services for delivery in South Asia and Sub-Saharan Africa. *The Scientific World Journal, 2013*.
- UNFPA. (2019). Maternal Health [Press release]. Retrieved from <https://www.unfpa.org/maternal-health>
- UNICEF. (2020). Ending Preventable Newborn Deaths and Stillbirths. doi:<https://data.unicef.org/resources/ending-preventable-newborn-deaths-and-stillbirths-by-2030/>
- Upvall, M., Sochael, S., & Gonsalves, A. (2002). Behind the mud walls: The role and practice of lady health visitors in Pakistan. *Health care for women international, 23*, 432-441. doi:10.1080/073993302760190038
- W.H.O. (2002). *Global action for skilled attendants for pregnant women: making pregnancy safer*. Retrieved from
- WHO. (2015). Global Health Observatory (GHO) data. Maternal Mortality. *Geneva: World Health Organization*.
- WHO. (2019a). Maternal Mortality.
- WHO. (2019b). Sexual and Reproductive Health [Press release]. Retrieved from <https://www.who.int/reproductivehealth/maternal-mortality-2000-2017/en/>
- Wong, K. L., Restrepo-Méndez, M. C., Barros, A. J., & Victora, C. G. (2017). Socioeconomic inequalities in skilled birth attendance and child stunting in selected low and middle income countries: Wealth quintiles or deciles? *PLoS One, 12*(5), e0174823.
- Worku, A. G., Yalew, A. W., Afework, M. F. J. B. i. h., & rights, h. (2013). Factors affecting utilization of skilled maternal care in Northwest Ethiopia: a multilevel analysis. *13*(1), 1-11.
- Yakoob, M. Y., Ali, M. A., Ali, M. U., Imdad, A., Lawn, J. E., Van Den Broek, N., & Bhutta, Z. A. (2011). The effect of providing skilled birth attendance and



emergency obstetric care in preventing stillbirths. *BMC public health*, 11(S3), S7.

Yaya, S., Bishwajit, G., & Shah, V. J. B. g. h. (2016). Wealth, education and urban–rural inequality and maternal healthcare service usage in Malawi. *1*(2), e000085.

Fatema, K., & Lariscy, J. T. (2020). Mass media exposure and maternal healthcare utilization in South Asia. *SSM-Population Health*, 11, 100614.

## Appendix-A

<b>CHARACTERISITCS</b>	<b>NUMBER OF WOMEN (n=6711)</b>	<b>PERCENTAGE</b>
<b>Employment status</b>		
Unemployed	5721	85.25
Employed	989	14.75
<b>Mothers Educational</b>		
None	3212	47.8
Primary	1096	16.3
Secondary	1491	22.2
Higher	911	13.5
<b>Media exposure</b>		
Not Exposed	3321	49.4
Exposed	3390	50.5
<b>Birth Order</b>		
1 <sup>st</sup> birth	1337	19.9
2 <sup>nd</sup> birth	1412	21.0
3 <sup>rd</sup> birth	1159	17.2
4 <sup>th</sup> birth or higher	2803	41.7
<b>Means of Transport</b>		
No transport	2485	37
Bicycle	397	5
Motor Cycle/Scooter	3219	48
Car/Truck	611	9.1
<b>Healthcare Decision</b>		
Male dominated	3658	54.5
Not-Male dominated	3054	45.5
<b>Wealth status</b>		
Poor	2743	40.8
Moderate	1371	20.4
Rich	2597	38.6
<b>Place of Residence</b>		
Urban	2248	33.5
Rural	4463	66.5
<b>Community Female Literacy Level</b>		
Low	1738	25.9
Medium	2351	34.0
High	2621	39.0
<b>Community Poverty</b>		
Low	3186	47.4
Moderate	1363	20.3
High	2163	32.2
<b>Community perception of distance to health facility</b>		
Low	3528	52.5

High	3183	47.4
------	------	------

## Appendix-B

### Univariate Analysis

a.

Mother's education	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
None	1329.326	1882.547	3211.873
	41.39	58.61	100.00
Primary	281.4402	815.3387	1096.779
	25.66	74.34	100.00
Secondary	228.5308	1263.018	1491.549
	15.32	84.68	100.00
Higher	39.48604	871.608	911.094
	4.33	95.67	100.00
Total	1878.783	4832.512	6711.295
	27.99	72.01	100.00

Exposure to Mass Media	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
Not Exposed	1230.445	2090.363	3320.808
	37.05	62.95	100.00
Exposed	648.3378	2742.149	3390.487
	19.12	80.88	100.00
Total	1878.783	4832.512	6711.295
	27.99	72.01	100.00

Birth order	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
1	218.5989	1118.821	1337.42
	16.34	83.66	100.00
2	303.9372	1107.644	1411.582
	21.53	78.47	100.00
3	285.2269	873.865	1159.092
	24.61	75.39	100.00
4 or higher	1071.02	1732.181	2803.201
	38.21	61.79	100.00
Total	1878.783	4832.512	6711.295
	27.99	72.01	100.00

Means of Transport	assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
No Transport	789.9813	1694.718	2484.699
%	31.79	68.21	100.00
Bicycle	156.2691	240.6863	396.9555
%	39.37	60.63	100.00
Motor Cycle/Scooter	841.6732	2377.025	3218.699
%	26.15	73.85	100.00
Car/Truck	90.85901	520.082	610.9411
%	14.87	85.13	100.00
Total	1878.783	4832.512	6711.295
%	27.99	72.01	100.00

Healthcare decision	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
Male dominated	1176.69	2480.916	3657.606
%	32.17	67.83	100.00

Not male dominated	702.0922	2351.596	3053.688
%	22.99	77.01	100.00
Total	1878.783	4832.512	6711.295
%	27.99	72.01	100.00

Wealth Index	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
Poor	1246.094	1497.132	2743.226
%	45.42	54.58	100.00
Moderate	355.8149	1015.501	1371.316
%	25.95	74.05	100.00
Rich	276.8734	2319.879	2596.753
%	10.66	89.34	100.00
Total	1878.783	4832.512	6711.295
%	27.99	72.01	100.00

Community Perception of distance to Health facility	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
Low	670.8995	2857.535	3528.434
%	19.01	80.99	100.00
High	1207.883	1974.977	3182.86
%	37.95	62.05	100.00
Total	1878.783	4832.512	6711.295
	27.99	72.01	100.00

Type of place of residence	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
Urban	331.8594	1916.33	2248.189
%	14.76	85.24	100.00
Rural	1546.923	2916.182	4463.105
	34.66	65.34	100.00
Total	1878.783	4832.512	6711.295
	27.99	72.01	100.00

Community poverty level	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
Low	577.0969	2608.424	3185.521
%	18.12	81.88	100.00
Moderate	390.208	972.3339	1362.542
%	28.64	71.36	100.00
High	911.4778	1251.754	2163.231
%	42.14	57.86	100.00
Total	1878.783	4832.512	6711.295
	27.99	72.01	100.00

Community Female Literacy level	Assistance during delivery		
	Unskilled assistant	Skilled attendant	Total
Low	766.1222	972.2833	1738.405
%	44.07	55.93	100.00
Med	718.8189	1632.743	2351.562
%	30.57	69.43	100.00
High	393.8415	2227.486	2621.327
%	15.02	84.98	100.00
Total	1878.783	4832.512	6711.295
	27.99	72.01	100.00

## Appendix-C

### Bivariate logistic regression ( Unadjusted Logistic Regression)

#### a. Employment Status & SBA

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
0b.emp	0	.	.	.	.	.	.
1.emp	-.402	.111	-3.61	0	-.62	-.183	***
Constant	1.008	.073	13.77	0	.864	1.152	***
Mean dependent var	0.700		SD dependent var	0.458			
Number of obs	6803.000		F-test	13.065			
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**b. Mothers Educational Level & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
0b.med	0	.	.	.	.	.	
1.med	.716	.121	5.89	0	.477	.954	***
2.med	1.362	.145	9.40	0	1.077	1.646	***
3.med	2.746	.226	12.17	0	2.303	3.19	***
Constant	.348	.078	4.44	0	.194	.502	***
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		63.837	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**c. Media exposure & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
0b.expo_med	0	.	.	.	.	.	
1.expo_med	.912	.102	8.96	0	.712	1.112	***
Constant	.53	.083	6.37	0	.366	.693	***
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		80.255	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**d. Birth order & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.bor	0	.	.	.	.	.	
2.bor	-.34	.13	-2.60	.01	-.596	-.083	***
3.bor	-.513	.131	-3.91	0	-.771	-.255	***
4.bor	-1.152	.115	-10.01	0	-1.378	-.926	***
Constant	1.633	.12	13.57	0	1.396	1.869	***
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		50.855	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**e. Means of transport & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
0b.mot	0	.	.	.	.	.	
1.mot	-.331	.161	-2.06	.04	-.647	-.015	**
2.mot	.275	.099	2.77	.006	.08	.47	***
3.mot	.981	.18	5.44	0	.627	1.336	***
Constant	.763	.078	9.77	0	.61	.917	***
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		13.893	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**f. Healthcare decision & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.ctr	0	.	.	.	.	.	
2.ctr	.463	.084	5.50	0	.297	.628	***
Constant	.746	.079	9.39	0	.59	.902	***
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		30.244	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**g. Wealth status & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.wlth	0	.	.	.	.	.	
2.wlth	.865	.123	7.04	0	.624	1.107	***
3.wlth	1.942	.139	13.98	0	1.669	2.215	***
Constant	.184	.09	2.05	.041	.007	.36	**
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		97.713	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							



**h. Community perception of distance to health facility & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.compdh	0	.	.	.	.	.	
2.compdh	-.957	.139	-6.88	0	-1.231	-.684	***
Constant	1.449	.092	15.81	0	1.269	1.629	***
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		47.269	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**i. Place of residence & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.v025	0	.	.	.	.	.	
2.v025	-1.119	.144	-7.77	0	-1.402	-.836	***
Constant	1.753	.117	15.01	0	1.524	1.983	***
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		60.427	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**j. Community female literacy level & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.comflt1	0	.	.	.	.	.	
2.comflt1	.582	.165	3.54	0	.259	.906	***
3.comflt1	1.494	.18	8.28	0	1.14	1.849	***
Constant	.238	.122	1.96	.051	-.001	.477	*
Mean dependent var		0.700		SD dependent var		0.458	
Number of obs		6803.000		F-test		34.402	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**k. Community poverty level & SBA**

add	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
1b.compov	0	.	.	.	.	.	
2.compov	-.595	.164	-3.62	0	-.918	-.273	***
3.compov	-1.191	.165	-7.22	0	-1.516	-.867	***
Constant	1.508	.108	13.93	0	1.296	1.721	***
Mean dependent var	0.700		SD dependent var		0.458		
Number of obs	6803.000		F-test		26.132		
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

**Appendix-D**

**Multilevel Analysis**

**a. Variance Inflation Factor.**

Variable	VIF	1/VIF
1.emp	1.20	0.833408
med		
1	1.47	0.680775
2	2.12	0.472056
3	2.14	0.466711
1.expo_med	2.59	0.385723
bor		
2	1.83	0.547272
3	1.69	0.591468
4	2.68	0.373556
mot		
1	1.14	0.880684
2	2.19	0.457304
3	1.61	0.622119
2.ctr	1.84	0.542773
wlth		
2	1.84	0.543846
3	4.73	0.211565
2.compdh	2.68	0.373149

2.v025		3.40	0.294003
comflt1			
2		2.56	0.391222
3		4.28	0.233428
compov			
2		1.82	0.549084
3		3.35	0.298898
-----			
Mean VIF		2.36	

### b. Null Model Estimation.

Mixed-effects logistic regression  
6,803

Number of obs =

Group Variable		No. of Groups	Observations per Group			Integration Points
			Minimum	Average	Maximum	
v001		458	1	14.9	38	7
v002		5,842	1	1.2	6	7

Wald chi2(0) =  
.  
Log likelihood = -3521.1375  
Prob > chi2 =  
.

		Odds	Std. Err.	z	P> z	[95% Conf. Interval]
add						





1.453526	Exposed		1.194799	.1194909	1.78	0.075	.9821249
	bor						
.8205917	2		.6205541	.0884663	-3.35	0.001	.4692802
.683907	3		.5100658	.0763245	-4.50	0.000	.380413
.4902832	4 or higher		.3758264	.0509783	-7.21	0.000	.2880896
	mot						
1.330704	Bicycle		.9389781	.1670411	-0.35	0.723	.6625666
1.205801	Motor Cycle/Scooter		.983666	.1021891	-0.16	0.874	.8024533
1.755618	Car/Truck		1.252476	.2157995	1.31	0.191	.8935292
	ctr						
1.71144	Not male dominated		1.42028	.1351325	3.69	0.000	1.178654
	hcc						
1.354388	5-9		.9980268	.1554736	-0.01	0.990	.7354298
1.306014	10-14		.9399028	.1577526	-0.37	0.712	.6764223
1.400173	15 and above		.9443857	.1897559	-0.28	0.776	.6369671
	wlth						
3.026465	Moderate		2.323047	.3135171	6.25	0.000	1.783119
7.321725	Rich		5.210948	.9041804	9.51	0.000	3.708686
3.383826	_cons		2.295924	.4543574	4.20	0.000	1.557783

-----  
 -----  
 Note: \_cons estimates baseline odds (conditional on zero random effects).

```

-----
--
Random-effects Parameters | Estimate Std. Err. [95% Conf.
Interval]
-----+-----
v001: Identity           |
var(_cons) | 1.968607 .289531 1.475602
2.626326
-----+-----
v002: Identity           |
var(_cons) | 1.555349 .4259252 .909348
2.660269
-----
LR test vs. logistic model: chi2(2) = 575.44 Prob > chi2 =
0.0000

```

Note: LR test is conservative and provided only for reference.

```
. estat ic
```

Akaike's information criterion and Bayesian information criterion

```

-----
-
Model | Obs ll(null) ll(model) df AIC
BIC
-----+-----
. | 6,803 . -3233.452 20 6506.905
6643.407
-----
-

```

Note: N=Obs used in calculating BIC; see [R] BIC note.

#### d. Model-2 Estimation

Mixed-effects logistic regression  
6,803

Number of obs =

```
-----+-----
```

Group Variable		No. of Groups	Observations per Group			Integration Points
			Minimum	Average	Maximum	
v001		458	1	14.9	38	7
v002		5,842	1	1.2	6	7

```
-----+-----
```

157.65 Wald chi2(6) =

Log likelihood = -3406.359 Prob > chi2 =

0.0000

```
-----+-----
```

```
--
```

	add	Odds Ratio	Std. Err.	z	P> z	[95% Conf. Interval]
comflt1						
med		2.602946	.6049304	4.12	0.000	1.650608 4.104746
high		6.665627	1.976741	6.40	0.000	3.727442 11.91986
przd						
Rural		.643165	.1340004	-2.12	0.034	.4275418 .9675339
compov						
moderate		.9165248	.2432297	-0.33	0.743	.5448163 1.541836
high		.6483191	.1786167	-1.57	0.116	.3778127 1.112503
compdh						
high		.321452	.0642814	-5.68	0.000	.21722 .4756994





245.18 Wald chi2(21) =  
 Log likelihood = -3240.3098 Prob > chi2 =  
 0.0000

```
-----
```

	add	Odds Ratio	Std. Err.	z	P> z	[95% Conf. Interval]
-----						
	emp					
1.088337	Employed	.8390648	.1113571	-1.32	0.186	.6468858
	med					
2.329172	primary	1.781437	.2436725	4.22	0.000	1.36251
3.067962	secondary	2.321175	.330347	5.92	0.000	1.756167
13.86448	higher	8.752272	2.054219	9.24	0.000	5.525071
	ctr					
1.63016	Not male dominated	1.350391	.1297255	3.13	0.002	1.118635
	expo_med					
1.554818	Exposed	1.276667	.1283895	2.43	0.015	1.048276
	bor					
.8077281	2	.6091459	.0876962	-3.44	0.001	.4593856
.6615113	3	.4920439	.0742998	-4.70	0.000	.3659911
.4565535	4 or higher	.3487188	.047939	-7.66	0.000	.266354
	mot					
1.253137	Bicycle	.8804495	.1585614	-0.71	0.480	.6186006

Motor Cycle/Scooter		1.216089	.1258068	1.89	0.059	.9929031	
1.489443							
Car/Truck		2.044668	.3491259	4.19	0.000	1.463122	
2.85736							
	hcc						
	5-9		1.07132	.1685465	0.44	0.661	.7870511
1.458261							
	10-14		1.096598	.1858562	0.54	0.586	.7866513
1.528667							
	15 and above		1.165585	.2360693	0.76	0.449	.7836963
1.733566							
	compdh						
	high		.3363645	.0661704	-5.54	0.000	.2287493
.4946073							
	przd						
	Rural		.7305014	.1502415	-1.53	0.127	.4881522
1.093168							
	compov						
	moderate		1.173238	.3073201	0.61	0.542	.7021358
1.960431							
	high		.8456015	.2298602	-0.62	0.537	.4963446
1.440616							
	comflt1						
	med		1.772747	.4036494	2.51	0.012	1.134568
2.769892							
	high		2.546776	.7405036	3.22	0.001	1.440437
4.502846							
	_cons		4.79946	1.574513	4.78	0.000	2.523172
9.129308							

-----  
-----  
Note: \_cons estimates baseline odds (conditional on zero random effects).  
-----  
--

```

Random-effects Parameters | Estimate Std. Err. [95% Conf.
Interval]
-----+-----
--
v001: Identity           |
var(_cons) | 1.949234 .2860666 1.461985
2.598872
-----+-----
--
v002: Identity           |
var(_cons) | 1.684494 .441386 1.007929
2.815197
-----+-----
--
LR test vs. logistic model: chi2(2) = 573.60 Prob > chi2 =
0.0000

```

Note: LR test is conservative and provided only for reference.

```
. estat ic
```

Akaike's information criterion and Bayesian information criterion

```

-----+-----
-
Model | Obs ll(null) ll(model) df AIC
BIC
-----+-----
-
. | 6,803 . -3240.31 24 6528.62
6692.422
-----+-----
-

```

Note: N=Obs used in calculating BIC; see [R] BIC note.

## Appendix-E

### 1. Construction of Community Level Variable.

Community level variables are self-computed using the individual level variables given in the DHS.

For a particular community level variable, one category is selected from the corresponding individual level variable, e.g, for community poverty level, category representing respondents belonging to “poorest wealth quintile” is selected. This category is then sorted (using *bysort* and *egen* command in STATA) at Primary Sampling Unit and “mean” is calculated subsequently. Next, the mean value is divided into three categories i.e., “low”, “medium” and “high”. In this way an individual attribute is converted into community attribute. This methodology is used for all the community level variables.

### 2. Weight.

DHS recommends that weights should be used to make data more representative of the population. In this study weights have been assigned to variables by using the following values.

$$\text{wgt} = \text{V005}/1000000$$

### 3. Calculation of ICC.

ICC has been calculated by using the following formula.

$$ICC_{logit} = \rho = \pi_{00} / (\pi_{00} + \frac{\pi^2}{3})$$

Where:

$$\pi_{00} = 3.99 \text{ (Community variance in the Null Model)}$$

$$\frac{\pi^2}{3} = 3.29: \text{this value is referred to as standard logistic distribution}$$

By putting these values in the formula;

$$ICC = \frac{3.99}{7.28}$$

$$ICC = 0.548.$$

Similarly ICC for Model-1, Model-2 and Model-3 are calculated by applying the above formula.

#### **4. Note on Reference Category (RC)**

Conventionally reference category Odd ratio is assigned a value of 1 and the rest of the odd ratios are interpreted based on this value of reference category. In this study this convention has been followed and the result have been interpreted based base value of “1” for the reference category.

-----**END**-----