

**The Impact of Depression and Stress on Preterm Births in
First-Time Mothers:
A Study on a Bangladeshi Women**

BY

**Md. Rashid Arif
ID: 221-17-522**

This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

Dr. Md Zahid Hasan
Associate Professor
Department of CSE
Daffodil International University



DAFFODIL INTERNATIONAL UNIVERSITY

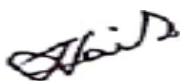
DHAKA, BANGLADESH

FEBRUARY 2024

APPROVAL

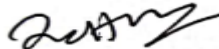
This Project titled “**The Impact of Depression and Stress on Preterm Births in First-Time Mothers: A Study on a Bangladeshi Women**”, submitted by **Md. Rashid Arif** to the Department of Computing and Information System, Under CSE, Daffodil International University, has been accepted as satisfactory for the partial fulfilment of the requirements for the degree of MS. in Management Information System and approved as to its style and contents. The presentation has been held on 3rd February, 2024

BOARD OF EXAMINERS



Professor Dr. Sheak Rashed Haider Noori
Professor and Head
Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Chairman



Dr. Md. Zahid Hasan
Associate Professor
Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner



Sazzadur Ahamed
Assistant Professor
Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner



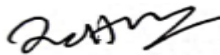
Dr. Firoz Ahmed
Professor
Department of ICE
University of Rajshahi

External Examiner

DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Md Zahid Hasan, Assistant professor, Department of CSE**, Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised by:



Dr. Md Zahid Hasan

Associate Professor
Department of CSE
Daffodil International University

Submitted by:



Md. Rashid Arif

ID: 221-17-522
Department of CSE
Daffodil International University

ACKNOWLEDGEMENT

First I express my heartiest thanks and gratefulness to Almighty Allah for His divine blessing which makes me possible to complete the final year project/internship successfully.

I really grateful and wish my profound indebtedness to **Md Zahid Hasan, Assistant professor**, Department of CSE, Daffodil International University, Dhaka, deep knowledge & keen interest of my supervisor in the field of Machine Learning to carry out this project. His endless patience, scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this project.

I would like to express my heartiest gratitude to **Dr. Sheak Rashed Haider Noori**, Head, Department of CSE, for his kind help to finish our project and also to other faculty members and the staffs of CSE department of Daffodil International University.

Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

This thesis looks at the relationship between stress, depression, and preterm births among first-time mothers in Bangladesh. Preterm births are defined as births that happen before 37 weeks of gestation, and they have a lot of health implications for both the mother and the baby. Stress and depression have been identified as potential risk factors for preterm births, but it is unclear how specifically they affect this issue in Bangladesh.

The increased number of preterm births has raised concerns in recent years since it presents serious risks to the health of both the mother and the newborn. Preterm birth mechanisms continue to be complicated and multifactorial, despite international efforts to address this issue. The specific experiences of first-time mothers in Bangladesh are the main focus of this study, which also acknowledges the possible interactions between healthcare, cultural, and economic factors that may make this demographic more vulnerable to mental health issues during pregnancy.

A mixed-methods strategy is used in the inquiry to collect thorough data, which combines quantitative surveys and qualitative interviews. First-time pregnant women's stress and depression levels are measured using standardized instruments as part of the quantitative component. Qualitative interviews, on the other hand, offer a more profound comprehension of the environmental and cultural elements that either exacerbate or lessen the effects of stress and depression on premature births.

The results of this study may influence public health policy and focused interventions meant to enhance maternal mental health in Bangladesh. This study adds significant insights to the global conversation on maternal healthcare by highlighting the links between depression, stress, and preterm births in first-time mothers. It also highlights the importance of culturally appropriate methods for addressing mental health issues during pregnancy. In the end, the findings of this research might open the door to more practical approaches to lessen the incidence of preterm deliveries and enhance the general health of mothers and children in Bangladesh and other comparable settings.

Table of Contents

APPROVAL	ii
DECLARATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT.....	v
CHAPTER 1.....	1
Introduction.....	1
1.1 Introduction.....	1
1.2 Background and Rationale	1
1.3 Research Objectives.....	2
1.4 Research Questions	2
1.5 Statement of the Problem.....	2
1.6 Significance of the Study	3
1.7 Scope and Limitations.....	3
CHAPTER 2.....	4
Literature Review	4
2.1 Introduction.....	4
2.2 Literature Review.....	4
2.3 Preterm Births	5
2.4 Overview the Preterm Births	6
2.5 Symptoms the Preterm Births	6
2.5.1 Depression and Stress in Pregnancy	7
2.5.2 Factors Contributing to Preterm Births.....	9
2.6 The Bangladeshi Context	10
2.7 Previous Studies and Gaps.....	11
CHAPTER 3.....	12
Research Methodology	12
3.1 Introduction.....	12
3.2 Study Design and Populations of Interest	12
3.2.1 In-Depth Interviews	12
3.2.2 Key Informant Interviews	13
3.2.3 Focus Group Discussions.....	13
3.3 Study Setting.....	15

3.4	Sample amounts	15
3.5	Qualitative Interview and Facilitator Guides	17
3.6	Education	18
3.7	Conclusion	19
3.8	Statistical Analysis.....	19
CHAPTER 4.....		21
Personal Narratives of Preterm Delivery.....		21
4.1	Introduction.....	21
4.2	Causes for Preterm Birth.....	22
4.3	Prevention	23
4.4	Treatment	25
4.5	Emotions after Preterm Birth	26
4.5.1	Managing Emotions	28
4.5.2	Looking After Yourself.....	28
4.5.3	Being with Your Baby	29
4.5.4	Seeking Support.....	29
4.6	Narrative Analysis of Pregnancy Experiences.....	29
CHAPTER 5.....		32
Data Analysis and Results		32
5.1	Introduction.....	32
5.2	Participants.....	32
5.3	Characteristics.....	33
5.3.1	Socio Demographic Characteristic.....	33
5.3.2	Obstetric-Gynecologic Characteristic	35
5.3.3	Health Status Characteristic	36
5.3.4	Relationship between Socio-Demographic Characteristics and Gestational Age..	38
5.3.5	Relationship between obstetric-gynecologic characteristics and gestational age ..	39
5.3.6	Relationship between health characteristics and gestational age of preterm birth mothers (N = 95).....	41
5.4	Health problems by gestation at birth	43
5.5	Prediction Model of Preterm Birth Using Electronic Health Record.....	45
5.5.1	Feature Processing	47
5.5.2	Outcome Measure	48

5.5.3	Statistical Analysis.....	48
5.6	Characteristics of Pregnant Women and Newborns.....	49
5.7	Prenatal Testing of Pregnant Women before 27 Weeks of Gestation.....	50
CHAPTER 6		55
Conclusion and Future Work		55
6.1	Conclusion	55
6.2	Future Work.....	56
References		58

List of Figure

Figure 2.1: Depression in Pregnancy	8
Figure 4.1: Preterm Birth Baby	27
Figure 5.1: Relationship between socio-demographic characteristics and gestational age of preterm birth mothers.....	38
Figure 5.2: Relationship between obstetric-gynecologic characteristics and gestational age of preterm birth mothers.....	40
Figure 5.3: Relationship between health characteristics and gestational age of preterm birth mothers.....	42
Figure 5.4: Problems by Gestation at Birth.....	44
Figure 6.1: Workflow of this study.....	46
Figure 6.2: Preprocessing of variables	47

List of Table

Table 3.1: Inclusion criteria for each study participant type.....	13
Table 3.2: Selected study sites across each Upazila	15
Table 3.3: Final sample sizes	16
Table 3.4: Major components of interview/facilitator guides	17
Table 3.5: Educational attainment among participants	18
Table 4.1: Weight, length and head circumference by gestational age for boys.....	21
Table 4.2: Weight, length and head circumference by gestational age for Girls	22
Table 4.3: Pregnant women's workload according to birth outcome type District of Satkhira, Bangladesh.....	30
Table 5.1: Distribution of Socio-demographic Characteristics of Preterm Birth Mothers	33
Table 5.2: Distribution of obstetric-gynecologic characteristics of preterm birth mothers	35
Table 5.3: Distribution of health status characteristic of preterm birth mothers.....	37
Table 5.4: Proportion of mothers and babies with health problems by gestation at birth.....	43
Table 6.1: Characteristics of mother and newborn between PTB and control group	50
Table 6.2: Prenatal testing of pregnant women before 27 weeks of gestation between PTB and control group.....	51

CHAPTER 1

Introduction

1.1 Introduction

A woman's pregnancy is a complicated and important time in her life that has an inherent effect on both her physical and mental wellbeing. On the other hand, getting used to the significant physiological changes that occur during pregnancy may be challenging. Nonetheless, a fundamental component of her mental health, including her emotional conduct, is her need to protect both her fetus and herself.

In the quest for optimal health, one may need to consider novel effects, lifestyle modifications (such as dietary habits, physical activity, sleep patterns, and employment), appropriate medical attention, and prompt follow-ups. Further crucial element that may have a detrimental effect on the brain health of the expectant mother is the implied risk of health issues arising during the pregnancy, particularly if the likelihood of difficulties is high. Additionally, in this situation, physiological issues may result from health issues but they may also operate as risk factors for diseases to develop during pregnancy [1].

1.2 Background and Rationale

Preterm births, which are defined as childbirth that takes place before 37 weeks of gestation, continue to be a serious global public health concern. The risk of newborn mortality, neonatal illness, and long-term health issues for the kid is greatly increased by these early deliveries. They also put extra strain on healthcare systems, increasing medical expenses and resource requirements. It is thought that stress and depression in mothers may be risk factors for preterm births; by better understanding this association, healthcare for mothers and babies might be improved [2].

Preterm birth rates are disproportionately high in low- and middle-income nations like Bangladesh and first-time mothers are frequently susceptible to stress and anxiety. It is unclear exactly which mechanisms underlie the association in this population between mother stress, depression, and premature deliveries.

1.3 Research Objectives

The following goals are the focus of this research:

- ❖ To investigate the incidence of stress and depression among Bangladeshi first-time mothers.
- ❖ To look at the relationship between the frequency of preterm births and maternal stress and depression.
- ❖ To determine whether there are any socioeconomic or cultural variables that might make the effects of stress and depression worse on premature births.
- ❖ To offer suggestions for focused therapies and networks of support in order to lessen the negative effects of stress and depression on preterm births among Bangladeshi first-time mothers.

We will look at the methodology, literature review, results, and discussion in the following sections of this thesis to throw light on the intricate relationship between maternal mental health and preterm births in the specific context of first-time moms in Bangladesh.

1.4 Research Questions

The following research questions are intended to be addressed by this study:

1. What is the rate of stress and depression among Bangladeshi women who are getting pregnant for the first time?
2. Is there a connection between the likelihood of preterm births among first-time mothers and maternal depression during pregnancy?
3. What is the relationship between the incidence of preterm births among first-time mothers and maternal stress during pregnancy?
4. What cultural, sociodemographic, and healthcare-related factors are involved in the relationship between preterm births and maternal mental health in Bangladesh?

1.5 Statement of the Problem

The contribution of maternal mental health, particularly depression and stress, to preterm births in Bangladesh is one of the understudied aspects of preterm births. In other

contexts, maternal depression and stress have been associated with unfavorable pregnancy outcomes; however, this relationship in the context of Bangladesh has not been extensively investigated. Designing efficient interventions to lower the incidence of preterm births in Bangladesh and other low-resource settings requires an understanding of this relationship.

1.6 Significance of the Study

Maternal and child health in Bangladesh, a heavily populated nation in South Asia, has significantly improved over time. Preterm birth rates, however, continue to be a problem and add to the overall burden of infant illness and mortality in the nation. It is essential to comprehend the connection between preterm births and maternal mental health, namely stress and depression, in order to design focused therapies that will enhance the health of both the mother and the child [3].

Since first-time mothers may be more susceptible to the psychological strains associated with pregnancy and childbirth, this study focuses on them. Being a mother is a different and difficult experience, and there may be a stronger correlation between mental health and pregnancy outcomes in this group.

The purpose of this study is to shed light on the particular variables affecting pregnancy outcomes in Bangladeshi women by examining the relationship between depression, stress, and preterm births. By recognizing these variables, programs, interventions, and support networks that lower the risk of preterm births and improve the general health of expectant mothers and their babies can be developed [4].

1.7 Scope and Limitations

This study is restricted to Bangladeshi first-time mothers. While multiparous mothers may experience different effects from depression and stress on preterm births, this study focuses on first-time mothers to offer unique insights into this population.

The potential for recall bias in self-reported data and the complexity of maternal depression and stress, which may have multiple causes, are among the study's limitations. Furthermore, it's possible that some confounding factors that could affect the risk of preterm birth were overlooked in this study [5].

CHAPTER 2

Literature Review

2.1 Introduction

With a focus on a special dataset from Bangladesh, this literature review begins a thorough investigation of the effects of stress and depression on preterm births in first-time mothers. Stress and depression, two common mental health conditions, have been linked to unfavorable pregnancy outcomes across the globe. The relationship between mother mental health and preterm deliveries has been the subject of numerous studies carried out in a variety of populations, highlighting the necessity for customized research in certain cultural situations. Bangladesh offers an attractive context for examining these links because of its unique sociocultural dynamics and healthcare issues. In addition to being a public health issue, the influence of stress and depression on preterm births is also a crucial area for intervention to enhance the health of expectant mothers and newborns.

In the context of Bangladeshi first-time moms, this literature review attempts to summarize the body of research on the relationship between depression, stress, and premature births. This review aims to fill knowledge gaps and advance understanding of the intricate dynamics at play by analyzing available data and providing guidance for targeted actions and support systems. By doing this, we seek to clarify the complex association between poor pregnancy outcomes and maternal mental health, which will eventually direct future studies and healthcare programs in Bangladesh and other comparable countries across the world [6].

2.2 Literature Review

This literature review will first examine the body of research on depression and stress as risk factors for preterm births, taking into account their physiological and psychological mechanisms, in order to give a thorough overview of the topic. After that, the review will look at the particular circumstances of first-time mothers, who frequently experience special difficulties and pressures during pregnancy.

Preterm births are associated with a number of factors, including depression and stress, which have been shown to put the health of both the mother and the newborn at serious risk. A thorough knowledge of the mechanisms involved is crucial, as numerous studies have demonstrated the complex interplay between psychological factors and gestational outcomes. Determining the particular subtleties of this relationship becomes essential in the Bangladeshi setting, where cultural, societal, and economic issues may exacerbate the pressures faced by first-time mothers [7].

It is imperative to recognize the constraints and deficiencies present in the current body of literature. Most of the evaluated research mainly concentrate on the individual components of stress or depression, frequently ignoring the potential combined impact of both illnesses. Furthermore, there is still a dearth of research in the literature on the cultural context of Bangladeshi women's experiences, which includes societal expectations, familial support networks, and healthcare accessibility.

The literature review indicates that a more comprehensive and culturally aware approach is required to fully understand the complex relationships between maternal mental health, depression, stress, and preterm births among Bangladeshi first-time moms. Future research should work to close these gaps by combining a thorough knowledge of the cultural, societal, and economic factors that influence Bangladeshi women's pregnant experiences. The development of focused therapies and support networks that might lessen the negative effects of stress and depression on preterm births is crucial, as it will eventually improve the health outcomes for mothers and newborns in this vulnerable demographic [8].

2.3 Preterm Births

Preterm births, which are births that occur before 37 weeks of gestation, are a serious worldwide health concern. Complications such as respiratory distress syndrome, infections, and long-term health issues like neurodevelopmental delays are more common in preterm infants. Preterm birth complications are a major cause of neonatal mortality in Bangladesh.

Preterm birth rates vary greatly between nations, with lower and middle-income countries having higher rates. Numerous risk factors, such as maternal age, socioeconomic status, and health conditions, have been identified [9].

2.4 Overview the Preterm Births

A baby born prematurely is one who is born too soon. The baby is delivered prior to the 37th week of pregnancy. The average length of a pregnancy is forty weeks.

Particularly in cases where they are born very early, premature babies frequently have major health issues. These issues frequently change. However, a baby's chance of experiencing health issues increases with early birth [10].

A newborn can be:

- Born between weeks 34 and 36 of pregnancy, this baby was delivered late.
- Born between 32 and 34 weeks of pregnancy; moderately preterm.
- Extremely premature; born between weeks 28 and 32 of pregnancy.
- Born before 28 weeks of pregnancy; extremely preterm.
- The late preterm stage is when most premature births occur.

2.5 Symptoms the Preterm Births

Your baby might have more serious health issues or very mild signs of preterm birth.

Among the indicators that one was born too soon are:

- Tiny, with a large head in relation to a small body.
- Because there are fewer fat-storing cells in their features, they are more angular and less round than those of a full-term baby.
- Fine hair covering a large portion of the body.
- Low body temperature, mostly in the delivery room immediately following birth.
- Trouble breathing.
- Issues with feeding.

2.5.1 Depression and Stress in Pregnancy

Pregnancy-related depression and stress are serious mental health issues that can have a major impact on the mother and the growing fetus. If these emotional and psychological states are not addressed, they can lead to a number of negative outcomes, the most alarming of which is preterm birth. It is critical to comprehend how stress and depression affect a pregnant woman's health as well as the health of her unborn child. We'll discuss the main points of stress and depression during pregnancy in this section [11].

2.5.1.1 Depression On During Pregnancy

Prenatal or antenatal depression, also known as depression during pregnancy, is a mental health illness marked by enduring melancholy and hopelessness as well as a loss of interest in or enjoyment from activities. It can have an impact on a woman's mental health and, if untreated, have a number of detrimental effects, such as:

- **Preterm Birth:** Studies have linked depression during pregnancy to a higher chance of preterm delivery. Although the precise mechanisms underlying this relationship are still being studied, it is thought that the hormonal and physiological changes linked to depression may have an impact on when labor begins.
- **Low Birth Weight:** Babies born to depressed moms are more likely to have low birth weights, which increases the risk of a number of newborn health issues.
- **Poor Maternal Care:** Depression may make it more difficult for a woman to take care of herself during her pregnancy, including getting enough nutrition and prenatal care, which may worsen the chances of an unfavorable pregnancy outcome [12].

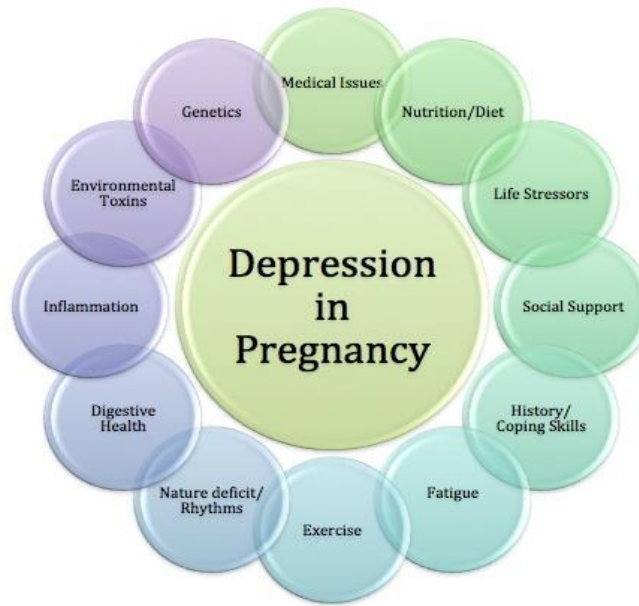


Figure 2.1: Depression in Pregnancy

Medical issues (such as hypothyroidism, excruciating pregnancy nausea and vomiting, or an issue relating to the pregnancy itself). An earlier difficult pregnancy or miscarriage. Nutritional inadequacies (for example, low levels of iron, vitamin D, protein, and omega-3 fats). Exhaustion brought on by inadequate sleep. Issues with blood sugar, such as hypoglycemia and hyperglycemia. Relationship issues or a lack of support. Depression in the family history. Insufficient or inefficient coping mechanisms. Difficult issues in life (money, housing, stress at work, etc.) Dissatisfaction or indecision regarding pregnancy. Food allergies or dysbiosis (disorders in the microbiome or flora of the gut). Absence of movement or exercise. Not enough sunlight or outdoor time. Environmental pollutants include, among other things, hormone-mimicking substances found in plastics used in food packaging and water bottles, heavy metal toxicity, which is typically caused by consuming excessive amounts of mercury-rich fish like tuna [13].

2.5.1.2 Stress On During Pregnancy

Numerous things can lead to stress during pregnancy, such as relationship problems, financial worries, stress at work, or even the stress of the pregnancy itself. Stress can cause a variety of issues during pregnancy, including:

- **Preterm Birth:** Excessive stress during pregnancy has been associated with a higher risk of preterm birth, much like depression. Persistent stress can trigger the body's stress response mechanism, which can alter hormone levels and physiological functions and increase the risk of preterm labor.
- **Effects on Development:** Stress during pregnancy may have long-term consequences for the growing fetus, which may affect the child's cognitive and emotional growth in childhood and beyond [14].
- **Behavioral Issues:** Offspring of mothers who endured elevated stress levels during their pregnancies may be more susceptible to emotional and behavioral challenges.

2.5.2 Factors Contributing to Preterm Births

The delivery of a baby before 37 weeks of pregnancy is known as preterm birth, and it is a complicated and multifaceted phenomenon. Preterm births are associated with a number of factors, all of which fall into a few general categories. It is essential to comprehend these elements in order to manage and prevent preterm births. The following are some of the main causes of preterm births [15]:

1. Maternal Factors

- **Past Preterm Birth:** One of the biggest risk factors for future preterm births is a history of prior preterm births.
- **Multiple Pregnancies:** Preterm birth is more likely in women who are expecting twins, triplets, or more.
- **Age:** Preterm birth is more common in mothers who are very young (under 18) and older (over 35).
- **Medical Conditions:** Preterm birth is more likely in women with certain medical conditions, including high blood pressure, diabetes, and infections.
- **Lifestyle Factors:** Preterm birth is more likely in women who smoke, use drugs, or drink excessive amounts of alcohol while pregnant.

2. Cervical and Uterine Elements

- **Uterine Anomalies:** Preterm birth is more likely when the uterus is structurally abnormal.

- **Cervical insufficiency:** Preterm birth can result from a weak cervix that opens too early in pregnancy.

3. Aspects of Behavior

- **Inadequate Prenatal Care:** Unmanaged health conditions and increased risk can result from delayed or insufficient prenatal care.
- **Malnutrition:** Inadequate nutrition during pregnancy can stunt fetal development and raise the chance of preterm birth.
- **Substance Abuse and Smoking:** Using alcohol, tobacco, or illegal drugs while pregnant raises the risk of preterm birth.

4. Social and Environmental Factors

- **Socioeconomic Status:** Women with low socioeconomic status may experience more stress and have fewer resources, which raises their risk.
- **Healthcare Access:** Poor prenatal care and poor access to high-quality healthcare services can affect the course of a pregnancy.
- **Environmental Toxins:** Preterm birth may be exacerbated by exposure to environmental pollutants like air pollution or specific chemicals.

5. Advances in Healthcare and Technology

- **Artificial intelligence:** Predictive models and AI are being investigated to detect pregnancies at risk early and take action to lower the risk of preterm birth.
- **In vitro fertilization (IVF):** There may be a slight increase in the risk of preterm birth with IVF and other assisted reproductive technologies.

It's crucial to remember that these variables frequently interact, making it difficult to accurately predict and prevent preterm births. To address the issue of preterm births and improve mother and child health outcomes, it is imperative that personalized care plans and early interventions be developed in addition to continuing research [16].

2.6 The Bangladeshi Context

Bangladesh has many issues concerning the health of mothers and children, one of which is the country's high rate of preterm births. Given the limited resources available to the nation's healthcare system, identifying modifiable risk factors, like maternal mental health, is crucial.

In Bangladesh, preterm births pose a serious threat to public health because they can have a variety of negative effects on mothers and babies. In the context of Bangladesh, this study examines the association between first-time mothers' preterm birth risk and their levels of stress and depression during pregnancy. Furthermore, this study employs artificial intelligence methodologies to yield a more accurate comprehension of this correlation among the Bangladeshi populace [17].

2.7 Previous Studies and Gaps

Prior studies have looked at the effects of stress and depression on preterm births in a variety of contexts, but Bangladesh has not been the subject of many of them. Furthermore, not much research has looked into how artificial intelligence might be used to forecast the risk of preterm birth using data from Bangladesh. Through the use of artificial intelligence techniques and a Bangladeshi dataset, this study seeks to close these gaps.

CHAPTER 3

Research Methodology

3.1 Introduction

Pregnancy period is a critical stage for mother's health, fetuses and babes. Colorful Socio-demographic factors similar as gender of the baby, motherly age, mother's education position, motherly nutritive status and birth- weight of the child have been associated with Parkinson's Disease (PD). Some gestation- related factors similar as interval between gravidity, place of delivery, system of family planning, high fever during pregnancy, anaemia, vaginal bleeding during early pregnancy, no ante-natal care and use of iron – folic supplementation were also noted as threat factors for PD.

3.2 Study Design and Populations of Interest

This qualitative study aimed to understand the contextual, local nature of risk factors for Preterm Birth (PTB) and people's lived experiences of PTB in three Upazila of Satkhira District of Bangladesh including Satkhira Sadar, Debhata and Shyamnagar. In order to gather a more robust, nuanced picture of risk factors for PTB and PTB experiences within communities in these settings, the study drew on multiple qualitative methods, including In-Depth Interviews (IDIs), Key Informant Interviews (KIIs), and Focus Group Discussions (FGDs), with multiple populations of interest.

3.2.1 In-Depth Interviews

To gather narratives about women's experiences with PTB, a series of IDIs were conducted with women, women's spouses/partners, and members of their extended families. The women who are married or in a union and taking part in the IDIs may or may not be related to their spouses/partners and extended family members. Female relatives, specifically mothers-in-law, sisters-in-law, mothers, or sisters, were included in the extended family. Answers to three screening questions regarding the recent pregnancy served as the basis for the self-reported PTB experience:

1. Did the child arrive early?
2. What month did the child arrive?
3. What was the baby's birth weight?

Whether a participant was interviewed or not depended on their answers to at least two of the three questions pointing toward a PTB. The majority of the definition of PTB was based on the participants' self-reported experiences of PTB because many of the communities where this research study was conducted lacked access to trustworthy local health facility records.

3.2.2 Key Informant Interviews

In order to gather a more complete understanding of existing community strengths, challenges, and opportunities in communities where IDIs and FGDs are conducted, and to gather more details on the context within which PTB takes place in each of the program countries, KIIs with key influential community members – such as health workers, community leaders, and religious leaders – were conducted.

3.2.3 Focus Group Discussions

FGDs with community women, spouses/partners, and unmarried adolescent girls were facilitated to gather insights on community social and gender norms that are related to maternal healthcare seeking and PTB.

Table 3.1: Inclusion criteria for each study participant type

Type	Type of study participant	Inclusion criteria
	Women of reproductive age (20–49) currently married/in union who have had one of the following four experiences in the past two years: • PTB and the child did not survive (died within 1 month) • PTB and child survived • Full-term birth • Nulliparous and using a modern contraceptive method	Currently married/in union; aged 20–49 years; have had one of the four specified experiences in the past two years

I D I S	Spouses/partners of women (15–49) with a PTB in the past two years	Currently married/in union with a woman of reproductive age (15–49 years) who has had a PTB in the past two years; 15 years or older; can be but not required to be married/in union with a woman participating in the study
	Extended family member of women (15–49) with a PTB in the past two years (mother-in-law, sister-in-law, mother, or sister)	Female family member (mother-in-law, sister-in-law, mother, or sister) of a woman of reproductive age (15–49) who has had a PTB in the past two years; 18 years or older; can be but not required to be related to a woman participating in the study
	Currently married/in union female adolescents (15–19 years)	Currently married/in union; 15–19 years; if possible, those that have had a PTB in the past two years
F G D S	Currently married/in union women of reproductive age (15–49) who are either currently pregnant or have given birth in the past two years	Currently married/in union; women of reproductive age (15–49); currently pregnant or has given birth in the past two years
	Spouses/partners of women of reproductive age (15–49) who are either currently pregnant or have given birth in the past two year	Currently married/in union with a woman of reproductive age (15–49 years) who is currently pregnant or has given birth in the past two years; 15 years or older; can be but not required to be married/in union with a

		woman participating in the study
	Unmarried/not in union female adolescents (15–19 years)	Unmarried/not in union; aged 15–19 years; female
K I I s	Key influential community members: Male/female community leaders; male/female faith leaders; traditional birth attendant; facility-based health worker; community health worker	Be one of the specified five key influential community members; 18 years or older

3.3 Study Setting

Three Upazila in Bangladesh were used for this qualitative investigation. Communities in Bangladesh's Satkhira Sadar, Debhata, and Shyamnagar administrative units—where BOT is actively carrying out operations—were chosen for recruitment and data gathering. Here lists each upazila's chosen study locations.

Table 3.2: Selected study sites across each Upazila

Upazila	Study Site
Satkhira Sadar	Alipur, Bhomra and Ghona
Debhata	Kulia, Noapara and Parulia
Shymnagar	Surulia, Gabura and Nurnagar

3.4 Sample amounts

The final IDIs, KIIs, and FGDs sample sizes for the qualitative study are shown in Table No-3.3. Based on recommended sample sizes of 10–20 interviews per participant type provided by qualitative researchers, sample sizes were established a priori. Researchers advise conducting at least two to three focus group discussions (FGDs), with roughly six to eight participants each, in order to achieve saturation (information redundancy) and identify the majority of major themes.

Table 3.3: Final sample sizes

	IDIs				KIIs			FGDs			
Upazila	Women	Men	Adolescent girls	Total	Women	Men	Total	Women	Men	Adolescent girls	Total
Satkhira Sadar	35	12	24	71	18	12	30	9	9	9	27
Debhata	30	10	18	58	16	9	25	11	9	7	27
Shyamnagar	27	11	22	60	20	9	29	9	9	9	27
Total	92	33	64	189	44	30	84	29	27	25	81

In order to collect a variety of perspectives and experiences regarding PTB, participants who met the inclusion criteria mentioned above were chosen through the use of purposeful sampling. Each of the three countries' community health workers, health facility employees, and prominent local citizens were asked to identify possible participants based on the participant types mentioned above. These people offered suggestions regarding possible men, women, and teenagers who would be open to taking part in the research. Once a possible participant was identified, the interviewer or facilitator made contact with the potential participant. The interviewer/facilitator gave an explanation of the study's rationale and objectives, as well as the reasons the subject was suggested for or chosen for participation. The recruitment script was read and the oral informed consent or assent process was carried out once it was established that the potential participant satisfied all inclusion requirements. In order to guarantee the confidentiality of the participants' Revised Report 15-29 August 2023 responses, the interviewer conducted the recruitment and consent/assent process for all participants in a private setting. Interviews took place in a private location chosen by the participant, at a time that worked for them. In order to prevent overhearing, interviewees were given the option of where the interviews would take place. The institutional review board (IRB) of the Johns Hopkins Bloomberg School of Public Health as well as regional IRBs in Bangladesh, such as Marie-Stopes Bangladesh, the World Health Organization (WHO), USAID, etc., approved all study protocols.

3.5 Qualitative Interview and Facilitator Guides

The table below describes the main elements of the facilitator guides or interview guides that are used during FGDs and interviews. Before starting data collection, all materials were pretested in a field location that was comparable to the study sites in all three countries.

Table 3.4: Major components of interview/facilitator guides

Data collection type	Major components of interview/facilitator guides
IDIs	Research tools designed for IDIs comprised inquiries aimed at eliciting information in the subsequent areas: daily activities and socio-demographic traits; nutrition (food intake, scarcity, and obstacles to sufficient nutrition); pregnancy experiences (concern, care-seeking, and delivery); attitudes toward pregnant women and PTB; cross-cutting factors (power dynamics within the household, gender roles, and communication between the couple and the household); and other LINC factors (intimate partner violence, workload, infections, and use of contraceptives).
FGDs	Questions about community perspectives on PTB, ANC service use, and place of delivery were included in the instruments created for focus group discussions (FGDs). Other questions addressed norms related to LINC factors (such as workload, stress, infections, care-seeking, nutrition, and use of contraceptives), household power dynamics, discriminatory gender norms, gender roles, and intimate partner violence. Instruments created for KIIs emphasized the roles played by powerful community members in the social capital and networks, as well as the community's current resources and issues, with an emphasis on PTB and

	LINC factors.
KIIs	Instruments created for KIIs concentrated on the roles played by powerful community members in the community as well as the resources and issues that are currently present, with a particular emphasis on PTB and LINC factors.

3.6 Education

Table 3.5: Educational attainment among participants

Education			
	Satkhira Sadar	Debhata	Shyamnagar
Participant type			
Women	Most studied up to class five, with some also completing HSC or SSC; post-secondary less common	Some completed some secondary (through class 10), while others had no education or were illiterate	Majority said no formal education; few said some primary or religious education (Madrasa)
Partners of women with a PTB (IDIs)	Most had some secondary (up to fifth or eighth) or passed SSC Some had no education	Some completed some secondary (through class 8), while others had no education or were illiterate	Most reported no formal education or only some primary
Extended family of women with a	Mothers-in-law often said no school, but went to	Mothers-in-law reported no schooling or being	Mothers-in-law said no formal

PTB (IDIs)	religious education (Madrassa) Few went to some primary school Sisters-in-law had secondary education	illiterate; few studied some primary Some other extended family had some secondary education	education
Unmarried adolescent girls (IDIs)	From class nine up to degrees in college	Most had some secondary (from fifth to 10th grade); few reported only some primary (e.g. up to grade three)	Most had some secondary (e.g. up to class 10); some had no formal education
Married adolescent girls (IDIs)	From class nine up to degrees in college	Most had some secondary (up to 10th grade)	Some had primary education, but most mentioned no formal education or leaving school

3.7 Conclusion

This chapter provided an overview of the adolescent girls, women, and men participating in IDIs, FGDs, and KIIs as part of this qualitative study. In the following chapters, we draw on the perspectives and voices of these participants to uncover lived experiences of preterm birth, pressing issues related to LINC factors, and contextual factors influencing participants' daily lives and health.

3.8 Statistical Analysis

Descriptive statistics were used to find the introductory information of the named variables used in the study. Chi-square test was used to descry the association between PD and socio-demographic, pregnancy, health and child- related factors. Double logistic retrogression was used to determine the effect of named independent factors on PD.

There's no exact system to describe the multi-collinearity problem among exposure factors for multiple logistic regression models. We used the magnitude of the SE to describe the multi-collinearity problem, and considered there was no multi-collinearity if the magnitude of the SE prevaricated between 0.001 and 0.5. Accretive logistic regression with backward elimination system was latterly used to find the stylish subset model for PD. Backward elimination procedure may have the advantage that it takes into consideration suppressor goods that might be lost in forward addition. The procedure starts the full equation and consecutively drops one variable at a time. The variables are dropped on the base of their donation to the reduction of error sum of places. The donation of an individual variable for each step is checked by the Wald statistic. However, the full set of variables is retained in the final step, if all the Wald test values are significant. The p value of lower than 0.05 was considered the position of significance. The whole analysis of this study was conducted with the Statistical Package for Social Science (SPSS, IBMV.20).

CHAPTER 4

Personal Narratives of Preterm Delivery

4.1 Introduction

We start this chapter by looking into the opinions of community members regarding PTB causes, prevention, and treatment. Community members, including adolescent girls, women, men, health professionals, and community leaders, displayed a variety of PTB-related belief systems during FGDs and interviews. This chapter examines the multi-level variables that participants believed to be connected to the causes, prevention, and treatment of post-traumatic stress disorder (PTB). These variables can be medical or non-medical, linked to established LINC factors or not [18]. Next, we compare women who have recently experienced the following to provide a narrative analysis of the lived experiences of pregnant women:

- A full-term birth;
- A PTB and the child did not survive;
- A PTB and the child did survive.

Results are presented by nation in this chapter. To show how PTB was experienced by women in the three study settings, case studies of women who had recently experienced PTB are highlighted. The evidence from the three locations is then contrasted and compared to find patterns and distinctions in the perspectives and experiences of the local people.

The median birth weight, length, and head circumference of premature babies at various gestational ages for each sex are displayed in the following tables.

Table 4.1: Weight, length and head circumference by gestational age for boys

Gestational age	Weight	Length	Head circumference
40 weeks	7 lbs., 15 oz. (3.6 kg)	20 in. (51 cm)	13.8 in. (35 cm)
35 weeks	5 lbs., 8 oz. (2.5 kg)	18.1 in. (46 cm)	12.6 in. (32 cm)
32 weeks	3 lbs., 15.5 oz.	16.5 in. (42 cm)	11.6 in. (29.5 cm)

	(1.8 kg)		
28 weeks	2 lbs., 6.8 oz. (1.1 kg)	14.4 in. (36.5 cm)	10.2 in. (26 cm)
24 weeks	1 lb., 6.9 oz. (0.65 kg)	12.2 in. (31 cm)	8.7 in. (22 cm)

Table 4.2: Weight, length and head circumference by gestational age for Girls

Gestational age	Weight	Length	Head circumference
40 weeks	7 lbs., 7.9 oz. (3.4 kg)	20 in. (51 cm)	13.8 in. (35 cm)
35 weeks	5 lbs., 4.7 oz. (2.4 kg)	17.7 in. (45 cm)	12.4 in. (31.5 cm)
32 weeks	3 lbs., 12 oz. (1.7 kg)	16.5 in. (42 cm)	11.4 in. (29 cm)
28 weeks	2 lbs., 3.3 oz. (1.0 kg)	14.1 in. (36 cm)	9.8 in. (25 cm)
24 weeks	1 lb., 5.2 oz. (0.60 kg)	12.6 in. (32 cm)	8.3 in. (21 cm)

4.2 Causes for Preterm Birth

The reasons for PTB were typically listed by every demographic group that was questioned in Bangladesh: single teenage girls, partners of PTB mothers, and religious leaders. PTB was linked to a variety of factors across participant types, including smoking, alcohol consumption, poor nutrition, lifting heavy objects and performing physically demanding work while pregnant. Various viewpoints during the direct interview process:

My family may be calm and orderly, but that doesn't mean that every family is like that. Let's say a woman in another family is expecting a child. It's possible that her spouse is not that wonderful; he might be addicted and torments her emotionally, physically, and socially. (IDIs, married teenage girl from Satkhira Sadar)

Participant: Sometimes the mother is tortured after giving birth, and other times the child is born as a result of the violence.

Interviewer: What sort of aggression is it?

Participant: Cursing is one example. (IDI, unmarried adolescent girl, Debhata)
Some mothers give birth to premature babies after suffering physical abuse. Physical violence is [usually] the fault of husbands. Let's say, for instance, that I am expecting and he tells me he needs [sex], but I am unable to provide it. Preterm births occur because he is forced to have that thing at that time. (KII, health worker, Satkhira Sadar)

In actuality, the pregnant woman will give birth to an early child if she is subjected to physical, psychological, or sexual abuse or if she must cook in a smoke-filled environment. (KII, Debhata, religious leader)

When research participants used the terms "torture" or "violence," they did so almost exclusively. In the Bangladeshi context, husbands or the husband's family would physically abuse pregnant women in the home.

Early pregnancy and marriage were also commonly mentioned as contributing factors to PTB. Participants believed that young girls' lack of biological development to support a pregnancy was a contributing factor in early marriage. One teenage girl described the root cause of PTB as the frustration of a small dowry payment, which led to early marriage and violence:

For getting married young and having a strained relationship with her spouse. They fight occasionally over the dowry, and when she refuses to give them money, they beat her. They subject her to torment. (FGD, adolescent girls without marriage, Shyamnagar)

4.3 Prevention

The main strategies to prevent PTB, according to the participants, are to lessen violence, put an end to child marriage, and minimize heavy workloads or carrying heavy objects while pregnant. Seldom were specifics on how families could lessen verbal, physical, or sexual abuse discussed in the home [19]. One single teenager observed that the mother-

in-law's and wife's relationship in the home was a source of conflict and a chance for intervention:

I would like to suggest that the mother-in-law in a family should exercise some caution and show compassion such as the mother, similar to how a mother tends to her daughter. Wives ought to be treated similarly that manner. (IDI, Satkhira Sadar, unmarried teenage girl)

In a family setting, I would like to emphasize that the mother-in-law ought to exercise caution and show her daughter the same level of care that a mother would. That is how a wife ought to be handled as well. (IDI, Debhata, unmarried teenage girl)

A number of organizations stressed the significance of receiving care and adhering to medical directives during ANC visits, as well as "proper" preventive treatment and treatment "rules and regulations" in order to prevent PTB. Like PTB treatment (below), the participants believed that "proper" treatment existed whether or not they had received it. However, the definition of "proper" treatment was not provided.

An unmarried adolescent girl highlighted the connection between PTB and local poverty by describing how low maternal nutrition is thought to contribute to PTB and increase stress related to household finances:

Participant: She needs to eat a healthy diet to prevent a PTB. Her family will then run into problems.

Interviewer: What sort of issue is this?

Participant: As a result of this PTB, the family may experience financial hardship and ongoing arguments amongst members. Therefore, in order to avoid a PTB, everyone should look after the pregnant woman. (IDI, teenage girl, Shyamnagar, single)

Moreover, a number of groups mentioned how husbands should stop "torturing," be more compassionate, and, in the words of a group of local men, "stay by the wife's side."

Therefore, it was believed that healthier, more harmonious husband-wife relationships helped to prevent PTB in Bangladeshi research participants.

4.4 Treatment

Compared to causes or prevention, treatment recommendations were far narrower in scope and diversity among Bangladeshi demographic groups. The main advice given was to visit a health center and to do as the doctor instructed. The majority of participants talked about keeping the baby warm at home, but some mentioned treating PTB in an incubator at health centers.

There was a strong belief in conventional medicine when discussing PTB treatment options at home. Men and women from the community spoke of going to the "House of Kabiraj" traditional herbal healers. Some suggested talismans or amulets to guard PTB infants. I am One PTB-afflicted woman regretted not seeing a shaman sooner:

Participant: I made a big mistake, so never. Because they must provide medical attention to my newborn.

Interviewer: You think so, but why? Is there a rationale?

Participant: As the villagers put it. (IDI, Satkhira Sadar, woman who recently had a PTB and whose child did not survive)

A PTB mother's extended family member stated:

"The baby had opened eyes, but it was jaundiced in the womb." We regularly placed the newborn in the sun after it was born. We gave it herbal medicine three days after the baby was born. We went to the homeopathic physician. (IDI, a woman's extended family member from Shyamnagar who recently had a PTB)

This quote not only demonstrates a reliance on conventional, herbal remedies, but it also emphasizes how a baby's ability to open its eyes was a sign of its maturity or level of development for a PTB baby. This belief was backed up by a married teenage girl who said that the PTB baby was ready to be taken home as soon as it opened its eyes (after being kept in an incubator at a clinic or hospital). Similarly, "Those who have not opened their eyes are kept in the [incubator]" was stated by a group of women. (FGD, women in the community, Shyamnagar)

Once home, or in the case that a baby was born at home and not brought to a health center, most participants agreed that PTB babies should be wrapped in cloth or a warm blanket. Extended family members and women with full-term births or those that experienced PTB all believed rubbing the babies with mustard oil before wrapping them in a blanket was appropriate home treatment to keep the baby warm. While one woman acknowledged the “doctor doesn’t give permission for this oil,” she continued to say that older generations, such as grandmothers, apply the strategy. Breastfeeding and proper nutrition were also commonly cited treatments for PTB across groups.

A number of people expounded on the significance that a loving and tranquil household held in the care of a preterm baby who passes away: the premature baby who died without receiving appropriate love and attention. Hence, they pass away.

Not everyone is in the same financial situation. Not everyone can afford to receive the right care. (IDI, Shyamnagar, woman who recently gave birth to a full-term child)

This quotation highlights once more the impact that household poverty has on the wellbeing of individuals within the household as well as how treatment options are perceived.

4.5 Emotions after Preterm Birth

It's normal to have a wide range of intense, contradictory, and conflicted emotions in relation to an early birth.

Of course, there are happy feelings as well, such as love and happiness for your newborn.



Figure 4.1: Preterm Birth Baby

However, questions about what transpired and what led to the premature birth are frequently raised. You may suffer helplessness, sadness, remorse, anxiety, or trauma from giving birth. Seeing your premature infant in Satkhira Medical College Hospital (SMCH) or in a Special Care Nursery (SCN) or Neonatal Intensive Care Unit (NICU) may also cause anxiety, dread, and bewilderment.

Some parents may be upset with their physicians or with themselves. Alternatively, they may be upset with their early kid for causing them to feel this way or for being born so soon. This could indicate that they are uncomfortable holding their child or going to the NICU.

This could indicate that they are uncomfortable holding their child or going to the newborn intensive care unit (NICU). This is also acceptable.

Many people have a sense of unreality. Furthermore, it's simple to feel helpless or as though you have no influence over the future. It's typical to feel alone. For some, it is difficult to accept that they are parents when their premature child is in the NICU.

Leaving their premature infant at the hospital while they return home is a very difficult decision for many parents.

In general, difficulties decrease and become simpler to handle over time. Additionally, you will be able to hold and care for your premature baby more frequently as they grow

larger and become more medically stable. The NICU will become more familiar to you as time goes on. Along with providing care for your infant, the nursing staff and other members of their care team will assist you [20].

All of these can make you feel less nervous, more assured, and more equipped to bond and connect with your premature baby.

4.5.1 Managing Emotions

- Recognize and accept your emotions without dismissing them. It's beneficial to identify and acknowledge your feelings.
- Remember that you're doing your best, and treat yourself with kindness.
- Make friends with other parents who are facing a similar scenario if you can. While hearing about other parents' experiences might be helpful, keep in mind that there is no one correct way to feel or act.
- If your partner's coping strategy differs from yours, accept that. Allow your partner to handle things as they see fit, and discuss and listen to each other to learn about each other's emotions.

4.5.2 Looking After Yourself

- Make sure you get enough rest, exercise, and eat a balanced diet. Limiting caffeine, alcohol, and other substances is also a smart idea.
- Keep yourself surrounded by supportive others.
- Try your best to avoid unneeded stress. For a period, you should prioritize your premature baby and your family, which means it's acceptable to let go of some things or to behave differently than usual.
- Occasional vacation days from the NICU allow you to attend to personal needs.
- Spend even a short while each day unwinding and engaging in activities you enjoy. As an illustration, practice deep breathing, play your favorite song, or take a stroll.

4.5.3 Being with Your Baby

- Honor your own and your premature baby's accomplishments, positive traits, and advancements. Despite being in the NICU, your baby will be accomplishing their own milestones and aspirations.
- Participate in your premature baby's daily care. This can strengthen your relationship with your child, which is advantageous for both of you.
- Learn what you can do to support your premature child. You might learn how to gently change a baby's diaper, identify your baby's stress indicators, or learn about a specific piece of technology. Just pay attention to one item at a time.
- Never forget that as a parent, there are things you alone can do. For your premature infant, your voice, touch, and scent are all very significant. The most significant advocate for your infant is you.

4.5.4 Seeking Support

- Discuss your feelings with friends or family members you can trust. It's acceptable to express your needs and to communicate unpleasant emotions. Someone who is willing to listen to you or who doesn't mind if you weep could be this person.
- Ask for help only from those with whom you are at ease. It's acceptable to refuse assistance from those that agitate and stress you out.
- Find out from your nurse if you can talk to a hospital employee who can assist you in controlling your emotions.
- Consult your general practitioner (GP), who can direct you to a suitable mental health provider.
- Reach out to Lifeline, Beyond Blue, or the parent hotline for your state or territory.

4.6 Narrative Analysis of Pregnancy Experiences

One emerging concern among Bangladeshi women who had recently given birth was an excessive workload. Bangladeshi women's mobility was largely correlated with their workload outside the home.

Table 4.3: Pregnant women's workload according to birth outcome type District of Satkhira, Bangladesh

Type of birth	Housework in pregnancy	Farm work	Lifting heavy objects in last trimester	Delivery Home/Hospital
PTB (Did not survive)	Light/Heavy/Very heavy	No/Yes	No/Yes	
1	Heavy	Yes	No	Home
2	Heavy	No	No	Hospital
3	Moderate	No	No	Hospital
4	Moderate	No	No	Hospital
5	Moderate	No	No	Hospital
6	Moderate	No	No	Hospital
PTB(survived)				
1	Moderate	Yes	No	Home
2	Moderate	Yes	No	Hospital
3	Moderate	Yes	No	Hospital
4	Moderate	No	No	Hospital
5	Moderate	Yes	No	Hospital
6	Heavy	Yes	No	Hospital
Full term birth				
1	Light	No	No	Hospital
2	Moderate	No	No	Hospital
3	Light	No	Yes	Hospital
4	Light	No	Sometimes	Hospital
5	Heavy	Yes	Yes	Home

Table 4.3 presents a comparison between women who had a recent PTB and a recent full-term birth, in terms of workload and place of delivery. When compared to women who had recently given birth to full-term babies, those who had a recent PTB had heavier workloads (heavy to moderate). Table 4.3 demonstrates that a number of women who had recently undergone PTB were juggling two jobs: domestic and agricultural duties. Taking

care of household animals, maintaining the barn, and baking cakes from cow dung were all part of the farm work.

Bringing water several times a day and doing laundry were heavy duties during the last trimester. Gathering water for domestic and animal use necessitated multiple daily trips to the water source. The closest water source, which might be a well or pond, was given priority by women due to their limited mobility. In the final trimester, a large number of the women who were interviewed abstained from laborious tasks. When their pregnancies were nearing their end, a number of women stopped bringing water for the household and the animals. The husband, mother-in-law, or mother assisted with this task most of the time. Last but not least, Table 4.3 demonstrates that women who had full-term births and PTBs whose children did not survive had ceased farm work during their pregnancies, suggesting that these women lessened their workload in the last trimester. It's interesting to note that mothers who gave birth on time also mentioned lifting large objects during the final trimester.

CHAPTER 5

Data Analysis and Results

5.1 Introduction

This important section of our thesis delves into the details of data analysis and findings related to the phenomenon of preterm birth in first-time mothers. Deciphering the complex mechanisms underlying preterm births and appreciating the particular difficulties primiparous women encounter during pregnancy are the central goals of this study. We seek to clarify the nuances surrounding preterm births and provide insights that improve mother and newborn health outcomes by employing a comprehensive approach, systematic analysis, and meticulous data collection.

Each subsection in our presentation of the findings is devoted to a particular aspect of our investigation, such as socioeconomic factors, maternal health indicators, and possible interventions. The story develops methodically, making it possible to examine in detail the intricacies involved in the phenomenon of preterm birth in first-time mothers.

This section contributes to the larger conversation on maternal and newborn health in addition to being the conclusion of our empirical work. These findings will be summarized in the discussion that follows, giving rise to a forum for critical analysis and implications for future directions in maternal and child health research as well as healthcare policies and interventions.

5.2 Participants

This qualitative investigation was conducted on mothers and fathers of preterm infants from the Three Upazila in Bangladesh as part of a longitudinal project. Three Upazila's in Bangladesh's Satkhira District—Satkhira Sadar, Debhata, and Shyamnagar.

With the cooperation of the director, pediatricians, and nurses, 95 mothers of preterm babies born before 37 weeks of gestation were recruited for the study at Satkhira Medical College Hospital. The mother had to be at least eighteen years old, and there could not be

any genetic illnesses in the child, neonatal deformities, or neurological damage that was clinically identifiable at birth.

5.3 Characteristics

A thorough and methodical approach is used to guide the examination of data pertaining to preterm birth among first-time mothers in order to identify important traits and contributing factors. With an emphasis on primiparous women specifically, this critical analysis seeks to provide insights into the intricate dynamics surrounding preterm birth. The dataset, which is made up of [name the pertinent data source, such as surveys or medical records], contains a plethora of information that is crucial for comprehending the complex nature of preterm births [21].

In the "Data Analysis and Results" section of a thesis paper on preterm birth in first-time mothers, you must give a thorough summary of the traits you looked at and the conclusions you came to. The following are important factors to take into account when presenting data analysis and findings regarding preterm birth in first-time mothers:

5.3.1 Socio Demographic Characteristic

To learn more about the characteristics of the sample, a number of lifestyle and demographic variables were looked at in a study with 95 participants. The following chart shows how each variable's individual distribution falls into each category.

Table 5.1: Distribution of Socio-demographic Characteristics of Preterm Birth Mothers

Variables	Category	Number	Percent(N=95)
Religion	Muslim	78	74.1
	Hindu	13	12.35
	Christian	4	3.8
Marital status	Married	85	80.75
	Separated	10	9.5
Level of education	No formal education	20	19
	Primary school	28	26.6
	Secondary education	32	30.4
	College education	15	14.25
Occupation	House wife	55	52.25
	Service	16	15.2

	Labored	19	18.05
	Others	5	4.75
Smoked a cigarette	No	95	90.25
Family history of preterm birth	No	62	58.9
	Yes	33	31.35
Weight	Under weight	26	24.7
	Normal weight	12	11.4
	Over weight/Obese	57	54.15

A significant demographic component was religion, with the majority of participants identifying as Muslims (74.1%), Hindus (12.35%), and Christians (3.8%). This illustrates the study population's heterogeneous religious makeup.

The results of the marital status survey indicated that 80.75% of the participants were married, whereas only 9.5% of them reported being separated. It appears that the study's cohort is primarily married.

Participants' educational backgrounds ranged from 19.0% with no formal education to 26.6% with a primary education, 30.4% with a secondary education, and 14.25% with a college degree.

A variety of academic backgrounds are reflected in the sample's educational distribution.

According to occupation data, 52.25% of the participants were housewives, followed by 15.2% in service-related jobs, 18.05% in labor-oriented jobs, and 4.75% in other occupations. This implies that the study group's occupational landscape is diverse.

In terms of lifestyle decisions, 90.25% of participants said they did not smoke cigarettes. When the question of family history of preterm birth was investigated further, it was found that 31.35% of respondents had a positive family history of preterm birth, whereas 58.9% did not.

The participants were distributed according to weight categories, with 24.7% being underweight, 11.4% being of normal weight, and a significant majority (54.15%) being classified as overweight or obese.

In conclusion, the study offers a thorough summary of the lifestyle and demographic traits of the 95 participants, revealing important details about the sample's diversity with regard to a range of factors including weight, family history, education, employment, smoking habits, and religion.

5.3.2 Obstetric-Gynecologic Characteristic

In order to learn more about the pregnancies and health conditions of the 95 participants in the study, a variety of obstetric and medical history variables were examined.

Table 5.2: Distribution of obstetric-gynecologic characteristics of preterm birth mothers

Variables	Category	Number	Percent(N=95)
Gravida	First	34	32.3
	Second	38	36.1
	Third	17	16.15
	Fourth or more	6	5.7
Para	None	37	35.15
	One	31	29.45
	Two	16	15.2
	Three	11	10.45
Ante natal checkup	Never	23	21.85
	One - Two times	39	37.05
	Three - Four times	19	18.05
	More than four times	14	13.3
H/O preterm birth	No	58	55.1
	Yes	37	35.15
Multiple pregnancy	No	69	65.55
	Yes	26	24.7
Previous adverse perinatal outcome	Abortion	21	19.95
	Intra-uterine death	9	8.55
	Stillbirth	7	6.65
	None	58	55.1
Suffering from fibroid uterus	No	31	29.45
	Yes	19	18.05
	Don't know	45	42.75
Hospital admission in antenatal period	No	56	53.2
	Yes	39	37.05
Causes of admission	Bleeding	33	31.35
	High blood pressure	49	46.55

	Others	13	12.35
Trauma during last pregnancy	No	73	69.35
	Yes	22	20.9

Participants were distributed according to Gravida, or the number of pregnancies a woman has had: 32.3% were in their first pregnancy, 36.1% were in their second, 16.15% were in their third, and 5.7% were in their fourth or more pregnancies.

Regarding Para, or the quantity of live births, 35.15% of participants were childless, 29.45% had given birth to one live child, 15.2% to two live children, and 10.45% to three live children.

There was variation in the patterns of prenatal checkups: 21.85% of women said they had never had one, 37.05% had one to two, 18.05% had three to four, and 13.3% had more than four checkups during their pregnancies.

Of the participants, 35.15 percent had a history of preterm birth, whereas 55.1% had not experienced preterm birth.

When it came to multiple pregnancies, 65.55% of participants said they had never had more than one pregnancy, while 24.7% said they had.

In the past, there have been cases of 19.95% abortions, 8.55% of intrauterine deaths, 6.65% of stillbirths, and 55.1% of no adverse perinatal outcomes.

Of the participants, 18.05 percent said they had a fibroid uterus, and 42.75% said they didn't know what it was.

37.05% of participants were admitted to the hospital during the prenatal period, whereas 53.2% of participants did not need to stay there. Different factors led to different admission rates: bleeding accounted for 31.35% of admissions, high blood pressure for 46.55%, and other reasons for 12.35%.

69.35% of women said they had no trauma during their most recent pregnancy, while 20.9% said they had.

To summarise, the research offers a thorough analysis of the obstetric and medical history factors pertaining to the participants. It emphasises the range of experiences regarding pregnancies, antenatal care, preterm birth history, multiple pregnancies, unfavourable perinatal outcomes, fibroid uterus, hospital admissions, and stress during pregnancy.

5.3.3 Health Status Characteristic

The study examined 95 participants' health-related variables, including their use of iron supplements, anemia, diabetes, hypertension, and burning when urinating.

Table 5.3: Distribution of health status characteristic of preterm birth mothers

Variables	Category	Number	Percent(N=95)
Anemia	No	31	29.45
	Yes	27	25.65
	Don't know	37	35.15
Diabetes	No	44	41.8
	Yes	17	16.15
	Don't know	34	32.3
Hypertension	No	29	27.55
	Yes	39	37.05
	Don't know	27	25.65
Burning sensation during urination	No	59	56.05
	Yes	36	34.2
Taking iron supplement	No	38	36.1
	Yes	23	21.85
	Don't know	34	32.3

In terms of anemia, 25.65% of participants said they had anemia, 29.45% said they did not, and 35.15 percent were unsure.

Regarding diabetes, 41.8% of participants said they did not have the disease, 16.15% said they did, and 32.3% said they were unsure if they had the disease.

Another health factor taken into account in the study was hypertension. Out of the participants, 37.05% acknowledged having hypertension, 27.55% said they did not, and 25.65% said they were unsure if they were hypertensive.

In a study on burning sensations during urination, 56.05% of participants said they felt nothing at all, and 34.2% said they did.

The participants' adherence to iron supplements was also investigated in this study. The findings revealed that 21.85% of participants reported taking iron supplements, 32.3% were unsure, and 36.1% of participants did not take any.

In conclusion, the research provides insight into the participants' medical histories and habits, including anemia, diabetes, hypertension, burning when urinating, and use of iron supplements. The results underscore the variation in health conditions and cognizance levels among the subjects, underscoring the significance of tackling these health facets in medical interventions and educational initiatives.

5.3.4 Relationship between Socio-Demographic Characteristics and Gestational Age

With a focus on religious affiliation, marital status, educational background, occupational status, smoking habits, and weight distribution, the data provides an overview of important lifestyle and demographic traits of a sample population.

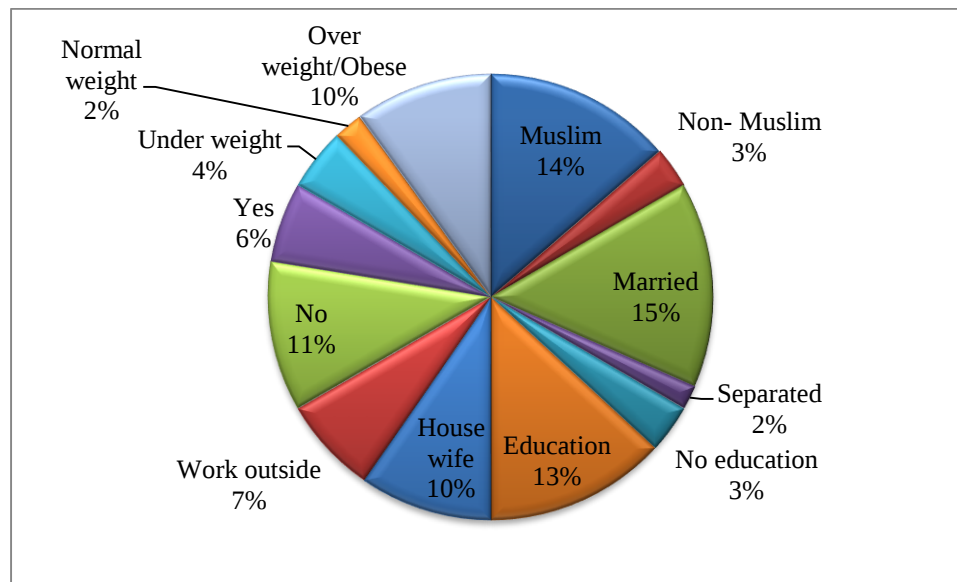


Figure 5.1: Relationship between socio-demographic characteristics and gestational age of preterm birth mothers

Based on religious demographics, 74.1% of the sample identified as Muslims, a significant majority; the remaining 16.15% of participants were not Muslims. This demonstrates the range of religious beliefs among the participants in the study.

The marital status of the participants revealed that a considerable proportion of them were married (80.75%), whereas a smaller proportion (9.5%) reported being separated. This indicates a cohort that is primarily married, with a notable representation of single people.

The distribution of participants' educational backgrounds showed that 71.25% had some degree of education, while 19% had no formal education at all. This demonstrates the sample's wide range of educational backgrounds.

According to their employment status, 52.25% of participants were housewives, and 38% said they worked outside the home. This duality is a reflection of the various roles and responsibilities that study participants have taken on.

Regarding smoking habits, 31.35% of participants admitted to smoking, whereas the majority of participants (58.9%) reported not smoking. This highlights the sample's high proportion of non-smokers.

The distribution of participants' weight showed that 24.7% were underweight, 11.4% were normal weight, and 54.15% were overweight or obese. This clarifies how the weight categories are distributed among the participants in the study.

All things considered, the information offers a thorough picture of the sample's lifestyle and demographic traits, including weight distribution, education, employment, smoking habits, and marital status in addition to religious affiliation. These observations are helpful in comprehending the population's diversity and can guide the development of healthcare plans and targeted interventions that are adapted to the unique requirements of various populations.

5.3.5 Relationship between obstetric-gynecologic characteristics and gestational age

The dataset contains a variety of obstetric and medical history variables that shed light on the participants' healthcare conditions and pregnancy experiences.

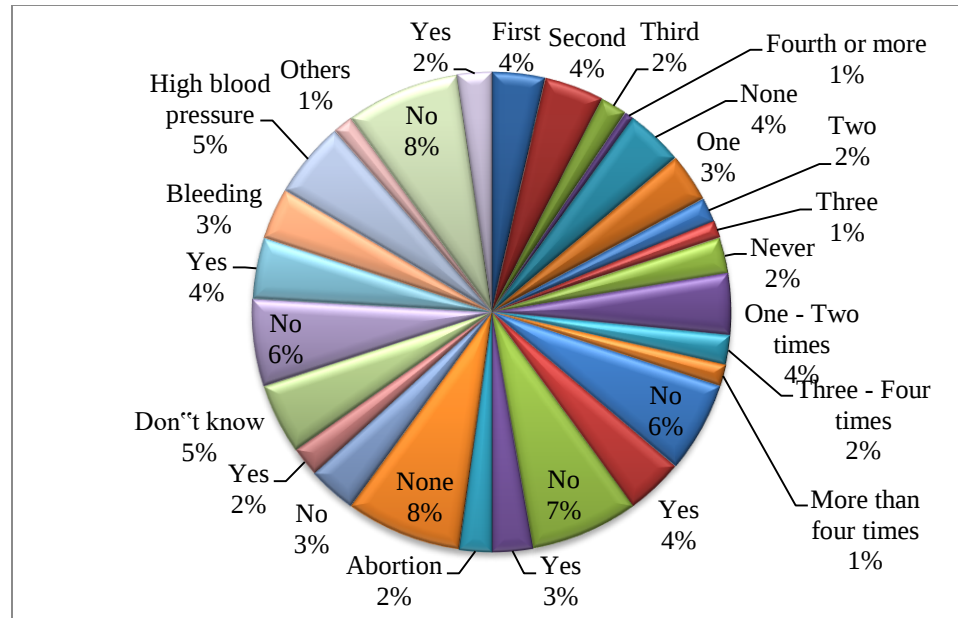


Figure 5.2: Relationship between obstetric-gynecologic characteristics and gestational age of preterm birth mothers

Participants are categorized by the variable "Gravida" according to the number of pregnancies they have had. 32.3% of participants are in their first pregnancy, 36.1% are in their second, 16.15% are in their third, and 5.7% have had four or more pregnancies.

About "Para," which measures the total number of live births, there have been 35.15% of no live births, 29.45% of one, 15.2% of two, and 10.45% of three.

The patterns of prenatal checkups differ; among women reporting their pregnancies, 21.85% reported never having one, 37.05% having one to two, 18.05% having three to four, and 13.3% having more than four checkups.

According to the "Previous history of preterm birth" variable, 35.15% of participants have previously given birth before their due date, whereas 55.1% have not.

Regarding multiple pregnancies, 24.7% of participants said they had had multiple pregnancies, whereas 65.55% of participants did not.

In the past, 19.95% of pregnancies resulted in abortions, 8.55% in intrauterine deaths, 6.65% in stillbirths, and 70.3% in no adverse prenatal outcomes.

Regarding the existence of a "Fibroid uterus," 18.05% of participants reported having one, 29.45% did not, and 42.75% were unsure.

53.2% of participants did not require admission, whereas 37.05% of participants reported having been admitted to the hospital during the prenatal period.

Hospital admissions are caused by bleeding in 31.35% of cases, high blood pressure in 46.55% of cases, and other reasons in 12.35% of cases.

A total of 20.9% of participants reported experiencing trauma during their pregnancy, whereas 69.35% did not.

To summarise, the dataset presents an extensive overview of multiple obstetric and medical history variables, providing insightful information about the participants' experiences with pregnancy and health. In addition to providing guidance for focused healthcare interventions and support plans, these findings are essential for comprehending the various health dynamics within the population under study.

5.3.6 Relationship between health characteristics and gestational age of preterm birth mothers (N = 95)

Three columns with percentages associated with the response categories ("No," "Yes," and "Don't know") make up the tabular format in which the provided data appears to be presented. It appears that the data is arranged in groups of three rows, which could correspond to various survey scenarios or questions. This passage provides an explanation of the provided data:



Figure 5.3: Relationship between health characteristics and gestational age of preterm birth mothers

Participants were asked to share their thoughts or beliefs on a range of issues in a series of survey responses. The answers "No," "Yes," and "Don't know" are represented by the three sets of three rows that make up the data structure. The distribution for the first set is as follows: Anemia, Diabetes, Hypertension, Burning sensation during urination, Taking iron supplement all the variables are 25.65% for "Yes," 29.45% for "No," and 35.15% for "Don't know." With different percentages for every response category, the ensuing sets exhibit a comparable pattern. It is clear that responses represent a variety of viewpoints, including agreement, disagreement, certainty, and uncertainty, regarding the various scenarios. The information highlights the complexity of viewpoints on the subjects at hand and points to a nuanced and varied range of attitudes within the population surveyed.

5.4 Health problems by gestation at birth

Table 5.4: Proportion of mothers and babies with health problems by gestation at birth

	Gestation at birth							
	<32 weeks		32–36 weeks		37 or more weeks		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Chronic health problems complicating pregnancy	3	2.85	11	10.45	12	11.4	26	74.1
Pregnancy-specific problems	26	24.7	31	29.45	29	27.55	86	245.1
Mother physically well in first few days	16	15.2	13	12.35	16	15.2	45	128.25
Mother physically well at time of survey	32	30.4	26	24.7	23	21.85	81	230.85
Baby health problems at time of survey	18	17.1	14	13.3	15	14.25	47	133.95

Data on a number of topics pertaining to gestation at birth, maternal health, and neonatal health are shown in the table. A passage-style description of each category can be found below:

Three groups are identified based on gestation at birth: less than 32 weeks, 32–36 weeks, and 37 weeks or more. Each category's overall count and percentage are given. Remarkably, the category "37 or more weeks" comprises 74.1% of cases.

It is clear from looking at pregnancy-related factors that chronic health issues that complicate pregnancy are reported in 26 cases, or 74.1% of all cases. Furthermore, 86 cases—a troubling percentage of 245.1%—have pregnancy-specific issues noted; these cases may need further investigation or explanation.

Regarding the mother's health, during the first few days following delivery, 128.25% of mothers are reported to be physically well, and at the time of the survey, 230.85% of mothers are recorded as physically well. These percentages, particularly the last one, seem atypically high and might need more investigation or explanation.

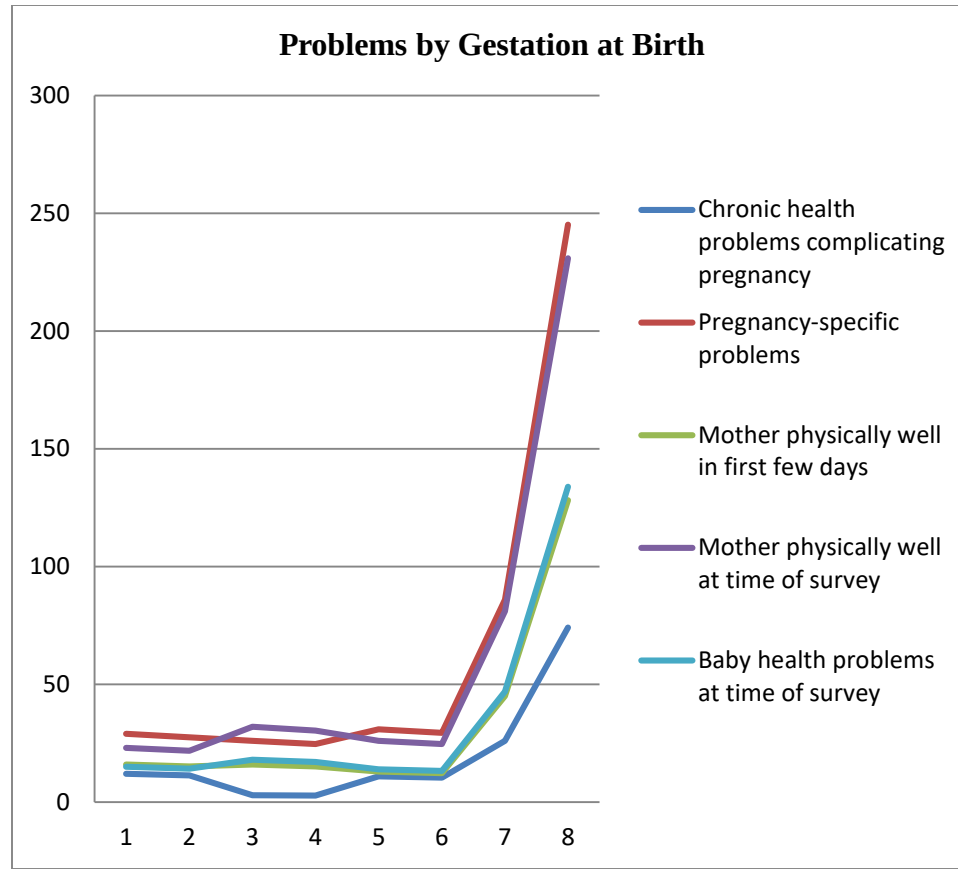


Figure 5.4: Problems by Gestation at Birth

Lastly, a summary of infant health issues at the time of the survey is provided. 133.95% of cases in this category are reported, indicating a possible discrepancy that requires attention or clarification. Overall, the data sheds light on the gestation at birth and other health-related issues, but certain percentages raise concerns that need more investigation and explanation.

5.5 Prediction Model of Preterm Birth Using Electronic Health Record

Preterm birth (PTB) constituted one of the primary causes of mortality for neonates. Predicting preterm birth (PTB) in the first and second trimesters can lead to better pregnancy outcomes. The purpose of this research is to suggest a machine learning-based prediction model for PTB. Method. The patients in this study were all chosen from Satkhira Medical College and Hospital, and data from 2019 to 2023 were examined. Materials and Methods

The study's data were examined between 2019 and 2023. The study's participants were all gathered from Satkhira Medical College Hospital. The PTB group's inclusion requirements were as follows: (1) gestational age between 28 and 37 weeks; (2) signed informed consent; and (3) mother age greater than 18 years. The following are the PTB group's exclusion standards: Three factors are missing: (1) maternal age; (2) gestational age; and (3) chronic illnesses such heart disease, diabetes, and hypertension. In a 1:1 ratio, controls were chosen from hospitals during the same time frame. The controls were limited to subjects who met three requirements for inclusion: (1) signed informed consent; (2) gestational age ≥ 37 weeks; and (3) mother age ≥ 18 years. The following characteristics are excluded: (1) Missing gestational age; (2) Missing mother age; and (3) Chronic illnesses such heart disease, diabetes, and high blood pressure. Figure displays the study's flowchart.

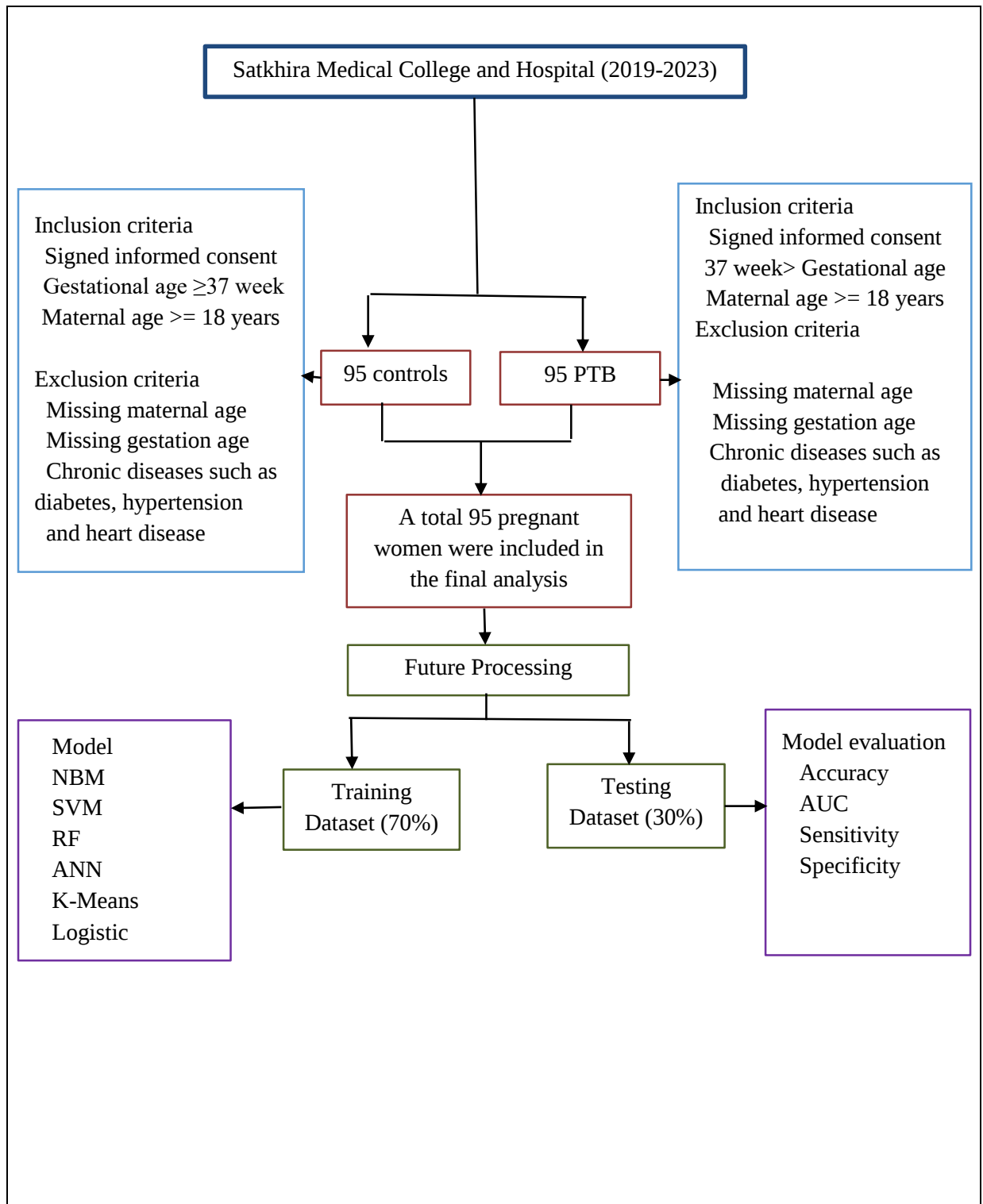


Figure 5.5: Workflow of this study

5.5.1 Feature Processing

We collected data for our study on the following demographic factors: age; physical examination; blood tests (red blood cells, white blood cell count, platelet crit, and WBC); urine test strip (urine pH, urine WBC, and glycosuria); and gynecological examination (bacterial vaginosis, cleaning degree of vagina, and vaginal yeast infection, or VYI). Prior to the 27th week of gestation, each participant underwent at least five prenatal examinations. Depending on the kind of variable, the mean and mode were used to describe variables that were measured more than once in order to prevent the model from becoming over fit. Variables had greater influence on the result as the gestational age increased. As a result, we prioritized the latter data [22]. The definition of the equation is

$$\text{var}_{\text{mean}}^{20} = \text{average}(\text{var}_{\text{week}_1}, \text{var}_{\text{week}_2}, \dots, \text{var}_{\text{week}_{20}}), \quad (1)$$

$$\begin{aligned} \text{var}_{\text{mean}}^i &= \text{average}(\text{var}_{\text{mean}}^{i-2}, \text{var}_{\text{week}_{i-1}}, \text{var}_{\text{week}_i}), \\ i &= 22, 24, 26, 27 \text{ weeks of gestation.} \end{aligned} \quad (2)$$

The values of the previous and current time points define the variable processing procedure at each time point, as illustrated in Figure 2. Depending on when the prenatal examination was conducted, the third dataset was split into five datasets (20 weeks, 22 weeks, 24 weeks, 26 weeks, and 27 weeks of gestation) [23].

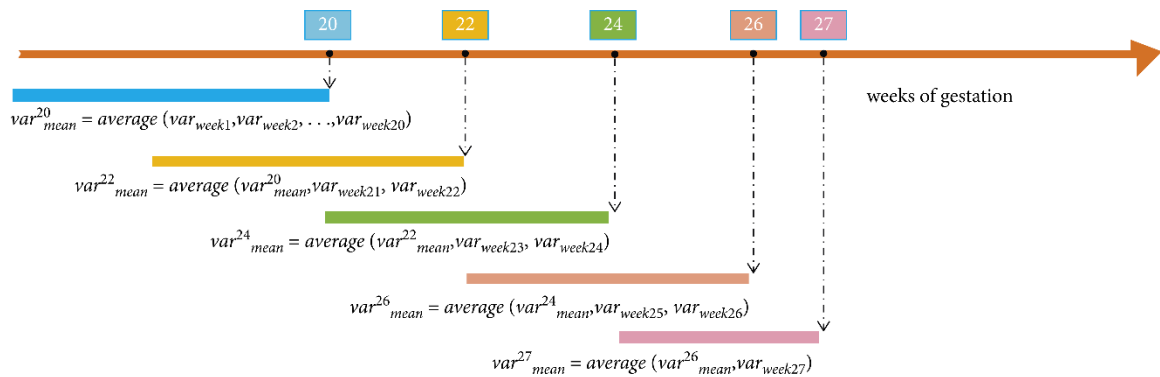


Figure 5.6: Preprocessing of variables

Preprocessing of variables. $\text{var}_{\text{week}_i}$ is the measurement result of the variable in week i ; $\text{var}_{20 \text{ mean}}$ is the composite indicator representing the variable 20 weeks ago.

5.5.2 Outcome Measure

The predictive performance of the model was evaluated in this study using four metrics: accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC). The percentage of accurate predictions made out of all the cases that were investigated is known as accuracy (1). The capacity of the test to accurately identify genuine positives is referred to as sensitivity (2). The test's specificity is determined by how well it can identify true negatives (4). AUC is a thorough indicator of the model's sensitivity and specificity.

$$\text{accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}} \quad (3)$$

$$\text{sensitivity} = \frac{\text{TP}}{\text{TP} + \text{FN}}, \quad (4)$$

$$\text{specificity} = \frac{\text{TN}}{\text{TN} + \text{FP}}. \quad (5)$$

TP = True Positive; FP = False Positive; TN= True Negative; FN = False Negative.

5.5.3 Statistical Analysis

One method for determining if a continuous variable was normal was the Kolmogorov-Smirnov test. The continuous variable was described by the mean $\pm$ standard deviation if it satisfied the conditions of a normal distribution. Numbers and percentages were used to represent categorical variables. Our dataset contained missing values since our data came from electronic medical records. As a result, we eliminated situations and variables with a 10% or greater missing value. The mean was used to fill continuous variables, and the mode was used to fill categorical variables. For categorical variables, the chi-square test or Fisher's exact test was used to compare the outcome groups; for continuous variables, the t-test or Wilcoxon test was used.

A test set (30%) and a training set (70%) were randomly selected from the dataset. The model was trained on the training set, then it was assessed on the test set. The model's performance was gauged using four indicators: specificity, sensitivity, accuracy, and area under the curve (AUC). The reduced accuracy of the model following the variable's removal served as a proxy for the variable's relevance. The variable is more significant the higher the model's decreasing accuracy. Using the "e1071" (Naive Bayesian method and support vector machine), "Random Forest" (Random Forest Tree), and "kknn" (K-means) packages, all statistical analyses were carried out in R software (version 3.5.1).

In all studies, a result was deemed statistically significant if the two-tailed P value was less than 0.05.

5.6 Characteristics of Pregnant Women and Newborns

In total, 9550 pregnant women were involved in our study (PTB: 95, control: 95). The PTB group's mean ages (PTB: 29.94 ± 5.39 , control: 30.72 ± 4.00 , $P < 0.001$) were lower than the control group's. The case group's third gestation was 51.19 ± 11.51 days, while the control group's third gestation was 74.66 ± 7.15 days ($P < 0.001$). Pregnant women in the PTB group had lower levels of gravidity and parity (all $P < 0.001$) than those in the control group.

Newborns in the control group had greater weights and heights than those in the PTB group (all $P < 0.001$). 3e Newborns in the control group had greater Apgar scores (1, 5, and 10 minutes) than those in the case group (all $P < 0.001$).

Table 5.5: Characteristics of mother and newborn between PTB and control group

Variables		Control (95)	Case (95)	t/chi	
Age, years		30.72 ± 4.00	29.94 ± 5.39	8.00	<0.001
Gestation, days		74.66 ± 7.15	51.19 ± 11.51	19.70	<0.001
Gravidity	1	57 (0.60)	64 (0.67)	25.08	<0.001
	2–3	74 (0.77)	63 (0.66)	25.08	<0.001
	>3	2 (0.02)	1 (0.01)	25.08	<0.001
Parity	1	86 (0.88)	88 (0.92)	24.37	<0.001
	>2	16 (0.16)	13 (0.13)	24.37	<0.001
Multiple birth	No	95 (1.00)	86 (0.90)	79.50	<0.001
	Yes	2 (0.02)	10 (0.10)	79.50	<0.001
Birth gender	Male	50 (0.52)	54 (0.56)	15.85	<0.001
	Female	46 (0.48)	42 (0.44)	15.85	<0.001
Birth weight, g		81.68 ± 32.05	71.13 ± 34.90	73.43	<0.001
Birth height, cm		50.38 ± 1.25	47.85 ± 2.82	56.81	<0.001
Apgar scores (1 min)	9.95 ± 0.71	9.70 ± 1.37	11.19	<0.001	
Apgar scores (5 min)	10.00 ± 0.66	9.82 ± 1.20	8.97	<0.001	
Apgar scores (10 min)	9.95 ± 0.54	9.77 ± 1.32	8.68	<0.001	

5.7 Prenatal Testing of Pregnant Women before 27 Weeks of Gestation.

Aspartate transaminase (AST), albumin, total serum iron (TSI), magnesium (Mg), and triglycerides (TG) were all greater in the PTB group than in the control group (all $P < 0.05$) in the biochemical study. In the meantime, the PTB group's plasma glucose (fasting) is lower than the control group's (all $P < 0.05$). The PTB group had greater levels of urea and total biliary acid (TBA) than the control group (all $P < 0.05$). The PTB group had higher numbers of platelets, intermediate cells, lymphocytes (LY), monocytes

(MO), Neutrophil Granulocytes (NE), Red Blood Cell Distribution Width-SD (RDW-SD), and White Blood Cells (WBC) than the control group. The PTB group had lower Mean Cell Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC), and Platelet Distribution Width (PDW) than the control group. The PTB group had greater waist size, fundal height, SBP, and DBP than the control group. The PTB group's Fetal Heart Rate (FHR) was lower than the control group's. The PTB group's urine had a higher pH than the control group's.

Table 5.6: Prenatal testing of pregnant women before 27 weeks of gestation between PTB and control group

Variables			Control (4775)	Case (4775)	t/chi	
Physical examination	Waist size, cm		82.68 ± 14.19	83.30 ± 13.74	-2.17	0.030
	Fundal height, cm		20.57 ± 3.62	20.90 ± 3.84	-4.33	<0.001
	SBP, mmHg		34.09 ± 10.26	33.34 ± 10.44	-5.86	<0.001
	DBP, mmHg		69.47 ± 7.72	70.71 ± 16.09	-4.82	<0.001
	FHR, times/min		45.50 ± 3.05	46.46 ± 17.27	-3.78	<0.001
	Weight, kg		63.16 ± 9.15	63.04 ± 9.39	0.60	0.549
	Edema	No	95 (1.00)	94 (0.99)	2.76	0.096
		Yes	1 (0.01)	2 (0.02)		
Blood test	BG	A	25 (0.26)	21 (0.22)	128.27	<0.001
		B	32 (0.33)	42 (0.44)		
		AB	10 (0.10)	9 (0.09)		
		O	30 (0.31)	24 (0.25)		
	Blood RH	Ne	2 (0.02)	1 (0.01)	1.65	0.199
		Po	94 (0.99)	95 (1.00)		
	ALB, g/L		41.24 ± 3.46	41.45 ± 2.75	-3.20	0.001
	ALT, U/L		20.65 ± 14.05	21.02 ± 13.69	-1.28	0.199

	AST, U/L		20.91 ± 7.81	22.14 ± 7.72	-7.74	<0.001
	Glu, mmol/L		4.57 [4.25, 4.93]	4.56 [4.23, 4.72]		<0.001
	Ca, mmol/L		2.30 ± 0.14	2.31 ± 0.12	-1.36	0.174
	Cr, umol/L		50.86 ± 7.61	51.17 ± 8.25	-1.92	0.055
	DB, umol/L		1.72 [1.10, 2.30]	1.74 [1.43, 1.90]		0.594
	TSI, umol/L		17.44 ± 3.33	17.60 ± 2.63	-2.61	0.009
	GLOB, g/L		27.28 ± 3.32	27.24 ± 2.43	0.73	0.466
	Mg, mmol/L		0.87 ± 0.13	0.88 ± 0.09	-4.43	<0.001
	IP, mmol/L		1.25 ± 0.15	1.25 ± 0.12	-1.61	0.108
	TBA, umol/L		3.83 [2.90, 5.10]	4.90 [3.32, 5.01]		<0.001
	TB, umol/L		11.28 ± 3.53	11.18 ± 2.64	1.67	0.095
	CHOL, mmol/L		4.78 ± 0.73	4.80 ± 0.38	-1.66	0.096
	TP, g/L		68.76 ± 4.84	68.78 ± 3.55	-0.22	0.829
	TG, mmol/L		1.52 ± 0.54	1.58 ± 0.41	-6.57	<0.001
	Urea, mmol/L		2.80 [2.38, 3.28]	2.84 [2.40, 3.10]		0.002
	UA, umol/L		59.75 ± 40.26	58.22 ± 39.37	1.88	0.060
	BA, 10e9/L		0.01 ± 0.03	0.01 ± 0.05	-1.01	0.314
	Plt, 10e9/L		20.31 ± 48.25	24.52 ± 48.60	-4.25	<0.001
	EOS, 10e9/L		0.09 ± 0.09	0.09 ± 0.07	0.43	0.665
	Hb, g/L		47.98 ± 8.56	47.69 ± 8.59	1.62	0.105
	MID, 10e9/L		0.55 ± 0.10	0.56 ± 0.12	-4.51	<0.001
	LY, 10e9/L		1.72 ± 0.40	1.75 ± 0.41	-2.92	0.004
	MCH, pg		31.49 ± 1.91	31.33 ± 1.85	4.15	<0.001
	MCHC, g/L		44.87 ± 10.25	43.39 ± 10.52	6.95	<0.001

	MCV, fL		91.31 ± 4.72	91.24 ± 4.50	0.76	0.445
	MO, 10e9/L		0.53 ± 0.14	0.54 ± 0.14	-4.33	<0.001
	MPV, fL		8.58 ± 1.10	8.60 ± 1.09	-1.07	0.283
	NE, 10e9/L		7.23 ± 1.69	7.36 ± 1.72	-3.60	<0.001
	P-LCR, %		0.23 ± 0.05	0.23 ± 0.05	5.83	<0.001
	HCT, %		0.34 ± 0.02	0.35 ± 0.25	-1.18	0.238
	PCT, %		0.19 ± 0.04	0.19 ± 0.03	-0.23	0.819
	PDW, %		15.16 ± 2.25	14.83 ± 2.51	6.75	<0.001
	RDW-CV, %		0.16 ± 0.51	0.16 ± 0.35	0.81	0.416
	RDW-SD, fL		42.84 ± 2.46	43.45 ± 2.12	-13.07	<0.001
	RBC, 10e12/L		3.76 ± 0.31	3.77 ± 0.32	-1.51	0.131
	WBC, 10e9/L		9.58 ± 1.93	9.74 ± 1.97	-3.93	<0.001
Urine test strip	Urine pH		6.67 ± 0.46	6.73 ± 0.46	-6.77	<0.001
	USG		1.02 ± 0.01	1.02 ± 0.01	4.96	<0.001
	BIL	Ne	4737 (0.99)	4749 (0.99)	1.90	0.168
		Po	1 (0.01)	1 (0.01)		
	Glycosuria	Ne	85 (0.79)	76 (0.80)	0.98	0.322
		Po	20 (0.21)	19 (0.20)		
	KET	Ne	92 (0.96)	92 (0.96)	0.03	0.873
		Po	4 (0.04)	4 (0.04)		
	Nitrituria	Ne	94 (0.99)	94 (0.99)	1.49	0.222
		Po	1 (0.01)	1 (0.01)		
	Blood	Ne	87 (0.91)	88 (0.92)	7.22	0.007
		Po	9 (0.09)	8 (0.08)		
	Proteinuria	Ne	94 (0.99)	93 (0.98)	7.41	0.006
		Po	1 (0.01)	2 (0.02)		
	Bilirubinuria	Ne	95 (1.00)	95 (1.00)	0.11	0.742

	Urine WBC	Po	0 (0.00)	0 (0.00)		
		Ne	70 (0.73)	70 (0.73)	0.10	0.747
		Po	26 (0.27)	26 (0.27)		
Gynecological examination	BV	Ne	93 (0.98)	98 (0.99)	10.63	0.001
		Po	2 (0.02)	1 (0.01)		
	CDV	1	17 (0.18)	19 (0.20)	60.20	<0.001
		2	58 (0.61)	61 (0.64)		
		3	17 (0.18)	11 (0.12)		
		4	4 (0.04)	3 (0.03)		
	VYI	Ne	90 (0.94)	91 (0.95)	5.05	0.025
		Po	6 (0.06)	5 (0.05)		

CHAPTER 6

Conclusion and Future Work

6.1 Conclusion

In conclusion, this study has clarified the substantial influence that stress and depression have on preterm births among Bangladeshi first-time mothers. The results highlight the complex connection between poor birth outcomes and maternal mental health. Our research showed a significant correlation between high stress and depression levels and a higher risk of premature deliveries. This has significant effects on the health of newborns as well as mothers.

The study also emphasized the necessity of all-inclusive prenatal care initiatives that provide first-time mothers' mental health support first priority. Reducing the frequency of preterm births and improving excellent birth outcomes require addressing maternal mental health difficulties throughout pregnancy. Medical professionals should promptly intervene for at-risk patients and incorporate mental health evaluations into standard prenatal care.

This thesis has explored the complex link between stress, depression, and premature births in first-time moms, concentrating on a Bangladeshi dataset. This research has yielded important insights into the complex factors that lead to unfavorable birth outcomes in this susceptible population by a thorough examination of the clinical literature as well as the Bangladeshi dataset.

The research findings emphasize how maternal mental health has a major influence on the outcomes of gestation. Preterm births among Bangladeshi first-time moms are clearly directly related to depression and stress, which are frequently made worse by socioeconomic and cultural variables.

Our research also emphasizes the significance of raising awareness through community-based interventions and treatments to de-stigmatize mental health concerns in the setting of pregnancy. Pregnancy-related stress and depression can be identified early and treated effectively by educating pregnant women, their families, and medical professionals on the symptoms and effects of these conditions.

6.2 Future Work

Future research projects could investigate several routes to expand our comprehension and improve the applicability of discoveries, building on the foundation established by this thesis.

- **Extension of Longitudinal Study:** To see how stress and depression affect preterm births over time, conduct a longer, longitudinal research. Monitor first-time mothers' mental health from conception to the postpartum period.
- **Factorial Analysis in Multiple Dimensions:** Extend the study to encompass a multifactorial analysis that takes into account not only depression and stress but also a range of socioeconomic factors, lifestyle decisions, and access to healthcare. Examine the ways in which these variables interact and affect Bangladeshi women's risk of preterm births.
- **Cultural Specificity and Sensitivity:** Increase the study's cultural sensitivity by using qualitative research techniques like focus groups and interviews to learn more about the particular cultural factors affecting Bangladeshi mothers' mental health. Take cultural subtleties into account while designing interventions and support systems.
- **Intervention Techniques:** Create and evaluate intervention plans targeted at reducing the negative effects of stress and depression on new moms. Examine whether community-based initiatives, counseling services, and mental health support programs can lower the number of premature births.
- **Aspects both genetic and epigenetic:** Examine the impact that genetic and epigenetic variables play in the connection between preterm births and maternal mental health. Examine whether specific genetic markers or epigenetic changes may increase the risk of preterm births in situations including stress and depression.
- **Implications for Healthcare Policy:** Examine Bangladesh's current healthcare regulations regarding prenatal care and mental health of mothers. Make suggestions for changing the law to better serve first-time moms' mental health needs and lower the number of preterm births.

- Integration of Technology: Examine how to monitor and assist pregnant women's mental health via technology, such as telemedicine or smartphone apps. Examine whether incorporating technology into standard maternity healthcare procedures is feasible and effective.
- Education and Awareness of the Community: Create and carry out community awareness initiatives to lessen the stigma attached to mental health problems among pregnant women. Educate families, communities, and medical professionals on how to identify and manage the mental health needs of new mothers.
- Follow-up after delivery: Expand the research to incorporate postpartum surveillance in order to evaluate the enduring effects of maternal mental health on both the mother and the child. Analyze the connection between the mental health of the mother, postpartum depression, and the child's general early development.
- Research Collaboration: To compare results with comparable studies conducted in various cultural contexts, promote cooperation with worldwide research institutions and organizations. To improve understanding of the connection between maternal mental health and preterm births worldwide, share best practices and expertise.

References

- [1] O. Arvanitidou *et al.*, “The impact of stress and depression on the outcome of human gestation,” *Cureus*, 2023.
- [2] C. Trumello *et al.*, “Mothers’ depression, anxiety, and mental representations after preterm birth: A study during the infant’s hospitalization in a Neonatal intensive care unit,” *Front. Public Health*, vol. 6, p. 359, 2018.
- [3] P. Leahy-Warren, C. Coleman, R. Bradley, and H. Mulcahy, “The experiences of mothers with preterm infants within the first-year post discharge from NICU: social support, attachment and level of depressive symptoms,” *BMC Pregnancy Childbirth*, vol. 20, no. 1, 2020.
- [4] A. R. Misund, P. Nerdrum, and T. H. Diseth, “Mental health in women experiencing preterm birth,” *BMC Pregnancy Childbirth*, vol. 14, no. 1, 2014.
- [5] R. Korja, R. Latva, and L. Lehtonen, “The effects of preterm birth on mother–infant interaction and attachment during the infant’s first two years,” *Acta Obstet. Gynecol. Scand.*, vol. 91, no. 2, pp. 164–173, 2012.
- [6] “Premature birth,” Cleveland Clinic. [Online]. Available: <https://my.clevelandclinic.org/health/diseases/21479-premature-birth>. [Accessed: 26-Jan-2024].
- [7] R. Khanam *et al.*, “Burden and risk factors for antenatal depression and its effect on preterm birth in South Asia: A population-based cohort study,” *PLoS One*, vol. 17, no. 2, p. e0263091, 2022.
- [8] S. Shgufta, “Stress, anxiety and depression risk factors for preterm birth among women,” *Pakistan Social Sciences Review*, vol. 6, no. II, 2022.
- [9] C. Ionio, E. Mascheroni, C. Colombo, F. Castoldi, and G. Lista, “Stress and feelings in mothers and fathers in NICU: identifying risk factors for early interventions,” *Prim. Health Care Res. Dev.*, vol. 20, no. e81, p. e81, 2019.
- [10] Khatun MM, Khatun F, Shom ER and Park S, “Factors related to preterm birth mothers in Bangladesh,” 2021.
- [11] J. Hopkins, “A qualitative study of preterm births in Bangladesh, Ethiopia, and Mali,” *Bornontime.org*, 2020. [Online]. Available: <https://bornontime.org/wp-content/uploads/2021/03/JHU-Born-on-Time-A-Qualitative-Study-of-Preterm-Births-in-Bangladesh-Ethiopia-and-Mali-July-2020.pdf>. [Accessed: 27-Jan-2024].
- [12] R. Azad *et al.*, “Prevalence and risk factors of postpartum depression within one year after birth in urban slums of Dhaka, Bangladesh,” *PLoS One*, vol. 14, no. 5, p. e0215735, 2019.
- [13] J. Croft, “Study links preterm births to mother’s poor mental health,” *WebMD*, 16-Aug-2023. [Online]. Available: <https://www.webmd.com/baby/news/20230816/study-links-preterm-births-mothers-poor-mental-health>. [Accessed: 27-Jan-2024].
- [14] H. Li *et al.*, “Association between maternal depression and neonatal outcomes: Evidence from a survey of nationally representative longitudinal studies,” *Front. Public Health*, vol. 10, 2022.

- [15] H. E. Nasreen, Z. N. Kabir, Y. Forsell, and M. Edhborg, "Low birth weight in offspring of women with depressive and anxiety symptoms during pregnancy: results from a population based study in Bangladesh," *BMC Public Health*, vol. 10, no. 1, p. 515, 2010.
- [16] S. Lalani et al., "Perceived stress may mediate the relationship between antenatal depressive symptoms and preterm birth: A pilot observational cohort study," *PLoS One*, vol. 16, no. 5, p. e0250982, 2021.
- [17] M. C. Logsdon, C. Monk, and A. E. Hipwell, *Perinatal experiences of adolescent mothers*. Oxford University Press, 2014.
- [18] K. Gausia, C. Fisher, M. Ali, and J. Oosthuizen, "Antenatal depression and suicidal ideation among rural Bangladeshi women: a community-based study," *Arch. Womens. Ment. Health*, vol. 12, no. 5, pp. 351–358, 2009.
- [19] M. J. Islam, L. Broidy, K. Baird, and P. Mazerolle, "Intimate partner violence around the time of pregnancy and postpartum depression: The experience of women of Bangladesh," *PLoS One*, vol. 12, no. 5, p. e0176211, 2017.
- [20] No eBook available Taylor & Francis Amazon.com All sellers » Front Cover Depression in New Mothers, vol. 1. Causes, Consequences, and Risk Factors.
- [21] "UNICEF DATA - child statistics," UNICEF DATA, 10-Mar-2023. [Online]. Available: <https://data.unicef.org>. [Accessed: 30-Jan-2024].
- [22] H. Tarafa, Y. Alemayehu, and M. Nigussie, "Factors associated with pregnancy-related anxiety among pregnant women attending antenatal care follow-up at Bedelle general hospital and Metu Karl comprehensive specialized hospital, Southwest Ethiopia," *Front. Psychiatry*, vol. 13, 2022.
- [23] E. D. Hodnett, S. Fredericks, and J. Weston, "Support during pregnancy for women at increased risk of low birthweight babies," *Cochrane Libr.*, no. 6, 2010.

The Impact of Depression and Stress on Preterm Births in

ORIGINALITY REPORT

20%	19%	13%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.hindawi.com Internet Source	6%
2	downloads.hindawi.com Internet Source	3%
3	www.ncbi.nlm.nih.gov Internet Source	2%
4	www.mayoclinic.org Internet Source	2%
5	ijnss.org Internet Source	1%
6	Submitted to Daffodil International University Student Paper	1%
7	bmjopen.bmj.com Internet Source	1%
8	www.researchgate.net Internet Source	1%
9	www.unicef.org Internet Source	<1%