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The effect of experiencing a premature birth on postpartum maternal EPDS scores

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Preface

The literature used for this thesis refers to "women" and "mothers". These terms have been adopted in the context of this work but are intended to include all people with a uterus who give birth and are not intended to discriminate based on gender.

Furthermore, according to Section 3 of the Midwives Act the professional title "midwife" covers all members of the profession and thus includes all genders (m/f/d).

Abstract

Premature birth is a global health issue affecting around 15 million infants annually, contributing to perinatal morbidity and mortality. Postpartum depression (PPD) is common after childbirth, impacting maternal and child health long-term. This thesis examines whether a preterm birth before 37+0 weeks of gestation increases PPD risk, measured by the Edinburgh Postnatal Depression Scale (EPDS), while controlling for prenatal depressive symptoms.

Data from the PRINCE (Prenatal Identification of Children's Health) study in Hamburg, Germany were used. A total of 537 mothers without prenatal depressive symptoms (EPDS scores <11) were analyzed. Participants were divided into two groups: 33 mothers with preterm births (Group A) and 504 with non-preterm births (Group B). Six months postpartum, EPDS scores were measured.

Results indicated that mothers in the preterm group did not have higher EPDS scores than those in the non-preterm group. The preterm group had a slightly lower mean EPDS score (3.85, SD = 3.08) than the non-preterm group (4.25, SD = 3.71), although this difference was not statistically significant ($t(535) = 0.605$, $p = 0.545$). No participants in the preterm group scored above the clinical cutoff of 11, while 38 in the non-preterm group did.

Possible explanations include previous studies overestimating PPD risk associated with preterm birth by not controlling for prenatal depressive symptoms. Additionally, the various support systems in Germany may have reduced the psychological impact of preterm birth. Moreover, most preterm births in this study were late preterm (34+0 to 36+6 weeks of gestation), associated with fewer complications and lower stress levels.

This study highlights the need to control for confounding factors when examining the relationship between preterm birth and PPD. The findings suggest that among mothers without depressive symptoms in pregnancy, preterm birth alone may not increase PPD risk. This underscores the essential role of midwives in providing postpartum support to all mothers.

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List of Abbreviations

BSSS……Berlin Social Support Scales

DFG……Deutsche Forschungsgemeinschaft

EPDS……Edinburgh Postnatal Depression Scale

KFO……..Klinische Forschergruppe

PPD……Postpartum Depression

PRINCE……..Prenatal Identification of Children's Health

PSS……..Perceived Stress Scale

RIBI……Retrospective Infant Behavior Inhibition Scale

STAI……State Trait Anxiety Inventory

UKE……University Medical Center of Hamburg Eppendorf

1 Introduction

"[…], the doctors told us that there was nothing further they could do. This incredible medical team that had done so much to help our daughter survive her first 16 days was at a standstill. We held our daughter in our arms for a few more hours until her little heart stopped beating. Then we shed our tears, said goodbye and went home to tell our little boy he wouldn't have a sister." (World Health Organization, 2012, p. 15)

As this personal quote shows, a premature birth can bring psychological challenges for the parents involved. The aim of this paper is to investigate the relationship between the occurrence of a premature birth and symptoms of postpartum depression using underlying data from the PRINCE study, a longitudinal research conducted at the Department of Obstetrics and Prenatal Medicine, at the University Medical Center of Hamburg-Eppendorf in Hamburg, Germany.

This introductory section of the thesis first presents the topics of preterm birth and postpartum depression, then discusses the relevance and aim of the work, followed by an elaboration of the research gap and finally emphasizes the relevance for midwifery science.

Every year, around 15 million babies worldwide are born prematurely (Blencowe et al., 2012; World Health Organization, 2012). The average global preterm birth rate is around 11% and contributes significantly to perinatal mortality and morbidity worldwide (Blencowe et al., 2012). The causes of prematurity are not yet fully understood and are likely to be complex and variable (Goldenberg et al., 2008). Preterm births are associated with various health consequences and developmental limitations besides their economic costs (Euro Peristat Project, 2022).

Another common condition is postpartum depression (PPD), which affects the mothers mental health after childbirth and is reported with prevalences up to 60% (Halbreich & Karkun, 2006). The consequences not only affect the mother but also the long-term health and development of the child (Field, 2010; Slomian et al., 2019). As the etiology of PPD is not fully understood, it is important to know the risk factors for its occurrence (Dubey et al., 2021; Zhao & Zhang, 2020). One risk factor being discussed in literature is whether the experience of a premature birth leads to increased postpartum depressive symptoms (De Paula Eduardo et al., 2019; Guintivano et al., 2018; Vigod et al., 2010).

The above-identified relevance of the topic leads to the aim of this work, which is to identify a potential risk group for PPD – mothers of preterm infants - in order to be able to provide them with targeted and preventive healthcare services. Another aim is to focus on

midwifery practice, as midwifes provide care for women after premature births. It is therefore essential for midwives to know risk factors of PPD in order to enhance the quality of care they provide to this vulnerable group.

The research gap results from the literature, because the existing studies that deal with the relationship between prematurity and postpartum depression do not control for confounding variables like depression during pregnancy (Grote et al., 2010; Guintivano et al., 2018; Jarde et al., 2016; Staneva et al., 2015). This present work controls the confounding variable “depression during pregnancy” by only analyzing those whose depressive symptoms in pregnancy were within a healthy standard range. This will be described in more detail within the methodology section.

The relevance of this topic for midwifery science in particular arises from the shortage in the provision of psychotherapeutic support in the postpartum period and for postpartum depression. In Germany, due to the shortage of psychotherapists, waiting times are long and treatment places are very limited (*Wartezeiten auf eine Psychotherapie - Studien&Umfragen. Deutscher Bundestag.*, 2022). Midwives are one of the first points of contact for parents in this vulnerable phase. They should therefore know the risk factors for postpartum depression in order to be best prepared in their work and, for example, to carry out special screening measures such as the Edinburgh Postnatal Depression Scale for PPD in these risk groups.

Overall, this leads us to the following research question of this thesis: Do mothers of preterm infants - who did not show elevated depression scores during pregnancy - have an increased risk of postpartum depression compared to mothers who also did not show elevated depression scores during pregnancy, but experienced a non-preterm birth?

2 Theoretical Framework

In the following theoretical section, first the topics of premature birth and postpartum depression are explored and then the relationship between the two is examined based on the current state of research.

2.1 Premature Birth

2.1.1 Definition

Preterm birth is defined by the World Health Organization (WHO) as any birth before 37 completed weeks of gestation (36 weeks+6 days) or fewer than 259 days after the first

day of the women's last period (World Health Organization, 1977). Prematurity can then be divided into subcategories based on gestational age at birth. These categories are extremely preterm (< 28 weeks of gestation), very preterm (28+0 to 31+6 weeks of gestation), moderately preterm (32+0 to 33+6 weeks of gestation) and late preterm births (34+0 to 36+6 weeks of gestation) (Blencowe et al., 2012).

2.1.2 Prevalence of Premature Birth

The literature on preterm births shows a high prevalence of prematurity worldwide, with an average global preterm birth rate of around 11% based on data from 184 countries (Blencowe et al., 2012). This corresponds to an annual total of around 15 million premature babies worldwide (Blencowe et al., 2012; World Health Organization, 2012).

There are large differences in preterm birth rates between developed and less developed countries, ranging from around 5% preterm birth rates in highly developed countries to almost 20% in less developed countries (Blencowe et al., 2012).

Blencowe et al. (2012) have also looked at the distribution of preterm births into their subcategories and found that most preterm births are moderate and late preterm, occurring between 32+0 and 36+6 weeks of gestation (about 85% of all preterm births). Very preterm births between 28+0 and 31+6 weeks account for about 10% of all preterm births and extremely preterm births below 28 weeks gestation account for about 5% of all preterm births worldwide.

The question on how premature birth rates have developed over the last years and decades must be considered from a nuanced perspective: Blencowe et al. (2012), for example, found increasing or stable preterm birth rates in 62 of 65 countries studied worldwide. Another study found an increase in prematurity rates in the European environment, more precisely in Denmark (Langhoff-Roos et al., 2006). Yet another study shows stable to slightly decreasing premature birth rates in the US around 10 % (Osterman et al., 2024). Similarly in Germany, where stable premature birth rates around 8 % have been reported over the last decade (Berger et al., 2019; IQTIG Bundesauswertung Perinatalmedizin Geburtshilfe, 2022). Another trend which has been observed relates to the rates of late preterm births (34+0 - 36+6 weeks of gestation): Increasing numbers have been reported within the last few years in highly developed countries which according to the literature is due to an increasing number of provider-initiated preterm births (Davidoff et al., 2006).

To summarize, the prevalence of prematurity differs widely around the world between highly and less developed countries and there is no official global measurement

system available yet. If a global rate is to be summarized, it is around 11%, which equates to around 15 million premature births worldwide per year (Blencowe et al., 2012). This high number of premature births leads to the question of how they are caused and what the consequences are for these approximately 15 million children and their families. These questions will be addressed in the following paragraphs.

2.1.3 Causes of Prematurity

The causes for prematurity are heterogenous and often unknown (Euro Peristat Project, 2022; Menon, 2008). In literature, they are often divided into two groups: spontaneous premature births, which make about 2/3 of premature births and provider initiated preterm births, which are also called iatrogenic (Euro Peristat Project, 2022).

Spontaneous preterm births include, for example, births after premature rupture of membranes or premature contractions. There are different reasons for labor to begin before the due date, including intrauterine infections such as malaria (Desai et al., 2007), decidual bleeding, overstretching of the myometrium, genetic components or vascular diseases, among many others (Blencowe et al., 2013; Gracie et al., 2011; Romero et al., 2014). These factors ultimately lead to an activation of the so-called “common pathway”, which describes changes in the membranes and the decidua, contractions of the myometrium and cervical ripening, which will ultimately lead to birth (Gracie et al., 2011; Romero et al., 2014).

Provider-initiated iatrogenic preterm birth is often the result of induction of labor or an elective c-section due to maternal or fetal indications. These risk factors which are associated with provider-initiated preterm birth include: intrauterine growth restriction in the fetus, pre-eclampsia or hypertensive diseases in the mother, advanced maternal age or high maternal body mass index (Euro Peristat Project, 2022; Genova et al., 2022; Prunet et al., 2017). Other risk factors associated with prematurity include stress, low socio-economic status, multiple pregnancies (Euro Peristat Project, 2022), smoking (Savitz & Murnane, 2010), primiparity and previous premature birth (Prunet et al., 2017).

The causes of preterm birth differ widely around the world: In less developed countries, the incidence of provider-initiated preterm births is very low, whereas in more developed countries, the prevalence of these iatrogenic preterm births is high and rising (Blencowe et al., 2012; Joseph et al., 2002). This phenomenon may be attributed to a number of factors, including an increase in maternal age in highly developed countries, the rising prevalence of infertility treatments, a rise in the incidence of multiple pregnancies and an elevated risk of maternal health complications, which frequently result in the induction of labor in the late preterm period (Blencowe et al., 2013).

2.1.4 Consequences of Prematurity

There are various consequences of preterm birth, which are divided into three categories. The first relates to the consequences for the child: Preterm birth is the leading cause of newborn deaths (World Health Organization, 2012) and the second largest direct cause of child deaths in children younger than 5 years after pneumonia (Blencowe et al., 2012; L. Liu et al., 2012). It must also be noted that mortality rates increase with decreasing gestational age at birth (Katz et al., 2013). The consequences for the child are also strongly dependent on the setting the child is born into: The "survival gap" after a premature birth states that the chances of survival are higher in more developed countries while in less developed countries the chances of survival after a premature birth are much lower (Blencowe et al., 2012; World Health Organization, 2012). Further consequences for the child after a premature birth include physical areas such as visual or hearing impairment, long-term lung diseases or motor limitations (Blencowe et al., 2013; Mwaniki et al., 2012). Neurodevelopmental delays, impaired learning and an increased risk of cerebral palsy were also found after prematurity (Mwaniki et al., 2012).

The second category relates to the consequences of premature birth for the mother and parents: Psychological distress and increased worry as well as stress levels were found (Hendy et al., 2024), especially if the child had a lower gestational age at birth and entailed a higher medical risk (Singer et al., 1999; Tooten et al., 2013). Additionally, an elevated risk for postpartum depression in mothers following premature birth has been found in some studies (De Paula Eduardo et al., 2019; Guintivano et al., 2018; Vigod et al., 2010).

The third category of consequences after premature birth is the economical: It has been shown that the prolonged hospitalization period, ongoing healthcare needs and special educational needs lead to increased economic costs for the healthcare systems involved and for society as a whole (Blencowe et al., 2013; Petrou et al., 2019).

2.2 Postpartum Depression (PPD)

2.2.1 Definition

Postpartum Depression (PPD) is defined as *"[…] a clinical condition that lasts for at least two weeks, creates significant impairment in functioning, and typically requires professional treatment"* ("Diagnostic and Statistical Manual of Mental Disorders, 4th Ed. (DSM-IV)," 1995, p. 1228; Yim et al., 2015).

The onset of depressive symptoms is related to the birth, although the precise temporal relationship is not clearly defined in literature: Symptom onset can occur as early as hours after the birth, within a few days or weeks up to one year postpartum (O'Hara & McCabe, 2013; Sonnenmoser, 2007; Yim et al., 2015).

Characteristic symptoms of PPD are diverse and range from negative mood, exhaustion, irritability, loss of interest and reduced concentration to suicidal thoughts or actions (Pearlstein et al., 2009; Slomian et al., 2019; Sonnenmoser, 2007). Symptoms that are particularly related to the parental role should also be mentioned, which include, for example fear of failure, passivity or a reduced understanding of the infant's needs (Dorsch & Rohde, 2016; Hübner-Liebermann et al., 2012).

As a number of these symptoms are characteristics of early parenthood, it is important to be able to differentiate between postpartum depression (PPD) and the postpartum blues, which will be explored in more detail below.

2.2.2 Differentiating Postpartum Blues

The postpartum blues, also known as baby blues, present with symptoms which are similar to those observed in PPD, including irritability, crying, anxiety, sadness and mood swings (O'Hara & Wisner, 2014). However, the symptoms are less severe in postpartum blues than in PPD (Grigoriadis & Romans, 2006).

The duration of symptoms is reported to be approximately 14 days postpartum, with a peak occurring around day 5. This likely reflects the hormonal readjustments after birth (Grigoriadis & Romans, 2006; O'Hara & Wisner, 2014).

Literature reports a frequency of postpartum blues between 26% (O'Hara, 1991) and 84% (Oakley & Chamberlain, 1981), which makes postpartum blues a frequent phenomenon.

2.2.3 Prevalence of PPD

The majority of literature on PPD prevalence reports rates between 10-15% (Gavin et al., 2005; Sonnenmoser, 2007; Yim et al., 2015). However, high numbers of up to 60 % have been reported (Halbreich & Karkun, 2006).

There are various factors which influence the prevalence rates of PPD, for example unreported cases (Dubey et al., 2021) or cultural factors such as the mother's integration into the community (Halbreich & Karkun, 2006). In addition, prevalence rates differ depending on the time period in which they were assessed (Slomian et al., 2019) as

supported by studies indicating that the prevalence of PPD decreases during the first year postpartum (Garfield et al., 2021; Genova et al., 2022; Grekin et al., 2017; Norhayati et al., 2015).

2.2.4 Assessment of PPD – The EPDS

The Edinburgh Postnatal Depression Scale (EPDS) was developed in 1987 as a screening tool for postpartum depression (Cox et al., 1987). Since then, it has become one of the most widely used instruments for detecting PPD (Halbreich & Karkun, 2006). The EPDS is a 10-item self-report questionnaire, which is short and practical, as well as easy to evaluate (Yim et al., 2015). The scale assesses the subject's depressive symptoms during the previous seven days, with a total score ranging from 0 to 30 points. It`s effectiveness is supported by the sensitivity of 95% and specificity of 93% (Harris et al., 1989).

It is a cost effective method for large-scale screening of PPD risk, making it a useful tool in both clinical and research settings (Yim et al., 2015). In practice, it allows individuals scoring above a certain cut-off to be identified for follow-up diagnostic procedures, which will lead to the initiation of the necessary support and therapy (Levis et al., 2020). The literature describes varying cut-off values for when additional diagnostic is recommended, depending on the context (Levis et al., 2020). This question will be further addressed in the methodology section of this work.

2.2.5 Risk Factors for PPD

The exact mechanisms underlying the development of postpartum depression are not fully understood yet, which underlines the importance of knowing risk factors for the occurrence of PPD (De Paula Eduardo et al., 2019).

In the existing literature, risk factors for PPD are often divided into two categories: Biological and psychosocial risks (Yim et al., 2015), which will be outlined below.

The underlying biological processes describe the development of pregnancy hormones: During pregnancy, estradiol levels rise significantly, reaching levels up to 100 times higher than in non-pregnant women (O'Hara & Wisner, 2014). In the days following birth, however, these hormone levels drop rapidly (Bloch et al., 2000; Douma et al., 2005; O'Hara & Wisner, 2014). This sudden decrease of hormone levels can have significant psychological consequences: Women who are particularly sensitive to the sudden hormonal changes after childbirth have an increased risk of developing PPD (O'Hara & Wisner, 2014).

It seems probable that a genetic predisposition is involved in this process (Guintivano et al., 2018; Mahon et al., 2009; O'Hara & Wisner, 2014).

The psychosocial risk factors are diverse and include, for example, a history of depression (Cruise et al., 2018; Guintivano et al., 2018; X. Liu et al., 2022; Sonnenmoser, 2007; Yogman, 2021), lack of social support and relationships (Cruise et al., 2018; Guintivano et al., 2018; O'Hara & McCabe, 2013), low socioeconomic status (Cruise et al., 2018; O'Hara & Wisner, 2014) or the presence of an unwanted pregnancy (Cruise et al., 2018; Gastaldon et al., 2022). Furthermore, risk factors such as experiencing a premature birth (Cruise et al., 2018; De Paula Eduardo et al., 2019; Vigod et al., 2010) or a negative birth experience (Zhao & Zhang, 2020) have been associated with an increased risk of PPD.

2.2.6 Consequences of PPD

Having presented the definition, symptoms, assessment, prevalence and risk factors of postpartum depression, its consequences are described below.

The consequences of PPD cover three main areas: the health of the mother, the health of the child and the mother-child interaction.

Consequences for maternal health include an increased likelihood of relationship difficulties and risky behaviors (Slomian et al., 2019), as well as an elevated risk of impaired long-term physical and mental health (Slomian et al., 2019). Additionally, PPD has been linked to a reduction in maternal sensitivity towards their children (Field, 2010).

The consequences for the child include reduced social engagement, less mature regulatory behavior and increased negative emotionality (Feldman et al., 2009). Furthermore, elevated cortisol reactivity has been observed, indicating increased sensitivity to stress (Barry et al., 2015; Feldman et al., 2009). In addition, children of mothers with postpartum depression are more prone to disrupted sleep patterns (Slomian et al., 2019), emotional dysregulation and behavioral problems (Fihrer et al., 2009; Latva et al., 2008; Slomian et al., 2019; Tooten et al., 2013).

As a third domain, PPD significantly affects the quality of mother-child interactions. Research indicates that maternal commitment to their children is reduced (Slomian et al., 2019; Sonnenmoser, 2007), which results in reduced bonding and breastfeeding experiences (Field, 2010; Slomian et al., 2019).

2.3 The Connection of PPD and Premature Birth

This final section of the theoretical background examines the relationship between premature birth and postpartum depression (PPD).

A large body of research has already indicated higher rates of PPD in mothers of infants born prematurely compared to mothers who gave birth at term (De Paula Eduardo et al., 2019; Guintivano et al., 2018; Ihongbe & Masho, 2017; Vigod et al., 2010; Yogman, 2021). Rates of PPD after preterm birth are reported to be up to 40% (Vigod et al., 2010) compared to the most commonly reported 10-15% prevalence of PPD in non-risk groups (Gavin et al., 2005; Sonnenmoser, 2007; Yim et al., 2015). Attempts have been made to explain these increased rates, for example, by the increased stress levels experienced by parents after a premature birth (Gulamani et al., 2013; Vigod et al., 2010).

However, a primary limitation of the studies was that the majority of them did not consider the potential confounding variable of “depression during pregnancy” (Guintivano et al., 2018; Staneva et al., 2015; Vigod et al., 2010). Therefore, it is important to control the confounding variable “depression during pregnancy” to discover the actual effect of premature birth on postpartum depression scores. The importance of this issue is underlined by several studies indicating that “depression during pregnancy” is a risk factor for preterm labour, which in turn is associated with elevated depression scores postpartum (Grote et al., 2010; Guintivano et al., 2018; Jarde et al., 2016; Staneva et al., 2015).

Thus, the research gap to be filled in this thesis is the question of whether mothers of preterm infants who did not show elevated depression scores during pregnancy are at increased risk for postpartum depression compared to mothers who also did not have elevated depression scores during pregnancy and experienced a non-preterm birth.

3 Method

The methodology section of this thesis is divided into two parts. First, the study design, participants, measures and procedure of the PRINCE study are described. Since some of the data from the PRINCE study is used in this thesis, the second part of the methodology describes this specific data on preterm birth and maternal EPDS scores in more detail.

3.1 PRINCE Data Collection

3.1.1 Study Design

The PRINCE (Prenatal Identification of Children's Health) study is a prospective longitudinal observational study that has been conducted since February 2011 at the Department of Obstetrics and Prenatal Medicine, University Medical Center of Hamburg-Eppendorf (UKE), Hamburg, Germany. Since 2015, it has been part of the DFG-funded Clinical Research Unit (KFO 296). The study is led by Prof. Dr. Petra C. Arck (Laboratory for Experimental Feto-Maternal Medicine) and Prof. Dr. Anke Diemert (Clinic for Obstetrics and Perinatal Medicine).

Data collection began in February 2011, and the last birth recorded within the study took place in May 2023. However, postpartum questionnaire data as well as pediatric data are still being collected, providing valuable insights into maternal and fetal health beyond the immediate birth period. The study collects a variety of data throughout its progression, which is described in detail under 5.1.3 "Measures and Procedure".

3.1.2 Participants

The PRINCE study monitored a total of 761 pregnancies. Participants were required to meet the following inclusion criteria: They had to be at least 18 years old, legally able to give consent and present with an intact pregnancy between 12+0 and 14+6 weeks of gestation at the time of the initial study visit. Participants were excluded if they met any of the following exclusion criteria: presence of maternal autoimmune or chronic infectious diseases, nicotine, alcohol, or drug abuse, prior fertility treatment or multiple pregnancies.

Although no monetary compensation was provided to participants, they received parking vouchers for free parking in the clinic's underground garage. Reimbursement for public transportation costs (e.g., bus or train) could not be offered. In addition, participants were provided with nutrition calendars and pregnancy guides. After submission of birth data, they were also sent a collection of ultrasound images on a CD or USB stick.

Participants were recruited via the website of the Department of Obstetrics at the University clinic Hamburg Eppendorf, where the study was presented under the "Research" section. In addition, flyers were distributed in various areas of the clinic. In the early stage of the study, the research team actively visited gynecologists in private practices in Hamburg to present the study and distribute recruitment materials. In addition, a large part of the recruitment took place by word-of-mouth referrals.

3.1.3 Measures and Procedure

Throughout the PRINCE study, data collection occurred at specific stages of pregnancy and continued into the postpartum period, following a structured progression, which will be described below.

At the initial appointment, typically conducted during the first trimester (between 12+0 and 14+6 weeks of gestation) a comprehensive medical history was taken. Participants were asked about current illnesses, infections, and medication intake and their vaccination status was reviewed. A detailed ultrasound of the fetus and uterus was performed and blood samples were collected for fundamental research purposes. Additionally, the mother's height and weight were recorded. Participants also completed a detailed psychometric questionnaire which, among others, included the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987), the Perceived Stress Scale (PSS) (Cohen et al., 1983), the Berlin Social Support Scale (BSSS) (Schwarzer & Schulz, 2000) as well as the State Trait Anxiety Inventory (STAI) (Spielberger, 1983). Furthermore, participants completed a nutrition protocol named EBISpro (Erhardt, 2016).

The second appointment, which was held during the second trimester (between 22+6 and 24+6 weeks of gestation) followed similar procedures. Participants were again asked about current illnesses, infections, medication use and vaccination status. A second detailed ultrasound was performed, blood samples were collected again and the mother's weight and height were measured. The above-described psychometric questionnaire and nutrition protocol were completed again.

During the third trimester, two additional appointments were conducted. The first, occurring between 28+0 and 29+6 weeks of gestation, involved another detailed ultrasound and weight measurement for the mother. If desired, birth registration for delivery at the University clinic Hamburg Eppendorf was completed. The second appointment in the third trimester, held between 34+0 and 36+6 weeks of gestation, mirrored previous visits: participants were asked about illnesses, infections, medication intake and vaccinations. An ultrasound was performed, blood samples were taken, and the mother's weight and height were recorded. As with earlier visits, participants completed both the psychometric questionnaire and the nutrition protocol again.

In the postpartum phase, data collection continued. Birth data and newborn data were collected via birth card, which was distributed to participants in their maternity booklets and returned from participants by mail. The following data were collected via birth card: The question of whether complications occurred during pregnancy and if so, which ones, the

date of birth, the gestational age at delivery, the type of delivery, the question whether a (premature) rupture of membranes occurred, the sex of the child, the APGAR score of the child, the arterial umbilical cord pH as well as the child's measurements. Over the further course of the child`s first year of life, two psychometric questionnaires were sent to mothers: one at 6 months and another at 12 months postpartum, assessing both the child's development and the mother's psychological well-being. These questionnaires included once again the EPDS (Cox et al., 1987), the PSS (Cohen et al., 1983), the BSSS (Schwarzer & Schulz, 2000), the STAI (Spielberger, 1983) as well as the Retrospective Infant Behavior Inhibition Scale (RIBI) (Gensthaler et al., 2013). Additionally, yearly questionnaires are still being collected, from the child's first birthday through to the age of nine, assessing for example life events, nutritional and developmental factors, questions about the child's health and illnesses as well as the parents perceived stress throughout the years (Cohen et al., 1983). Moreover, pediatric examinations are being conducted during the child's fifth and tenth year of life. This systematic data collection approach allows a comprehensive, longitudinal assessment of both maternal and child health throughout pregnancy and early childhood.

3.2 Data on Premature Birth and Maternal PPD

As mentioned above, the PRINCE study collected a large amount of data. The following section refers to selected data on prematurity and maternal postpartum depression which are analyzed in this thesis.

Premature birth data were categorized into two groups based on gestational age at birth. Group A included participants who gave birth at or before 36+6 weeks of gestation (preterm birth group), while Group B included participants who gave birth at 37+0 weeks gestation or later (non-preterm birth group).

The planned data analysis involved comparing the EPDS scores six months postpartum between group A and B using an unpaired t-test for independent samples. This statistical method was suitable due to the independence of the groups. The primary objective was to determine whether there was a statistically significant difference in EPDS scores postpartum between the preterm birth and the non-preterm birth group.

A crucial methodological consideration was the control of the confounding variable "depression during pregnancy" as outlined in the theoretical framework under 4.3. This was achieved by adjusting the sample: The depression scores from the EPDS, which participants completed once in each trimester of pregnancy, were summed and averaged. A value for the "average depressiveness during pregnancy" was then determined for each

participant. A cut-off value, as described in the following section, was then used to identify participants with increased depressive symptoms during pregnancy and exclude them from the analysis. This allowed for the confounding factor “depression during pregnancy” to be adjusted for.

Varying EPDS cut-off values have been described in literature depending on the context (Levis et al., 2020). An EPDS cut-off value of 11 was found to maximize sensitivity and specificity. This suggests that a cut-off of 11 can be employed if the aim is to minimize false negatives and identify the majority of patients meeting diagnostic criteria. In this study, a cut-off of 11 was applied to ensure effective control of the confounding factor. By doing so, some participants who may not have experienced depression during pregnancy were excluded, thereby avoiding false negatives. This approach ensured that no depressive symptoms during pregnancy were present in the participants included in the cleaned sample.

Regarding the final sample utilized for analysis, of the above-mentioned 761 participants initially recruited into the PRINCE study, 13 cases dropped-out during pregnancy due to miscarriage (n = 4) or withdrawal of consent (n = 9). Additionally, two infants died postpartum and another 150 participants did not return the EPDS and the other postpartum questionnaires for unknown reasons. This left a total of 596 participants who completed the EPDS postpartum.

From this sample, 56 participants showed high EPDS scores during pregnancy (above the cut-off of 11) and were excluded to control for the confounding variable of “depression during pregnancy”, reducing the sample size from 596 to 540 participants. Furthermore, three additional participants were excluded due to missing data on gestational age at birth, as it was not possible to determine whether they belonged to group A (preterm birth group) or B (non-preterm birth group), further reducing the sample to 537 participants.

Thus, the final cleaned sample comprised 537 participants who did not exhibit depressive symptoms during pregnancy. This "healthy sample" was divided into two groups: Group A, consisting of 33 participants who experienced a preterm birth (≤ 36+6 weeks gestation), and Group B, consisting of 504 participants who did not have a premature birth (≥ 37+0 weeks gestation). Further information regarding the sample and its characteristics is presented in the subsequent section under “Descriptive Data Analysis”.

4 Results

4.1 Descriptive Data Analysis

As described above, the final sample consisted of n = 537 participants who did not present with depressive symptoms above the cut off score of 11 on the Edinburgh Postnatal Depression Scale (EPDS) during pregnancy. Their mean EPDS score in pregnancy was 4.2 (SD = 2.7), indicating that this group can be classified as "healthy" in regard to self-reported depressive symptoms.

For the purpose of analysis, the n = 537 participants were divided into two groups: Group A, which included 33 participants who gave birth at or before 36+6 weeks of gestation (preterm birth group), and Group B, which included 504 participants who gave birth from 37+0 weeks of gestation onward (non-preterm birth group), including 500 term births and 4 post-term births occurring at or beyond 42+0 weeks of gestation (see Figure 1). The age of the participants in the final sample ranged from 21 to 49 years, with a mean age of 33 years and SD = 3.6 years (see Figure 2).

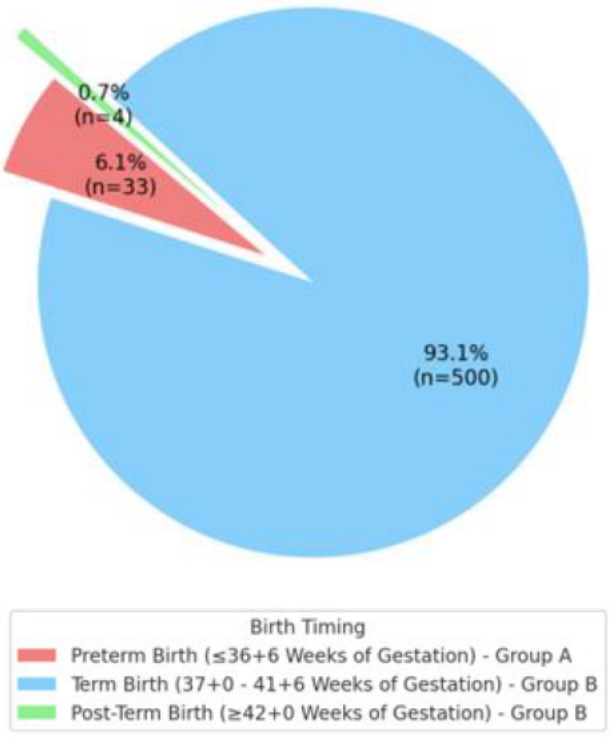

Figure 1 – Distribution of Participants by Group
(Source: own visualization, created using Matplotlib in Python)

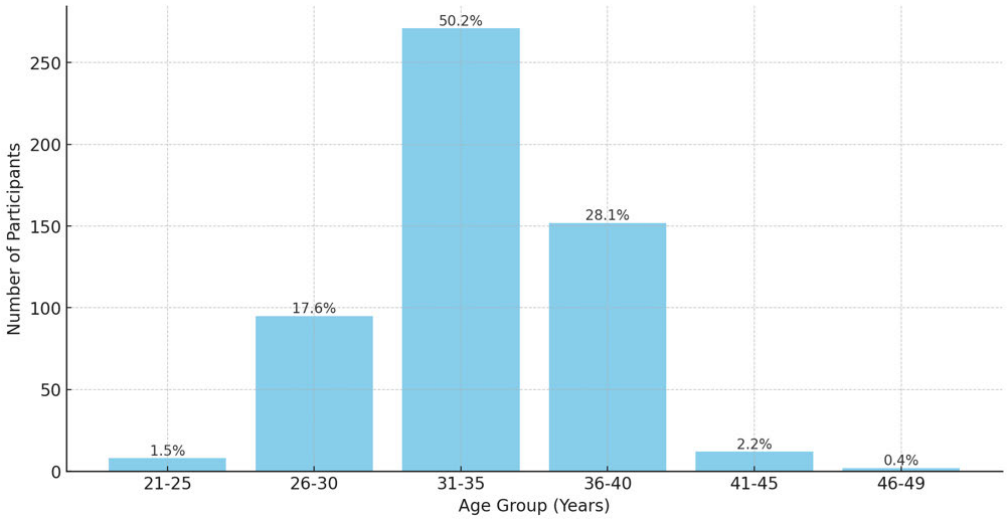

Figure 2 – Distribution of Participants by Age
(Source: own visualization, created using Matplotlib in Python)

Of the 33 preterm births that occurred before 37+0 weeks of gestation (Group A), the earliest was recorded at 31+6 weeks. Two births occurred between 32+0 and 32+6 weeks, four between 33+0 and 33+6 weeks, seven between 34+0 and 34+6 weeks, six between 35+0 and 35+6 weeks, and 13 occurred between 36+0 and 36+6 weeks of gestation. This means that the majority of preterm births within this sample were classified as late preterm (see Figure 3).

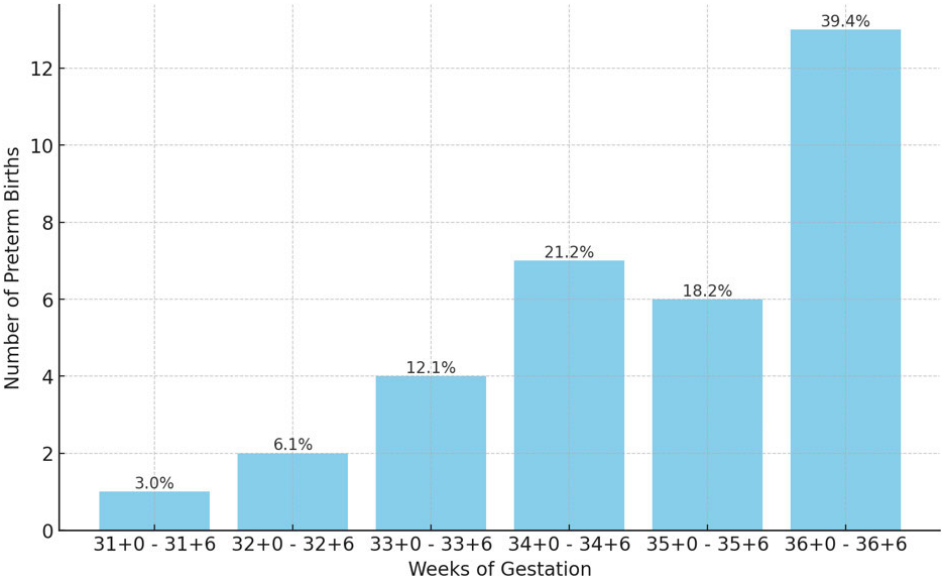

Figure 3 – Distribution of Preterm Births by Gestational Week (Group A)
(Source: own visualization, created using Matplotlib in Python)

Figure 4 shows the distribution of Non-Preterm births by weeks of gestation (Group B). As can be seen, more than 99% of births in group B are classified as term births between 37+0 and 41+6 weeks of gestation (n=500). 105 of these 500 term births can be classified

as Early Term births between 37+0 and 38+6 weeks of gestation. 0.8% of the births occurred after 42+0 weeks of gestation, representing prolonged pregnancies (n=4).

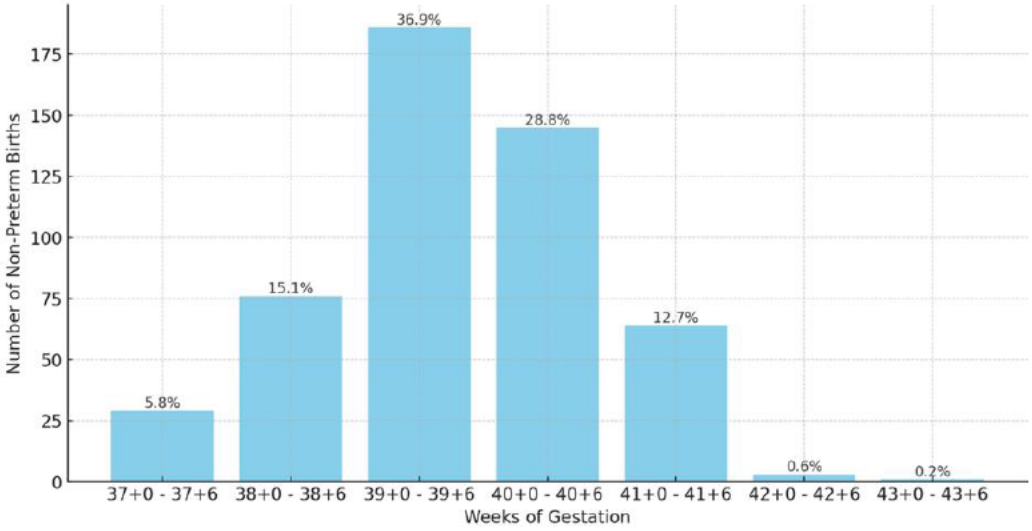

Figure 4 – Distribution of Non-Preterm Births by Gestational Week (Group B)
(Source: own visualization, created using Matplotlib in Python)

Figure 5 illustrates the distribution of EPDS Scores at 6 months postpartum in the cleaned sample. Of the 537 participants, 499 presented postpartum EPDS scores below 11. A total of 38 participants exhibited EPDS scores of 11 or above. All of these 38 participants with elevated postpartum depression above the EPDS cut-off of 11 belonged to the Non-Preterm birth Group B. As shown, none of the participants with Preterm births (Group A) exhibited a postpartum EPDS score above 11. This finding will be further explored in the discussion.

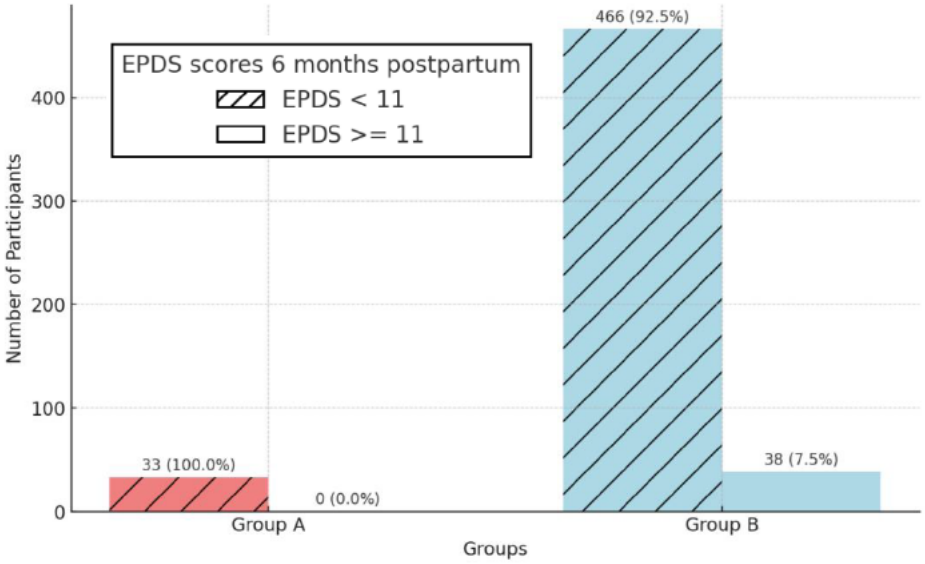

Figure 5 – EPDS Scores 6 Months Postpartum by Group
(Source: own visualization, created using Matplotlib in Python)

4.2 Data Analysis for Research Question

The statistical analysis was conducted using the *IMB SPSS Statistics v. 29* software. The test requirements for the performed analysis were fulfilled (normal distribution and homoscedasticity). For the statistical test, a significance level of $\alpha = 0.05$ was set.

As described in chapter 4.3, the research question of this thesis is to examine whether mothers after a preterm birth show higher EPDS scores postpartum compared to mothers, who did not experience a preterm birth. The sample for this analysis was cleaned, which means only mothers whose EPDS scores in pregnancy were within a healthy range were included in the analysis, as explained in chapter 5.2.

To answer this question, an unpaired t-test for independent samples was conducted, to find out whether the EPDS scores in groups A/B differ significantly (A = birth up to and including 36+6 weeks of gestation, B = birth from 37 + 0 weeks of gestation)

The 33 Preterm mothers in group A showed a mean EPDS score 6 months postpartum of 3.85 (SD = 3.08) while the mean EPDS score of the 504 Non-Preterm mothers in group B was 4.25 (SD = 3.71). These results indicate that the experience of a preterm birth in this sample did not result in Preterm mothers showing higher EPDS scores than the Non-Preterm mothers. Instead, mothers in the Non-Preterm group (Group B) had slightly higher postpartum EPDS scores than Preterm mothers (Group A). However, this difference was not statistically significant ($t(535) = 0.605$, $p = 0.545$), indicating only a directional trend (Figure 6).

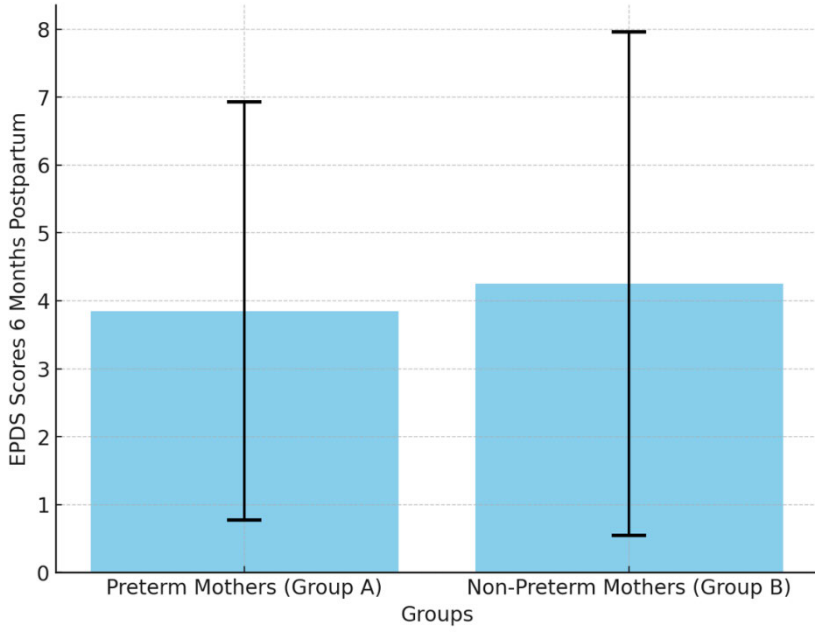

Figure 6 – Visualization of Mean EPDS Scores and Standard Deviations Postpartum
(Source: own visualization, created using Matplotlib in Python)

For purposes of comparison, had the sample not been adjusted, the results would have manifested in the opposite direction. In this scenario, the EPDS scores in the Preterm group A would have been higher (mean = 4.95, SD = 4.33) than those observed in the Non-Preterm group B (mean = 4.82, SD = 4.32). However, this effect would also not have been statistically significant (t (591) = -0.174, p = 0.862).

It can thus be concluded that the control of the confounding factor “depression during pregnancy” resulted in a reversal of the effect`s direction, with neither of the two effects reaching statistical significance. These results will be addressed in the discussion of this thesis.

5 Discussion

The following section presents an answer to the research question, based on the statistical results and in the context of limiting factors. Additionally, further research directions are presented, followed by implications for practice, with a focus on midwifery.

5.1 Main Findings

This thesis addresses the research question of whether the experience of a preterm birth before 37+0 weeks of gestation is associated with an increased risk of postpartum depression in a cleaned sample, as indicated by elevated EPDS scores postpartum. The primary findings of this study indicate that the confounding factor of “depression during pregnancy” must be controlled, in order to accurately assess the relationship between premature birth and postpartum depression.

If this confounding factor is not controlled, it cannot be guaranteed that the observed relationship between premature birth and postpartum depression is due to the premature birth itself.

After controlling for this confounding factor “depression during pregnancy” in this thesis, the results show that preterm birth does not lead to increased EPDS scores postpartum. This finding can be explained by several factors:

Firstly, it is possible that the increased EPDS scores observed in literature after a premature birth were not a consequence of the premature birth itself, but instead a result of depressive symptoms during pregnancy, which was not controlled for in most of these studies (De Paula Eduardo et al., 2019). Moreover, the connection found in literature between depression during pregnancy and the increased risk of experiencing a premature

birth is also an important aspect to be considered (Grote et al., 2010; Guintivano et al., 2018; Staneva et al., 2015).

Another factor that may contribute to the observed results is the availability of medical care in Germany, specifically in Hamburg, where the PRINCE data collection took place. Parents of premature babies have access to a range of support services that are directly linked to the premature baby units, which may help to minimize the psychological stress experienced by parents. This could explain why the mothers in our sample exhibited lower EPDS scores after a preterm birth than mothers after a non-preterm birth and no mother in the preterm-birth group showed EPDS scores above the cut-off of 11. The hospitals in Hamburg that care for premature babies offer a wide range of support services for parents. These include group counseling for parents, contact with social service workers and integrated psychological support services, which are offered in the University Medical Center of Hamburg-Eppendorf as well as the Marien Hospital Hamburg, two large clinics in Hamburg specialized in the care of premature babies (conversation with Mandy Lange, head of the intensive care unit for premature and newborn babies at the UKE, November 1st 2024). There is also literature indicating that counselling, support and resilience programs offered in neonatal units are associated with lower rates of PPD in parents (Bergström et al., 2012).

Furthermore, it must be considered that the majority of preterm births in our sample - almost 80 % - occurred between 34+0 and 36+6 weeks of gestation, categorizing them as late preterm births. These are generally associated with minor complications and relatively short hospital stays, as a negative connection between gestational week at birth and child impairment is commonly found (Boyle et al., 2015; Katz et al., 2013; Manuck et al., 2016). The present thesis does not report the number of preterm infants in the sample with severe complications. However, it can be postulated that the proportion of infants with severe complications was probably low in this thesis, given the distribution of gestational weeks at birth. It is also known that parents experience less psychological distress if the preterm birth has few complications and the later the preterm birth (Genova et al., 2022; Singer et al., 1999; Tooten et al., 2013), which may have influenced our postpartum EPDS scores.

5.2 Limitations

Although the confounding factor of “depressive symptoms during pregnancy” was controlled for in this thesis, several other confounding variables that may affect the occurrence of postpartum depression were not considered. These include a history of depression prior to pregnancy (Robertson et al., 2004), the support network available, which

is known as a protective factor against PPD (Yim et al., 2015), other mental health factors such as history of anxiety disorders (Robertson et al., 2004) or (dis-)satisfaction with the birth experience (Oakley & Chamberlain, 1981). In addition, medical complications during pregnancy, such as pre-eclampsia and gestational diabetes mellitus have also been identified as potential risk factors for the development of postpartum depressive symptoms (Caropreso et al., 2020; Wilson et al., 2020). Consequently, it is essential to consider these potential confounding variables in future studies.

Another limitation of this thesis is that no distinction was made as to whether there were differences in postpartum depression depending on how early the premature birth took place (Genova et al., 2022; Ihongbe & Masho, 2017). No extremely or early preterm births occurred in the PRINCE study, as the majority of the preterm births in our sample were classified as late preterm. Distinguishing between extremely, very, moderate, and late preterm births would be beneficial in future studies with larger samples and a wider range of preterm birth categories to examine the potential differences in maternal PPD depending on preterm birth category.

Furthermore, neonatal outcomes or complications among the preterm infants were not examined in this thesis. In preterm infants, increased infant risk is associated with increased maternal depressive symptoms in the postpartum period (Singer et al., 1999), indicating that not all preterm births are equally associated with postpartum depression. In future studies, it would therefore be interesting to consider the neonatal outcomes and complications over time on the neonatal unit when assessing postpartum depression.

Moreover, it is important to consider the high rate of missing EPDS scores postpartum in the PRINCE Study, which could reflect the continued lack of recognition of the importance of mental health in society or the overwhelm of parents postpartum. Of the 761 participants who participated, 150 did not complete the postpartum EPDS, which reduced the sample size for this thesis.

It is also essential to acknowledge a significant limitation of using the EPDS to study postpartum depression. Despite its utilization in this study, as in numerous others, to evaluate depressive symptoms, the EPDS serves merely as a screening instrument, which means that elevated EPDS scores do not directly imply a clinical diagnosis of depression (Cox et al., 1987). Elevated EPDS scores only reflect increased depressive symptoms; the following step needs to be the diagnosis to identify mothers who are genuinely affected by depression in order to initiate treatment.

5.3 Future Research Directions

Based on the limitations outlined in the last section, several directions of future research have already been identified. These include, among others, the control of further confounding variables, the differentiation of postpartum depression based on the category of preterm birth (extremely/very/moderately/late preterm) and the consideration of neonatal complications.

Additionally, further suggestions for future research can be found in the following sources: For example, investigating how premature birth affects other mental health topics such as anxiety would be a valuable contribution. Furthermore, additional research is required to better understand prevention strategies. While some preventive factors for postpartum depression after premature birth have been identified, such as Cangaroo Care and the support network (Anwar et al., 2023; Yim et al., 2015), future studies should place greater emphasis on other potential preventive factors.

Moreover, future studies could investigate the impact of experiencing a preterm birth on fathers and siblings. While there is already some research on this subject (Garfield et al., 2021; Yogman, 2021), further investigation would enhance understanding of this topic.

Another avenue of research in future studies should be midwives. One key question to address should be: What resources or special training do midwives need to provide optimal postpartum support for parents after a premature birth? It would also be valuable to examine whether continuous midwife care after a preterm birth can function as a preventive factor on postpartum depression.

5.4 Implications for Midwifery Practice

As the findings of this thesis have been primarily examined from a medical perspective, which is mostly due to the close interdisciplinary connection of the topic with neonatology and psychology, this section will examine the practical implications for the midwifery field.

The first practical implication addresses the role of midwives in pregnancy care: Midwives should be fully involved in the care of pregnant women from the initial stages of pregnancy onwards. This continuous care will lead to a relationship of trust between the pregnant woman and her midwife (Perriman et al., 2018), which forms a basis for conversations about mental health. In order to provide optimal care, mindwives should conduct a comprehensive health assessment, including questions about mental illnesses.

During pregnancy, midwives should monitor the mental health of pregnant women to identify those with elevated risk or symptoms of postpartum depression. In this context, close interdisciplinary collaboration is essential, enabling midwives to integrate psychological support when needed.

If a premature birth occurs, continuous care by midwives should be ensured after the birth, for example through established links to neonatal units. This continuous midwifery care could help to reduce the psychological stress, which parents often experience after a premature birth (Galea et al., 2022; Trumello et al., 2018). Again, psychotherapists should be involved without great barriers when midwives reach the limits of their care. Research suggests that most affected parents do not proactively seek psychological support (Cruise et al., 2018), which underlines the importance for midwives, nurses and doctors to connect affected parents with psychological therapists.

From a political perspective, the availability of intensive midwifery care following a premature birth is needed. This could be implemented, for example, by adding a number to the midwives` billing catalog allowing the midwife more time, as the need for care may be higher due to the increased stress of parents on the neonatal ward (Galea et al., 2022; Trumello et al., 2018). Furthermore, this care needs to be accessible in the clinical setting and not only at home, as some parents will stay on the neonatal wards with their premature babies. In addition, midwifery care should be accessible without significant administrative obstacles beyond the traditional 12-week period after birth. This is particularly important for parents of extremely and very preterm infants who may not bring their child home until months after birth. At this stage, continued or resumed midwifery care is crucial to ease the transition to life with the infant at home (Galea et al., 2022).

The implementation of EPDS screening as a routine procedure on neonatal wards represents an additional method of identifying parents who may be at risk for postpartum depression. Another important step towards comprehensive support can be to expand access to self-help groups for parents of premature babies. Furthermore, it is helpful if midwives are trained in the prevention of PPD to optimize midwifery care. With knowledge about protective factors of PPD like skin-to-skin-care or the release of oxytocin while breastfeeding (Anwar et al., 2023; Scime et al., 2019; Zhao & Zhang, 2020), midwives can integrate such measures into their daily work.

As a final practical implication for midwives, this thesis wants to highlight a unique facility that came up during research. The University Clinic of Heidelberg offers a specialized mother-child program for postpartum depression (*Mutter-Kind-Einheit (MKE) Universitätsklinikum Heidelberg*, 2024). This program integrates cognitive behavioral

therapy for maternal depression with psychodynamic mother-child therapy, with the aim of strengthening maternal-child bonds and interactions. This innovative approach could serve as a resource for midwives and other health care professionals encountering postpartum depression in mothers, connecting them with specialized support and guidance.

6 Conclusion

This thesis investigated whether experiencing a premature birth before 37+0 weeks of gestation increases the risk of postpartum depression (PPD), as measured by the Edinburgh Postnatal Depression Scale (EPDS). By controlling for the confounding factor of depressive symptoms during pregnancy - including only mothers with EPDS scores below the cut-off of 11 during pregnancy - the study aimed to isolate the effect of preterm birth on postpartum depressive symptoms.

The primary finding revealed that preterm birth did not lead to increased EPDS scores postpartum. In fact, mothers who experienced preterm births had slightly lower mean EPDS scores six months postpartum compared to those who had non-preterm births, although this difference was not statistically significant. Notably, none of the mothers in the preterm birth group exhibited EPDS scores postpartum above the cut-off of 11, whereas 38 mothers in the non-preterm group did. These findings suggest that, within this healthy sample, preterm birth alone does not increase the risk of developing PPD.

Several factors may explain these results: Previous studies might have misattributed the risk for PPD after preterm births by not controlling for prenatal depressive symptoms. Additionally, factors such as robust psychological support systems in Germany and the prevalence of late preterm births with fewer complications in this sample could have influenced the results.

In summary, this thesis contributes valuable insights into the relationship between preterm birth and postpartum depression, highlighting that preterm birth alone may not increase the risk of PPD when controlling for prenatal depressive symptoms. The findings underscore the importance of comprehensive care and the pivotal role of midwives in supporting maternal mental health. By implementing the practical implications outlined and addressing the identified limitations through future research, healthcare professionals can enhance outcomes for mothers and their families, ultimately promoting better long-term health for both mothers and children.

References

Anwar, F., Warsi, A., Ahmed, J., Zaidi, B., Turab, A., Khan, M. A., & Khan, K. S. (2023). The effectiveness of kangaroo mother care in lowering postpartum depression in mothers of preterm and low birth weight babies: A systematic review and meta-analysis. *Annals of Medicine & Surgery*, *85*(6), 2841–2848. https://doi.org/10.1097/MS9.0000000000000480

Barry, T. J., Murray, L., Fearon, R. M. P., Moutsiana, C., Cooper, P., Goodyer, I. M., Herbert, J., & Halligan, S. L. (2015). Maternal postnatal depression predicts altered offspring biological stress reactivity in adulthood. *Psychoneuroendocrinology*, *52*, 251–260. https://doi.org/10.1016/j.psyneuen.2014.12.003

Berger, R., Rath, W., Abele, H., Garnier, Y., Kuon, R.-J., & Maul, H. (2019). Reducing the Risk of Preterm Birth by Ambulatory Risk Factor Management. *Deutsches Ärzteblatt International*, *116*(50), 858–864. https://doi.org/10.3238/arztebl.2019.0858

Bergström, E.-B., Wallin, L., Thomson, G., & Flacking, R. (2012). Postpartum depression in mothers of infants cared for in a Neonatal Intensive Care Unit – Incidence and associated factors. *Journal of Neonatal Nursing*, *18*(4), 143–151. https://doi.org/10.1016/j.jnn.2011.11.001

Blencowe, H., Cousens, S., Chou, D., Oestergaard, M., Say, L., Moller, A.-B., Kinney, M., Lawn, J., & the Born Too Soon Preterm Birth Action Group (see acknowledgement for full list). (2013). Born Too Soon: The global epidemiology of 15 million preterm births. *Reproductive Health*, *10*(S1), S2. https://doi.org/10.1186/1742-4755-10-S1-S2

Blencowe, H., Cousens, S., Oestergaard, M. Z., Chou, D., Moller, A.-B., Narwal, R., Adler, A., Vera Garcia, C., Rohde, S., Say, L., & Lawn, J. E. (2012). National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: A systematic analysis and implications. *The Lancet*, *379*(9832), 2162–2172. https://doi.org/10.1016/S0140-6736(12)60820-4

Bloch, M., Schmidt, P. J., Danaceau, M., Murphy, J., Nieman, L., & Rubinow, D. R. (2000). Effects of Gonadal Steroids in Women With a History of Postpartum Depression. *American Journal of Psychiatry*, *157*(6), 924–930. https://doi.org/10.1176/appi.ajp.157.6.924

Boyle, E. M., Johnson, S., Manktelow, B., Seaton, S. E., Draper, E. S., Smith, L. K., Dorling, J., Marlow, N., Petrou, S., & Field, D. J. (2015). Neonatal outcomes and delivery of care for infants born late preterm or moderately preterm: A prospective population-based study. *Archives of Disease in Childhood - Fetal and Neonatal Edition*, *100*(6), F479–F485. https://doi.org/10.1136/archdischild-2014-307347

Caropreso, L., De Azevedo Cardoso, T., Eltayebani, M., & Frey, B. N. (2020). Preeclampsia as a risk factor for postpartum depression and psychosis: A systematic review and meta-analysis. *Archives of Women's Mental Health*, *23*(4), 493–505. https://doi.org/10.1007/s00737-019-01010-1

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior*, *24*(4), 385. https://doi.org/10.2307/2136404

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of Postnatal Depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry*, *150*(6), 782–786. https://doi.org/10.1192/bjp.150.6.782

Cruise, S. M., Layte, R., Stevenson, M., & O'Reilly, D. (2018). Prevalence and factors associated with depression and depression-related healthcare access in mothers of 9-month-old infants in the Republic of Ireland. *Epidemiology and Psychiatric Sciences*, *27*(5), 468–478. https://doi.org/10.1017/S2045796017000026

Davidoff, M. J., Dias, T., Damus, K., Russell, R., Bettegowda, V. R., Dolan, S., Schwarz, R. H., Green, N. S., & Petrini, J. (2006). Changes in the Gestational Age Distribution among U.S. Singleton Births: Impact on Rates of Late Preterm Birth, 1992 to 2002. *Seminars in Perinatology*, *30*(1), 8–15. https://doi.org/10.1053/j.semperi.2006.01.009

De Paula Eduardo, J. A. F., De Rezende, M. G., Menezes, P. R., & Del-Ben, C. M. (2019). Preterm birth as a risk factor for postpartum depression: A systematic review and meta-analysis. *Journal of Affective Disorders*, *259*, 392–403. https://doi.org/10.1016/j.jad.2019.08.069

Desai, M., Ter Kuile, F. O., Nosten, F., McGready, R., Asamoa, K., Brabin, B., & Newman, R. D. (2007). Epidemiology and burden of malaria in pregnancy. *The Lancet Infectious Diseases*, *7*(2), 93–104. https://doi.org/10.1016/S1473-3099(07)70021-X

Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV). (1995). *American Journal of Psychiatry*, *152*(8), 1228. https://doi.org/10.1176/ajp.152.8.1228

Dorsch, V., & Rohde, A. (2016). Postpartale psychische Störungen – Update 2016. *Frauenheilkunde up2date*, *10*(04), 355–374. https://doi.org/10.1055/s-0042-112631

Douma, S. L., Husband, C., O'Donnell, M. E., Barwin, B. N., & Woodend, A. K. (2005). Estrogen-related Mood Disorders: Reproductive Life Cycle Factors. *Advances in Nursing Science*, *28*(4), 364–375. https://doi.org/10.1097/00012272-200510000-00008

Dubey, A., Chatterjee, K., Chauhan, V. S., Sharma, R., Dangi, A., & Adhvaryu, A. (2021). Risk factors of postpartum depression. *Industrial Psychiatry Journal*, *30*(Suppl 1), S127–S131. https://doi.org/10.4103/0972-6748.328803

Erhardt, Dr. J. (2016). *EBISpro* [Computer software]. https://www.ebispro.de/

Euro Peristat Project. (2022). *European Perinatal Health Report.*

Feldman, R., Granat, A., Pariente, C., Kanety, H., Kuint, J., & Gilboa-Schechtman, E. (2009). Maternal Depression and Anxiety Across the Postpartum Year and Infant Social Engagement, Fear Regulation, and Stress Reactivity. *Journal of the American Academy of Child & Adolescent Psychiatry*, *48*(9), 919–927. https://doi.org/10.1097/CHI.0b013e3181b21651

Field, T. (2010). Postpartum depression effects on early interactions, parenting, and safety practices: A review. *Infant Behavior and Development*, *33*(1), 1–6. https://doi.org/10.1016/j.infbeh.2009.10.005

Fihrer, I., McMahon, C. A., & Taylor, A. J. (2009). The impact of postnatal and concurrent maternal depression on child behaviour during the early school years. *Journal of Affective Disorders*, *119*(1–3), 116–123. https://doi.org/10.1016/j.jad.2009.03.001

Galea, M., Park, T., & Hegadoren, K. (2022). Improving mental health outcomes of parents of infants treated in neonatal intensive care units: A scoping review. *Journal of Neonatal Nursing*, *28*(5), 327–334. https://doi.org/10.1016/j.jnn.2021.10.002

Garfield, C. F., Lee, Y. S., Warner-Shifflett, L., Christie, R., Jackson, K. L., & Miller, E. (2021). Maternal and Paternal Depression Symptoms During NICU Stay and Transition Home. *Pediatrics*, *148*(2), e2020042747. https://doi.org/10.1542/peds.2020-042747

Gastaldon, C., Solmi, M., Correll, C. U., Barbui, C., & Schoretsanitis, G. (2022). Risk factors of postpartum depression and depressive symptoms: Umbrella review of current evidence from systematic reviews and meta-analyses of observational studies. *The British Journal of Psychiatry*, *221*(4), 591–602. https://doi.org/10.1192/bjp.2021.222

Gavin, N. I., Gaynes, B. N., Lohr, K. N., Meltzer-Brody, S., Gartlehner, G., & Swinson, T. (2005). Perinatal Depression: A Systematic Review of Prevalence and Incidence. *Obstetrics & Gynecology*, *106*(5, Part 1), 1071–1083. https://doi.org/10.1097/01.AOG.0000183597.31630.db

Genova, F., Neri, E., Trombini, E., Stella, M., & Agostini, F. (2022). Severity of preterm birth and perinatal depressive symptoms in mothers and fathers: Trajectories over the first postpartum year. *Journal of Affective Disorders*, *298*, 182–189. https://doi.org/10.1016/j.jad.2021.10.080

Gensthaler, A., Möhler, E., Resch, F., Paulus, F., Schwenck, C., Freitag, C. M., & Goth, K. (2013). Retrospective Assessment of Behavioral Inhibition in Infants and Toddlers: Development of a Parent Report Questionnaire. *Child Psychiatry & Human Development*, *44*(1), 152–165. https://doi.org/10.1007/s10578-012-0316-z

Goldenberg, R. L., Culhane, J. F., Iams, J. D., & Romero, R. (2008). Epidemiology and causes of preterm birth. *The Lancet*, *371*(9606), 75–84. https://doi.org/10.1016/S0140-6736(08)60074-4

Gracie, S., Pennell, C., Ekman-Ordeberg, G., Lye, S., McManaman, J., Williams, S., Palmer, L., Kelley, M., Menon, R., Gravett, M., & the PREBIC "-Omics" Research Group. (2011). An integrated systems biology approach to the study of preterm birth using "-omic" technology—A guideline for research. *BMC Pregnancy and Childbirth*, *11*(1), 71. https://doi.org/10.1186/1471-2393-11-71

Grekin, R., Brock, R. L., & O'Hara, M. W. (2017). The effects of trauma on perinatal depression: Examining trajectories of depression from pregnancy through 24 months postpartum in an at-risk population. *Journal of Affective Disorders*, *218*, 269–276. https://doi.org/10.1016/j.jad.2017.04.051

Grigoriadis, S., & Romans, S. (2006). Postpartum Psychiatric Disorders: What Do We Know And Where Do We Go? *Current Psychiatry Reviews*, *2*(1), 151–158. https://doi.org/10.2174/157340006775101481

Grote, N. K., Bridge, J. A., Gavin, A. R., Melville, J. L., Iyengar, S., & Katon, W. J. (2010). A Meta-analysis of Depression During Pregnancy and the Risk of Preterm Birth, Low Birth Weight, and Intrauterine Growth Restriction. *Archives of General Psychiatry*, *67*(10), 1012. https://doi.org/10.1001/archgenpsychiatry.2010.111

Guintivano, J., Manuck, T., & Meltzer-Brody, S. (2018). Predictors of Postpartum Depression: A Comprehensive Review of the Last Decade of Evidence. *Clinical Obstetrics & Gynecology*, *61*(3), 591–603. https://doi.org/10.1097/GRF.0000000000000368

Gulamani, S. S., Premji, S. S., Kanji, Z., & Azam, S. I. (2013). A Review of Postpartum Depression, Preterm Birth, and Culture. *Journal of Perinatal & Neonatal Nursing*, *27*(1), 52–59. https://doi.org/10.1097/JPN.0b013e31827fcf24

Halbreich, U., & Karkun, S. (2006). Cross-cultural and social diversity of prevalence of postpartum depression and depressive symptoms. *Journal of Affective Disorders*, *91*(2–3), 97–111. https://doi.org/10.1016/j.jad.2005.12.051

Harris, B., Huckle, P., Thomas, R., Johns, S., & Fung, H. (1989). The use of Rating Scales to Identify Post-natal Depression. *British Journal of Psychiatry*, *154*(6), 813–817. https://doi.org/10.1192/bjp.154.6.813

Hendy, A., El-sayed, S., Bakry, S., Mohammed, S. M., Mohamed, H., Abdelkawy, A., Hassani, R., Abouelela, M. A., & Sayed, S. (2024). The Stress Levels of Premature Infants' Parents and Related Factors in NICU. *SAGE Open Nursing*, *10*, 23779608241231172. https://doi.org/10.1177/23779608241231172

Hübner-Liebermann, B., Hausner, H., & Wittmann, M. (2012). Recognizing and Treating Peripartum Depression. *Deutsches Ärzteblatt International*. https://doi.org/10.3238/arztebl.2012.0419

Ihongbe, T. O., & Masho, S. W. (2017). Do Successive Preterm Births Increase the Risk of Postpartum Depressive Symptoms? *Journal of Pregnancy*, *2017*, 1–10. https://doi.org/10.1155/2017/4148136

IQTIG Bundesauswertung Perinatalmedizin Geburtshilfe. (2022). *Institut für Qualitätssicherung und Transparenz im Gesundheitswesen*.

Jarde, A., Morais, M., Kingston, D., Giallo, R., MacQueen, G. M., Giglia, L., Beyene, J., Wang, Y., & McDonald, S. D. (2016). Neonatal Outcomes in Women With Untreated Antenatal Depression Compared With Women Without Depression: A Systematic Review and Meta-analysis. *JAMA Psychiatry*, *73*(8), 826. https://doi.org/10.1001/jamapsychiatry.2016.0934

Joseph, K. S., Demissie, K., & Kramer, M. S. (2002). Obstetric intervention, stillbirth, and preterm birth. *Seminars in Perinatology*, *26*(4), 250–259. https://doi.org/10.1053/sper.2002.34769

Katz, J., Lee, A. C., Kozuki, N., Lawn, J. E., Cousens, S., Blencowe, H., Ezzati, M., Bhutta, Z. A., Marchant, T., Willey, B. A., Adair, L., Barros, F., Baqui, A. H., Christian, P.,

Fawzi, W., Gonzalez, R., Humphrey, J., Huybregts, L., Kolsteren, P., … Black, R. E. (2013). Mortality risk in preterm and small-for-gestational-age infants in low-income and middle-income countries: A pooled country analysis. *The Lancet*, *382*(9890), 417–425. https://doi.org/10.1016/S0140-6736(13)60993-9

Langhoff-Roos, J., Kesmodel, U., Jacobsson, B., Rasmussen, S., & Vogel, I. (2006). Spontaneous preterm delivery in primiparous women at low risk in Denmark: Population based study. *BMJ*, *332*(7547), 937–939. https://doi.org/10.1136/bmj.38751.524132.2F

Latva, R., Korja, R., Salmelin, R. K., Lehtonen, L., & Tamminen, T. (2008). How is maternal recollection of the birth experience related to the behavioral and emotional outcome of preterm infants? *Early Human Development*, *84*(9), 587–594. https://doi.org/10.1016/j.earlhumdev.2008.02.002

Levis, B., Negeri, Z., Sun, Y., Benedetti, A., & Thombs, B. D. (2020). Accuracy of the Edinburgh Postnatal Depression Scale (EPDS) for screening to detect major depression among pregnant and postpartum women: Systematic review and meta-analysis of individual participant data. *BMJ*, *371*, m4022. https://doi.org/10.1136/bmj.m4022

Liu, L., Johnson, H. L., Cousens, S., Perin, J., Scott, S., Lawn, J. E., Rudan, I., Campbell, H., Cibulskis, R., Li, M., Mathers, C., & Black, R. E. (2012). Global, regional, and national causes of child mortality: An updated systematic analysis for 2010 with time trends since 2000. *The Lancet*, *379*(9832), 2151–2161. https://doi.org/10.1016/S0140-6736(12)60560-1

Liu, X., Wang, S., & Wang, G. (2022). Prevalence and Risk Factors of Postpartum Depression in Women: A Systematic Review and Meta-analysis. *Journal of Clinical Nursing*, *31*(19–20), 2665–2677. https://doi.org/10.1111/jocn.16121

Mahon, P. B., Payne, J. L., MacKinnon, D. F., Mondimore, F. M., Goes, F. S., Schweizer, B., Jancic, D., NIMH Genetics Initiative Bipolar Disorder Consortium, BiGS Consortium, Coryell, W. H., Holmans, P. A., Shi, J., Knowles, J. A., Scheftner, W.

A., Weissman, M. M., Levinson, D. F., DePaulo, J. R., Zandi, P. P., & Potash, J. B. (2009). Genome-Wide Linkage and Follow-Up Association Study of Postpartum Mood Symptoms. *American Journal of Psychiatry*, *166*(11), 1229–1237. https://doi.org/10.1176/appi.ajp.2009.09030417

Manuck, T. A., Rice, M. M., Bailit, J. L., Grobman, W. A., Reddy, U. M., Wapner, R. J., Thorp, J. M., Caritis, S. N., Prasad, M., Tita, A. T. N., Saade, G. R., Sorokin, Y., Rouse, D. J., Blackwell, S. C., Tolosa, J. E., & Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. (2016). Preterm neonatal morbidity and mortality by gestational age: A contemporary cohort. *American Journal of Obstetrics and Gynecology*, *215*(1), 103.e1-103.e14. https://doi.org/10.1016/j.ajog.2016.01.004

Menon, R. (2008). Spontaneous preterm birth, a clinical dilemma: Etiologic, pathophysiologic and genetic heterogeneities and racial disparity. *Acta Obstetricia et Gynecologica Scandinavica*, *87*(6), 590–600. https://doi.org/10.1080/00016340802005126

Mutter-Kind-Einheit (MKE) Universitätsklinikum Heidelberg. (2024, November 5). https://www.klinikum.uni-heidelberg.de/einrichtungen/mutter-kind-einheit-mke-1599

Mwaniki, M. K., Atieno, M., Lawn, J. E., & Newton, C. R. (2012). Long-term neurodevelopmental outcomes after intrauterine and neonatal insults: A systematic review. *The Lancet*, *379*(9814), 445–452. https://doi.org/10.1016/S0140-6736(11)61577-8

Norhayati, M. N., Nik Hazlina, N. H., Asrenee, A. R., & Wan Emilin, W. M. A. (2015). Magnitude and risk factors for postpartum symptoms: A literature review. *Journal of Affective Disorders*, *175*, 34–52. https://doi.org/10.1016/j.jad.2014.12.041

Oakley, A., & Chamberlain, G. (1981). Medical and social factors in postpartum depression. *Journal of Obstetrics and Gynaecology*, *1*(3), 182–187. https://doi.org/10.3109/01443618109067376

O'Hara, M. W. (1991). Prospective Study of Postpartum Blues: Biologic and Psychosocial Factors. *Archives of General Psychiatry*, *48*(9), 801. https://doi.org/10.1001/archpsyc.1991.01810330025004

O'Hara, M. W., & McCabe, J. E. (2013). Postpartum Depression: Current Status and Future Directions. *Annual Review of Clinical Psychology*, *9*(1), 379–407. https://doi.org/10.1146/annurev-clinpsy-050212-185612

O'Hara, M. W., & Wisner, K. L. (2014). Perinatal mental illness: Definition, description and aetiology. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *28*(1), 3–12. https://doi.org/10.1016/j.bpobgyn.2013.09.002

Osterman, M. J. K., Hamilton, B. E., Martin, J. A., Driscoll, A. K., & Venezuela, C. P. (2024). *National Vital Statistics Reports, Volume 73, Number 2*.

Pearlstein, T., Howard, M., Salisbury, A., & Zlotnick, C. (2009). Postpartum depression. *American Journal of Obstetrics and Gynecology*, *200*(4), 357–364. https://doi.org/10.1016/j.ajog.2008.11.033

Perriman, N., Davis, D. L., & Ferguson, S. (2018). What women value in the midwifery continuity of care model: A systematic review with meta-synthesis. *Midwifery*, *62*, 220–229. https://doi.org/10.1016/j.midw.2018.04.011

Prunet, C., Delnord, M., Saurel-Cubizolles, M.-J., Goffinet, F., & Blondel, B. (2017). Risk factors of preterm birth in France in 2010 and changes since 1995: Results from the French National Perinatal Surveys. *Journal of Gynecology Obstetrics and Human Reproduction*, *46*(1), 19–28. https://doi.org/10.1016/j.jgyn.2016.02.010

Robertson, E., Grace, S., Wallington, T., & Stewart, D. E. (2004). Antenatal risk factors for postpartum depression: A synthesis of recent literature. *General Hospital Psychiatry*, *26*(4), 289–295. https://doi.org/10.1016/j.genhosppsych.2004.02.006

Romero, R., Dey, S. K., & Fisher, S. J. (2014). Preterm labor: One syndrome, many causes. *Science*, *345*(6198), 760–765. https://doi.org/10.1126/science.1251816

Savitz, D. A., & Murnane, P. (2010). Behavioral Influences on Preterm Birth: A Review. *Epidemiology*, *21*(3), 291–299. https://doi.org/10.1097/EDE.0b013e3181d3ca63

Schwarzer, R., & Schulz, U. (2000). *Berlin social support scales (BSSS)*. http://www.coping.de

Scime, N. V., Gavarkovs, A. G., & Chaput, K. H. (2019). The effect of skin-to-skin care on postpartum depression among mothers of preterm or low birthweight infants: A systematic review and meta-analysis. *Journal of Affective Disorders*, *253*, 376–384. https://doi.org/10.1016/j.jad.2019.04.101

Singer, L. T., Salvator, A., Guo, S., Collin, M., Lilien, L., & Baley, J. (1999). Maternal Psychological Distress and Parenting Stress After the Birth of a Very Low-Birth-Weight Infant. *JAMA*, *281*(9), 799. https://doi.org/10.1001/jama.281.9.799

Slomian, J., Honvo, G., Emonts, P., Reginster, J.-Y., & Bruyère, O. (2019). Consequences of maternal postpartum depression: A systematic review of maternal and infant outcomes. *Women's Health*, *15*, 174550651984404. https://doi.org/10.1177/1745506519844044

Sonnenmoser, M. (2007). Postpartale Depression: Vom Tief nach der Geburt. *Deutsches Ärzteblatt*, *02/07*. https://www.aerzteblatt.de/archiv/54466/Postpartale-Depression-Vom-Tief-nach-der-Geburt

Spielberger, C. D. (1983). *State-Trait Anxiety Inventory for Adults. CA: Consulting Psychologists Press. Palo Alto.* [Dataset]. https://doi.org/10.1037/t06496-000

Staneva, A., Bogossian, F., Pritchard, M., & Wittkowski, A. (2015). The effects of maternal depression, anxiety, and perceived stress during pregnancy on preterm birth: A systematic review. *Women and Birth*, *28*(3), 179–193. https://doi.org/10.1016/j.wombi.2015.02.003

Tooten, A., Hoffenkamp, H. N., Hall, R. A. S., Braeken, J., Vingerhoets, A. J. J. M., & Van Bakel, H. J. A. (2013). Parental Perceptions and Experiences after Childbirth: A Comparison between Mothers and Fathers of Term and Preterm Infants. *Birth*, *40*(3), 164–171. https://doi.org/10.1111/birt.12052

Trumello, C., Candelori, C., Cofini, M., Cimino, S., Cerniglia, L., Paciello, M., & Babore, A. (2018). Mothers' Depression, Anxiety, and Mental Representations After Preterm

Birth: A Study During the Infant's Hospitalization in a Neonatal Intensive Care Unit. *Frontiers in Public Health*, *6*, 359. https://doi.org/10.3389/fpubh.2018.00359

Vigod, S., Villegas, L., Dennis, C., & Ross, L. (2010). Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: A systematic review. *BJOG: An International Journal of Obstetrics & Gynaecology*, *117*(5), 540–550. https://doi.org/10.1111/j.1471-0528.2009.02493.x

Wartezeiten auf eine Psychotherapie—Studien&Umfragen. Deutscher Bundestag. (2022).

Wilson, C. A., Newham, J., Rankin, J., Ismail, K., Simonoff, E., Reynolds, R. M., Stoll, N., & Howard, L. M. (2020). Is there an increased risk of perinatal mental disorder in women with gestational diabetes? A systematic review and meta-analysis. *Diabetic Medicine*, *37*(4), 602–622. https://doi.org/10.1111/dme.14170

World Health Organization. (1977). WHO: Recommended Definitions, Terminology and Format for Statistical Tables Related to The Perinatal Period And Use of A New Certificate For Cause of Perinatal Deaths. *Acta Obstetricia et Gynecologica Scandinavica*, *56*(3), 247–253. https://doi.org/10.3109/00016347709162009

World Health Organization. (2012). *Born too soon: The global action report on preterm birth*. https://iris.who.int/handle/10665/44864

Yim, I. S., Tanner Stapleton, L. R., Guardino, C. M., Hahn-Holbrook, J., & Dunkel Schetter, C. (2015). Biological and Psychosocial Predictors of Postpartum Depression: Systematic Review and Call for Integration. *Annual Review of Clinical Psychology*, *11*(1), 99–137. https://doi.org/10.1146/annurev-clinpsy-101414-020426

Yogman, M. W. (2021). Parental Depression After Preterm Birth: An Opportunity for Prevention. *Pediatrics*, *148*(2), e2021051136. https://doi.org/10.1542/peds.2021-051136

Zhao, X., & Zhang, Z. (2020). Risk factors for postpartum depression: An evidence-based systematic review of systematic reviews and meta-analyses. *Asian Journal of Psychiatry*, *53*, 102353. https://doi.org/10.1016/j.ajp.2020.102353

Declaration on Oath

Hiermit versichere ich, Monja Maidorn, [redacted], dass ich die vorliegende Bachelorarbeit mit dem Titel

“The effect of experiencing a premature birth on postpartum maternal EPDS scores”

selbstständig und ohne fremde Hilfe, insbesondere ohne entgeltliche Hilfe von Vermittlungs- und Beratungsdiensten sowie ohne die Anwendung von KI-Sprachmodellen wie z.B. ChatGPT, angefertigt und keine anderen als die von mir angegebenen Quellen und Hilfsmittel benutzt habe. Alle wörtlichen oder sinngemäßen Entlehnungen aus anderen Arbeiten sind an den betreffenden Stellen als solche kenntlich gemacht und im entsprechenden Verzeichnis aufgeführt, das gilt insbesondere auch für alle Informationen aus Internetquellen. Ich erkläre zudem, dass ich die an der Medizinischen Fakultät Hamburg geltende „Satzung zur Sicherung guter wissenschaftlicher Praxis und zur Vermeidung wissenschaftlichen Fehlverhaltens an der Universität Hamburg“ in der jeweils gültigen Fassung eingehalten habe.

Des Weiteren versichere ich, dass ich die vorliegende Bachelorarbeit vorher nicht in dieser oder ähnlicher Form in einem anderen Prüfungsverfahren dieser oder einer anderen Fakultät bzw. Hochschule eingereicht habe.

Ich erkläre mich einverstanden, dass meine Bachelorarbeit zum Zweck der Plagiatsprüfung gespeichert und von meiner/-m Erst- und Zweitprüfenden mit einer gängigen Software zur Erkennung von Plagiaten überprüft werden kann.

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Hamburg, 29.11.2024 [redacted]

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