Anxiety during pregnancy and at three months postpartum: prevalence, variations and associated factors in a cohort of nulliparous women

Masters by Research Thesis

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Declaration and Permission

This thesis has been submitted to the University of Dublin Trinity College in fulfillment of the requirements for the master’s degree by research (MSc). It has not been submitted as an exercise for a degree at this or any other University.

I declare that the content is my own work unless otherwise acknowledged.

The thesis will be embargoed until the findings of the full MAMMI study are published.

Signed:

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List of abbreviations

APA: American Psychiatric Association
BMI: Body mass index
CCEI: Crown Crisp Experiential Index
CWIUH: Coombe Women and Infants University Hospital
DASS 21: 21 item Depression, Anxiety and Stress Scale
DASS 21 anxiety subscale: 7 item anxiety subscale
DoH: Department of Health
DoHC: Department of Health and Children
DSM: Diagnostic and Statistical Manual of Mental Disorders
EPDS: 10 item Edinburgh Postnatal Depression Scale
EPDS 3A: 3 item anxiety subscales of the Edinburgh Postnatal Depression Scale
GAD 7: Generalized Anxiety Disorder 7 item Scale
HADS: Hospital Anxiety Depression Scale
HIPE: Hospital In-Patient Enquiry
HIQA: Health Information Equality Authority
HPO: Healthcare Pricing Office
ICD: International Classification of Diseases
MAMMI study: Maternal health And Maternal Morbidity in Ireland study
MBRRACE: Mother and Babies; Reducing Risk through Audits and Confidential Enquiries
NICE: National Institute for Health and Care Excellence
NMBI: Nursing and Midwifery Board of Ireland
NPRS: National Perinatal Reporting System
PHQ: Patient Health Questionnaire
RH: Rotunda Hospital
SCID: Structured Clinical Interview for DSM
SIGN: Scottish Intercollegiate Guideline Network
STAI: State Trait Anxiety Inventory
UCHG: University College Hospital Galway
WHO: World Health Organization
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Summary

Title
Anxiety during pregnancy and at three months postpartum: prevalence, variations and associated factors in a cohort of nulliparous women.

Background
Anxiety in the perinatal period is a common condition that can have consequences for mother, baby and the extended family, but the prevalence reported in Irish national documents relies on international figures.

Design
The study is a longitudinal quantitative study design.

Aim
To identify the prevalence of anxiety in pregnancy and at three months postpartum in nulliparous women in Ireland and to identify the factors associated with anxiety at both time points.

Setting
The study setting is two urban maternity hospitals in Ireland.

Sample
The sample of women; n=1668, are sourced from a larger study known as the Maternal health and Maternal Morbidities in Ireland study (MAMMI).

Method
University approval for this study and site hospital approval for the overall MAMMI study were granted. Women of 18 and over, who could read and understand English were recruited at their booking visit to the maternity hospitals to complete survey 1 in early pregnancy and survey 2 at three months postpartum. Anxiety was assessed using two measurement scales; the anxiety subscale of the Depression, Anxiety and Stress Scale 21 and the Edinburgh Postnatal Depression Scale 3A anxiety scale, and according to a single statement, all of which were in the two survey tools used at both time points. The prevalence of anxiety is reported in pregnancy and at three months postpartum. Factors for association with anxiety were sourced from the surveys and the patient hospital records. Pearson’s chi-square analyses is used to report associations between anxiety and categories at both time points.

Results
Prevalence of anxiety reported in pregnancy was between 9.2% (n=154) and 26.4% (n=438). At three months postpartum prevalence of anxiety was between 8.6% (n=142) and 28.1% (n=462). In pregnancy, prevalence of anxiety was highest according to the EPDS 3A (≥4) at 26.4% (n=438), and lowest according to the EPDS 3A (≥6) at 9.2% (n=154). At three months postpartum prevalence of anxiety was lowest according to the DASS 21 anxiety subscale (8.6%, n= 142) and highest according to the single statement (28.1%, n=462). Prevalence of anxiety, according to the measurement scales, was higher in pregnancy and lower postpartum. On the other hand prevalence of anxiety, according to the single statement, was lower in pregnancy and higher postpartum.

Between 28.1% (n=43) and 48.8% (n=212) of women who reported anxiety at three months postpartum also reported anxiety in pregnancy. Between 5% (n=68) and 15.8% (n=192) of women who reported anxiety at three months postpartum did not report anxiety in pregnancy.

According to the DASS 21 the prevalence of anxiety in pregnancy was greater than the prevalence of depression, or stress, but at three month postpartum the prevalence of anxiety was less than depression, or stress.
There was a statistically significant association, according to the DASS 21 anxiety subscale, between anxiety in pregnancy and sociodemographic factors including; age (p<0.001), country of birth (p<0.001), ethnicity (p<0.001), educational level (p<0.001), type of health care (p<0.001), smoking (p<0.001), experience of intense anxiety (p<0.001) and relationship status (p<0.01). According to the EPDS 3A (≥6) anxiety in pregnancy was significantly associated with country of birth (p<0.001), educational level (p=0.04), smoking (p=0.006) and experience of intense anxiety (p<0.001).

At three months postpartum significant associations were found between anxiety according to the DASS 21 anxiety subscale and sociodemographic factors including; age (p<0.001), country of birth (p<0.001), ethnicity (p<0.001), educational level (p=0.003), type of health care used (p<0.05) and smoking (p<0.001). Anxiety, according to the EPDS 3A (≥6), at three months postpartum was associated with educational level (p=0.03). According to both the DASS 21 anxiety subscale and the EPDS 3A (≥6) lifetime experience of intense anxiety (p<0.001), relationship problems with partner (p<0.001 and p<0.01 respectively), fear of any partner ever (p<0.001), and a need for more emotional support since the birth of the baby (p<0.001), were all found to be significantly associated with anxiety.

Mode of birth, and blood loss at birth, were not found to be significantly associated with anxiety at three months postpartum. Continuation or not of breastfeeding at three months postpartum was significantly associated with anxiety according to the DASS 21 anxiety subscale (p=0.02) and the EPDS 3A (≥6) (p=0.006).

**Conclusion**

Prevalence of anxiety reported varied widely depending on the type of assessment tool used, the cut-offs applied and the timing of assessment in the same sample of women. While prevalence of anxiety according to the measurement scales was higher in pregnancy and decreased at three months postpartum, prevalence according to the single statement was lower in pregnancy and higher postpartum. Women with anxiety in pregnancy are proportionally more likely to report anxiety at three months postpartum. Furthermore a similar number of women who reported anxiety in pregnancy also reported anxiety at three months postpartum.

These findings suggest that women need to be assessed for anxiety on an ongoing basis. Given the significant association between anxiety in pregnancy and educational levels, country of birth, smoking and intense anxiety in their lifetime; these factors might be considered when assessing for anxiety in pregnancy.

Similarly, at three months postpartum, given the statistically significant association between anxiety and educational level, intense anxiety in a lifetime, as well as relationship problems with partner since the birth of the baby, a fear of any partner ever, and an expressed need for more emotional support since the birth of the baby, clinicians might consider these factors too when assessing for anxiety.
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1 Chapter 1

1.1 Introduction.

The normality of anxiety is well documented across the disciplines of mental health nursing (Stuart 2013), neuroscience (LeDoux 2015), psychology (Robertson 2016) and even psychiatry (Barlow 2002). Indeed, the existentialists are said to have viewed anxiety as an integral part of human nature (LeDoux 2015). LeDoux (2015) states that they were greatly influenced by Kierkegaard who argued that anxiety was the price paid for freedom to choose (Hannay 2014).

On the other hand, Freud is said to have identified anxiety as a neurosis, and viewed anxiety as the product of suppression of stressful thoughts and impulses from childhood (LeDoux 2015). However, some people do suffer from anxiety that interferes with their daily lives and as such anxieties can be categorised into disorders in compendia such as the Diagnostic and Statistical Manual of Mental Disorders (DSM 5) (American Psychiatric Association 2013). Against this backdrop sociologists argue that normal anxieties and fears are being inflated into psychiatric disorders with a tenfold increase in the estimated prevalence of an anxiety disorder in the previous three decades (Horwitz & Wakefield 2012).

Becoming pregnant and a new mother is recognised as being an adaptive experience (Wenzel 2011). Anxiety is well recognised as a necessary adaptive emotion which can be accompanied by feelings of panic, quickening heart rate and worry that almost everybody will be familiar with (Barlow 2002, Horwitz & Wakefield 2012, Stuart 2013, LeDoux 2015). As an adaptive motivational response, anxiety enhancing reactions and enables adaptation to new and challenging life experiences (Horwitz & Wakefield 2012, Stuart 2013, LeDoux 2015). Life events such as pregnancy and the transition to motherhood are associated with adjustments that can be associated with many emotional experiences including symptoms of anxiety (Heron et al. 2004, Wenzel 2011, Bayrampour et al. 2016). For many women pregnancy is joyful, and while most women also experience anxiety, for some it can be overwhelming and it can be associated with morbidities (Anniverno et al. 2013). There is vast literature available on perinatal depression (Meltzer-Brody et al. 2015), but anxiety, which is recognised as the most common mental health disorder (Kessler et al. 2012), has received less attention in the perinatal period (Wenzel 2011, Glover et al. 2014, Higgins et al. 2018).

The normality of anxiety in the perinatal period is made explicit in UK guidelines which state that clinicians bear in mind that some changes in mental state and functioning are “normal”, and for that reason careful consideration should be paid to the context (NICE National Collaborative Centre for Mental Health 2014, p. 115). Close attention is required to differentiate anxiety that is transient from anxiety that is persistent. It is suggested in the same guidelines (NICE National Collaborative Centre for Mental Health 2014), and in a combined Ireland and UK report (Knight...
that all women in pregnancy and postpartum are assessed and offered a care plan including treatment, referral and follow-up as required.

Maternal mental health and wellbeing is fundamental to maternal and child health (Glover et al. 2014). Childbirth factors associated with anxiety in pregnancy include caesarean delivery, fear of birth and premature delivery (Field 2018). Ding et al. (2014) reports that maternal anxiety in pregnancy is associated with low birth weight and preterm birth in a systematic review and meta-analysis of 12 studies and 17304 women. Maternal anxiety in pregnancy, both self-reported and following clinical interview, is a predictor of postpartum anxiety and mood disorders (Grant et al. 2008). Demographic risk factors associated with anxiety include being a young mum, being well educated and in employment (Field 2018). Social problems associated with anxiety include lack of family support and relationship issues (Bener et al. 2012, Field 2018). Postpartum anxiety is associated with depression (Floris et al. 2016), mother-infant interaction and conduct disorders in adolescents (Field 2018), less adaptive coping mechanisms; such as self-blame (George et al. 2013), poor partner relationship, lower breast feeding rates and lower socio-economic status (Wenzel et al. 2005). There is a strong correlation between maternal antenatal anxiety and child behaviour and emotional problems (O'Connor et al. 2002, Barker et al. 2011). O'Connor et al. (2002) found that children of women with anxiety in pregnancy scored more than 2 standard deviation points above the mean in behavioural and emotional problems at 4 years of age. Pregnancy provides a unique opportunity for women to focus on their health and wellbeing. Frequent interactions with healthcare professionals enable significant and impactful changes in health and wellbeing. In The Maternity Care Strategy (Department of Health 2016) it is recommended that supports and interventions are provided for perinatal mental health care including anxiety. This report was quickly followed by the Specialist Perinatal Mental Health Services Model of Care for Ireland (Health Service Executive 2017), in which anxiety is recognised as a significant mental health issue independent of depression.

1.1.1 Assessment of anxiety

The literature strongly recommends that perinatal anxiety warrants appropriate recognition, assessment and early intervention (Matthey 2004, Miller et al. 2006, Skouteris et al. 2009, Wenzel 2011, Scottish Intercollegiate Guideline Network 2012, Glover et al. 2014, NICE National Collaborative Centre for Mental Health 2014). Within the UK and Ireland, The Saving Lives, Improving Mothers’ Care Report they state that even though anxiety can be the first symptom of escalating changes in mental state they highlight that there is an under recognition and downgrading of symptoms of anxiety, as well as a lack of assessment in some cases (Knight et al. 2015, p. 30). Worryingly, given the multiple risks associated with perinatal anxiety, the NICE National Collaborative Centre for Mental Health (2014) also report that the full range of anxiety disorders are under-recognised in pregnancy and in the postpartum period. To address this gap in
care they recommend that women are asked about anxiety in pregnancy and postpartum using a recognised assessment tool.

There are nineteen maternity units in Ireland and, until the implementation of the Model of Care for Specialist perinatal Mental Health only three of these units had any perinatal mental health care teams in situ (Health Service Executive 2017). In Ireland there is an under-recognition of anxiety in the perinatal period (Higgins et al. 2017). Although it has been reported that over half of women in Ireland discharged following inpatient care for a mental illness from conception to six weeks postpartum had an anxiety disorder (342/558), and that there is one study of 74 pregnant women reports unprecedented levels of anxiety at 74.3% in pregnancy (Carolan-Olah & Barry 2014). Overall there is a dearth of literature in Ireland in relation to perinatal anxiety.

1.1.2 Prevalence of anxiety

Prevalence of anxiety varies depending on a number of factors including the population studied, time of assessment and measurement scales used (Bandelow & Michaelis 2015). Prevalence of anxiety disorders are generally lower than prevalence of anxiety symptoms. For example the 12 month prevalence of any anxiety disorder in women aged 18 years and over is reported at 8.7% (Alonso et al. 2004). While prevalence of self-reported perinatal anxiety symptoms, in a systematic review of 102 studies, is reported at 22.9% in pregnancy and 14.9% between 5-12 weeks postpartum (Dennis et al. 2017). Prevalence also varies depending on the time point. In pregnancy prevalence of anxiety, according to assessment tools, varies between 12.2% and 14.6% and at three months postpartum prevalence varies between 4.8% and 8.1% (Heron et al. 2004, Figueiredo & Conde 2011) respectively. Prevalence also varies depending on parity with Swalm et al. (2010) reporting that first time, nulliparous mothers were 1.6 times more likely to have high anxiety scores in pregnancy.

1.1.3 Anxiety measurement scales

Although it is suggested that pregnant women may be reluctant to reveal their mental health concerns (Kingston et al. 2015), it is also proposed that an anxiety measurement scale can bridge that gap (Signal 2017). Indeed, women have found that an anxiety measurement scale could facilitate their need to discuss their feelings and have their experiences of anxiety validated (Evans et al. 2017). It is also argued that maternal anxiety and emotional health and wellbeing should be assessed and treated at the earliest opportunity thus affording mental health the same emphasis as maternal and fetal physical health (Glover 2014). Midwives, who deliver the majority of maternity care in the antenatal, intranatal and postnatal period, are ideally placed to initiate assessment, provide extra supports and initiate referrals where appropriate. Notwithstanding that, it has been found that they lack knowledge and awareness of anxiety in the perinatal period (Higgins et al. 2016, Higgins et al. 2017). Ultimately, with early recognition of anxiety through assessment,
appropriate and effective interventions such as talk therapy, education, psychotherapy and/or pharmacology can be employed in a timely fashion (Howard et al. 2014).

1.1.4 Perinatal anxiety in Ireland

Even though one Irish study reported prevalence of anxiety in pregnancy in a sample of 74 women (Carolan-Olah & Barry 2014), prevalence figures for anxiety in the Perinatal Mental Health Model of Care for Ireland report are based on international studies (HSE 2017). That might be because of the levels of anxiety in pregnancy reported were 74.3%. It would appear that prevalence of anxiety was reported for the complete State Trait Anxiety Inventory (STAI) and not the two subscales as is recommended in the literature (Spielberger et al. 1970).

No figures for the prevalence of anxiety in the general population in Ireland have been identified (Tedstone-Doherty et al. 2008), nor are they available (St Patrick’s Hospital 2018), in spite of Casey & Pillay (2008) reporting that anxiety symptoms and disorders are frequently encountered by general practitioners and psychiatrists.

Nonetheless and irrespective of the dearth of national data on perinatal anxiety, perinatal mental health in Ireland has received welcome recognition in recent years with the publication of the National Specialist Perinatal Mental Health Services Model of Care Report (HSE 2017). In the report the international literature is acknowledged and the prevalence of anxiety is reported as being greater than that of depression. That report was pre-empted by The National Maternity Strategy, in which acknowledged the need “to identify women at risk of developing or experiencing emotional or mental health difficulties” in the antenatal and postnatal period (DoH 2016, p.63).

Prior to the publication of the Specialist Perinatal Mental Health Services Model of care for Ireland (HSE 2017), anxiety did not feature in a Government policy document on the provision of mental health services in Ireland in 2006 (DoHC 2006). Within that Vision for Change document the main areas of perinatal mental health focused on are “depression, bipolar disorder and schizophrenia” (DoHC 2006, p.156). Whereas in a more recent evidence review of the same document (Cullen & McDaid 2017, p. 44) it is acknowledged that; “much of the focus on perinatal mental health has been on depression, and commensurate attention is needed for other mental health problems, to include anxiety rates may be high or often missed or inaccurately diagnosed”.

The historic lack of attention given to anxiety and the conflation of anxiety with depression is reflected in one of the national documents distributed to women in the postpartum period (HSE 2010), where the only mention of anxiety is anxiety as symptom of postnatal depression (Higgins et al. 2017).
1.2 Rationale for this study

To date literature in Ireland has relied entirely on international figures for the prevalence of perinatal anxiety (Health Service Executive 2017, Higgins et al. 2017), in spite of one Irish study that reports prevalence of anxiety for 74 women in the third trimester of pregnancy at 74.3% (Carolan-Olah & Barry 2014). Not only that, anxiety has been conflated with depression (Health Service Executive 2017, Higgins et al. 2017). No other study was identified that reports prevalence of anxiety for any population, general or perinatal, in Ireland. Furthermore, Schmied et al. (2013), in a review of longitudinal studies of maternal mental health, found that anxiety is under investigated compared to depression. This is borne out by the fact that, in Ireland, there is data on the prevalence of antenatal depression in pregnancy; 16% in 4229 women (Jairaj et al. 2018). In addition, Glover et al. (2014) argue that anxiety in pregnancy is largely undetected. While treatment options for anxiety are considered effective (Stuart 2013, LeDoux 2015), untreated anxiety can have a significant adverse outcomes for both mother and baby. Adverse outcomes for baby’s include low birth weights and prematurity (Ibanez et al. 2012, Ding et al. 2014) and poor mother-infant bonding (Wenzel 2011), for children behavioural problems and hyperactivity (O'Connor et al. 2002) and for mothers include fear of birth, low self-esteem and confidence (Field 2018), poor social support, insomnia (Swanson et al. 2011) and relationship difficulties with partner (Bayrampour et al. 2015a).

Nonetheless, it has been found in an Irish study that only a quarter of midwives reported asking women about anxiety in the perinatal period (Higgins et al. 2017). Health care professionals lack of awareness of anxiety in the perinatal period has been found to leave women feeling confused about their feelings of anxiety (Highet et al. 2014). This lack of prevalence figures, awareness, assessment and referral may leave women to suffer in silence in pregnancy and in the postpartum period. It is possible that opportunities for assessment and referral are being missed at a time when women in pregnancy are in frequent contact with midwives and other maternity healthcare professional. This study aims to contribute to and to increase the profile, awareness and knowledge of anxiety as reported by women in pregnancy and postpartum in Ireland.

1.3 Overview of the research in this study

This thesis sets out to address the gap identified in knowledge identified in section 1.2. It will achieve this by reporting prevalence of anxiety and associated factors during pregnancy and at three months postpartum in a cohort of 1668 nulliparous mothers in Ireland. The data for this study were obtained from women recruited to a larger prospective cohort study known as the Maternal health And Maternal Morbidity in Ireland study (www.mammi.ie). As the name suggests the MAMMI study was undertaken to identify the morbidities that may be associated with pregnancy and early motherhood, including mental health, sexual health, urinary
incontinence and pelvic girdle pain. Participants in the MAMMI study were nulliparous women, those who had no previous babies. The MAMMI study was a good fit for this study for three reasons. First, within the MAMMI study surveys there are two assessment tools and one single statement which can be used to report prevalence of anxiety in pregnancy and again at three months postpartum. Second, the surveys contain a range of questions on demographic, social and clinical factors which have been identified in the literature as being associated with anxiety. Finally, the women are becoming mothers for the first time which limits the possible confounding factors associated with previous pregnancies, childbirth and motherhood. For those three reasons it was decided that the data from the MAMMI study would be used for this study.

Prevalence of anxiety will be reported according to the two assessment tools and the single statement. Factors, that have been identified in the literature as being associated with perinatal anxiety, will be assessed for associations.

1.4 Overview of the thesis.

Although anxiety is recognised as a normal emotion associated with adaptations to changes in life including pregnancy and childbirth, anxiety can become problematic interfering with normal behaviour and cognitive function for mothers in pregnancy and postnatally. Indeed, anxiety as a disorder is reported to be the most prevalent of all the mental disorders in the general population. Anxiety disorders in the perinatal period are associated with low birth weight infants, premature labour, mother-infant bonding and child behavioural problems. In spite of the adverse outcomes associated with anxiety, fewer than a quarter of midwives in an Irish study asked women about symptoms of anxiety in the perinatal period. There is a dearth of information in relation to perinatal anxiety in Ireland with one study reporting unprecedented levels of anxiety in the third trimester. This is reflected in the national literature where anxiety prevalence in the perinatal period is reported based on international data. This study will fill the gap in knowledge by reporting prevalence of anxiety in a cohort of women in Ireland in pregnancy and at three months postpartum, using two anxiety measurement scales and a single anxiety statement.

This thesis has six chapters. Chapter 2 provides a comprehensive overview of anxiety, prevalence of anxiety, measurement scales and a background literature review of studies reporting prevalence of anxiety, in pregnancy and at three months postpartum. That is followed by Chapter 3 in which the measurement scales, the Depression, Anxiety and Stress Scale and the Edinburgh Postnatal Depression Scale, are introduced, followed by a literature search and review of studies using either of the two scales to measure anxiety. The study methods follow in Chapter 4 including the ethical principles underpinning the study. Data analysis and findings are presented in Chapter 5 and the final Chapter 6 discusses the findings in the context of the background literature makes recommendations for research, policy and practice and concludes with the strengths and the limitations of the study.
2 Chapter 2 Background literature

2.1 Introduction to anxiety

This chapter presents an overview of prevalence of anxiety in the general population, then perinatal anxiety. This is followed by a review of studies reporting prevalence of anxiety both in pregnancy and at three months postpartum and a discussion of measurement scales used. The chapter continues with the theory and construct development of the two measurement scales used in this study; the Depression, Anxiety and Stress Scale 21 (DASS 21) and the Edinburgh Postnatal Depression Scale (EPDS). The chapter concludes with a summary of key issues.

2.2 Anxiety

Anxiety is a described as a normal adaptive emotion to change or stressful life events (LeDoux 2015). Indeed the normality of anxiety is well recognised in many disciplines of mental health (Barlow 2002, Wenzel 2011, Stuart 2013, LeDoux 2015, Barry 2016, Robertson 2016). Anxiety is recognised as being helpful in adapting to feelings of fleeting and temporary discomfort (Horwitz & Wakefield 2012). It is argued that anxiety provides that motivation necessary for drive and achievement, and that the adaptive quality of anxiety, and the human ability to plan, drives humans to achieve (Barlow 2002). Indeed, the existentialists are said to have viewed anxiety as an integral part of human nature (LeDoux 2015). LeDoux (2015) states that they were greatly influenced by Kierkegaard who argued that anxiety, which exists between thought and action, was the price payed for freedom to choose (Hannay 2014).

On the other hand, Freud, is said to have identified anxiety as a neurosis, and viewed anxiety as the product of suppression of stressful thoughts and impulses from childhood (LeDoux 2015). The characteristics of anxiety for those who suffer include being unable to distinguish threat from safety a heightened reaction to unpredictable events, avoidance, an overestimation of the likelihood of threatening events and consequential maladaptive behaviour and cognitive control (LeDoux 2015). Anxieties are categorised into disorders in the Diagnostic and Statistical Manual of Mental Disorders with the most recent edition in 2013. The DSM has been published since 1952 (American Psychiatric Association 2013). In the DSM 5 anxiety disorders are identified and include generalized anxiety disorder, panic disorder, obsessive compulsive disorder and social anxiety (American Psychiatric Association 2013).

2.2.1 Definition of anxiety

Anxiety is described as an emotional response to future events that are perceived as being threatening and unpredictable giving rise to psychological, behavioural and cognitive processes (Clark & Beck 2010). Others, agree and describe it as a cognitive awareness that you are in danger.
(LeDoux 2015). Others describe anxiety as having two related concepts, the first is that anxiety is an adaptive response, the second that anxiety is a disorder (Gutiérrez-Garcia & Contreras 2013).

As an adaptive response anxiety is recognised as a protective emotional and physical response necessary to mobilise individuals (Barlow 2002), providing the energy that contributes to the fight or flight reaction necessary for survival (Cannon 1915). As a disorder anxiety can cause the individual sufficient distress to interfere with daily functions and activities (LeDoux 2015) and have a disabling impact on physiological, cognitive and behavioural responses (Gutiérrez-Garcia & Contreras 2013). Furthermore, most people, at some stage in their lives, will feel anxious, think anxious thoughts and act out of anxiety (Horwitz & Wakefield 2012).

Many words are used to describe anxiety including dread, alarm, worry, panic, fear and stress (LeDoux 2015).

2.2.2 Anxiety, stress and fear

Distinguishing anxiety from fear and stress is acknowledged as complex. Indeed, LeDoux (2015) refers to the tangled web of anxiety and fear stating that there is confusion in distinguishing the two and suggests that fear is in response to a real threat and anticipated worry about the consequences. However, the anxiety response involves uncertainty about the possibility of a threat and the anticipated consequences. Others agree stating that fear is a reaction to a specific threat, whereas anxiety is a reaction to the anticipation of the threat (Barlow 2002). This argument is further augmented by the belief that the trigger to fear can be named whereas with anxiety there may not be a definitive stimulus but the inherent feelings of dread, distress and discomfort continue (Stuart 2013).

Stress is defined as a temporary reaction, accompanied by irritability, agitation and oversensitivity (Robertson 2016) whereas anxiety has a broader remit and is accompanied by the autonomic or cognitive responses. Furthermore, Clark & Watson (1991) have a theory, known as the tripartite theory, in which they state that stress is the negative affect common to both anxiety and depression. This theory has underpinned the development of scales used to measure anxiety and depression and stress independently. One such scale is the Depression, Anxiety and Stress Scale (DASS) (Lovibond & Lovibond 1995a).

2.2.3 Anxiety as an adaptive response

As an adaptive, protective and healthy emotional response, anxiety provides the energy to motivate and mobilise individuals. This type of healthy response enables adaptation to new, stressful and frightening circumstances (Kasper et al. 2002, Horwitz & Wakefield 2012, LeDoux 2015, Robertson 2016). These defining characteristics of anxiety are all included in the following quotation which states that “it is almost universally accepted that the capacity to feel fear and anxiety is adaptive, enabling, as it does, rapid and energetic response to imminent danger, or
preparation for more distal challenges” (Poulton et al. 2009, p. 124). From an evolutionary point of view anxiety promotes survival by inciting individuals to avoid danger (Crocq 2015, Barry 2016). In fact, it is argued that without the anxiety response one would not survive very long (Gutiérrez-Garcia & Contreras 2013, Bandelow & Michaelis 2015). Anxiety is said to motivate behaviour which can enhance performance and productivity (Spielberger & Reheiser 2009). Furthermore, goal driven anxiety responses can nurture personal growth and learning (Barlow 2002).

Frosch (2003) states that an expectable level of anxiety is a sign of good mental health, and the capacity to cope with and react to anxiety is a necessity in life. In fact, good mental health is defined as an adaptive and enriching process. This belief is made explicit by the World Health Organization (2014) who state that mental health is; “a state of well-being in which every individual realises his or her full potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community.”

Nonetheless, a subtle balance exists between too little anxiety, which results in a lack of motivation, and too much which impairs function (Glas 2003, LeDoux 2015, Robertson 2016). Within the scope of responses to anxiety there are a spectra of helpful and unhelpful coping mechanisms (Fontaine 2009, Stuart 2013, LeDoux 2015). Those who use helpful coping mechanisms for dealing with anxiety are said to be resilient, demonstrating characteristics of commitment to situations, control of their life and openness to challenge (Stuart 2013). However, inherent vulnerabilities, including a history of anxiety disorders, persistent and repetitive exposure to challenges, poor coping strategies and an inability to manage emotions, may lead to an anxiety disorder (Gutiérrez-Garcia & Contreras 2013, LeDoux 2015).

The impact of anxiety is best explained by the physiological, affective, cognitive and behavioural responses experienced (Kasper et al. 2002).

2.2.3.1 Physiological responses to anxiety

The physiological responses are attributed to the autonomic nervous system. These responses heighten a person’s capacities without a conscious or voluntary effort (LeDoux 2015). The autonomic nervous system responses include cardiovascular, respiratory and neuro-muscular changes, including a faster heartbeat, deeper, faster breathing and a rise in arterial pressure. The physiological changes result in an elevated physical ability enabling and contributing to the fight or flight response (Cannon 1915, Fontaine 2009, Crocq 2015).

However, the physiological changes can also become persistent, with heart palpitations occurring when there is no apparent need for alarm, chest pain, which may be misinterpreted as a heart attack, or hyperventilation leading to dizziness or panic attacks (Stuart 2013). These consequential somatic symptoms, when persistent and pervasive, can lead to exhaustion and a sense of losing control (Barlow 2002) and interfere with normal physical function and everyday activities.
2.2.3.2 Affective responses to anxiety

Affective responses are defined by the feelings experienced and felt by the individual and include mood and emotions. They are mostly subjective (Stuart 2013). Feelings including certainty, courage, braveness and pride are helpful, while feelings of apprehension, uncertainty, dread, and fear can also be helpful even if uncomfortable. However, if these uncomfortable feelings become persistent and pervasive they are very unhelpful (Barlow 2002, Tully 2008, LeDoux 2015). Ultimately, persistent feelings of dread and fear have the power to render the person incapacitated, leading to what can be described as a generalised anxiety disorder (Barlow 2002).

2.2.3.3 Cognitive responses to anxiety

Cognitive responses are concerned with thinking, interpretation of oneself and reasoning (Stuart 2013). The cognitive responses to anxiety include heightening concentration, awareness and hypervigilance. Adaptive, positive cognitive styles include acknowledgment of strengths and limitations as well as planning and developing realistic short and long-term goals (Fontaine 2009). Negative cognitive styles include pessimism, rumination, concern about future events, a tendency towards worry, nervousness and shyness and low self-esteem (Fontaine 2009). Furthermore, unhelpful thinking and belief responses include blaming oneself and persistent feelings of worry may underpin obsessive thought patterns (Stuart 2013). As a consequence of negative affect, cognitive responses such as clarity of judgement, thought and organisation can be replaced by confusion, an inability to focus and poor memory (Stuart 2013). All of these responses can lead to perceived lack of control, a fear of harm or indeed of dying (LeDoux 2015).

2.2.3.4 Behavioural responses to anxiety

Avoidance is recognised as the primary behavioural response to anxiety (Barlow 2002, Stuart 2013, LeDoux 2015). The avoidance response can be helpful in removing a person from danger (Barry 2016), but can also be used in an attempt to distract the individual from the underlying feelings of dread. As such, it can be used in an unconscious attempt to bury the emotional pain of anxiety, interfering with an individual’s self-awareness and ability to engage with and address the triggers of anxiety (Fontaine 2009). Another type of avoidance is procrastination which is characterised by putting things off rather than confronting or dealing with them (Barlow 2002). Avoidance behaviours are components of the anxiety disorders classified as social anxiety (Barlow 2002), which is typically associated with awkwardness, discomfort and embarrassment in social situations, particularly in communication and interactions with others. In social interactions there is an underlying, disturbing belief by the individual of being scrutinised and judged by others (Stuart 2013).
2.3 Theories of anxiety

Many theories of anxiety exist which is not surprising given its complexity and the many ways in which anxiety can present itself. While there is a lack of consensus in the literature, there is recognition of biological, genetic, psychological, social, environmental, cognitive, attachment and adaptation theories (Barlow 2002, Horwitz & Wakefield 2012, Stuart 2013, LeDoux 2015).

Early theories, attributed to Kierkegaard, focused on anxiety being an inherent part of life giving individuals the freedom to choose (Hannay 2014). Later Freud is attributed with developing the psychoanalytic theory (Strachey 1973). Accordingly anxiety is thought to have developed as a result of early episodes in development which are in the unconscious mind. Through psychoanalysis these episodes are brought to a conscious level. It is suggested that Freud was the father of the biological model (Le Doux 2015). According to Glas (2003), Bowlby is attributed with forming the attachment theory in which anxiety and depression are attributed to poor attachment between infant and mother in the formative years. The biological model of anxiety is said to have developed from the Freud model and attributes anxiety to the imbalance of chemical in the brain and treatment is pharmacological (Barlow 2002, American Psychiatric Association 2013). In more recent times a combination of theories are recognised within the biopsychosocial model. Accordingly it is suggested that anxiety is the result of multiple factors including but not limited to genetics, environment and personality.

2.3.1 Nursing model

For clarity one model of nursing incorporating the biopsychosocial model of anxiety is explored (Figure 2.1). Stuart (2013) proposes a nursing model referred to as Stuart’s Adaptation to Stress Model. In this model Stuart (2013) acknowledges predisposing factors, followed by precipitating stressors, then appraisal of stressors, and in turn coping resources followed by coping mechanisms which are subdivided into constructive and destructive. These coping mechanisms feed into the continuum of coping responses from adaptive to maladaptive. The predisposing factors are recognised as including the three elements of biology, psychology and social. The biological factors include genetic vulnerability, physical health and disability, the social factors include age, culture, education, occupation, family relationships, social supports, living arrangements and the psychological factors include self-esteem, coping skills, past experiences, locus of control and motivation. Precipitating stressors are recognised as stimuli or adaptations that are challenging and/or threatening requiring increased energy from the individual. Stuart (2013) acknowledges that individuals often cope better with large, significant life altering changes such as grief than the constant, daily hassles and stressors that can chip away at one’s ability to cope. In the
following stage Stuart (2013) proposes assessment or appraisal of stressors including the cognitive, affective, physiological, behavioural and social stresses. Within the model Stuart (2013) advocates that the nurse fully understand and not assume the nature and intensity of the stress response from the suffers viewpoint. She suggests looking at resources to neutralise cognitive stressors. Affective appraisal includes looking at responses of irritability, fear, anger, acceptance, joy or sadness. The physiological response appraisal is underpinned by the reactions to hormonal changes including joy following a surge of oxytocin after the birth of the baby or baby blues seen commonly between 5 - 10 days postpartum and attributed to the fall in oestrogen after the birth of the baby (Henderson & Macdonald 2004). According to Stuart (2013) behavioural appraisal includes identifying changes in the normal behavioural pattern including avoidance, disengagement or overstimulation and inability to sleep. Social response appraisal include searching for understanding and meaning, identifying factors contributing to anxiety and
comparing skills and capacity to deal with issues. In turn coping resources included assessing the resources available to determine what can be done.

Finally, coping mechanisms include constructively focussing on the problem and engaging personal abilities to problem solve, ability to cognitively control the anxiety or accept it as a sign of the need for change. On the other hand, destructive coping is attribute to denial of the anxiety and an inability to engage in and resolve the anxiety, but instead demonstrate emotional responses such as denial, suppression and/or projection.

Stuart (2013) states that depending on the coping mechanisms, responses are evaluated on an adaptive, maladaptive continuum. Stuart (2013) concludes that adaptive responses are integrative leading to growth, learning and goal achievement. Whereas maladaptive responses block integration preventing growth, decrease autonomy and lack of mastery of environment.

2.3.1.1 Anxiety disorders

Anxiety disorders are defined as feelings and consequential behaviours that begin to have a significant impact on daily living, occurring more days than not in a week, over a period of six months or more (Barker 2008, American Psychiatric Association 2013). Just as in the rest of the population, it is normal to expect some anxiety in pregnancy and it is absolutely normal for new mothers to feel anxious (Wenzel 2011). However, when anxiety begins to significantly impact on relationships, sleep and behaviour then may be an anxiety disorder is present. The levels of anxiety are defined by pervasiveness, persistence and the consequential distress that interferes significantly with psychosocial functioning (APA 2013). Wittchen et al. (2011) report that anxiety disorders cause a serious loss to human potential, mainly through avoidance or failure to perform in education, career or the relationship sphere.

2.3.2 Classification of anxiety disorders.

Classification manuals include the Diagnostic Statistical Manual of Mental Disorders, DSM 5 (APA 2013) and the International Classification of Diseases and Related Health Problems, ICD-10 (WHO 2011). Both the DSM 5 and the ICD-10 define and recognise specific anxieties including the aforementioned social anxiety disorder, panic disorder and generalised anxiety disorder. Historically in the DSM-1, according to Crocq (2015), anxiety was seen as a symptom of a psychoneurotic disorder, whereas in the most recent DSM 5 (APA 2013) anxiety disorders are delineated into three “spectra” (Crocq 2015, p. 324): anxiety disorders; obsessive compulsive and related disorders; and trauma and stressor-related disorders. Anxiety disorders include generalised anxiety disorder (GAD), social anxieties and panic disorders. Whereas the obsessive compulsive (OCD) and related disorders are classified according to the behaviours displayed for example obsessive, repetitive thought patterns. Anxieties occurring as a reaction to a trauma or a stressor include post-traumatic stress disorder (PTSD) and adjustment disorders (AD).
Unlike the DSM 5, the 10th revision version of the ICD-10, classifies anxiety disorders in one chapter titled ‘Neurotic, stress related and somatoform disorders’ (WHO 2011). Neither compendium classifies anxiety in the perinatal period as a specific disorder.

2.3.3 Prevalence of anxiety disorder in the general population

The prevalence of anxiety varies in the population based on age, gender, assessment and diagnostic criteria. Nonetheless, anxiety disorders are considered the most frequent of all psychiatric disorders (Kessler et al. 2012) but they receive less attention than other disorders, probably because the patients are seen mainly as outpatients (Bandelow & Michaelis 2015). The reported prevalence of any anxiety disorder in two European and one American study involving the general population varies broadly from 6.4% as high as 21.3% (Table 2.1). Wittchen et al. (2011) reported the prevalence of anxiety at 14%, based on best estimates from national experts as well as a reanalysis of prevalence data where original data were not available. Kessler et al. (2012) reported 12 month prevalence in 18-64 year old at 21.3%, following completion of surveys which included an assessment tool which was compatible with an earlier edition of the DSM; DSM IV (APA 2000). Alonso et al. (2004) reported a much lower 12 month prevalence of 6.4% for 18 year olds or older and also used an assessment tool compatible with the DSM IV (APA 2000) which was administered by lay persons. The difference in prevalence is recognised in the literature and is attributed to variations in the use of diagnostic criteria (different versions of the DSM), variations in method of data collection, language differences including translation problems and target populations.

Table 2.1 Prevalence of anxiety in the general population

<table>
<thead>
<tr>
<th>Author and Study</th>
<th>Country</th>
<th>Sample size</th>
<th>Assessment tool/measure</th>
<th>Any anxiety disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alonso et al. (2004). European Study of the Epidemiology of Mental Disorders.</td>
<td>6 European countries</td>
<td>n=21424</td>
<td>Computerised interview CIDI for DSM-IV</td>
<td>6.4%</td>
</tr>
<tr>
<td>Wittchen et al. (2011). The size and burden of mental disorders in Europe 2010.</td>
<td>27 European countries</td>
<td>Not reported</td>
<td>Literature review, reanalysis and national experts survey.</td>
<td>14.0%</td>
</tr>
<tr>
<td>Kessler et al. (2012). US National Comorbidity Survey Replication.(NCS-R)</td>
<td>USA</td>
<td>n=5223</td>
<td>Survey with correlates (not specified) for DSM-IV.</td>
<td>21.3%</td>
</tr>
</tbody>
</table>

Wittchen et al. (2011) found that the levels of anxiety across European countries did no vary depending on cultural differences. While Alonso et al. (2004) and Kessler et al. (2012) do not report prevalence of anxiety in relation to cultural or social difference.

The prevalence of anxiety varies depending on age group and gender. The prevalence for those between 18-24 was 9.2%, decreasing to 7.0% for those between 25-34 years of age, and
decreasing again to 6.5% for those between 35 and 49 years of age (Alonso et al. 2004). Women had a 12 month prevalence of 8.7% compared to just 3.8% for men (Alonso et al. 2004). Anxiety disorders are reported to occur more frequently in women than men, at a ratio of 2:1 (APA 2013). Similarly, Alonso et al. (2004) report that women are twice as likely to have any one of the anxiety disorders in their lifetime than men (17.6% women; 9.5% men). Wittchen et al. (2011) and Kessler et al. (2012) both concur that more women than men suffer from anxiety disorders.

2.4 Perinatal anxiety

Anxiety is recognised as being inherent in the changes that accompany pregnancy and the adaptation to motherhood that follows (Wenzel 2011, Matthey 2016). Although pregnancy and childbirth is a happy occasion for most women, similar to anxiety at any other time in a person’s life, women will and do experience fluctuations in levels of anxiety in pregnancy and postpartum (Wenzel 2011, Anniverno et al. 2013, Pariante et al. 2014, Matthey 2016). Pregnancy is synonymous with physical, psychological and biological changes which can result in fluctuations of mood (Wenzel 2011, Anniverno et al. 2013). A new role, new expectations and new responsibilities are accompanied by changes in relationship with self, partner and infant. In addition there are the physical and hormonal changes that accompany pregnancy, childbirth and motherhood (Figueiredo & Conde 2011, Glover 2014, Henshaw et al. 2014).

Notwithstanding the evidence supporting anxiety as a normal emotional response, and bearing in mind the concern about ‘overpathologising’ motherhood (Matthey 2010, p. 263, 2016, p. 134), a number of women will experience anxiety that goes beyond the normal realm, as the impact becomes omnipresent, having a negative effect on everyday life (Wenzel 2011, Anniverno et al. 2013, Pariante et al. 2014, Matthey 2016). Wenzel (2011, p. 7) states that perinatal anxiety becomes a problem when ‘it consumes a significant proportion of a women’s time, takes away from her ability to fulfil major role responsibilities, and interferes with her ability to take care of herself’. When anxiety becomes persistent and burdensome it may be classified as an anxiety disorder (APA 2013) adding a heavy psychological burden to women during pregnancy and motherhood (Henderson & Redshaw 2013). The negative impact of anxiety on new mothers diminishes their ability to care for their babies and to sustain relationships (Wenzel 2011, Pariante et al. 2014).

The need to assess for and monitor anxiety in pregnancy and postpartum is a recommended part of woman’s care in the perinatal period according to international clinical guidelines (Scottish Intercollegiate Guideline Network 2012, NICE National Collaborative Centre for Mental Health 2014) and a Specialist Perinatal National Report (HSE 2017). Matthey (2010) recommends that anxiety should be measured at more than one time point to allow for the transient, self-limiting anxieties that accompany pregnancy and motherhood and to identify those women with anxieties that persist.
2.5 Measurement Scales

A wide variety of measurement scales are used to report prevalence of perinatal anxiety. Measurement scales are concerned with measuring psychological parameters and emotional constructs (Meades & Ayers 2011, Alderdice et al. 2012, Brunton et al. 2015, Evans et al. 2015). Measurement scales, also referred to as psychometric tools, have their roots in psychology, and are widely used in social sciences and research (Martin & Savage-McGlynn 2013). The overall aim of psychological measurement scales is to reveal psychological constructs such as anxiety, which are also referred to as “latent” or hidden states (Martin & Savage-McGlynn 2013, p. 453). Specific tools have been developed to measure anxiety in pregnancy (Alderdice et al. 2012, Brunton et al. 2015), but no specific tool has been developed for measuring anxiety in the postpartum population (Meades & Ayers 2011, Simpson et al. 2014), despite being viewed as necessary (Nguyen et al. 2010). Most of the measurement scales used to measure anxiety in the perinatal population were developed for the general population (Morrell et al. 2013). The argument exists that specific measurement scales need to be developed to differentiate pregnancy symptoms, e.g., sleep disturbances, tingling sensations, nausea, worry, from anxiety symptoms (Matthey 2016). Many different scales have been used to report prevalence of anxiety in pregnancy and postpartum and there is a call for valid and reliable measurement scales in research and clinical practice as well as reflection and consideration of what is being measured and why (Alderdice et al. 2013).

Alderdice et al. (2013, p. 434) caution that in spite of the urgent need for measurement scales that can identify women who need additional support in the perinatal period careful consideration needs to be given to the risk of ‘overpathologising’ pregnancy and over-referral of women. Furthermore, they caution that the use of ill-conceived screening tools might cause more worry and anxiety and suggest that consideration be given to what it is that is being measured and why it is being measured.

2.5.1 Prevalence of perinatal anxiety and measurement scales used.

The prevalence of anxiety in pregnancy and postpartum is reported in the following section according to a variety of measurement scales. In seven longitudinal studies using eight different methods for measuring anxiety, the reported prevalence of anxiety disorders and perinatal anxiety varied from 3.4% (Goodman & Tyer-Viola 2010) to 24.5% (George et al. 2013) respectively (Table 2.2). The prevalence of anxiety was determined by three methods including validated anxiety measurement scales, interview schedules that are compatible with the DSM or ICD, and validated single items questions on peoples experience of anxiety (Table 2.3). Two studies reported the prevalence of anxiety according to validated measurement scales for anxiety symptoms (Figueiredo & Conde 2011, George et al. 2013). Two studies report prevalence
according to a self-rating anxiety disorder scale (Heron et al. 2004, Goodman & Tyer-Viola 2010). Two reported anxiety prevalence using a structured clinical interview using the criteria for the DSM IV (Goodman & Tyer-Viola 2010, Fairbrother et al. 2016). The remaining two reported prevalence according to single items and not a validated measurement scale (Woolhouse et al. 2009, Henderson & Redshaw 2013).

The difference in reported prevalence is, undoubtedly, a result of the variations in sample sizes, timing of ascertainment in pregnancy and postpartum, and the type of measurement scale or question used to report anxiety.

Figueiredo & Conde (2011) and Heron et al. (2004) report the prevalence of anxiety at 12% and 15% respectively in the second trimester, declining to 4% and 8% respectively in the postpartum period. Figueiredo & Conde (2011) reported prevalence according to the State Trait Anxiety Inventory – State subscale (STAI-S) (Spielberger 1983) using a cut off of ≥45 (Table 2.3). The State anxiety subscale measures anxiety that is defined by its transient emotional reaction characterised by subjective feelings of tension and heightened activity of the autonomic nervous system (Spielberger 1983). The Trait anxiety subscale measures anxiety that is defined by vulnerability or predisposition to anxiety, where the individual suffers from a proneness to intense anxiety reaction. The State subscale used by Figueiredo & Conde (2011) captures how the person feels at the moment in time, with items such as item 4; “I feel strained” and item 8; “I am satisfied” (Spielberger 1983, p. 72). Whereas, Heron et al. (2004) reported prevalence according to two anxiety subscales from the self-reporting measurement scale; Crown Crisp Experiential Index (CCEI), formerly called the Middlesex Hospital Questionnaire (Crown & Crisp 1966, Crisp et al. 1978). The CCEI was developed to measure clinically relevant ‘neurosis’ including anxiety (Crown & Crisp 1966). In this seminal study, from the Avon Longitudinal Study of Parents and Children (ALSPAC), Heron et al. (2004) reported anxiety according to the two anxiety subscales in the CCEI. The phobic anxiety subscale included items such as “Do you find yourself worrying about getting some incurable disease” and “Do you worry unduly when relatives are late coming home?” (Crown & Crisp 1966, p. 922). Other items include “worry a lot” feel “strung up inside” (Heron et al. 2004, p. 66). Heron reported good correlation between the CCEI and the STAI having done a pilot study on 54 pregnant women.
Table 2-2 Measurement scales used to report perinatal anxiety

<table>
<thead>
<tr>
<th>Measurement scale</th>
<th>Source of scale</th>
<th>Types of anxiety measured</th>
<th>Number of items</th>
<th>Scoring</th>
<th>Likert Scale</th>
<th>Cut offs used to report anxiety</th>
<th>Language</th>
<th>Time period for reported feelings</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAI-State</td>
<td>Figueiredo &amp; Conde (2011)</td>
<td>STAI-State anxiety</td>
<td>20</td>
<td>20-80</td>
<td>.</td>
<td>≥45</td>
<td>Portuguese</td>
<td></td>
</tr>
<tr>
<td>*CCEI two anxiety subscales</td>
<td>Heron et al (2004)</td>
<td>Anxiety</td>
<td>16 items, 2 subscales</td>
<td>.</td>
<td>.</td>
<td>≥9</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scale - Anxiety subscale (HADS).</td>
<td>Zigmond and Snaith (1983)</td>
<td>Anxiety symptoms</td>
<td>7</td>
<td>.</td>
<td>5 point</td>
<td>No-anxiety 0-7, Moderate 8-10, Definite anxiety 11+</td>
<td>English</td>
<td>Present state of mind</td>
</tr>
<tr>
<td>George et al (2013)</td>
<td>Anxiety symptoms</td>
<td>7</td>
<td>0-21</td>
<td>4 point</td>
<td>No anxiety 0-7, Moderate anxiety 8-10, Severe anxiety 10+,</td>
<td>French</td>
<td>In the past week</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Instrument and Methodology</td>
<td>Aims and Instruments</td>
<td>Assessment Period</td>
<td>Language(s)</td>
<td>Time Frame</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>-------------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PRIME-MD Patient Health Questionnaire (PHQ).</strong> Self-administered.</td>
<td>Spitzer (1999)</td>
<td>Anxiety disorders and Depression according to DSM IV</td>
<td>14 (9 depression and 5 anxiety)</td>
<td>Depression 4 point likert. Anxiety yes/no responses</td>
<td>Algorithm used to assign an anxiety disorder.</td>
<td>English</td>
<td>In the last two weeks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goodman and Tyer-Viola (2010)</td>
<td>Panic disorder &amp; other anxiety disorders</td>
<td>not specified</td>
<td>Only used panic syndrome and other anxiety disorder syndrome items.</td>
<td>as above</td>
<td>English and Spanish</td>
<td>In the last two weeks</td>
<td></td>
</tr>
<tr>
<td><strong>Generalized Anxiety Disorder 7 item scale GAD 7</strong></td>
<td>Spitzer et al (2006)</td>
<td>Anxiety symptoms.</td>
<td>7</td>
<td>0-21</td>
<td>4 point</td>
<td>Minimal 0-4, Mild 5-9, Moderate 10-14, Severe 15-21,</td>
<td>English</td>
<td>In the last two weeks</td>
</tr>
<tr>
<td></td>
<td>Fairbrother et al (2016)</td>
<td>Anxiety symptoms</td>
<td>7</td>
<td>0-21</td>
<td>4 point 0-3</td>
<td>≥10</td>
<td>English</td>
<td>.</td>
</tr>
<tr>
<td><strong>Structured Clinical Interview for DSM-IV</strong></td>
<td>First et al (1996) according to Fairbrother et al (2016)</td>
<td>Anxiety disorders **</td>
<td>not specified</td>
<td>Interviews conducted by PhD students</td>
<td>n/a</td>
<td>n/a</td>
<td>English</td>
<td>In the past 6 months but criteria not applied by Fairbrother study.</td>
</tr>
</tbody>
</table>

*Free floating anxiety, phobic anxiety, obsessive compulsive traits and symptoms, somatic symptoms, depression symptoms and hysteria traits and symptoms.

**Panic disorder, agoraphobia, social anxiety disorder, specific phobias, acute stress disorder, post-traumatic stress disorder, obsessive compulsive disorder and generalised anxiety disorder, assessment includes persistence of symptoms for 6 or more months.
Using another scale George et al. (2013) reported prevalence of moderate anxiety at 24.5% and severe anxiety at 18.5% in the third trimester of pregnancy, remaining almost unchanged for those with moderate anxiety at 24.3% but higher for those with severe anxiety at 20.2%, at 6 - 8 weeks postpartum. Anxiety was reported at two cut-off scores to report moderate and severe anxiety according to the seven-item anxiety subscale of the Hospital Anxiety and Depression Scale-Anxiety, (HADS) (Zigmond & Snaith 1983). The anxiety items in the HADS subscale include “Do you feel tensed up?” and “Do you feel something awful is about to happen?” (Zigmond & Snaith 1983, p. 362).

Using the Patient Health Questionnaire (PHQ) (Spitzer et al. 1999), which is a self-administered questionnaire compatible with DSM-IV, Goodman & Tyer-Viola (2010) reported prevalence of any anxiety disorders in the third trimester at a much lower figure of 4.3% and lower again, 3.4% at 6 weeks postpartum. The PHQ includes items such as “In the past 4 weeks have you had an anxiety attack-suddenly feeling fear or panic?” and if the reply was yes other items included, “Do these attacks come suddenly out of the blue….in a situation where you do not expect to be nervous or uncomfortable” (Spitzer et al. 1999, p. 1739).

Fairbrother et al. (2016) reported anxiety disorders according to an interview schedule known as the Structured Clinical Interview Schedule (SCID) (First et al., 1996, as cited in Fairbrother et al. 2016). Those women who had already scored above the cut-off scores on a range of measurement scales (n=115/347), including the GAD-7 (Spitzer et al. 2006) were interviewed in the postpartum period. The GAD-7 is an anxiety scale developed specifically to screen for generalized anxiety disorder (Spitzer et al. 2006). Following interview according to the SCID by trained PhD students prevalence of generalized anxiety disorder (GAD) was reported at 16.2% in the third trimester of pregnancy and 18.6% at three months postpartum in primiparous mothers but remained the same at both time points in multiparous women (14.6%). Prevalence in pregnancy was based on interviews carried out retrospectively in the postnatal period (Fairbrother et al. 2016).

2.5.2 Prevalence of perinatal anxiety according to single items/statements

Henderson & Redshaw (2013) reported a decline in the prevalence of anxiety from pregnancy to postpartum according to a single undefined item in a survey tool completed by women (n = 5332) retrospectively at three months postpartum (Table 2.3). Prevalence in pregnancy for both primiparous and multiparous women was the same at 13.9%, prevalence decreased for both multiparous and primiparous women in the postpartum period. Although the decrease was greater for the multiparous women at 6-8 weeks postpartum (8.8% compared to 12.3%), it was similar for both by three months postpartum (5.0% and 5.1%). Another study by Woolhouse et al. (2009) reported prevalence of anxiety according to a single statement but unlike Henderson & Redshaw (2013), they found that the prevalence of anxiety in a sample of nulliparous women increased from 7.3% in early pregnancy, to 15.7% at three months postpartum (Woolhouse et al. 2009).
<table>
<thead>
<tr>
<th>Study Design</th>
<th>Author, Year, Country</th>
<th>Sample Size</th>
<th>Measurement Scale (see Table 2.3)</th>
<th>Parity</th>
<th>Prenatal</th>
<th>Postpartum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective</td>
<td>Figueiredo &amp; Conde, 2011, Italy</td>
<td>n=260</td>
<td>STAI-State anxiety ≥45</td>
<td>Multiparous 36.4%/Primiparous 63.6%</td>
<td>12.2%</td>
<td>18.2%</td>
</tr>
<tr>
<td>Prospective</td>
<td>Heron et al, 2004, England</td>
<td>n=8383</td>
<td>CCEI</td>
<td>Not reported</td>
<td>14.6%</td>
<td></td>
</tr>
<tr>
<td>Prospective</td>
<td>George et al, 2013, France</td>
<td>n=400 in pregnancy, n=173 postpartum</td>
<td>HADS 8-10 (moderate anxiety)</td>
<td>Multiparous 16.5%/Primiparous 83.5%</td>
<td>24.5%</td>
<td></td>
</tr>
<tr>
<td>Prospective</td>
<td>Goodman &amp; Tyer-Viola, 2010, U.S.A</td>
<td>n=491 in pregnancy, n=299 postpartum</td>
<td>PHQ</td>
<td>Multiparous 45%/Primiparous 55%</td>
<td>4.3%</td>
<td></td>
</tr>
<tr>
<td>Retrospective</td>
<td>Fairbrother et al, 2016, Canada</td>
<td>n=310 in pregnancy, n=115 postpartum</td>
<td>GAD-7 / SCID</td>
<td>Primiparous</td>
<td>16.2%</td>
<td></td>
</tr>
<tr>
<td>Retrospective</td>
<td>Henderson &amp; Redshaw, 2013, England</td>
<td>n=5332</td>
<td>Single item asking about experience of anxiety</td>
<td>Primiparous</td>
<td>13.9%</td>
<td></td>
</tr>
<tr>
<td>Prospective</td>
<td>Woolhouse et al, 2009, Australia</td>
<td>n=1507&amp;1454 in pregnancy, n=1427 postpartum</td>
<td>Single item “intense anxiety or panic attacks”</td>
<td>Primiparous</td>
<td>7.3%</td>
<td>8.4%</td>
</tr>
</tbody>
</table>
Woolhouse et al. (2009, p. 82) acknowledge using the anxiety statement because ‘at the time of the design of the study, we were unable to identify any standardised measures (of anxiety) which were validated for use in the perinatal period’.

Three of the studies reported that anxiety in pregnancy was associated with postnatal anxiety (Heron et al. 2004, Goodman & Tyer-Viola 2010, George et al. 2013) and one reported that anxiety was associated with postnatal depression (Heron et al. 2004).

Heron et al. (2004) reported prevalence only for those women who had completed the CCEI at both time points (n=8383), however they also reported that women with high levels of anxiety in pregnancy were disproportionally more inclined to drop out of the study in the postpartum period.

Four studies found that prevalence of anxiety was higher in pregnancy than in the postpartum period (Heron et al. 2004, Goodman & Tyer-Viola 2010, Figueiredo & Conde 2011, Henderson & Redshaw 2013), particularly in the third month postpartum (Heron et al. 2004, Figueiredo & Conde 2011, Henderson & Redshaw 2013). However, in three other studies anxiety increased between pregnancy and the postpartum period (Woolhouse et al. 2009, George et al. 2013, Fairbrother et al. 2016). Moderate and severe anxiety, according to the HADS, increased slightly between the third trimester and six weeks postpartum, particularly in primiparous women (George et al. 2013). In another study the prevalence of anxiety disorders, following a structured clinical interview, increased between pregnancy and three months postpartum, particularly for primiparous women (Fairbrother et al. 2016). Woolhouse et al. (2009) also reported an increase in the prevalence of anxiety, according to a single anxiety item, between pregnancy and three months postpartum in women. On the other hand Henderson & Redshaw (2013) reported a decrease in prevalence according to a single anxiety item, but the assessment was carried out retrospectively in the postpartum period. Given the differences in means used to report anxiety, at the different time points, particularly with two studies reporting anxiety in pregnancy retrospectively (Henderson & Redshaw 2013, Fairbrother et al. 2016), and the difference in sample sizes (n=260 in one study and n=8383 in another), makes comparing anxiety prevalence between the studies hard to interpret.

2.5.3 Factors associated with perinatal anxiety

2.5.3.1 Demographics

In relation to demographics Henderson and Redshaw (2013) found that antenatal anxiety was significantly more common in women in their teens and early twenties, women in the most deprived quartile, in women of non-white ethnicity, in single mothers and in those mothers with long term physical and mental health problems (p<0.001). However, they did not find any significant difference found in parity, education or fertility treatment. Although younger women
were more likely to report anxiety postpartum the difference was not statistically significant (p = 0.10) (Henderson and Redshaw 2013). Postnatally, in relation to demographics only long term physical and mental health problems were significantly associated with anxiety (p<0.001) and women in their teens and early twenties were at greater risk (Henderson and Redshaw 2013).

2.5.3.2 Co-morbidity of anxiety and depression

The co-morbidity of depression and anxiety is well recognised in the literature (Henderson and Redshaw 2013). Co-morbidity, i.e., reporting symptoms of both anxiety and depression, varies from 4.2%, at some point in pregnancy and up to three months postpartum (Fairbrother et al, 2016), to 7.6% in the first trimester (Figueiredo & Conde (2011). Henderson & Redshaw (2013) found that of the 13.9% of women (n=743) who reported anxiety in pregnancy, 46% of those women also reported depression. Similarly, Henderson & Redshaw (2013) found that 29% of women who reported anxiety at 10 days postpartum also reported depression, and at three months postpartum; 36% of women with anxiety also reported depression. Similarly, Goodman & Tyer-Viola (2010) report that 15.6% (n=17) of pregnant women with depression also had an anxiety disorder and, at six weeks postpartum, 14.6% (n=7) of women had co-morbid depression and anxiety. Heron et al (2004) reported that following statistical analysis a concurrent association between anxiety and depression was high at two time point; r=0.74 at 18 weeks gestation and r=0.77 at 8 months postpartum. The frequency of co-morbid depression and anxiety highlights and further emphasises the need to screen for both (Goodman & Tyer-Viola 2010).

2.5.3.3 Gender and co-morbidity

Figueiredo & Conde (2011) assessed women and men for anxiety and depression at five time points; three time points in pregnancy, one at childbirth and one at three months postpartum. In relation to anxiety and depression for women, they found that prevalence for depression based on an EPDS >/=10 were significantly higher than anxiety based on the STAI >/=45 in the first and second trimester and at three months postpartum. This finding was exclusive to the women, there was no significant difference between anxiety and depression at any time point for men. The odds ratio showed that women, when compared to men, were more likely to have high anxiety scores in the third trimester (OR = 2.63; 95% CI = 1.39 – 3.99) and at childbirth ( OR = 2.44; 95% CI = 1.28-3.73). Significant differences between the sexes were also seen for combined anxiety and depression related to combined high scores in the EPDS and the STAI in the second (p=0.007) and third trimester (p=0.002) and at childbirth (p=0.009).

Figueiredo & Conde (2011) report that prevalence of anxiety was lower at three months postpartum compared to the three time points in pregnancy and at childbirth. While women’s rates of anxiety were reported to be significantly higher in the second and third trimester, no
significant difference was found for men’s rates of anxiety in pregnancy. Comparatively, prevalence of depression was not significantly different for either sex at any of the five time points. However, at three months postpartum, prevalence of anxiety and depression were significantly lower for women than in the first (p=0.001), second (p=0.003), third trimester (p=0.004) and at childbirth (p=0.001).

Figueiredo & Conde (2011) attribute the similar levels of anxiety for both men and women in early pregnancy and at three months postpartum to the adaptive processes. In early pregnancy they suggest that the news of pregnancy might present both sexes with the challenge of accepting a new role. Similarly, in the postpartum period they propose that both men and women may experience similar difficulties and challenges in adapting to the new role of parenthood and taking care of the infant. They also state that anxieties can be gender specific with women having higher anxiety than men in the third trimester and at childbirth when they are due to give birth. Figueiredo & Conde (2011) conclude that there is a need to differentiate psychological symptoms that a normal part of pregnancy associated with the physiological changes, as well as the adjustments associated with parenthood from more problematic symptoms experienced by vulnerable parents.

2.5.3.4 Coping

George et al. (2013) hypothesised that women with anxiety show maladaptive coping compared to those without anxiety, they found that pregnant women with severe anxiety according to the HADS used coping strategies significantly less often including acceptance (p = 0.016), positive reframing (p = 0.025) and humour (p = 0.04). In addition the higher the level of anxiety the more likely women were to use maladaptive coping responses such as self-blame (p = 0.001) and denial (p = 0.05). George et al. (2013) report that antenatal anxiety was associated with worry about pain and labour (p<0.001), but that there was no association between antenatal anxiety and premature birth, birth weight, interventions in labour and mode of birth. In the postpartum period George et al. (2013) found that severe anxiety was associated with self-blame (p = 0.05) and denial (p = 0.05).

Henderson and Redshaw (2013) found that women with anxiety reported negative interactions with midwives and doctors stating that they were not treated with respect and kindness. They found that anxiety was associated with overall satisfaction with care from staff, kindness, help with infant feeding and help after the birth (p<0.001). Women’s reported good physical wellbeing varied also, from 13% for those who reported anxiety to 49% for those who did not report anxiety (Henderson and Redshaw 2013).

2.5.3.5 Parity and perinatal anxiety

According to studies other than those reviewed above, parity and perinatal anxiety is reported. Dipietro et al. (2008), in a longitudinal study, reported from a sample of American women
(n=137) found that parity was an important contributor to anxiety in the perinatal period with multiparous women having higher levels of anxiety in pregnancy and at 6 weeks postpartum compared to the nulliparous women. But they found that by two years postpartum the levels of anxiety for both was similar with a decrease in prevalence in multiparous women and an in prevalence in nulliparous women. On the other hand, Swalm et al. (2010) reported, in a sample of 4706 women of mixed parity, that nulliparous women were 1.6 times more likely to have a high anxiety score in pregnancy. However, in a systematic review of postnatal anxiety, Field (2018) reported that the literature was inconclusive in relation to parity and postnatal anxiety.

2.5.3.6 Nulliparity and perinatal anxiety

In a sample of nulliparous women in Europe (n=97), Floris et al. (2016) report that anxiety in pregnancy was found to be associated with higher depression scores (EPDS) postpartum. They also found that mean anxiety scores decreased between the third trimester of pregnancy and four months postpartum and report that anxiety was not associated with mode of birth, use of epidural anaesthesia, pain in labour or infant feeding method. Race and ethnicity were found to be significantly associated with high anxiety levels, independent of income, in pregnancy, in a sample (n=8128) of nulliparous women in America (Grobman et al. 2016). Anxiety levels were measured using the STAI-Trait scale at three points during pregnancy, ethnic groups were classified as non-Hispanic white (n=864), non-Hispanic white (n=1070), Asian (n=3680) and other (n=399) and race and ethnicity were both found to be significantly associated with higher anxiety levels, independently of income. Help-seeking behaviour was found to be low amongst nulliparous women with anxiety (Woolhouse et al. 2009). Woolhouse et al. (2009) found that of the 14.7% of women who reported emotional difficulties (n=204) at nine months postpartum, 35% (n=72) reported anxiety symptoms. They found that fewer than half of these women discussed anxiety with a health professional 44.4% (n=32), in contrast to 71.1% (n=32/45) of women with coexisting depression and anxiety, and 65.5% (n=57/87) with depression.

2.5.3.7 Changes in perinatal anxiety over time points

Heron et al. (2004) reported the changes in anxiety at eight weeks postpartum in the same cohort of women based on their anxiety status at eighteen weeks pregnancy (Figure 2.1). They found that 29.6% (n=360) of women who reported anxiety in pregnancy also reported anxiety at eight weeks postpartum, while 3.8% (n=319) of those who reported no anxiety in pregnancy reported new onset anxiety postpartum. George et al. (2013) found that over half of women who were anxious in pregnancy were still anxious postpartum (59.3%).
Eighteen weeks of pregnancy and eight weeks postpartum. At each row the sample is divided into rounds for those who scored above the cut-off for anxiety and squares for those who scored below the cut-off for anxiety. The figures included in the table are the percentage of the total sample, the total number and the percentage of those reporting anxiety in pregnancy and those not reporting anxiety in pregnancy (brackets).

2.5.4 Measurement scales used in this study.

As demonstrated in the literature review prevalence of anxiety varies depending on the measurement scales and instruments used. Furthermore, there are no specific perinatal anxiety measurement scales recommended nor available (Meades & Ayers 2011). This study uses two anxiety measurements scales and an anxiety statement that are imbedded within the survey tools. Using the two scales in the same cohort of women might address some of the heterogeneity identified in research studies reporting prevalence of anxiety (Bandelow & Michaelis 2015)

2.6 Summary.

Anxiety is referred to as a normal, healthy, protective, adaptive, emotional response. Resilience, adaptability and good coping skills are all associated with the normal anxiety response. As a transient state, anxiety is manageable. But, due to persistence and pervasiveness it can also be problematic, distressing and interfere with daily life leading to a diagnosis of an anxiety disorder. The prevalence of anxiety is twice that for women as it is for men.

Becoming and being pregnant, delivering a baby and becoming a new mother are stages involving physical, physiological and social changes. For most women the transitions are smooth. But for some women pregnancy and newfound motherhood can be accompanied with more than acceptable levels of anxiety.

Prevalence of perinatal anxiety reported in seven longitudinal studies, measured using a variety of scales and single-item questions, varied widely: 7.3% -14.6% in the second trimester; 4.3% - 24.5% in the third trimester; 13.9% - 16.2% in pregnancy (time not specified), 3.4% - 24.2% between 6 to 8 weeks postpartum and 5% - 18.6% at three months postpartum. In three studies,
prevalence increased in the postpartum period, but decreased in the four other studies, showing additional variability. One study reported ongoing anxiety and new onset anxiety from pregnancy to eight weeks postpartum in the same sample of women. Anxiety levels did decrease for those who had anxiety in pregnancy, but new anxiety was reported at 3.8% for those who did not have anxiety in pregnancy. Prevalence varied depending on the means of reporting it, the time of measurement and the sample used. Anxiety measurement scales, single statements and clinical interviews for an anxiety disorders were just some of the means used to report prevalence of anxiety.

Factors seen amongst those with anxiety and reported as being significant associated with anxiety vary. Anxiety is recognised in the perinatal literature as being higher in women in their teens and early twenties and those with a history of physical and mental health problems. While antenatal anxiety is higher amongst those who are socioeconomically deprived, non-white and single mums, these factors were not significantly associated with anxiety in the postpartum period. Even though women with anxiety reported greater worries about childbirth, anxiety was not found to be associated with interventions in labour, nor mode of birth. On the other hand, postnatally women with anxiety are less inclined to report good physical health and support in the postnatal period. They were also less inclined to use positive coping mechanisms such as humour, acceptance and reframing. Anxiety was also found to be higher amongst women than men in the third trimester and around childbirth, but just as high as men at three months postpartum. However, the co-morbidity of anxiety and depression is well recognised in the literature reporting both in pregnancy and postpartum. So too is the continuation of anxiety symptoms for between 30% to 50% of women from the antenatal to the postnatal period.
### 3 Chapter 3 Systematic search and literature review

#### 3.1 Introduction

This chapter opens with the rationale for the systematic search and literature review of studies that used the DASS 21 and the EPDS 3A to report the prevalence of anxiety during pregnancy or the postpartum period. That is followed by a description of the factors assessed in the DASS 21 and the EPDS 3A, and the aims and objectives of this review. Prevalence of anxiety according to the DASS 21 anxiety subscale and the EPDS 3A, the anxiety element, in the perinatal period are reported. The review also includes prevalence of co-existing depression and stress and the co-morbidities of anxiety depression and stress, and concludes with the factors reported as being associated with anxiety. The previous chapter included studies conducted with general populations of non-pregnant women and women with and without a diagnosis of mental illness. This review aimed to identify the prevalence of anxiety in a general population of pregnant and/or postpartum women, and excluded studies conducted with only women who had a diagnosis of mental illness in order to minimise the variation in the prevalence that might occur when women with a diagnosis of mental illness were included.

#### 3.1.1 Rationale for conducting the search systematically and the literature review

This review was conducted to identify those studies that report prevalence of anxiety according to the DASS 21 and the EPDS 3A in the perinatal population, to provide a platform on which the findings from this study can be compared. The rationale for focusing on the DASS 21 and the EPDS 3A is that in both instruments are embedded in the surveys used at both time points in this study. Validated and reliable measurement scales are recognised as being useful for identifying anxiety prevalence for research purposes (Bandelow & Michaelis 2015). There are no particular measurement scales recommended for use in the perinatal period, indeed a variety of measurement scales are used to measure and report prevalence of anxiety (Meades & Ayers 2011, Brunton et al. 2015, Evans et al. 2015). However, according to two systematic reviews of all measurement scales in the perinatal period, the DASS and the EPDS are used to identify anxiety in pregnancy (Evans et al. 2015) and perinatally (Meades & Ayers 2011). In response to Ayers & Olander (2013) and Martin & Savage-McGlynn (2013), who both suggest that all research should include a thorough description and explanation of the theory unpinning the measurement scales used, both scales are presented below.

The literature was searched systematically to identify those studies that reported prevalence of antenatal and/or postnatal anxiety according to the DASS 21 or 42 anxiety subscale and the EPDS 3A, in order to minimise heterogeneity. Considerable heterogeneity exists in the measurement
scales used, in the populations and time periods studied (Dennis et al. 2017) making pooling and comparisons of findings difficult. Heterogeneity describes variability between study populations, clinical characteristics and methodologies, and is recognised as being a common feature in non-randomised control studies, such as prospective and cross sectional studies (Higgins & Green 2011). This systematic search and literature review addresses heterogeneity by reviewing only those studies that report anxiety prevalence and associated factors according to the two aforementioned scales that are used in this study.

3.2 The DASS and the EPDS

In research it is recommended that the design of instruments used to report emotional states is clearly stated (Ayers & Olander 2013, Martin & Savage-McGlynn 2013). In acknowledgement of that recommendation the theory behind the development of the Depression, Anxiety and Stress Scale (DASS) and the Edinburgh Postnatal Depression Scale (EPDS) is made explicit. This is followed by an overview of the DASS, the DASS 21 anxiety subscale, and a section on the EPDS and the EPDS 3A and the respective cut-off scores recommended.

The DASS 21 anxiety subscale is the seven item anxiety scale derived from the DASS 21 (Lovibond & Lovibond 1995a). The second is a three item anxiety subscale, EPDS 3A identified (Matthey 2008, Phillips et al. 2009) in the longer ten item scale (EPDS) (Cox et al. 1987). The theory underpinning the development of both the DASS and the EPDS is based on the tripartite model of anxiety, depression and stress developed by Clark & Watson (1991), (Lovibond & Lovibond 1995a, Ross et al. 2003, Jomeen & Martin 2005, Phillips et al. 2009, Cunningham et al. 2015). The tripartite model supports the belief that the constructs of anxiety and depression share a common component of general distress or stress. The model proposes that anxiety and depression can be differentiated based on factors specific to each and the factors shared by both. As such, while anxiety and depression share the common general distress components such as irritability and agitation, the two constructs are made distinct by distinctive features unique to either. For example physiological hyperarousal is unique to anxiety while lack of pleasure or anhedonia (lack of ability to feel pleasure) is unique to depression. Hence, the tripartite model, as proposed by Clark & Watson (1991) differentiates general distress from specific anxiety and specific depression.

3.2.1 The Depression, Anxiety and Stress Scale (DASS).

The DASS is a self-reporting measurement scale used to measure the expression of the emotional states of depression, anxiety and stress over the past week (Lovibond & Lovibond 1995a). The scale is available in two forms, the DASS 42, and the shorter version, DASS 21 with 14 and 7 items respectively relating to each of the three domains of depression, anxiety and stress. For this
study the DASS 21, 7 item anxiety subscale was used to determine the prevalence of anxiety, during pregnancy and at three months postpartum.

The anxiety subscale addresses autonomic arousal, skeletal muscular effects, situational anxiety and the subjective experiences of anxiety. These four aspects of anxiety are shown in Table 3.1.

<table>
<thead>
<tr>
<th>Table 3-1 DASS 21: The four aspects and seven items of anxiety with corresponding numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Autonomic arousal</strong>-</td>
</tr>
<tr>
<td>2. I was aware of dryness in my mouth.</td>
</tr>
<tr>
<td>4. I experienced breathing difficulty (excessive, rapid breathing, breathlessness in the absence of exercise).</td>
</tr>
<tr>
<td>19. I was aware of the action of my heart in the absence of physical exercise (e.g., sense of heart rate increase, heart missing a beat).</td>
</tr>
<tr>
<td><strong>B. Skeletal muscular effects</strong>-</td>
</tr>
<tr>
<td>7. I experience trembling (e.g., in the hands).</td>
</tr>
<tr>
<td><strong>C. Situational anxiety</strong>-</td>
</tr>
<tr>
<td>9. I was worried about situations in which I might panic and make a fool of myself.</td>
</tr>
<tr>
<td><strong>D. Subjective experiences of anxiety</strong>-</td>
</tr>
<tr>
<td>15. I felt I was close to panic.</td>
</tr>
<tr>
<td>20. I felt scared without any good reason.</td>
</tr>
</tbody>
</table>

The depression subscale assesses aspects of depression including dysphoria, devaluation of life, hopelessness, self-deprecation, lack of motivation, anhedonia and apathy. The third emotional state, stress, assesses aspects of stress including chronic, non-specific arousal such as irritability, over reaction, extreme sensitivity, impatience and inability to relax.

The DASS 21 items are scored according to subjective experiences over the past week on a Likert scale from 0-3 corresponding to their frequency of occurrence (Table 3.2).

<table>
<thead>
<tr>
<th>Table 3-2 DASS 21 Likert scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>0. Did not apply to me - NEVER</td>
</tr>
<tr>
<td>1. Applied to me to some degree - SOMETIMES,</td>
</tr>
<tr>
<td>2. Applied to me a good part of the time - OFTEN</td>
</tr>
<tr>
<td>3. Applied to me most of the time - ALMOST ALWAYS.</td>
</tr>
</tbody>
</table>

Anxiety according to the DASS 21 can be reported in both a categorical fashion and a binary fashion. Firstly, scores were doubled as recommended by (Lovibond & Lovibond 1995b) and the scoring system used for the DASS 42 applied. The categorical scoring system for the DASS 42 (Lovibond & Lovibond 1995a) is presented below (Table 3.3). Firstly, those scoring in each of the five classifications of normal (0-7), mild (8-9), moderate (10-14), severe (15-19) and extremely severe anxiety (20+) will be classified accordingly. Secondly those who report mild to extremely severe symptoms (8 and above) will be assigned to the yes, anxiety group and those who report a normal anxiety score (0-7) will be assigned to the no anxiety group.

<table>
<thead>
<tr>
<th>Table 3-3 DASS 42 Scoring template</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Normal</td>
</tr>
<tr>
<td>Mild</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>Severe</td>
</tr>
<tr>
<td>ExtremelySevere</td>
</tr>
</tbody>
</table>

42
Notwithstanding that the DASS 21 anxiety subscale will be used to report the presence of anxiety its limitations are acknowledged. Lovibond & Lovibond (1995a, p. 3) state that the DASS “has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classification systems such as the DSM and ICD”. However, they do suggest that researchers should find the DASS useful given its capacity to discriminate between the three emotional states. The DASS 21 was not developed for the perinatal population specifically. It does include some somatic symptoms of anxiety including breathing pattern and awareness of heart action, but does not include other somatic symptoms of sleep, appetite or libido, which are naturally and normally affected by pregnancy, childbirth and baby care (Lovibond & Lovibond 1995a). Indeed, Cox et al. (2014), in their development of the EPDS, make it clear that they do not include somatic symptoms such as lack of sleep, given that symptoms of sleep disturbance do not belong in a scale assessing emotional states in new mothers whose sleep is affected while caring for a new infant.

3.2.2 Edinburgh Postnatal Depression Scale (EPDS)

The EPDS has been identified as a multidimensional scale with potential utility as a measurement scale of anxiety as well as depression in research and clinical settings (Martin & Redshaw 2018). The EPDS was developed specifically as a postpartum depression scale (Cox et al. 1987). However, over the past two decades it has been consistently shown to contain other factors including anxiety (Ross et al. 2003, Jomeen & Martin 2005, Phillips et al. 2009, Cunningham et al. 2015, Coates et al. 2016, Matthey & Agostini 2017) and more recently it has been suggested that research is needed into the potential utility of the subscale in screening practice (Martin & Redshaw 2018). The EPDS has been referred to as a national treasure for perinatal mental health researchers (Howard 2014). It was developed as a unidimensional scale, by psychiatrist, John Cox, and psychologists, Jeni Holden and Ruth Sagovsky in 1989, to identify depressive symptoms in the postpartum period (Cox et al. 1987), and to meet the needs of quantitative research (Cox et al. 2014). It is probably the most commonly used measurement scale in the perinatal period (Matthey & Agostini 2017), having been validated for use in pregnancy and postpartum (Murray & Cox 1990). Cox et al. (2014) assert that it is a useful tool for screening women for anxiety also. While the EPDS is a widely used self-screening tool now translated into fifty-eight languages (Cox et al. 2014), and recommended by national guidelines to assess mental health problems in the perinatal population (NICE National Collaborative Centre for Mental Health 2014, Matthey & Agostini 2017), it is not a diagnostic tool, and was never intended to be (Cox et al. 2014). Phillips et al. (2009) postulate that given the international use of the EPDS to measure depression in pregnancy and postpartum it would clearly be advantageous if it could be used to measure anxiety too. The univariant dimension of the EPDS has been challenged and anxiety items have been recognised and confirmed with factor analysis in the scale (Stuart et al. 1998, Brouwers et al. 2001, Ross et al. 2003, Jomeen & Martin 2005, Matthey et al. 2013a). The anxiety subscale
consists of three items; 3. I have blamed myself unnecessarily when things go wrong, 4. I have felt worried and anxious for no very good reason, and 5. I have felt scared and panicky for no very good reason. It was first referred to as the EPDS 3A by Matthey (2008). Optimum cut-off scores of ≥4 (Phillips et al. 2009) and ≥6 have been (Matthey 2008) determined following diagnostic interviews for anxiety disorders. Swalm et al. (2010) recommended a cut-off of ≥4 having concluded that that cut-off captured the top quartile of women in a large antenatal sample, but did not determine reliability with a diagnostic interview. The EPDS 3A has been validated in pregnancy (Swalm et al. 2010) and postpartum (Phillips et al. 2009, Swalm et al. 2010). Swalm et al. (2010) reported that it is emerging as a valid and reliable anxiety measurement tool.

### 3.2.2.1 Scoring of the EPDS and the EPDS 3A

The complete EPDS is a ten item self-report scale. The ten items are scored on a Likert scale from 0 (no, not at all) to 3 (yes, very often). Participants are asked to complete the scale based on how they felt over the past week. The minimum total score is 0, maximum 30, and a cut-off score of ≥13 suggests depression in the postpartum period (Cox et al. 2014).

Items specific to anxiety have been identified in the EPDS (Stuart et al. 1998, Brouwers et al. 2001, Jomeen & Martin 2005). Three anxiety items (Table 3.4) in particular were identified as the EPDS 3A (Matthey 2008). Total scores for the EPDS 3A range from 0-9 (Table 3.4).

<table>
<thead>
<tr>
<th>EPDS 3A</th>
<th>3. I have blamed myself unnecessarily when things go wrong,</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes, most of the time (3)</td>
</tr>
<tr>
<td></td>
<td>Yes, some of the time (2)</td>
</tr>
<tr>
<td></td>
<td>Not very often. (1).</td>
</tr>
<tr>
<td></td>
<td>No, never (0)</td>
</tr>
<tr>
<td></td>
<td>4. I have felt worried and anxious for no very good reason,</td>
</tr>
<tr>
<td></td>
<td>No, not at all (0)</td>
</tr>
<tr>
<td></td>
<td>Hardly ever (1)</td>
</tr>
<tr>
<td></td>
<td>Yes, sometimes (2)</td>
</tr>
<tr>
<td></td>
<td>Yes, very often (3)</td>
</tr>
<tr>
<td></td>
<td>5. I have felt scared and panicky for no very good reason.</td>
</tr>
<tr>
<td></td>
<td>Yes, quite a lot (3)</td>
</tr>
<tr>
<td></td>
<td>Yes, sometimes (2)</td>
</tr>
<tr>
<td></td>
<td>No, not much (1)</td>
</tr>
<tr>
<td></td>
<td>No, not at all (0)</td>
</tr>
</tbody>
</table>

Table 3-4 The three items in the EPDS 3A

Recommended cut-off scores vary from ≥4 to ≥6 depending on the literature (Matthey 2008, Phillips et al. 2009, Swalm et al. 2010) (Table 3.5). To determine the optimum cut-off score for the EPDS 3A, Phillips et al. (2009) validated the scale with a sample of women in a residential mother and baby unit. They ran specificity (how accurate the scale was at determining those without anxiety), positive predictive value (PPV) (how accurate it was at correctly recognising those with anxiety), negative predictive value (NPV) (does it incorrectly measure anxiety in those without anxiety) and misclassification rates for the EPDS 3A. They recommended that a cut-off
score of $\geq 4$ on the EPDS 3A scale to identify those women with a possible anxiety disorder. They did however, caution that 50% of the women who score 4 or over would not have the disorder.

In an earlier study, Matthey (2008) recommended a higher cut-off of $\geq 6$ for women in the postnatal period. The sample were recruited from antenatal classes. Following a diagnostic interview for anxiety disorders Matthey (2008) found that 7.6% ($n=18$) had an anxiety disorder, and 12 of those 18 women did not have a co-morbid depressive disorder. Following analyses for sensitivity, specificity, PPV and NPV Matthey (2008) recommended the higher cut-off of $\geq 6$ for women in the postnatal period.

Table 3.5 Studies reporting cut-off scores for the EPDS 3A

<table>
<thead>
<tr>
<th>Author and study</th>
<th>EPDS 3A Cut off scores</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phillips et al. (2009). Validation of the subscales in EPDS including the EPDS 3A.</td>
<td>$\geq 4$. They found that this cut off identified those with an anxiety disorder (sensitivity 63%, specificity 70%).</td>
<td>n=309 women of unsettled infants, with infants ranging in age from 1 week to 12 months</td>
</tr>
<tr>
<td>Swalm et al. (2010). To replicate the factor structure of the Anxiety subscale EPDS 3A.</td>
<td>$\geq 4$, deemed an appropriate cut off for the EPDS 3A as it captured the top quartile of the antenatal sample.</td>
<td>Women who participated in an Australian prospective cohort study. Antenatally, n=4,706. Postnatally, n=3,858.</td>
</tr>
<tr>
<td>Matthey (2008). To determine the optimum cut off for EPDS 3A.</td>
<td>Recommended cut-off of $\geq 6$ For women.</td>
<td>n=238 women at 6 weeks postpartum.</td>
</tr>
</tbody>
</table>

Later again, Swalm et al. (2010) recommended a cut-off of $\geq 4$ in a study of the factor structure of the EPDS in a sample of pregnant ($n=4706$) and postpartum ($n=3853$) women. The cut-off was based on the utility of the EPDS 3A at screening for anxiety symptoms in the top quartile of a sample of antenatal women.

Given the lack of conclusive evidence in relation to the cut-off scores in the literature, both will be applied to the sample in this study to report prevalence of anxiety (Table 3.5).

### 3.3 Aims and objectives of the systematic search and the literature review

#### 3.3.1 Aim

The aim of this review was two-fold;

A. To identify those studies reporting prevalence of anxiety according to the DASS 21 and/or DASS 42 and/or the EPDS 3A in pregnancy and at three months postpartum.

B. To identify those studies reporting factors associated with anxiety according to the DASS 21 and/or DASS 42 and/or the EPDS 3A in pregnancy and at three months postpartum.

#### 3.3.2 Objective

A. To report the prevalence of anxiety in pregnancy and at three months postpartum;

- As measured by the DASS 21 or DASS 42 anxiety subscale.
As measured by the EPDS 3A.

B. To report the prevalence and comorbidities of anxiety, depression and stress.
C. To report the factors associated with anxiety in pregnancy and at three months postpartum
   • As measured by the DASS 21 or DASS 42 anxiety subscale.
   • As measured by the EPDS 3A.

3.4 Methods

3.4.1 Inclusion and exclusion criteria

The Population, Exposure, Outcome and Study design (PEOS) acronym was used to define the eligibility criteria (Bettany-Saltivok & Mc Sharry 2016).

Eligibility criteria included;

P- Population:
Pregnant and postpartum women.
Multiparous and nulliparous women were included.

E- Exposure
Studies that used the DASS (42 and 21) anxiety subscale or the EPDS 3A to measure anxiety in pregnancy and up to three months postpartum.

O- Outcomes
Prevalence of anxiety (percentages and numbers)
   • In pregnancy,
   • Up to three months postpartum.

S- Study Design
• Cross sectional and observational studies.

Exclusion criteria were;

• Studies that reported prevalence of anxiety using measurement scales other than the DASS 21 or 42 anxiety subscale and the EPDS 3A.
• Systematic reviews, conference proceedings and poster presentations.
• Studies of the factor structure and analysis of the measurement scales DASS and EPDS.
• Studies that exclusively recruited women with a current diagnosed of a mental illness.
• Studies published in languages other than English.

3.4.2 Search string

Using a combination of Boolean operatives, the search string is shown in table 3.6.
The full search string used in each database is available in Appendix 1.
### Table 3-6 Overview of the search string

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DASS</strong></td>
<td></td>
</tr>
</tbody>
</table>
TI ( “DASS” OR “Depression Anxiety Stress Scale” OR “Depression Anxiety Stress Scales” OR “Depression Anxiety and Stress Scale” OR “Depression Anxiety and Stress Scales” “DASS-21” OR “DASS-42” OR “DASS21” OR “DASS42” ) OR AB ( DASS OR “Depression Anxiety Stress Scale” OR “Depression Anxiety Stress Scales” OR “Depression Anxiety and Stress Scale” OR “Depression Anxiety and Stress Scales” “DASS-21” OR “DASS-42” OR “DASS21” OR “DASS42” )  |
| **maternity** |  
TI OR AB (maternal OR maternity OR mother OR mothers OR motherhood OR pregnant OR pregnancies OR gestational OR gestation OR antenatal OR “ante-natal” OR “ante natal” OR prenatal OR “pre-natal” OR “pre natal” OR intranatal OR “intra-natal” OR “intra natal” OR peripartum OR “peri partum” OR “peri partum” OR postnatal OR “post-natal” OR “post natal” OR postpartum OR “post partum” OR “post partum” OR puerperium OR perinatal OR “peri natal” OR “peri natal” OR parturient OR birth OR childbirth )  |
| **EPDS** |  
TI ( “Edinburgh Postnatal Depression Scale” OR “Edinburgh post-natal depression scale” OR “Edinburgh Depression Scale” OR “EPDS” OR “EDS” ) OR AB ( “Edinburgh Postnatal Depression Scale” OR “Edinburgh postnatal depression scale” OR “Edinburgh Depression Scale” OR “EPDS” OR “EDS” )  |
| **anxiety** |  
TI ( anxiety OR anxieties OR anxious ) OR AB ( anxiety OR anxieties OR anxious ) OR DE “Anxiety” OR DE “Anxiety Disorders” ) AND AB ( TI ( anxiety OR anxieties OR anxious ) OR AB ( anxiety OR anxieties OR anxious ) OR DE “Anxiety” OR DE “Anxiety Disorders” )  |
| (DASS AND maternity) | (DASS AND maternity) OR (EPDS AND anxiety) |

#### 3.4.3 Search strategy

Five electronic bibliographic databases were searched; PubMed, CINAHL-NEW, PsycINFO, Maternity and Infant Care and EMBASE (Appendix 1). Databases were searched from their foundation up to 27th March 2017. No limitations were applied.

#### 3.4.4 Selection of studies

After removal of duplicates, the retrieved titles and abstracts were transferred to COVIDENCE software (Covidence) and studies published in languages other than English were removed during title screening. Following screening of the title and abstract, the full text of remaining articles were screened.

#### 3.5 Findings from the systematic search

A data extraction form was developed to capture the following data;

- Author, year and country of study.
- Study design and setting, and time of ascertaining prevalence of anxiety.
- Sample size and parity.
- Sociodemographic characteristics of the participants.
- Anxiety definition.
- Data analysis methods.
- Sociodemographic characteristics of the participants.
- Prevalence of anxiety according to the EPDS 3A and/or DASS 21/42 anxiety subscale and cut-off scores used.
- Anxiety prevalence in pregnancy (numbers and percentages).
j. Anxiety prevalence at three months postpartum (numbers and percentages).
k. Mental health history and co-morbidities of depression, stress and anxiety, when reported.
l. Factors reported as being associated or correlated with anxiety in pregnancy and/or postpartum.

3.5.1 Results

A total of 3685 citations were retrieved from the five databases searched (Table 3.7).

<table>
<thead>
<tr>
<th>DATABASE</th>
<th>CITATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CINAHL NEW</td>
<td>458</td>
</tr>
<tr>
<td>PsycINFO</td>
<td>685</td>
</tr>
<tr>
<td>PubMed</td>
<td>750</td>
</tr>
<tr>
<td>Maternity and Infant Care (MIDIRS online)</td>
<td>234</td>
</tr>
<tr>
<td>EMBASE</td>
<td>1558</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>3685</strong></td>
</tr>
</tbody>
</table>

The PRISMA flow diagram presents the numbers of citations retrieved, screened by title, abstract, full text and included (Moher et al. 2009) (Figure 3.1). Following removal of duplicates 2046 titles were screened, a further 1396 were excluded leaving 650 abstracts for screening. A further 581 studies were excluded which left 69 studies for full text screening. Following full text review sixty-one studies were excluded and eight studies were included. The studies and the reasons for exclusion are tabulated in Appendix 2.

Figure 3-1 Prisma Flow Diagram
3.5.2 Included studies

Eight studies were included; six were conducted during pregnancy (Reid et al. 2009, Huang et al. 2014, Luoma et al. 2015, Din et al. 2016, Jonsdottir et al. 2017, Signal et al. 2017) and two in the postpartum period (Miller et al. 2006, Bener et al. 2012) (Table 3.3). The eight studies were conducted in eight different countries: U.S.A., Scotland, Iceland, Pakistan, New Zealand, Finland, Qatar and Australia (Table 3.8). Six studies were cross sectional studies (Miller et al. 2006, Reid et al. 2009, Bener et al. 2012, Huang et al. 2014, Din et al. 2016, Signal et al. 2017) and two were prospective cohort studies (Luoma et al. 2015, Jonsdottir et al. 2017).

While none of the studies provided a definition of anxiety, the definition was implicit in the measurement scales used.

Four studies reported anxiety prevalence according to the DASS 21 anxiety subscale, two in pregnancy (Reid et al. 2009, Huang et al. 2014) and two postpartum (Miller et al. 2006, Bener et al. 2012). Two studies reported prevalence according to the DASS 42 anxiety subscale, both in pregnancy (Din et al. 2016, Jonsdottir et al. 2017). Two of these studies also reported the prevalence according to the DASS anxiety categories (normal, mild, moderate, severe and extremely severe anxiety), one in pregnancy (Reid et al. 2009) and the other postpartum (Miller et al. 2006). Two studies reported the prevalence of anxiety according to the EPDS 3A in pregnancy (Luoma et al. 2015, Signal et al. 2017) and no study reported prevalence according to the EPDS 3A at three months postpartum. Five studies used an English version of the measurement scale, and three studies used translated versions; one used an Urdu translation of the DASS 42 (Din et al. 2016), another an Icelandic translation of the DASS 42 (Jonsdottir et al. 2017), and the third used a Finnish translation of the EPDS 3A (Luoma et al. 2015).

Those studies using the DASS 21 all doubled the score and reported anxiety according to the cut-off scores recommended for analyses of the DASS 42 (Miller et al. 2006, Reid et al. 2009, Bener et al. 2012, Huang et al. 2014). Only one study using the DASS reported anxiety using a cut-off ≥10 (moderate anxiety and above) (Huang et al. 2014), the other four studies reported anxiety using the cut-off ≥8 (mild anxiety and above).

The two studies that reported the prevalence of anxiety according to the EPDS 3A both used the cut-off ≥ 6 (Luoma et al. 2015, Signal et al. 2017).

Sample sizes ranged from n=230 (Din et al. 2016) to n=1649 (Bener et al. 2012) women. Four studies were stand-alone studies (Miller et al. 2006, Reid et al. 2009, Bener et al. 2012, Din et al. 2016) and the remaining four were part of larger studies (Huang et al. 2014, Luoma et al. 2015, Jonsdottir et al. 2017, Signal et al. 2017). The larger studies included women recruited to the Pregnancy Migraine study (Huang et al. 2014), the Icelandic Study of Perinatal Mental Health (Jonsdottir et al. 2017), the E Moe, Māmā: Maternal Sleep and Health in Aotearoa/New Zealand

50
study (Signal et al. 2017) and the Maternal Depression and Child Development study (Luoma et al. 2015).

Six studies reported prevalence of anxiety in pregnancy, but the trimester of assessment varied. Three reported prevalence during the third trimester of pregnancy (Luoma et al. 2015, Din et al. 2016, Signal et al. 2017). One reported the prevalence at three time points in pregnancy (16, 25 and 36 weeks of pregnancy) (Jonsdottir et al. 2017), but only in those women who were assigned to a distress group after recruitment. One reported prevalence in each trimester of pregnancy (Reid et al. 2009), and one reported prevalence prior to 20 weeks of pregnancy (Huang et al. 2014).

The remaining two studies reported prevalence in the postpartum period, one reported prevalence from 0-6 months (Bener et al. 2012) and the other from six weeks to six months (Miller et al. 2006). No study reported anxiety at three months postpartum specifically. However, both studies included the three months postpartum time point and are therefore included in this review. In two of the studies prevalence was reported in two samples of women that were further categorised; one based on a positive score in the measurement scales after recruitment to the study (Jonsdottir et al. 2017) and the other based on women’s ethnicity (Signal et al. 2017).
Table 3-8 Included studies

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Country</th>
<th>Study design</th>
<th>Measurement Scale</th>
<th>Language</th>
<th>Sample size n=</th>
<th>Study setting</th>
<th>Time of assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In Pregnancy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huang et al 2014</td>
<td>USA</td>
<td>Cross sectional</td>
<td>DASS 21</td>
<td>English</td>
<td>498</td>
<td>Pregnancy Migraine Study Cohort</td>
<td>Prior to 20 weeks of pregnancy</td>
</tr>
<tr>
<td>Reid et al 2009</td>
<td>Scotland</td>
<td>Cross sectional</td>
<td>DASS 21</td>
<td>English</td>
<td>302</td>
<td>Community setting</td>
<td>Across the three trimesters of pregnancy</td>
</tr>
<tr>
<td>Jonsdottir et al 2017</td>
<td>Iceland</td>
<td>Prospective</td>
<td>DASS 42</td>
<td>Icelandic</td>
<td>562</td>
<td>Icelandic study of Perinatal Mental Health (ISPMH)</td>
<td>At three time points in pregnancy (16, 25 and 36 weeks)</td>
</tr>
<tr>
<td>Din et al 2016</td>
<td>Pakistan</td>
<td>Cross sectional</td>
<td>DASS 42</td>
<td>Urdu</td>
<td>230</td>
<td>Urban hospital</td>
<td>During the third trimester of pregnancy</td>
</tr>
<tr>
<td>Signal et al 2017</td>
<td>New Zealand</td>
<td>Cross sectional</td>
<td>EPDS 3A</td>
<td>English</td>
<td>1144</td>
<td>E Moe, Māmā: Maternal Sleep and Health</td>
<td>During the third trimester of pregnancy</td>
</tr>
<tr>
<td>Luoma et al 2015</td>
<td>Finland</td>
<td>Prospective</td>
<td>EPDS 3A</td>
<td>Finnish</td>
<td>329</td>
<td>Maternal depression and child development study</td>
<td>During the third trimester of pregnancy</td>
</tr>
<tr>
<td><strong>Postpartum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bener et al 2012</td>
<td>Qatar</td>
<td>Cross sectional</td>
<td>DASS 21</td>
<td>English</td>
<td>1659</td>
<td>Primary health care setting</td>
<td>From birth to six months postpartum</td>
</tr>
<tr>
<td>Miller et al 2006</td>
<td>Australia</td>
<td>Cross sectional</td>
<td>DASS 21</td>
<td>English</td>
<td>325</td>
<td>Maternal and child health centres</td>
<td>From six weeks to six months postpartum</td>
</tr>
</tbody>
</table>
3.6 Prevalence of anxiety in the perinatal period

Prevalence of anxiety in the perinatal period according to the DASS 21 anxiety subscale, the DASS 42 anxiety subscale and the EPDS 3A is reported. Prevalence of anxiety, depression and stress, measured using the DASS 21 or DASS 42 are presented, followed by prevalence of anxiety alone, prevalence of anxiety and co-existing depression and/or co-existing stress in pregnancy and postpartum. Finally in section 3.8 the factors associated with anxiety are reported.

In pregnancy, prevalence of anxiety ranged from 12.4% (n=62) according to the DASS 21 (Huang et al. 2014) to 50.9% (n=89) according to the DASS 42 (Jonsdottir et al. 2017) (Table 3.9). Postpartum, prevalence of anxiety was 12.6% (n=41) (Miller et al. 2006) and 13.1% (n=218) both according to the DASS 21 (Bener et al. 2012) (Table 3.10). Most studies found that prevalence of anxiety was higher than depression and stress in pregnancy (Reid et al. 2009, Huang et al. 2014, Din et al. 2016, Signal et al. 2017). However, postpartum prevalence of anxiety was lower than depression and stress (Miller et al. 2006, Bener et al. 2012). Only two studies reported co-morbidity of anxiety and depression or anxiety and stress at between 7% and 25%, both postpartum (Miller et al. 2006, Bener et al. 2012). None of the studies reported co-morbidity of anxiety and depression or anxiety and stress in pregnancy. A number of factors were reported as being associated with anxiety. These included young age, dissatisfaction with emotional support and depression in pregnancy (Reid et al. 2009, Signal et al. 2017) and unplanned pregnancy, lack of family support and caesarean section in the postpartum period (Bener et al. 2012).

3.6.1 Prevalence of anxiety in pregnancy

Six studies reported the prevalence of anxiety in pregnancy (Table 3.9). Two reported the prevalence according to the DASS 21 anxiety subscale, one with a cut-off score of ≥8 (Reid et al. 2009) and the other with a cut-off score of ≥10 (Huang et al. 2014). Two studies reported the prevalence according to the DASS 42, both with a cut-off score of ≥8, (Din et al. 2016, Jonsdottir et al. 2017) and two according to the EPDS 3A (≥6). Only one study reported prevalence in nulliparous women (Luoma et al. 2015).

Two studies reported prevalence of anxiety according to the DASS 21, one at 24% (n=74) (Reid et al. 2009), and the other at 12.4% (n=62)(Huang et al. 2014). Using the same cut-off score of ≥10 as Huang et al. (2014), Reid et al. (2009) still reported a higher prevalence of anxiety at 18% (n=55). Prevalence of 42% (n=96) was reported during the third trimester in a sample of women in Pakistan (Din et al. 2016). No explanation was offered for the high prevalence however, they did use a translated version of the DASS 42 (Din et al. 2016). Jonsdottir et al. (2017) also reported a high prevalence at each of the three time points in pregnancy (47.4%, n=168; 51.7%, n=139 and 50.9%, n=89), again using a translated version of the DASS 42. The high prevalence rate in Jonsdottir et al. (2017) sample is attributed to the fact that women included in the study were
identified as being distressed following a positive score on the DASS 42 and/or the EPDS at any one of the three time points of assessment in pregnancy. Those women identified as distressed were allocated to a group and identified as the distress group (n=360). Those women who did not have a positive score were allocated to the non-distress group (n=202). Jonsdottir et al. (2017) reported prevalence of anxiety for those women in the distress group only and did not provide comparative data for those women in the non-distress group.

Table 3.9 Prevalence of anxiety in pregnancy

<table>
<thead>
<tr>
<th>Cut-off score</th>
<th>Prevalence</th>
<th>Parity</th>
<th>Time ascertained</th>
<th>Categories n= (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS 21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥8, ≥10</td>
<td>24% (n=74)</td>
<td>Nulliparous and multiparous</td>
<td>Anytime during pregnancy</td>
<td>Mild 6.3%, n=19; Moderate 10.6%, n=32; Severe 2.3%, n=7; Extremely severe 5.3%, n=16.</td>
</tr>
<tr>
<td></td>
<td>18% (n=55)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DASS 21</td>
<td>≥10</td>
<td>Not reported</td>
<td>Prior to 20 weeks’ gestation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.4% (n=62)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DASS 42</td>
<td>≥8</td>
<td>Nulliparous and multiparous</td>
<td>During 3rd trimester of pregnancy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>42% (n=96)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DASS 42</td>
<td>≥8</td>
<td>Not reported</td>
<td>During each trimester, 16, 25 and 36 weeks’ gestation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>47.4% (n=168)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>51.7% (n=139), 50.9% (n=89)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPDS 3A</td>
<td>≥6</td>
<td>Nulliparous</td>
<td>During 3rd trimester of pregnancy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17% (n=55)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPDS 3A</td>
<td>≥6</td>
<td>Nulliparous and multiparous</td>
<td>35-37 weeks’ gestation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.1% (n=148) (Non-Maori) 25.2% (n=102) (Maori)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Prevalence not reported in full sample - women categorised as ‘distressed’ (n=360)/’non distressed’ (n=202) and prevalence was reported in the distressed group only. Numbers and percentage vary due to attrition.

Two studies reported prevalence according to the EPDS 3A in pregnancy. One reported anxiety at 17% (n=55) in nulliparous women (Luoma et al. 2015), and the other at 20.1% (n=148) in non-Maori women and 25.2% (n=102) in Maori women (Signal et al. 2017). Signal et al. (2017) did not report prevalence for the entire sample but did report that the Maori women were disproportionately more affected by anxiety. Apart from the women in the distress group (Jonsdottir et al. 2017) and the sample of women in Pakistan (Din et al. 2016) who had a reported prevalence of anxiety at 42% and 51.7% respectively, the prevalence of anxiety ranged from 12.4% to 18% according to the DASS 21(≥10) and from 17% to 25% according to the EPDS 3A (≥6).

3.6.1.1 Prevalence of anxiety in pregnancy according to the DASS 21 categories

Only one study reported anxiety according to the DASS categories in pregnancy (Reid et al. 2009) (Table 3.9). In Reid et al. (2009) sample of 302 women across the entire pregnancy, 6.3% (n=19)
reported mild anxiety, 10.6% (n=32) reported moderate anxiety, 2.3% (n=7) reported severe anxiety and 5.3% (n=16) reported extremely severe anxiety.

### 3.6.2 Prevalence of anxiety in the postpartum period

There was less variation in the reported prevalence of anxiety in the postpartum period (Table 3.10). Prevalence was 12.6% (n=41) in a nulliparous sample of women (Miller et al. 2006) and 13.1% (n=218) in a sample of women with mixed parity (Bener et al. 2012) according to the DASS 21 (≥8). The former study also reported prevalence of anxiety according to the DASS categories in the postpartum period (Miller et al. 2006), 4.7% (n=15) had mild, 3.7% (n=12) moderate, 1.2% (n=4) severe and 3% (n=10) extremely severe anxiety.

<table>
<thead>
<tr>
<th>Cut-off score</th>
<th>Prevalence</th>
<th>Parity</th>
<th>Time of assessment</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS 21 ≥8</td>
<td>12.6% (n=41) (Miller et al. 2006)</td>
<td>Nulliparous</td>
<td>From six weeks to six months postpartum</td>
<td>Mild 4.7%, n=15; Moderate 3.7%, n=12; Severe 1.2%, n=4; Extremely severe 3%, n=10</td>
</tr>
<tr>
<td>DASS 21 ≥8</td>
<td>13.1% (n=218) (Bener et al. 2012)</td>
<td>Nulliparous and multiparous</td>
<td>From birth to six months postpartum</td>
<td></td>
</tr>
</tbody>
</table>

### 3.6.3 Prevalence of anxiety and parity

Two of the studies reported prevalence in nulliparous women only, but in pregnancy (Luoma et al. 2015), and in the postpartum period (Miller et al. 2006) (Table 3.11). Prevalence of anxiety was reported at 17% (n=55) in the third trimester of pregnancy (Luoma et al. 2015) and 12.6% (n=41) between 6 weeks to 6 months postpartum (Miller et al. 2006).

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Parity</th>
<th>Time of assessment</th>
<th>Prevalence of anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luoma et al 2015</td>
<td>Nulliparous</td>
<td>During third trimester of pregnancy</td>
<td>17% (n=55)</td>
</tr>
<tr>
<td>Miller et al 2006</td>
<td>Nulliparous</td>
<td>From six weeks to six months postpartum</td>
<td>12.6% (n=41)</td>
</tr>
</tbody>
</table>
3.7 Prevalence of anxiety, depression and stress in pregnancy

Five studies reported prevalence of anxiety, depression and stress in pregnancy (Table 3.12). Prevalence of anxiety was higher than stress and/or depression in pregnancy according to the DASS 21 and 42 and the EPDS.

<table>
<thead>
<tr>
<th>Scale</th>
<th><strong>DASS 42</strong></th>
<th><strong>DASS 21</strong></th>
<th>DASS21</th>
<th>EPDS 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Groups</td>
<td>/</td>
<td>/</td>
<td>Pregnancy distress group</td>
<td>Non-distress group</td>
</tr>
<tr>
<td>DASS-Depression ≥10</td>
<td>29% (n=67)</td>
<td>*5.8% (n=29)</td>
<td>**T1 45.5% (n=164), T2 37.5% (n=101), T3 36% (n=67)</td>
<td>/</td>
</tr>
<tr>
<td>DASS-Anxiety ≥8</td>
<td>42% (n=96)</td>
<td>*12.4% (n=62)</td>
<td>**T1 47.4% (n=168), T2 51.2% (n=139), T3 50.9% (n=89)</td>
<td>/</td>
</tr>
<tr>
<td>DASS-Stress ≥14</td>
<td>36% (n=83)</td>
<td>*7.6% (n=38)</td>
<td>**T1 51.8% (n=183), 54.1% (n=146), T3 51.1% (n=95)</td>
<td>/</td>
</tr>
<tr>
<td>EPDS 3A ≥6</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>EPDS/EDS</td>
<td>/</td>
<td>/</td>
<td>EDS ≥12, **T1, 42.5% (n=150), T2 41.3% (n=109), T3 42.8% (n=79)</td>
<td>/</td>
</tr>
</tbody>
</table>

* Huang et al 2014 reported prevalence for those scoring moderate or above; cut-off score for depression ≥13; anxiety ≥10 and stress ≥18. **T1 = 16th week, T2 = 25th week, T3 = 36th week of pregnancy.

Din et al. (2016) and Huang et al. (2014) both reported a higher prevalence of anxiety (42%, n=96 and 12.4%, n=62, respectively) compared to either depression (29%, n=67 and 5.8%, n=29 respectively) or stress (36%, n=83 and 7.6%, n=38 respectively) in early pregnancy and in the third trimester respectively. Reid et al. (2009) reported the same prevalence of anxiety and stress in pregnancy (both 24%, n=74), and that both were higher than depression (20%, n=61). Whereas, Jonsdottir et al. (2017) reported higher prevalence of stress in the pregnancy distress group, closely followed by anxiety and depression in that order at each of the three time points in pregnancy.
Three studies reported prevalence of depression according to the entire EPDS (Reid et al. 2009, Jonsdottir et al. 2017, Signal et al. 2017). But only one, Signal et al. (2017), reported prevalence of anxiety according to the EPDS 3A and found that both Maori and non-Maori women reported a higher prevalence of anxiety (25.2% n=102, and 20.1% n=148 respectively) than depression (22.4% n=90 and 15.3% n=113 respectively) in the third trimester of pregnancy.

3.7.1 Prevalence of co-morbid anxiety depression and/or stress in pregnancy

None of the studies reviewed reported the prevalence of co-morbid anxiety, depression and/or stress.

3.7.2 Prevalence of anxiety, depression and stress postpartum

In contrast to the prevalence of anxiety in pregnancy, which was predominantly higher than stress or depression, the reported prevalence of depression was greater than anxiety in the postpartum period (Table 3.13). According to the DASS 21, Bener et al. (2012) and Miller et al. (2006) both reported higher prevalence of depression (18.6%, n=308 and 40.4%, n=38 respectively), than either anxiety (13.1%, n=218 and 19.1%, n=18 respectively), or stress (8.7%, n=145 and 16%, n=15 respectively). In addition, Miller et al. (2006) using a cut-off score of ≥ 9 for the full EPDS, reported prevalence of depression at 24.7% (n=80), but the authors did not report anxiety according to the EPDS 3A.

3.7.2.1 Prevalence of co-morbid anxiety, depression and/or stress postpartum

Both studies also reported the prevalence of co-morbid anxiety and depression in the postpartum period according to the DASS 21. Bener et al. (2012) found a high co-morbidity of anxiety with either depression or stress or both. On further analyses of the 13.1% (n=218) of women with anxiety, Bener et al. (2012) found the majority, 62% (n=135) of women had anxiety alone. Of the remaining 38% (n= 83) of women with anxiety, 21% (n=46) had comorbid anxiety and depression, 9% (n=20) had comorbid anxiety and stress, and 7% (n=17) had comorbid anxiety, depression and stress.

Miller et al. (2006) reported the full DASS 21 and full EPDS findings for the sample (n=325) and then further analysed the groups, to demonstrate the overlap between anxiety and depression and/or stress.

Miller et al. (2006) also reported that 24.6% (n=23) of those women with a positive score on any one of the DASS scores (28.9% n=94) had comorbid anxiety and depression. That figure is similar to Bener et al. (2012) who reported that 21% (n=46) of the 62% (n=135) of women with anxiety had comorbid anxiety and depression.

In summary, according to the studies reviewed the prevalence of anxiety was higher than depression in pregnancy however, conversely in the postpartum period the prevalence of
Depression was higher than anxiety. Furthermore, a considerable number of women had comorbid anxiety and depression in the postpartum period.

### Table 3.13 Prevalence of anxiety and co-morbid depression and stress postpartum

<table>
<thead>
<tr>
<th>Scale</th>
<th>DASS 21</th>
<th>DASS 21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author</strong></td>
<td>Bener et al 2012</td>
<td>Miller et al 2006</td>
</tr>
<tr>
<td><strong>Time period</strong></td>
<td>Postpartum</td>
<td>Postpartum</td>
</tr>
<tr>
<td><strong>Sub-Groups</strong></td>
<td>/</td>
<td>**Women who scored above normal on DASS, 28.9% n=94/325</td>
</tr>
<tr>
<td><strong>DASS-depression ≥10</strong></td>
<td>18.6%, n=308</td>
<td>40.4% n=38</td>
</tr>
<tr>
<td><strong>DASS-Anxiety ≥8</strong></td>
<td>*13.1%, n=218</td>
<td>19.1% n=18</td>
</tr>
<tr>
<td><strong>DASS-Stress ≥14</strong></td>
<td>8.7% n=145</td>
<td>15.9% n=15</td>
</tr>
<tr>
<td><strong>EPDS≥9 (depression)</strong></td>
<td>/</td>
<td>24.7% n=80.</td>
</tr>
</tbody>
</table>

*62% (n=135) women had anxiety, 21% (n=46) co-morbid anxiety and depression, 9% (n=20) co-morbid anxiety and stress, 7% (n=17) co-morbid anxiety, depression and stress. **24.6% (n=23) women had co-morbid anxiety and depression.

### 3.8 Factors associated with anxiety

Only three of the studies reported factors associated with anxiety. Two reported factors associated with anxiety in pregnancy (Reid *et al.* 2009, Signal *et al.* 2017) and one reported factors associated with anxiety in the postpartum period (Bener *et al.* 2012). Two studies reported factors associated with anxiety as measured by the DASS 21 anxiety subscale ≥8 (Reid *et al.* 2009, Bener *et al.* 2012) and one as measured by the EPDS 3A ≥6 (Signal *et al.* 2017).

A lack of social support (Reid *et al.* 2009), and a prior history of depression (Signal *et al.* 2017) were reported as being significantly associated with anxiety in pregnancy (Table 3.14). A lack of social support, financial stressors including difficulty managing within income, unplanned pregnancy and caesarean section were reported as being significantly associated with anxiety in the postpartum period (Bener *et al.* 2012).

#### 3.8.1 Factors associated with anxiety in pregnancy

<table>
<thead>
<tr>
<th>Study</th>
<th>Measurement scale</th>
<th>Analysis used</th>
<th>Factors associated with anxiety in pregnancy</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reid <em>et al.</em> (2009)</td>
<td>DASS 21 Anxiety subscale</td>
<td>Multiple regression</td>
<td>Dissatisfaction with emotional support from a partner. Distress from life events. Dissatisfaction with practical support from another. Lower ideal levels of maternal emotional support.</td>
<td>OR (95% CI) 1.64, (1.21-2.23)</td>
</tr>
<tr>
<td>Signal <em>et al.</em> (2017)</td>
<td>EPDS 3A</td>
<td>Logistic regression</td>
<td>Prior history of depression. Age categories of: (i) 16-19 years. (ii) 20-24 years. Ethnicity Maori, Non-Maori.</td>
<td>1.98, (0.78-5.36) 2.39, (1.07-5.36) 1.00 (0.71-1.39)</td>
</tr>
</tbody>
</table>
Reid et al. (2009) explored the predictors of anxiety in pregnancy using multiple regression analysis (Table 3.14). They found that dissatisfaction with emotional support from a partner, distress from life events, dissatisfaction with practical support and lower than ideal levels of maternal emotional support were all associated with anxiety in pregnancy (Reid et al. 2009). Signal et al. (2017) reported the difference in factors related to anxiety using logistic regression analysis. They found that a history of depression was associated with anxiety in pregnancy (Signal et al. 2017). Signal et al. (2017) also found that anxiety was significantly associated with age categories of 16-19 years and 20-24 years. In relation to ethnicity, anxiety was found to be higher in Maori women (25%) than non-Maori New Zealand women (20%) (Signal et al. 2017).

3.8.2 Factors associated with anxiety postpartum

Using chi-square to test for differences in proportions, Bener et al. (2012) found that of the 13.1% (n=218) women who reported anxiety according to the DASS 21 anxiety subscale (≥8), 25.2% did not have strong family support family support (p<0.001), 18.1% (n=41) were dissatisfied with married life (p<0.001), 29.4% had difficulty managing within income (p=0.003) and 55% did not plan their pregnancy (p=0.006) (Table 3.15). Using multivariable logistic regression analysis, Bener et al. (2012) found that unplanned pregnancy, lack of family support, dissatisfaction in married life and giving birth by caesarean section were all significantly associated with anxiety in the postpartum period (Table 3.10).

<table>
<thead>
<tr>
<th>Study</th>
<th>Analysis used</th>
<th>Factors associated with anxiety postpartum</th>
<th>DASS ≥8 13.1% (n=218)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bener et al. (2012)</td>
<td>Chi-square test.</td>
<td>Strong family support (p&lt;0.001)</td>
<td>Yes 74.8% (n=163)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Satisfaction with married life (p&lt;0.001)</td>
<td>No 25.2% (n=55)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Difficult to manage within income (p=0.003)</td>
<td>Yes 81.2% (n=177)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Planned pregnancy (p=0.006)</td>
<td>No 18.8% (n=41)</td>
</tr>
<tr>
<td>Multivariate analysis</td>
<td></td>
<td>Unplanned pregnancy.</td>
<td>Yes 70.6% (n=154)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack of family support.</td>
<td>No 29.4% (n=64)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dissatisfaction in married life.</td>
<td>Yes 45% (n=98)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Giving birth by caesarean section.</td>
<td>No 55% (n=120)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjusted OR (95% CI)</td>
<td>1.4 (1.1-1.8); p = 0.035</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.9 (1.3-2.8); p &lt; 0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.6 (1.1-2.5); p = 0.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.5 (1.1-1.2); p = 0.012</td>
</tr>
</tbody>
</table>

3.9 Conclusion

Findings from the eight studies identified in the systematic search and included in the literature review show that prevalence of anxiety in pregnancy ranged from 12.4% to 51.7%, and from
12.6% to 13.1% in the postpartum period. Prevalence varied depending on the time of assessment, scale used and the population. The prevalence of anxiety in the third trimester of pregnancy was 42.0% in a sample of women in Pakistan and 50.9% in a sample of women who, after recruitment, were identified as being ‘a distressed’ group in an Icelandic study. Otherwise, the prevalence of anxiety as measured by the DASS 21 varied from 12.4% in an American sample, to 24.0% in a Scottish sample of women in pregnancy. A similar variance of prevalence, from 17.0% to 25.2%, was reported using the EPDS 3A.

In the postpartum period, overall, prevalence of anxiety was lower at 12.6% and 13.1% according to the two studies, both used the DASS 21. None of the studies identified in the search reported prevalence according to the EPDS 3A in the postpartum period. None of the studies reviewed used the two anxiety measurement scales to report anxiety in the same cohorts.

Compared to prevalence of depression, prevalence of anxiety was higher in pregnancy but lower postpartum. In relation to comorbidity of anxiety and depression no studies reported co-morbidity in pregnancy but up to a quarter of women with anxiety in the postpartum period also had comorbid depression.

While the number of factors reported were limited, dissatisfaction with emotional and practical support were significantly associated with anxiety in both pregnancy and postpartum. In pregnancy, lower than ideal levels of maternal emotional support, a history of depression and young age were significantly associated with anxiety. While postpartum anxiety was found to be higher in ethnic minority groups, social support was associated with anxiety, as was dissatisfaction with married life, having an unplanned pregnancy and giving birth by caesarean section.
4 Chapter 4 Study methods

4.1 Introduction

In the study methods chapter the study’s aim and objectives, design and data collection methods are made explicit, together with the sampling strategy and recruitment and retention processes. The procedure for data analysis is described, as well as the ethical principles that underpinned this study.

4.1.1 Aim of the study

The overall aim of this research study is to identify the prevalence of anxiety in a sample of nulliparous women (n=1668) in pregnancy and at three months postpartum, and explore the associated factors.

Objectives

The objectives are;

1. To report the prevalence of anxiety in pregnancy (Time 1, T1) and at three months postpartum (Time 2, T2) according to the;
   - DASS 21 anxiety subscale, using a cut-off score ≥8.
   - DASS 21 anxiety subscale, according to the five categories of normal to extremely severe (normal, mild, moderate, severe, extremely severe).
   - EPDS 3A, using the cut-off score of ≥4.
   - EPDS 3A, using the cut-off score of ≥6.

2. To report the prevalence of anxiety experienced by the women as reported by a single-item statement;
   - anytime in their life time; in the 12 months before pregnancy; and since the start of the pregnancy.
   - at three months postpartum.

3. To report the changes in the prevalence of anxiety for women with/without anxiety in pregnancy at three months postpartum according to the;
   - DASS 21 anxiety subscale (≥8).
   - EPDS 3A (≥4).
   - EPDS 3A (≥6).

4. To report the comorbidities of depression and stress
   - At T1, as per the depression, anxiety and stress scales in DASS 21.
   - At T2, as per the depression, anxiety and stress scales in DASS 21.
5. To identify the demographic and clinical factors (section 4.4.2) associated with anxiety at T1 and T2;
   • according to the DASS 21 anxiety subscale (≥8).
   • according to the EPDS 3A (≥6).

4.2 Research design

This is a quantitative, longitudinal study, chosen because of its capacity to answer the research question (Polit & Beck 2008). The quantitative research design is used when measuring phenomena, in this case anxiety, using numerical data, such as the measurement scales DASS 21 and EPDS 3A (Corrigan 2013). (Corrigan 2013). The longitudinal design enabled gathering data at three-time points from the same sample of women. This enabled the identification of changes in the prevalence of anxiety between two time points, during pregnancy and three months postpartum. While the surveys provided the majority of factors to be explored for associations with anxiety, data obtained from consenting women’s hospital records enabled identification of clinical factors (e.g., mode of birth, baby’s birth weight) and type of healthcare used (i.e., private care or public health care) in the analysis.

This researcher was an active member of the larger MAMMI study team. As such my responsibilities included recruiting and retaining women to the study as well as data management and dissemination of study findings. Over the course of two years I attended monthly team meetings and was involved in the day-to-day running of the study. On a personal level I was actively involved and charged with recruitment and retention of participants to the study, keeping the personal data base up to date, inputting data from the surveys and packing and posting surveys and receiving surveys. The recruitment process involved visiting two of the site hospitals weekly over the course of one and a half years to meet with the gatekeepers (midwives) and manage the logistics of the study on those sites. This included supplying study packs, discussing recruitment of women with the staff onsite, gathering lists of those women who expressed interest in participating in the study. I was also responsible for following up and telephoning those women who expressed an interest in the study.

Data management included cleaning and checking the databases on an ongoing bases. The data management also included recognition and adherence to the Data Protection Act 1988 and 2003 (Data Protection Commissioner 1998 & 2003) and more recently by the Data Protection Commission (2018). Dissemination involved being part of the research team managing, organising and executing conferences for the MAMMI study.

The survey tools were in place when I joined the study and I used the data gathered from surveys 1 (antenatal) and 2 (3-months postpartum), and data from consenting women’s hospital records, for my study.
4.2.1 Data collection

Data were collected using self-completion surveys and from consenting women’s hospital records. The surveys were designed and used in the larger Maternal health And Maternal Morbidity in Ireland (MAMMI) study which aimed to identify the existence, extent and prevalence of maternal morbidities in pregnancy and at four time points up to twelve months postpartum. Survey 1 was developed to be completed in early pregnancy, T1 and survey 2 for completion at three months postpartum, T2, and the measurement scales, the DASS-21 and the EPDS were embedded in both surveys. Sociodemographic and a range of other factors were also in both survey tools. Data from consenting women’s hospital records were also collected as part of the larger study.

4.2.1.1 DASS 21

The DASS 21 (Appendix 3) contains 21 items with seven items related to each of three subscales; anxiety, depression and stress. Each item is scored on a Likert scale from 0-3 with 0 corresponding to never experienced anxiety, and 3 to almost always experienced anxiety (Appendix 4). The scores obtained can be categorised using cut-offs into the discrete categories of normal (0-7), mild (8-9), moderate (10-14), severe (15-19) and extremely severe (≥20) anxiety. Anxiety can also be categorised into a binary variable for those scoring normal; score <8, or ≥8; mild to extremely severe anxiety. In this study, the prevalence of anxiety is reported according to both reporting methods.

4.2.1.2 EPDS

The EPDS (Appendix 5) was developed as a unidimensional scale to measure depression in women in the postpartum period and has been found to contain anxiety items. It is a ten-item scale with responses scored on a Likert scale from 0-3, for items 1, 2 and 4, and inversely from 3-0 for all the remaining seven items 9 (Appendix 6). A 0 score corresponds to No, not at all, and 3 corresponds to Yes, very often. A cut off of ≥13 for the ten-item scale has been suggested for possible depression (Cox et al. 1987).

4.2.1.3 EPDS 3A

The anxiety subscale in the EPDS is composed of items 3, 4 and 5 as described in chapter 2. Item 4 is scored 0-3, and the remaining two items are scored inversely from 3-0. The cut-off scores recommended are ≥4 (Phillips et al. 2009, Swalm et al. 2010) and ≥6 (Matthey 2008). Both cut-off scores will be used to report the prevalence of anxiety in this study.
4.2.1.4  Single anxiety item statement

The single anxiety statement was included in both survey 1 and 2. The format was slightly different between the two surveys. In survey 1 the statement sat in a selection of health related statements. It read; “have you experienced any of the following;” followed by many statements including anxiety which read; “Intense anxiety (such as panic attacks)”. The statement appeared three times in survey one related to the following three time points; “At any time in your life before the pregnancy”, “During the 12 months before your pregnancy”, “Since the start of your pregnancy”. In survey 2 the anxiety statement stood alone and read “Since the birth, have you experienced anxiety or panic attacks”. In both surveys, the four optional responses, indicating frequency, were; never, rarely, occasionally and often. Woolhouse et al. (2009) reported prevalence from a cohort of nulliparous women (n=1431) in the Maternal Health Study in Australia using the same single item statement to report anxiety in early pregnancy and at three months postpartum, thus enabling direct comparison of prevalence in a similar cohort of women.

4.2.2  Sampling strategy.

The sample of women for this study (n=1668) were identified from women recruited to the larger MAMMI study. The women were recruited by purposive sampling from two, large Irish maternity hospitals/units. All eligible nulliparous women attending their first visit (booking visit) in both maternity units, usually between the 12th and 14th week of pregnancy, were offered a study information pack by the midwives or midwifery students conducting the visit.

4.2.2.1  Eligibility criteria

Eligibility for inclusion in the study was based on the criteria for the overall MAMMI study as well as including the specific criteria for this study denoted below*.

Inclusion criteria;
- nulliparous women (women who had no previous pregnancy resulting in a live or a still birth),
- women who were able to read and understand English sufficiently to complete the surveys,
- aged 18 years or more,
- *women included in this study must have consented to have their hospital records accessed.

Exclusion criteria;
- women who could not read and understand English sufficiently to complete the surveys,
- women under 18 years of age,
• women who, after recruitment, experienced miscarriage or stillbirth, or whose baby was ill in Neonatal Intensive Care Unit (NICU) or died.
• *Women who did not give consent to access their hospital records were not eligible for inclusion in this study.

4.2.2.2 Recruitment process.
Recruitment from the first site hospital, The Rotunda, Dublin, started on 31 January 2012 and closed in October 2014. Recruitment from the second site hospital, University College Hospital Galway, started in October 2013 and closed in July 2014 (see flow chart 4.1).

The recruitment process involved informing eligible women of the study in three ways;
• in a leaflet included in their appointment letter for the first booking visit,
• by posters in the respective outpatient departments where booking visits took place and
• by a midwife at their first booking visit to the maternity hospital.

At the first booking visit to the hospital/clinic, all eligible nulliparous women were informed of the MAMMI study. If women expressed an interest in taking part they were given a study pack that contained the following:
• a letter of introduction (Appendix 7),
• an information booklet (Appendix 8),
• survey 1(http://www.MAMMI.ie/),
• a freepost envelope,
• two copies of the consent form (Appendix 9), one to be retained by the woman.

The information booklet was awarded the plain English award by the National Language Literacy Agency (NALA) for use by the MAMMI study. Within the booklet a comprehensive overview and explanation of the MAMMI study was presented in a question and answer format with questions such as ‘Why have I been given this booklet?’ and “What sort of questions will you ask me?”. Contact details for the study team were available in the booklet including a direct phone number.

The survey tools were designed as A4 sized, bound booklets with between 51 (survey 1) and 77 pages (Survey 2). The survey included questions on sociodemographic factors, women’s past and present general health, urinary and bowel symptoms, sexual health, pain and mental health and emotional well-being. The surveys are available on the studies website (http://www.MAMMI.ie/).

If a woman accepted the study pack their consent was sought to share their name and telephone number with a member of the research team who telephoned them 1-2 weeks later to;
• offer more information about the study by a member of the research team,
• answer their questions and/or queries about the study, and
• find out if the woman was still interested in participating.
Women who declined to take part at this point received no further contact. Women who expressed a willingness to participate were asked to complete and return the consent form and survey in the freepost envelope provided. If survey 1 was not received within 3-4 weeks, a reminder web-text was sent. One further reminder was sent three weeks later and, if survey 1 was not received after that, no further contact was attempted.

4.2.2.3 Postnatal follow-up/retention

Based on the discharge information from consenting women’s hospital records, survey 2 was posted to eligible women at approximately 10 weeks after the date of her discharge from hospital. If survey 2 was not returned after 4 weeks, women received a telephone call reminder. If survey 2 was not returned within two weeks, a sensitively worded text was sent two weeks later. If the survey 2 was not returned within a further 2 weeks, it was reposted. No further reminders were issued to women who did not respond. Similarly no reminders were sent to those who indicated that they wished to withdraw from the study.

4.2.2.4 Recruitment outcome

A total of 5439 study packs were distributed and 2174 (40%) surveys were returned (Figure 4.1). This response rate is at the higher level of the response rate of 20% - 40% anticipated by Woolhouse et al. (2009) in the maternal health study on which the MAMMI study was based. Indeed their response rate was 24%, but the women were recruited by mail and not by midwives in the antenatal clinics. Of the 2174 women who returned survey 199 women were excluded or ineligible for postpartum follow-up because they had suffered a miscarriage or stillbirth, their baby died or was ill in the NICU or they chose to withdraw or they did not respond. The remaining 2075 women were eligible for follow-up at 3 months postpartum. Of those women, 1773 (85%) returned survey 2. Of those women 1668 (94%) gave consent for access to hospital records and were therefore eligible for inclusion in this study. Over 97% (n=1528) of women provided the date of completion of survey 1. The majority of women (87.4% n=1335) completed survey 1 in the second trimester of pregnancy (13-25+6 weeks gestation), 9.6% (n=147) completed it in the first trimester (up to 12+6 weeks gestation) and 3% (n=46) completed it in the third trimester of pregnancy (after 26 completed weeks gestation).
Flow chart, Recruitment process survey 1 & 2.

**Figure 4-1 Recruitment and retention process for Survey 1 and Survey 2**
4.3 Reliability and validity of the anxiety measurement scales

The reliability of a measurement scale refers to an instrument’s dependability, precision and comparability (Cluett & Bluff 2006). Reliability is based on a number of factors including internal consistency, and the most commonly reported measure of internal consistency is Cronbach’s alpha (\(\alpha\)) (Martin & Savage-McGlynn 2013). Typically values of \(\alpha = 0.80\) or greater are considered excellent, with higher values demonstrating greater degrees of internal consistency, but an \(\alpha = 0.60\) can be acceptable when there are fewer scale items (Martin & Savage-McGlynn 2013).

Validity refers to the extent to which a scale measures what it is supposed to measure as well as to the scales ability to reflect the construct being examined (Cluett & Bluff 2006, Burns & Grove 2012, Field 2014). Types of validity include concurrent validity and factorial validity (Watson 2013). Concurrent validity measures the extent to which a scale correlates with other established scales, while factorial validity is concerned with the underlying structure and/or relationship between items in a scale. For example, correlational analysis is concerned with demonstrating the relationship of one anxiety scale with another scale measuring anxiety. Whereas, factorial analysis is concerned with the underlying structure or the relationship between items in a measurement scale (Watson 2013). The objective of factor analysis is to identify those variables that are similar, but not identical to one another (Field 2014) and allows for variables to be condensed into smaller subsets or groups of items (Martin & Savage-McGlynn 2013). The relationship identified amongst variables gives an interpretation of the domain (for example; anxiety) that they are measuring, which is useful in scales such as the DASS 21 and the EPDS, which measure more than one domain.

Other forms of reporting validity include sensitivity and specificity. Sensitivity and specificity are used to report how good a test is at reporting those with or without a diagnosis. It refers to the ability of a scale/test to discriminate between cases and non-cases, for example determining those with and without anxiety. Sensitivity related to the scales ability to detect those who do have anxiety. Whereas specificity refers to the ability of the scale to detect only those who do not have anxiety thus not to provide “false positives” (Watson 2013, p. 328). A balance exists between the two insofar as sensitivity increases specificity can decrease, but an instrument that scores high on both is desirable (Watson 2013).

No Irish studies were identified that reported the reliability or the validity of either the DASS or the EPDS.

4.3.1 Reliability of the DASS 21 anxiety subscale

The reliability of the DASS 21 anxiety subscale is reported as excellent in both the non-perinatal study population and perinatal samples (Table 4.2). According to six studies, Cronbach’s alpha
ranged from 0.65 to 0.87 for the anxiety subscale of the DASS 21. Lovell et al. (2015) reported an α = 0.76, indicating acceptable internal consistency in a study of 3601 Australian mothers of children aged ≤5 years of age. In another study with 221 mothers, Tran et al. (2012) reported α = 0.77. Antony et al. (1998) reported an α = 0.87, albeit in the mixed, non-perinatal sample of participants with an anxiety disorders (clinical) and those without (non-clinical).

Reliability analysis of the DASS 21 anxiety subscale was performed in this study. The Cronbach’s alpha in this study was α = 0.65 (n=1633) in pregnancy and at α = 0.71 (n=1644) at three months postpartum. Albeit lower than the other studies reviewed it is an acceptable level.

### Table 4.1 DASS 21 anxiety subscale: Cronbach’s alpha

<table>
<thead>
<tr>
<th>Author, Year and country</th>
<th>n and sample</th>
<th>DASS 21 anxiety subscale Cronbach’s alpha (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antony et al. (1998), Canada.</td>
<td>n=49 non-clinical, 209 clinical. Mixed; nonclinical, n=49 and clinical diagnoses of panic disorder (n=67), obsessive-compulsive disorder (n=54), social phobia (n=74), specific phobia (n=17), and major depressive disorder (n=46)</td>
<td>0.87</td>
</tr>
<tr>
<td>Henry &amp; Crawford (2005), U.K.</td>
<td>n= 1794 (female=979, male=815). General population.</td>
<td>0.82</td>
</tr>
<tr>
<td>Norton (2007), U.S.A.</td>
<td>n=895. Undergraduate students categorised by race. African-American/Black (n=150), 230 Caucasian/White, 180 Hispanic/Latino and 258 Asian.</td>
<td>0.78</td>
</tr>
<tr>
<td>*Lovell et al. (2015), Australia</td>
<td>n= 3601. Mothers of children aged 5 years of age or less.</td>
<td>0.76</td>
</tr>
<tr>
<td>*Tran et al. (2013), Vietnam.</td>
<td>n=221. Mothers of young children</td>
<td>0.77</td>
</tr>
</tbody>
</table>

* Maternal populations.

### 4.3.2 Validity of the DASS 21.

Ng et al. (2007) reported that the DASS 21 was significantly correlated with other measures of anxiety and depression (the Clinical Global Impression Scale, the Health of the Nation Outcome Scale and the Mental Health Questionnaire 14) when tested with a clinical sample of 328 psychiatric in-patients. They found the DASS 21 to be a valid tool for reflecting clinical status and temporal changes, in this case improvement in psychiatric conditions, from initial admission assessment to final discharge assessment. Henry & Crawford (2005) stated that the tool can validly be used to measure the dimensions of depression, anxiety and stress, they concluded that the DASS 21 had good convergent and discriminate validity when compared to the longer DASS 42 version. Cunningham et al. (2016) reported that the DASS 42 anxiety subscale was highly correlated to the Beck’s Anxiety Inventory (BAI) in a sample of postpartum mothers who were inpatients in a psychiatric mother and baby unit in Australia (n=527). However, they did state that the generalisability of this finding to other postpartum samples was unknown.
4.3.2.1 Factor analysis of DASS 21.

Following factor analysis two anxiety items in the longer DASS 42 were found to correlate with both the anxiety and depression subscales or not correlate strongly on any of the three subscales (Antony et al. 1998, Clara et al. 2001). The two anxiety items were part of the anxiety subscale in the longer DASS 42. Anxiety item 9 and anxiety item 30 did not correlate strongly on any factor. These two anxiety items were removed when the shorter DASS 21 scale was developed. As a result the DASS 21 was reported to have an excellent (Antony et al. 1998) and cleaner factor structure for both the anxiety than the DASS 42 (Table 4.2). An excellent factor structure was reported in a mixed group of volunteers and outpatients diagnosed with an anxiety or major depressive disorder (Antony et al. 1998). Clara et al. (2001) reported similar findings, stating that the DASS 21 showed an improved correlation of factors in a sample of outpatients with an anxiety or depression disorder. A later study (Henry & Crawford 2005) with a much larger and a non-clinical sample also found that the DASS 21 scale was a more reliable scale than the longer DASS 42. They found and reported that items within the scale that had not loaded strongly (items that did not demonstrate adequate coherence with either depression or anxiety) on any one factor, but gave mixed results, were removed from the shorter DASS 21 version. All three studies found that the shorter DASS 21 has a cleaner factor structure than the longer version (Antony et al. 1998, Clara et al. 2001, Henry & Crawford 2005). In another non-clinical sample of mixed race (n=895), Norton (2007) also reported good factor structure for the DASS 21.
<table>
<thead>
<tr>
<th>Author, year &amp; country</th>
<th>Non clinical population sample</th>
<th>Clinical population sample</th>
<th>Methodology/scale</th>
<th>Reliability</th>
<th>Validity</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antony et al, (1998), Canada</td>
<td>n = 49, Community group</td>
<td>n = 184. Clinical group</td>
<td>Exploratory factor analysis. DASS 42 &amp; DASS 21</td>
<td>Internal consistency and concurrent validity of DASS 42 and DASS 21 in acceptable to excellent ranges.</td>
<td>DASS 42 and DASS 21 distinguishes differences between 3 domains.</td>
<td>DASS Anxiety subscale measured features unique to anxiety, DASS and S measured features unique to anxiety and depression. DASS 21 demonstrates cleaner factor structure.</td>
</tr>
<tr>
<td>Ng et al, (2007), Australia</td>
<td>n = 0</td>
<td>n = 388. Psychiatric inpatients in a private hospital in Australia</td>
<td>Test validity of DASS-21 as a routine clinical outcome measure</td>
<td>n/a</td>
<td>Support for the ability of the DASS 21 to reflect clinical status and changes across treatment time between admission and discharge.</td>
<td>Fitting instrument for purpose of brief, low cost, self-reporting instrument. Particularly fitting for a population of patients with depression and anxiety</td>
</tr>
<tr>
<td>Henry &amp; Crawford, (2005), U.K</td>
<td>n = 1794. General public.</td>
<td>-</td>
<td>Cross sectional, correlational and confirmatory factor analysis of DASS 21.</td>
<td>Reliabilities of DASS 21 adequate. DASS 21 consists of factors removed which do not strongly load on any one factor and is therefore has 'a cleaner latent structure'</td>
<td>The scale can validly be used to measure the three factors intended. However, the DASS 21 does tap into a general psychological distress and/or negative affect</td>
<td>Three weaker factors in DASS 42 are removed from shorter version DASS-21. However, the DASS-21 does tap into a general psychological distress and/or negative affect</td>
</tr>
<tr>
<td>Clara et al, (2001), Canada.</td>
<td>n = 0</td>
<td>n = 439 Psychiatric out-patients</td>
<td>Confirmatory factor analysis of DASS 21 &amp; 42</td>
<td>Confirmatory factor analysis of DASS 21 and 42 indicated support for the 3-factor model.</td>
<td>n/a</td>
<td>Findings of three independent factors consistent with the tripartite model. The DASS 21 showed an improved and cleaner construct</td>
</tr>
<tr>
<td>Norton, (2007), U.S.A.</td>
<td>n = 895. Undergraduate, multiracial student group</td>
<td>-</td>
<td>Internal consistency, convergent and divergent validity of DASS 21.</td>
<td>Acceptable to good internal consistency across four racial groups. Factor structure analysis not invariant across racial groups.</td>
<td>Report that factor intercorrelation was extremely high amongst African Americans, r's .920-.974 compared to Caucasians r's=.708-.795.</td>
<td>They suggest that cognitive and interpretive constructs are subject to cultural views.</td>
</tr>
</tbody>
</table>
4.3.3 **Reliability of the EPDS 3A.**

The reliability of the EPDS 3A has been reported as being both acceptable, Cronbach’s $\alpha = 0.60$ (Brouwers *et al.* 2001, Bina & Harrington 2016) and excellent, $\alpha = 0.80$ (Kabir *et al.* 2008) (Table 4.4). Acceptable internal consistency has been reported in studies using a translated version of the EPDS (Brouwers *et al.* 2001, Bina & Harrington 2016) whereas all those studies that reported good to excellent internal consistency used English versions of the EPDS in pregnancy and in the postpartum period. Although it is acceptable to have an internal consistency of 0.60 for a measurement scale with only 3 items (Martin & Savage-McGlynn 2013) most studies reported internal consistency at 0.69 and up to 0.80 in pregnancy and postpartum with different sample sizes of women including $n=101$ (Jomeen & Martin 2005) and $n=4706$ (Swalm *et al.* 2010). In this study the Cronbach’s alpha was $\alpha=0.74$ in pregnancy ($n=1658$), and $\alpha=0.73$ at three months postpartum ($n=1660$). The EPDS 3A demonstrated very good internal consistency.

<table>
<thead>
<tr>
<th>Table 4-3 EPDS 3A, anxiety subscale items 3, 4 &amp; 5: Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author, Year &amp; Country.</td>
</tr>
<tr>
<td><strong>Bina &amp; Harrington (2016), Israel.</strong></td>
</tr>
<tr>
<td><em>Brouwers et al. (2001), The Netherlands</em></td>
</tr>
<tr>
<td><em>Jomeen &amp; Martin (2005), U.K.</em></td>
</tr>
<tr>
<td><strong>Kabir et al. (2008), U.S.A.</strong></td>
</tr>
<tr>
<td><strong>Phillips et al. (2009), Australia</strong></td>
</tr>
<tr>
<td><em><strong>Swalm et al. (2010), Australia</strong></em></td>
</tr>
</tbody>
</table>

* In pregnancy, **Postpartum, *** Both

4.3.4 **Validity of the EPDS 3A.**

The validity of a measurement scale refers to the tool’s ability to measure the construct being examined, for example, through correlation with other anxiety measurement scales (Martin & Savage-McGlynn 2013). There are mixed reports regarding the validity of the EPDS 3A. Phillips *et al.* (2009) state that the three anxiety items in the EPDS correlated with the BAI anxiety scale (Becks Anxiety Inventory, BAI). On the other hand, Brouwers *et al.* (2001) reported weak correlation between the EPDS 3A and the STAI (0.36 and 0.45) respectively. Simpson *et al.* (2014) reported that the EPDS 3A was slightly more accurate than the full EPDS at detecting GAD. Matthey (2008), agree and reported that if women had not been assessed by the EPDS 3A rather than the entire EPDS, their anxiety symptoms would have been missed. They found that five of the 18 women diagnosed with an anxiety disorder had a score greater than six on the EPDS 3A, but lower than 13 on the complete EPDS. Matthey *et al.* (2013b), in a study comparing four self-reporting measurement scales used antenatally (EPDS 3A, Hospital Anxiety
and Depression Scale (HADS), Pregnancy-Related Thoughts (PRT), Pregnancy-Related Anxiety Questionnaire-Revised (PRAQ-R), Matthey Generic Mood Questionnaire (MGMQ)), found that the EPDS 3A was the second best measure detecting a wide range (26% and 73%) of those with high anxiety scorers on the other scales. But, Matthey et al. (2013b) did caution that the EPDS 3A only detected 54% of the women with an anxiety disorder.

Kabir et al. (2008) reported high specificity (80%) and sensitivity (95%). While Matthey (2008) also reported higher specificity (88%), but lower than acceptable sensitivity (66.7%). The study samples of women included n=199 and n=238 women, respectfully.

4.3.4.1 Factor analysis of the EPDS 3A

As previously stated the objective of factor analysis is to identify those variables that are similar, but not identical (Field 2014). The six studies referred to in Table 4.4 identified the three anxiety items in the full EPDS as items 3, 4 and 5. These studies were influenced by the work of Stuart et al. (1998), who found a strong correlation between the EPDS and an anxiety scale; the State Trait Anxiety Inventory (STAI). The three anxiety items were identified with factor analysis in non-clinical samples of women during pregnancy (Brouwers et al. 2001, Jomeen & Martin 2005) and postpartum (Matthey 2008, Tuohy & McVey 2008) and perinatally (Ross et al. 2003), as well as women receiving care for mental illness in the postpartum period (Phillips et al. 2009).

4.3.5 Reliability and validity of the single item statement

Woolhouse et al. (2009) stated that at the time of development of the Maternal Health Study there were no validated instruments for measuring anxiety in pregnant and postnatal women. However, the entire contents of both survey 1 and 2, including the single statement were validated by eighteen experts the statement was tested for face validity along with the entire contents of survey 1 and 2 in the Irish setting (Daly et al. 2018). The study was also piloted (Daly et al. 2018).
<table>
<thead>
<tr>
<th>Author, year &amp; country</th>
<th>Pregnant sample n=</th>
<th>Postpartum sample n=</th>
<th>Factor analysis methodology</th>
<th>EPDS 3A cut off score</th>
<th>Validity</th>
<th>Reliability</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brouwers et al (2001) The Netherlands</td>
<td>n=197</td>
<td>-</td>
<td>Confirmatory &amp; Exploratory Factor analysis (CFA &amp; EFA)</td>
<td>-</td>
<td>Pearson’s correlation between EPDS 3 anxiety items and the STAI State = 0.36 &amp; Trait= 0.45</td>
<td>EFA Orthogonal rotation varimax identified three factors in EPDS including items 3, 4 &amp; 5 as anxiety items</td>
<td>Items 3, 4 &amp; 5 can be used to identify anxiety</td>
</tr>
<tr>
<td>Jomeen &amp; Martin (2005) U.K.</td>
<td>n=101</td>
<td>-</td>
<td>CFA &amp; EFA</td>
<td>-</td>
<td></td>
<td></td>
<td>Identified items 3, 4 and 5 as loading on anxiety factor in EPDS</td>
</tr>
<tr>
<td>Matthey (2008) Australia</td>
<td>Women n= 238, men n=218. At circa 6 weeks postpartum.</td>
<td>-</td>
<td>Factor analysis *ROC, sensitivity and specificity. Against clinical diagnosis.</td>
<td>≥6 for women, ≥4 for men. First study to report optimum cut off for an anxiety disorder.</td>
<td>Sensitivity 66.7 and specificity 88.2 at 6 weeks postpartum.</td>
<td>Component factor analysis confirmed items 3, 4 and 5 load on one anxiety factor.</td>
<td>Identified items 3, 4 &amp; 5. Emerging evidence that the EPDS and EPDS3A can distinguish between depression and anxiety. If these factors had not been individually scored, 5 women would have been missed (of the 18 with an anxiety disorder, 7 had a score of greater than 13 on complete EPDS, whereas 12 had a score of 6 or more on the 3A.)</td>
</tr>
<tr>
<td>Tuohy &amp; McVey (2008) Scotland</td>
<td>n=440</td>
<td><strong>Orthogonal rotation</strong></td>
<td>-</td>
<td>-</td>
<td><strong>Oblique rotation identified 3 scales including 3, 4 &amp; 5 as loading on one factor</strong></td>
<td>Identified items 3, 4 and 5 as anxiety items.</td>
<td></td>
</tr>
<tr>
<td>Phillips et al (2009) Australia</td>
<td>n = 309, inpatients with unsettled infants.</td>
<td>-</td>
<td>CFA &amp; EFA and concurrent validity. Against clinical diagnosis.</td>
<td>A cut-off of ≥4 on the EPDS 3A detected the presence of probable anxiety disorders. Using a cut-off score of ≥5 resulted in increased specificity (90%) but lowered sensitivity (47%).</td>
<td>Anxiety subscale correlated with both the Becks anxiety inventory and the Becks depression inventory. Sensitivity 63%, specificity 70% (Cut off ≥4).</td>
<td>Items 3, 4 &amp; 5 loaded on one factor called anxiety.</td>
<td>3 item anxiety subscale could be used to identify those with anxiety disorders and the other 7 to identify depression. Two factor model a superior fit.</td>
</tr>
<tr>
<td>Ross et al (2003. Canada)</td>
<td>N=105, from 36 weeks’ gestation</td>
<td>To 16 weeks postpartum.</td>
<td>EFA. Principal component analysis. Anxiety on factors loading &gt;0.5.</td>
<td>-</td>
<td>-</td>
<td>Anxiety items 3, 4 and 5 loading &gt;0.5 on one factor.</td>
<td>Identified item 3, 4 &amp; 5, and concluded that two types of anxiety existed situational, sub-syndromal and clinically significant co-morbid anxiety.</td>
</tr>
</tbody>
</table>

*ROC Receiver Operating Characteristics; used to find the best combination of sensitivity and specificity of a measurement scale (Watson 2013).

**Orthogonal and oblique rotation are another form of interpreting factor analysis (Field 2014).
The limitations of the EPDS 3A have been made explicit from the time the subscale was identified. Brouwers et al. (2001) suggested that it is difficult for a short scale of three items to measure anxiety, and concluded that the subscale exists but that the entire EPDS score gives a more accurate measurement of both anxiety and depressive symptoms. Rowe et al. (2008) and Nguyen et al. (2010) agreed and caution that the subscale in the EPDS alone is unlikely to detect anxiety disorders. Similarly, findings of a systematic review of anxiety tools validated in the perinatal population, Evans et al. (2015) report that the anxiety subscale of the EPDS alone is insufficient to measure the construct of anxiety, even though it has been validated.

While Matthey et al. (2013a), who suggested that the EPDS 3A is a useful screening tool for perinatal anxiety, stated that further research was required to test if it has more robust psychometric properties than other specific anxiety measurement scales. They also suggested that while anxiety can occur independently of depression, it is prudent to regard the coexistence of both (Matthey et al. 2013a).

In recognition of the need to determine its acceptability, reliability and validity of the EPDS as a measurement scale the factor structure was demonstrated in a large sample of women (n=5551-5988) in pregnancy, at 18 and 32 weeks, and postpartum, at 8 weeks and 8 months, (Coates et al. 2016). Coates et al. (2016) concluded that the EPDS measures anxiety, depression and anhedonia, but unlike Matthey (2008), Phillips et al. (2009) and Swalm et al. (2010), found that four items (items 3, 4, 5 and 6) loaded on an anxiety subscale. However, Coates et al. (2016) did not suggest a cut off point for the four item EPDS anxiety subscale which is unfortunate given that a four-item scale might have added strength to data analysis.

Notwithstanding the finding in Coates et al. (2016) study, Swalm et al. (2010) assessed women in pregnancy (n=4706) and up to 48 weeks postpartum (n=3853) and reported that item 6 was problematic and loaded on both anxiety and depression, but more favourably on depression.

Jomeen & Martin (2005) cautioned that the EPDS 3A does not measure the somatic symptoms of hyperarousal, muscle tension, fear, worry and somatic discomfarts which are typical in anxiety responses to the overactivity of the autonomic nervous system. But, instead, as Brouwers et al. (2001) found, the factors in the EPDS pertinent to anxiety refer to subjective negative feelings and self-judgement.

Moreover, the wording used in the EPDS 3A has been questioned. Matthey & Agostini (2017) stated that the EPDS items 3, 4 and 5 are worded in such a fashion as to allow for the exclusion of genuine distress because of the qualifiers inherent in the items. For example item 3; “I blame myself unnecessarily when thing went wrong” might precludes those women who feel guilt and blame and interpret these feelings as justified and necessary (Matthey & Agostini 2017, p. 347). Item 4 and 5 (“I have been anxious or worried for no good reason”; “I have felt scared or panicky
for no good reason”) could potentially preclude those women who believe their worry is perfectly justified and therefore feel anxious or worried for a very good reason.

4.3.6 Validity and reliability of the survey tools

The surveys used to collect data for the MAMMI study were based on surveys used in an Australian Maternal Health Study (Brown et al. 2006). They were modified, with permission, for the Irish setting by Dr Daly (2014). Face and content validity of the surveys were tested following modification (Daly 2014). The validity and reliability of the survey tool is made explicit based on the work of Dr Daly and a description is available in Appendix 10.

4.4 Data analysis

Data were analysed using descriptive statistics and inferential statistics using The Statistical Package for Social Sciences, (SPSS) (IBM® Version 24. 2016). Data were cleaned, transformed and recoded, as required, to determine identification of factors associated with anxiety at each time point (Table 4.5).

4.4.1 Descriptive statistics.

To provide findings for objectives A (to report the prevalence of anxiety), B (to report the frequency of intense anxiety as per a single statement), C (To identify and report the changes in the prevalence of anxiety for women with/without anxiety in pregnancy at T2) and D (to report prevalence of depression and stress and co-morbidities) descriptive statistics were presented in numbers and percentages.

4.4.1.1 Characteristics of the sample of women

In order to assess the representativeness of the sample (Polit & Beck 2008, Burns & Grove 2012) the characteristics of participants were compared to data from two national reports; The National Perinatal Reporting System (NPRS) (Healthcare Pricing Office 2016) and the Activity in Acute Hospitals Report (HIPE Healthcare Pricing Office HSE 2014), and the two hospitals’ clinical reports. The women from hospital site one (n=1398, 83.8%), the Rotunda, were recruited between January 2012 and October 2014, and from hospital site two (n=270, 16.2%), University College Hospital Galway (UCHG) between October 2013 and July 2015. The clinical reports from the hospitals used to compare the sample of women were chosen from the median year of recruitment; the Rotunda Clinical report 2013 (Coulter-Smith 2014) and UCHG clinical report 2014 (Gaffney 2015).
4.4.1.2 Calculating the prevalence of anxiety

As per objective 1, anxiety prevalence according to the DASS 21 was calculated and doubled as recommended by Lovibond & Lovibond (1995a). Anxiety was reported in two ways. Firstly, in a binary fashion; for women reporting anxiety at or above the recommended cut-off (≥8) and those below the cut-off, and secondly according to the categories of anxiety including; normal, mild, moderate, severe and extremely severe. The EPDS 3A was calculated according to the two cut-off scores (≥4 and ≥6) as recommended in the literature (Matthey 2008, Phillips et al. 2009, Swalm et al. 2010).

4.4.1.3 Anxiety according to a single statement

As per objective 2, the frequency of anxiety was reported as a percentage according to the single-item statement as it appears in the surveys; have you experienced any of the following - intense anxiety (such as panic attacks). Anxiety was reported at the following four time points;

In Survey 1,
- at any time in your life before their pregnancy,
- during the 12 months before your pregnancy,
- since the start of your pregnancy,

In Survey 2, postpartum;
- since the birth of your baby.

4.4.1.4 Ongoing and new anxiety at three months postpartum

As per objective 3, persistent and new onset anxiety was reported at three months postpartum in a similar fashion to methods used by Heron et al. (2004). Prevalence of anxiety for those women who did and those who did not report anxiety in pregnancy was reported at three months postpartum. This analyses was completed for anxiety according to the DASS 21 anxiety subscale, the EPDS 3A ≥4 and the EPDS 3A ≥6.

4.4.1.5 Comorbid anxiety, depression and stress

As per objective 4, the prevalence of co-morbidities anxiety, depression and stress at T1 and T2, according to the complete DASS 21, were reported. Similar to Bener et al. (2012, p. 196), Venn diagrams were used to illustrate the comorbidities as follows;

1. anxiety and depression,
2. anxiety and stress, and
3. anxiety, depression and stress.
Inferential statistics were used to inform the factors associated with anxiety as per objective 5. Inferential statistics are useful for establishing if associations exist between independent variables (Corrigan 2013). The most appropriate test for categorical variables is Pearson’s chi-square (Corrigan 2013, Field 2014). This test is useful for identifying if a relationship exists between categorical variables or if the relationship is due to chance (Comiskey & Dempsey 2013, Field 2014).

In this study chi-square testing was used to test if associations existed or not with a range of variables. Statistical significance was reported at both $p \leq 0.05$ and at $p \leq 0.001$ (Field 2014).

Prior to conducting the analysis, the underlying assumptions for using chi-square tests were assessed (Field 2014). The assumptions included:

- Each observation was independent.
- Each participant was represented once only in the table.
- 80% of the expected cell frequencies exceeded 5 (Field 2014).

The factors associated/not associated with anxiety as determined by the DASS 21 anxiety subscale and the EPDS 3A $\geq 6$ were reported.

### 4.4.2.1 Factors for analyses for association with anxiety

<table>
<thead>
<tr>
<th>Factor associated with anxiety in pregnancy</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SOCIODEMOGRAPHIC FACTORS</strong></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Relationship status</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Country of birth</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Educational level</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Type of health care used</td>
<td>Hospital record</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Smoking</td>
<td>Survey 1</td>
</tr>
<tr>
<td><strong>CLINICAL FACTORS</strong></td>
<td></td>
</tr>
<tr>
<td>Lifetime history self-reported ‘intense anxiety (such as panic attacks)’</td>
<td>Survey 1</td>
</tr>
<tr>
<td>BMI</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Fertility treatment</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Baby’s birth weight</td>
<td>Hospital record</td>
</tr>
<tr>
<td>During pregnancy have you ever felt afraid of your partner</td>
<td>Survey 1</td>
</tr>
</tbody>
</table>

included age, relationship status, educational level, history of anxiety, fertility treatment, partner relationship, birth weight, gestation at birth, breastfeeding, alcohol and smoking habits. The source of the data and the variable type are recorded in Table 4.5 for those factors associated with anxiety in pregnancy and Table 4.6 for those factors associated with anxiety at three months postpartum. The source of the variables is also made explicit.

Table 4-6 Factors for analyses for associated with anxiety prevalence at three months postpartum

<table>
<thead>
<tr>
<th>Factor</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SOCIODEMOGRAPHIC FACTORS</strong></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Relationship status</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Country born in</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Educational level</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Type of health care</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Smoking</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Since the birth, have you experienced relationship problems with your partner/husband.</td>
<td>Survey 2</td>
</tr>
<tr>
<td>‘Are you afraid of your current partner?’</td>
<td>Survey 2</td>
</tr>
<tr>
<td>‘Have you ever been afraid of any partner?’</td>
<td>Survey 2</td>
</tr>
<tr>
<td>‘Looking back over the time since the birth of your baby, would you like to have had more emotional support (e.g. someone who regularly asked how you were, someone happy to listen to how you are feeling)?’.</td>
<td>Survey 2</td>
</tr>
<tr>
<td><strong>CLINICAL FACTORS</strong></td>
<td></td>
</tr>
<tr>
<td>‘Since the birth have you experienced intense anxiety or panic attacks?’</td>
<td>Survey 2</td>
</tr>
<tr>
<td>BMI</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Fertility treatment</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Mode of birth</td>
<td>Hospital record</td>
</tr>
<tr>
<td>Blood loss at birth</td>
<td>Hospital record</td>
</tr>
<tr>
<td>Baby’s birth weight</td>
<td>Hospital record</td>
</tr>
<tr>
<td>Gestation (excl multiple births)</td>
<td>Hospital record</td>
</tr>
<tr>
<td>Still breastfeeding at three months</td>
<td>Survey 2</td>
</tr>
</tbody>
</table>
4.4.2.2 Recoding

For analyses some of the variables were recoded from continuous to categorical data (Table 4.7). Fewer categories were used where possible to increase the strength of the analyses.

Table 4.7 Data transformation and re-coding

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type of data</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Numerical transformed to 4 categories (18-24, 25-29, 30-34, 35-39, 40+ years)</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Pre-pregnancy Body Mass Index (BMI)</td>
<td>Pre-pregnancy BMI was calculated by dividing the weight in kilograms (kg) by the height in metres squared (kg/m$^2$) and was categorised as follows; BMI&lt;18.49kg/m$^2$ was categorised as underweight, BMI 18.5-24.99kg/m$^2$ as ideal weight, BMI 25-29.99kg/m$^2$ as overweight, BMI 30-34.99kg/m$^2$ and BMI ≥35kg/m$^2$ as obese and severely obese. The obese and severely obese categories were combined because of low numbers in separate categories and meet the requirements for conducting inferential analyses (Field 2014)</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Relationship status</td>
<td>Recoded from 7 to 4 categories (Married/living together, in a relationship (not living together), single/divorced/widowed and other (engaged/split from partner)</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Country born in</td>
<td>Converted from string to 3 categories (Ireland, European (non-Irish) and Non-European)</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Ethnic origin</td>
<td>Converted from 8 to 3 categories (Irish, Any white background, African, Chinese, or any other Black or Asian background)</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Educational level</td>
<td>Recoded from 13 items into 2 categories (no degree and degree or over)</td>
<td>Survey 1</td>
</tr>
<tr>
<td>Type of health care used</td>
<td>String data transformed into 3 categories (Public, Semi-private and Private).</td>
<td>Hospital record</td>
</tr>
<tr>
<td>DASS 21 anxiety subscale categories</td>
<td>Recoded, scores doubled and classified; normal (anxiety 0-7), Mild: (anxiety 8-9), Moderate (anxiety 10-14), Severe (anxiety 15-19), extremely severe (anxiety 20+)</td>
<td>Survey 1 and 2</td>
</tr>
<tr>
<td>DASS 21 depression, anxiety and stress scales</td>
<td>Recoded into no anxiety (0-7), no depression (0-9), no stress (0-14) and anxiety (mild -extremely severe, ≥8), depression (mild – extremely severe, ≥10) and stress (mild - extremely severe, ≥14).</td>
<td>Survey 1 and 2</td>
</tr>
<tr>
<td>EPDS 3A</td>
<td>Recoded and scores calculated with cut-offs ≥4 and ≥6.</td>
<td>Survey 1 and 2</td>
</tr>
<tr>
<td>Smoking and alcohol</td>
<td>7 categories recoded into 3 categories; never or quit before pregnancy, quit in pregnancy, and smokes/drinks.</td>
<td>Survey 1</td>
</tr>
<tr>
<td>'Intense anxiety' such as panic attacks, statement at four time points.</td>
<td>4 categories recoded into 2; never and rarely, occasionally and often combined.</td>
<td>Survey 1 and 2</td>
</tr>
<tr>
<td>Fertility treatment</td>
<td>Recoded from 4 into 2 categories Yes (fertility drugs and IVF/ICSI and other combined) and No.</td>
<td>Survey 1 and 2</td>
</tr>
<tr>
<td>Mode of birth</td>
<td>12 categories recoded into 3 categories; vaginal non-instrumental birth, vaginal instrumental birth and caesarean section.</td>
<td>Survey 1 and 2</td>
</tr>
<tr>
<td>Gestation at birth</td>
<td>Calculated in Microsoft Excel by subtracting the estimated date of delivery (EDD) from the date of giving birth to calculate gestational age at birth. Then those born before 37 completed weeks of pregnancy were coded as preterm.</td>
<td>Hospital record</td>
</tr>
<tr>
<td>Blood loss at birth</td>
<td>Converted into 2 categories; ≤499mls normal blood loss, ≥500mls Postpartum Haemorrhage/PPH.</td>
<td>Hospital record</td>
</tr>
<tr>
<td>Baby’s birth weight</td>
<td>Categorised into three categories; less than &lt;2.5kgs, 2.5-4.5kgs and greater than ≥4.5kgs</td>
<td>Hospital record</td>
</tr>
</tbody>
</table>

4.4.2.3 Missing data

While every effort was made during data cleaning to source and correct all the data entries, a small number of data were missing. Therefore denominations do vary.
4.5 Ethics and Ethical considerations

Ethical approval for this study was granted by the Faculty of Health Sciences Ethics Committee, Trinity College Dublin on the 25th January 2017 (Appendix 11). Ethical approval for the overall MAMMI study was obtained for the two site hospitals; The Rotunda Hospital in 2011, and the University College Hospital Galway in 2013 (Appendix 12 and 13).

The fundamental need to uphold ethical principles throughout this research process were informed by the Nursing and Midwifery Board of Ireland professional guidance for ethical conduct (NMBI 2015) and the Declaration of Helsinki (World Medical Association 2013). The ethical principles of respect for autonomy, beneficence and non-maleficence, justice and confidentiality are presented below.

4.5.1 Respect for persons autonomy

Respect for autonomy is demonstrated by ensuring that all women participating in the study had access to information about the study, understood the information, were able to choose to take part or not take part, and had the right to withdraw at any time without consequence.

Women’s right to full disclosure was upheld insofar as all the information about the study was available in the information booklet in the study packs and on the MAMMI webpage. The information booklet was subject to advice from the National Adult Literacy agency and received the Plain English award in 2011 (Daly 2014). Women were given a telephone number to contact the research team at their own will, with any questions or queries they might have had. If women choose not to return the first survey after eight weeks, their information was permanently removed from the personal database.

4.5.1.1 Informed consent

A further demonstration of respect for autonomy is informed consent. The purpose of informed consent is to protect the research participants, in this case the pregnant women, by facilitating them in making an informed choice. The underlying principle of voluntary consent involves participants exercising the freedom to make a fully informed choice without coercion, force or deceit. Women were not deemed to be recruited to the study until the research team received the first completed survey with a signed consent form. Women were given two consent forms in the information pack; one to return with the survey and the second for personal records.

4.5.2 Beneficence and non-maleficence

The principles of beneficence and non-maleficence acknowledges participants “right to freedom from harm and discomfort” (Polit & Beck 2008, p. 170). Research should benefit both the
individual and society without harming those participating in the research process (Parahoo 2006). These rights were afforded to all participants in this research study. Two areas are singled out to illustrate this point.

**Sensitive questioning**

When developing the surveys, it was acknowledged that sensitive questions were being addressed such as EPDS item 10; “During the last week the thought of harming myself has occurred to me” (EPDS item 10, Appendix 5). An acknowledgement of how this type of questioning might affect women was addressed with notices of sources of support, website addresses and appropriate telephone numbers were included in the survey tools (Appendix 14).

**Baby wellbeing**

It was agreed that this researcher and the research team follow up only on those women who went home with a live baby. To ensure this happened, a process was established with the site maternity hospitals (Daly 2014). Notwithstanding that process, following discharge from the maternity hospitals there was no means of identifying the well-being of mothers and/or the well-being of their babies. For this reason this researcher needed to be cognisant of the gap in her knowledge regarding mothers’ and babies’ wellbeing when telephoning women for the first time after the birth.

Without prejudice retaining participants is crucial in a cohort study and Hunt & White (1998) make clear recommendation for retaining participants which guided the study and included this researcher employing sound principles of open communication, responding promptly to questions and queries and a willingness to fit into women’s schedules.

### 4.5.3 Justice

Women’s right to fairness and equity was recognised throughout the recruitment and retention process. Up to two weeks was allowed for reflection after women received the study pack. The time commitment to completing the surveys (45 minutes) was made transparent from the outset in the information booklet and cover letters, and it was reiterated again when this researcher communicated with the women by telephone. The sensitive nature of some of the questions in the survey were also made explicit in written and verbal communication from the outset.

Within the application to the FREC for ethical approval for this study it was acknowledged that pregnant women and pregnant women with an existing or history of a mental illness, who are considered to be vulnerable groups (NMBI 2015), might consent to be participants. Eligibility criteria included all nulliparous women over 18 years of age, who could read and write English and had the competence to complete the consent form. In recognition of the principle of equity all women who met this inclusion criteria were eligible for participation in the study. Including women with a mental illness, it was acknowledged, was just as important as including those with
a physical illness. As such, it was argued that all women should be treated as equitable and autonomous agents capable of controlling their own activities (NMBI 2015).

4.5.4 Confidentiality

Woman’s right to confidentiality and privacy were upheld by ensuring that the data were protected. Data were managed according to the Data Protection Act 1988, updated in 2003 (Data Protection Commissioner 1998 & 2003) and processes are compliant with the General Data Protection Regulation (Data Protection Commission 2018).

4.6 Data protection.

The data were managed using appropriate, organised and operational means guided by the Data Protection Act 1988 and 2003 (Data Protection Commissioner 1998 & 2003) and more recently by the Data Protection Commission (2018). The following is a detailed description of how the data management process was underpinned by these acts.

The data for the MAMMI study were contained in the following four areas,

- The hard copy of each survey.
- The hard copy of the consent form.
- The spread sheet of personal details in Microsoft EXCEL software.
- The SPSS data files in Microsoft EXCEL software.

On receipt of each woman’s completed survey 1, an identification study number was allocated. Thereafter, each survey was identified by this study ID number.

In Trinity College Dublin (TCD) the hard copies of the surveys were stored in locked, filing cabinets in a locked, fireproof room with a notice on the door declaring that access is restricted to the research team and that the data are protected by the DATA protection act 1988, 2003 and more recently 2018. The consent forms were stored in a locked filing cabinet in a locked room, separate from the surveys. Access to all areas was restricted to the members of the MAMMI team.

Personal details of each participant were recorded in a Microsoft Excel® personal details database, saved on TCD’s main server. The Microsoft Excel spreadsheets were password protected and only members of the MAMMI research team had access to the password. The computers were in restricted access areas of Trinity College Dublin.

The data from each survey were inputted and saved in Statistical Package for Social Sciences, (SPSS, IBM® Version 24. 2016) software. These files were also saved on the TCD’s main server and backed up on encrypted USB keys, stored in a lock cabinet in the team’s restricted access office. The SPSS files were coded with ID numbers only, they contained no personal details and were stored separately from women’s personal details. Access was password protected with restricted access to the MAMMI research team only. The desktop computers and the USB keys were in a locked office in a Trinity College Dublin building.
4.7 Conclusion

The aim of this quantitative, longitudinal study was to identify the prevalence of anxiety and associated factors in pregnancy and at three months postpartum. This study used data from a sub-sample of women recruited to the larger MAMMI study. The study tools included two surveys, in which data were collected in pregnancy and at three months postpartum, and data from consenting women’s hospital records. Two anxiety measurement scales, the DASS 21 and the EPDS 3A, and a single item anxiety statement were embedded in the survey tools. All three were used to report prevalence of anxiety.

The DASS 21 anxiety subscales is reported to have good reliability in the perinatal population. However, the DASS 21 anxiety subscale has not been validated in a pregnant or postpartum sample women. The reliability and validity of the EPDS 3A anxiety subscale is well documented. Factors identified as being associated with anxiety in the literature were identified in the survey tools and the patients hospital records and used for analyses.

Data analyses methods included descriptive statistics and univariate statistical analysis. Throughout the research process ethical principles have been upheld and data have been protected according to national data protection guidelines.
5 Chapter 5 - Findings

5.1 Introduction

This chapter starts with a description of the characteristics of the sample of women recruited and the retention rates. That is followed by the findings which are organised according to the study’s objectives.

The findings are reported according to the study objectives as follows;
1. Prevalence of anxiety in pregnancy and at three months postpartum according to;
   - the DASS 21 anxiety subscale, using a score of mild or above (i.e. ≥8).
   - the DASS 21 anxiety subscale, according to the five categories
   - the EPDS 3A, using the cut off score of ≥4.
   - the EPDS 3A, using the cut off score of ≥6.

2. Prevalence of anxiety according to single-item statement;
   - in survey 1; have you experience any of the following; Intense anxiety (such as panic attacks); as reported (i) in your life time, (ii) in the 12 months before your pregnancy (iii) since the start of your pregnancy and
   - postpartum in survey 2; (iv) “since the birth, have you experienced intense anxiety or panic attacks.”

3. Changes in the prevalence of anxiety between pregnancy and three months postpartum according to:
   - the DASS 21 anxiety subscale (≥8).
   - the EPDS 3A (≥4).
   - the EPDS 3A (≥6).

4. Comorbidities of depression and stress reported with anxiety;
   - in pregnancy, according to the DASS 21 anxiety subscale.
   - at three months postpartum, according to the DASS 21 anxiety subscale.

5. Sociodemographic and clinical factors associated with anxiety in pregnancy and at three months postpartum;
   - According to the DASS 21 anxiety subscale (≥8).
   - According to the EPDS 3A (≥6).

5.2 Findings

5.2.1 Recruitment and retention rates.

A total of 2174 (39.1%) of the 5439 women who were offered the study information packs joined the study (Figure 5.1). At three months postpartum, 2075 eligible women were followed-up: 99
women (4.6%) were ineligible for the reasons including miscarriage, stillbirth or a sick baby. Therefore, 1773 (85%) returned survey 2. Of the 1773 women with data at both time points, 1668 (94%) consented to having their hospital records accessed, therefore their data were eligible for inclusion and analysis.

Figure 5.1; Recruitment and retention flow chart of women eligible for inclusion in this anxiety study
5.2.2 Women’s characteristics compared with national and site hospital statistics

The characteristics of the nulliparous women in this study (n=1668) were compared with data on nulliparous women birthing in the two site hospitals; University College Hospital Galway (UCHG) (Gaffney 2015) and The Rotunda Hospital (Coulter-Smith 2014), and in three national reports, (CSO 2016, HIPE 2014, NPRS 2014) (Table 5.1).

While 6.2% of women participating in the study were under 24 years of age compared to 19.1% nationally (NPRS 2014), and 21.4% from the Rotunda Hospital (Coulter-Smith 2014), women under 18 years of age were ineligible for this study, while they are included in the two hospital reports. Women’s relationship status was similar to that of nulliparous and multiparous women birthing nationally (NPRS 2014). Over two-thirds, 68.8% of women had a degree or higher educational qualification, somewhat higher than the 55.3% of women between 25-34 years of age that had a third level qualification in Ireland in 2013 (Central Statistics Office 2016). Other figures regarding educational levels were not available. Women from European (other than Ireland) and non-European countries, were slightly overrepresented (29.7%), compared to national data (22.9%) (NPRS 2014), but comparable to the hospital sites (UCHG 24.6% and Rotunda Hospital 26.9%).

Comparisons show that women using the public health system for their maternity care appears to be underrepresented in this study compared to national data. Nationally, 81% of women availed of the public health care (HIPE 2014), whereas 62.2% of women in this study availed of public health. However, the category ‘semi-private’ is unique to one site, Rotunda Hospital, and reflects a package of care that is not wholly ‘private’ care.

The mode of birth for this sample of women was comparable with the mode of birth rates for nulliparous women in UCHG (Gaffney 2015). The Rotunda hospital did not provide mode of birth rates for nulliparous women.

Most of the babies (93.3%) born of women in this study, including twin babies (n=29), were within the normal birth weight range of 2500-4499 grams which is similar to national (91.1%) (NPRS 2014) and hospital (91.3%) (Gaffney 2015) figures.

The proportion of babies born before term gestation (37 weeks) at 5.8% was broadly similar to the national rates of 5.1% (HPO 2014), but lower than the hospital rates of 6.8% (Gaffney 2015) and 7.8% (Coulter-Smith 2014); which may reflect the exclusion follow up criteria for women in the study.

The proportion of women in Ireland exclusively breastfeeding at time of discharge from hospital was 46.3% nationally (HPO 2014), compared to the much higher breastfeeding rate of 85.8% amongst the study’s participants.
<table>
<thead>
<tr>
<th>Sociodemographic and clinical characteristics (n=1668)</th>
<th>NPRS 2013</th>
<th>UCHG 2014</th>
<th>RH 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Nulliparous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to 24 years</td>
<td>103 (6.2)</td>
<td>141 (8.1)</td>
<td>790 (21.4)</td>
</tr>
<tr>
<td>25 to 29 years</td>
<td>351 (21.1)</td>
<td>170 (14.6)</td>
<td>953 (25.8)</td>
</tr>
<tr>
<td>30 to 35 years</td>
<td>733 (44.0)</td>
<td>421 (36.3)</td>
<td>1211 (32.8)</td>
</tr>
<tr>
<td>35 to 39 years</td>
<td>400 (24.0)</td>
<td>321 (27.7)</td>
<td>640 (17.3)</td>
</tr>
<tr>
<td>40 years or more</td>
<td>78 (4.7)</td>
<td>3.5 (3.8)</td>
<td></td>
</tr>
<tr>
<td>Relationship status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>1046 (62.9)</td>
<td>44176 (63.8)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>599 (36.0)</td>
<td>24028 (34.7)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>18 (1.1)</td>
<td>1046 (1.5)</td>
<td></td>
</tr>
<tr>
<td>Educational attainment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to degree</td>
<td>517 (31.2)</td>
<td>736 (55.3)</td>
<td></td>
</tr>
<tr>
<td>Degree or over</td>
<td>1142 (68.8)</td>
<td>4994 (44.7)</td>
<td></td>
</tr>
<tr>
<td>Nationality/country of birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>1158 (70.4)</td>
<td>35383 (77.1)</td>
<td>6318 (73.1)</td>
</tr>
<tr>
<td>Other European</td>
<td>391 (23.8)</td>
<td>10891 (15.8)</td>
<td>1535 (17.8)</td>
</tr>
<tr>
<td>Non-European</td>
<td>97 (5.9)</td>
<td>4994 (7.1)</td>
<td>782 (9.1)</td>
</tr>
<tr>
<td>Type of health care insurance used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>1036 (62.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi-private</td>
<td>414 (24.8)</td>
<td>19 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>218 (13.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of Birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal non instrumental birth</td>
<td>555 (33.5)</td>
<td>390 (32.9)</td>
<td></td>
</tr>
<tr>
<td>Vaginal instrumental birth</td>
<td>578 (35.0)</td>
<td>397 (33.5)</td>
<td></td>
</tr>
<tr>
<td>Caesarean section</td>
<td>520 (31.5)</td>
<td>398 (33.6)</td>
<td></td>
</tr>
<tr>
<td>Baby’s birth weight, including twins (29)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 2500gms</td>
<td></td>
<td>89 (5.2)</td>
<td></td>
</tr>
<tr>
<td>2500gms-4500gms</td>
<td>1583 (93.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 4500gms</td>
<td>24 (1.4)</td>
<td>14 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Preterm births, including twins (29)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born before 37 weeks of pregnancy</td>
<td>96 (5.8)</td>
<td>79 (6.8)</td>
<td>290 (7.8)</td>
</tr>
<tr>
<td>Method of infant feeding before discharge from hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>1426 (85.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial feeding</td>
<td>234 (14.1)</td>
<td>53.4 (53.4)</td>
<td></td>
</tr>
</tbody>
</table>

Denominations will vary due to missing values. § HPF report 2014. CSO; sourced from the Central Statistics Office Ireland.
* Up to 24 years of age. ^ Nulliparous women only.
^^ All women, multiparous and primiparous. !including breech births
5.2.3 Objective 1 - Prevalence of anxiety in pregnancy and at three months postpartum using measurement scales

In pregnancy the prevalence of anxiety was 15.1% (n=246) according to the DASS 21 anxiety subscale, 26.4% (n=438) according to the EPDS 3A (≥4) and 9.3% (n=154) according to EPDS 3A (≥6) (Table 5.2).

According to the DASS 21 anxiety categories, prevalence of mild and moderate anxiety in pregnancy was 9.2% (n=152) and 3.3% (n=54) respectively, while 1.1% (n=18) of women had severe anxiety and 1.4% (n=23) of women had extremely severe anxiety.

At three months postpartum prevalence was 8.6% (n=142) according to the DASS 21 anxiety subscale, 24.6% (n=409) according to the EPDS 3A (≥4) and 8.7% (n=145) according to the EPDS 3A (≥6). According to the DASS 21 anxiety categories 5% (n=83) of women had mild, 1.9% (n=32) had moderate, 1.0% (n=16) had severe, and 0.7% (n=11) had extremely severe anxiety.

Table 5.2 Prevalence of anxiety in pregnancy and at three months postpartum

<table>
<thead>
<tr>
<th>Measurement scale cut-offs scores &amp; categories</th>
<th>In pregnancy</th>
<th>Three months postpartum</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS 21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥8</td>
<td>15.1% (n=246)</td>
<td>8.6% (n=142)</td>
</tr>
<tr>
<td>Normal (0-7)</td>
<td>84.9% (n=1387)</td>
<td>91.4% (n=1502)</td>
</tr>
<tr>
<td>Mild (8-9)</td>
<td>9.2% (n=151)</td>
<td>5% (n=83)</td>
</tr>
<tr>
<td>Moderate (10-14)</td>
<td>3.3% (n=54)</td>
<td>1.9% (n=32)</td>
</tr>
<tr>
<td>Severe (15-19)</td>
<td>1.1% (n=18)</td>
<td>1.0% (n=16)</td>
</tr>
<tr>
<td>Extremely Severe (20+)</td>
<td>1.4% (n=23)</td>
<td>0.7% (n=11)</td>
</tr>
<tr>
<td>EPDS 3A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥4</td>
<td>26.4% (n=438)</td>
<td>24.6% (n=409)</td>
</tr>
<tr>
<td>≥6</td>
<td>9.3% (n=154)</td>
<td>8.7% (n=145)</td>
</tr>
</tbody>
</table>

Overall prevalence of anxiety showed a decrease between pregnancy and three months postpartum. According to the DASS 21 prevalence decreased from 15.1% (n=246) to 8.6% (n=142). Prevalence of mild anxiety decreased from 9.2% (n=151) to 5% (n=83), moderate anxiety decreased from 3.3% (n=54) to 1.9% (n=32), severe anxiety decreased marginally from 1.1% (n=18) to 1.0% (n=16) and the prevalence of extremely severe anxiety halved from 1.4% (n=23) to 0.7% (n=11).

According to EPDS 3A prevalence decreased, albeit less, from 26.4% (n=438) to 24.6% (n=409) and from 9.3% (n=154) to 8.7% (n=145) using cut-off scores of ≥4 and ≥6 respectively.

5.2.4 Objective 2 - Prevalence of anxiety according to a single statement

Women were asked to report the frequency of their experience of anxiety according to the single statement “have you ever experienced intense anxiety (such as panic attacks)”, at three time points in survey 1; anytime in their life time, in the 12 months before pregnancy and since the start of
pregnancy, and once postpartum. At each time point women rated the frequency of anxiety as either ‘never, rarely, occasionally or often’. Over three quarters of women never experienced anxiety anytime in their lifetime (76.3%, n=1262), while 15.6% (n=258) reported experiencing anxiety rarely, 6.7% (n=111) occasionally and 1.4% (n=24) experienced anxiety often (Table 5.3). Over eighty five percent of women reported that they never experienced anxiety in the 12 months before pregnancy (85.9% n=1417). Fewer women again experienced anxiety rarely (9.3%, n=154) and occasionally (3.5%, n=58) in the twelve months before pregnancy than in their lifetime. Since the start of pregnancy more women never experienced anxiety (87.6%, n=1458), and less experienced anxiety in each of the three frequencies of rarely, occasionally and often. However, after the birth of the baby fewer women never experiencing anxiety (71.9%, n=1180), while more women reported anxiety rarely (15.6%, n=257), occasionally (10.7%, n=175) and often (1.8%, n=462). More women reported experiences of anxiety occasionally and often after the birth of the baby than at any other time. See Appendix 15 for diagrammatic representation of the findings.

### Table 5.3 Frequency of self-reported experiences of intense anxiety reported at four time points

<table>
<thead>
<tr>
<th>Experienced feelings of intense anxiety (such as panic attacks)</th>
<th>In their lifetime before pregnancy (n=1655)</th>
<th>12 months before pregnancy (n=1650)</th>
<th>Since the start of pregnancy (n=1664)</th>
<th>Since the birth of the baby (n=1642)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>76.3% (n=1262)</td>
<td>85.9% (n=1417)</td>
<td>87.6% (n=1458)</td>
<td>71.9% (n=1180)</td>
</tr>
<tr>
<td>Rarely</td>
<td>15.6% (n=258)</td>
<td>9.3% (n=154)</td>
<td>8.7% (n=144)</td>
<td>15.6% (n=257)</td>
</tr>
<tr>
<td>Occasionally</td>
<td>6.7% (n=111)</td>
<td>3.5% (n=58)</td>
<td>2.8% (n=47)</td>
<td>10.7% (n=175)</td>
</tr>
<tr>
<td>Often</td>
<td>1.4% (n=24)</td>
<td>1.3% (n=21)</td>
<td>0.9% (n=15)</td>
<td>1.8% (n=30)</td>
</tr>
<tr>
<td>Rarely, occasionally and often combined</td>
<td>23.8% (n=393)</td>
<td>14.1% (n=233)</td>
<td>12.4% (n=206)</td>
<td>28.1% (n=462)</td>
</tr>
</tbody>
</table>

### 5.2.5 Objective 3 - Changes in the course of anxiety between pregnancy and three months postpartum

The changes in the course of anxiety for individual women according to the anxiety measurement scales between pregnancy and three months postpartum are presented in the following sections and illustrated in the accompanying figures (figures 5.2, 5.3 and 5.4).

#### 5.2.5.1 DASS 21 Anxiety subscale

According to the DASS 21 anxiety subscale, of the 15.1% (n=246) of women who had anxiety in pregnancy 29.2% (n=71) continued to have anxiety at three months postpartum (Figure 5.2). A further 5% (n=68) of the 84.9% (n=1387) women who did not have anxiety in pregnancy reported new onset anxiety at three months postpartum.
According to the EPDS 3A (≥4), of the 26.4% (n=438) of women who had anxiety in pregnancy, 48.8% (n=211) continued to have anxiety postpartum (Figure 5.3), and 15.8% (n=192) of the 1220 women (73.6%) who did not have anxiety in pregnancy had new onset anxiety at three months postpartum. Based on the 1650 women who completed the EPDS ≥4 at three months postpartum, a similar proportion of women had persistent and new onset anxiety (12.8%, n=212 and 11.6%, n=192)

Figure 5-1 Persistent and new onset anxiety according to the DASS 21 anxiety subscale.

Women reporting persistent and new onset anxiety according to the DASS 21 anxiety subscale. Flow chart of anxiety across two occasions of measurement: in pregnancy (n=1633) and at three months postpartum (n=1610). On each row the sample is shown in ovals for those who scored above the cut-off for anxiety and rectangles for those who scored below the cut-off for anxiety (DASS 21). The percentages and numbers reported represent those who reported anxiety and those that did not report anxiety. The percentages in brackets at three months postpartum represents the proportion of the total sample (n=1610).

5.2.5.2 EPDS 3A ≥4

In pregnancy (n=1658)

- Yes, anxious: 26.4%, n=438
- No, not anxious: 73.6%, n=1220

At three months postpartum (n=1650)

- Yes, anxious: 48.8%, n=212 (12.8%)
- Yes, anxious: 15.8%, n=192 (11.6%)
- No, not anxious: 51.2%, n=222 (13.6%)
- No, not anxious: 84.2%, n=1024 (62%)

Figure 5-2 Persistent and new onset anxiety according to the EPDS 3A (≥4)

Women reporting persistent and new onset anxiety according to the EPDS 3A (≥4). Flow chart of anxiety across two occasions of measurement: in pregnancy (n=1658) and at three months postpartum (n=1650). On each row the sample is divided into ovals for those who scored above the cut-off for anxiety and rectangles for those who scored below the cut-off for anxiety (EPDS 3A ≥4). The figures included in the table are the percentage of those who reported anxiety and those that did not reporting anxiety in pregnancy, the total numbers and (the percentage of the total numbers in brackets)
5.2.5.3 EPDS 3A ≥6

According to the EPDS 3A (≥6) 28.1%, (n=43) of the 9.3%, (n=154) of women who had anxiety in pregnancy continued to have anxiety postpartum (Figure 5.4). Of the 90.7% (n=1504) women who did not have anxiety in pregnancy, 6.6% (n=99) had new onset anxiety at three months postpartum.

**Figure 5-3 Persistent and new onset anxiety according to the EPDS 3A (≥6)**
Flow chart of anxiety across two occasions of measurement: in pregnancy (n=1658) and at three months postpartum (n=1650). On each row the sample is divided into rounds for those who scored above the cut-off for anxiety and squares for those who scored below the cut-off for anxiety (EPDS 3A ≥6). The figures included in the table are the percentage of those who reported anxiety and those that did not reporting anxiety in pregnancy, the total numbers and (the percentage of the total numbers in brackets)

5.2.6 Objective 4 - Prevalence and co-morbidities of anxiety, depression and stress.

5.2.6.1 Prevalence of anxiety, depression and stress in pregnancy and at three months postpartum

In pregnancy more women reported anxiety (15.1%, n=246) than depression (9.7%, n=159) or stress (10.4%, n=168), according to the DASS 21 (Table 5.4). However, at three months postpartum, fewer women had anxiety (8.6% n=142) than either depression (10%, n=165) or stress (13.9%, n=228). While the prevalence of anxiety decreased by 6.5% between pregnancy and three months postpartum (15.1% to 8.6%), the prevalence of depression increased by 0.3% (9.7% to 10.0%) and the prevalence of stress increased by 3.5% (10.4% to 13.9%).

5.2.6.2 Prevalence of co-morbid anxiety, depression and stress

Of the 15.1% (n=246) women who had anxiety in pregnancy, 52% (n=128) had anxiety independently of depression and/or stress. Of the remaining women, 11.4% (n=28) had co-existing anxiety and depression, 13.4% (n=33) had co-existing anxiety and stress, and 23.2% (n=57) had co-existing anxiety, depression and stress (Figure 5.4 & Venn diagram 5.5). Further colour Venn Diagram in Appendix 16.

Of the 8.6% (n=142) women who had anxiety at three months postpartum, 31.7% (n=45) had anxiety independently of depression and/or stress. Of the remaining women 18.3% (n=26) had
anxiety and stress, 11.3% (n=16) had anxiety and depression and 38.7% (n=55) had anxiety, depression and stress. The overall number of women with anxiety alone was lower at three months postpartum (31.7% (n=45) compared to 52% (n=128) of women in pregnancy (Figure 5.4** and Venn diagram 5.6) (Appendix 17).

### Table 5-4 Co-morbidities of anxiety, depression and stress at both time points

<table>
<thead>
<tr>
<th>DASS 21</th>
<th>In pregnancy (n=1633)</th>
<th>Three months postpartum (n=1644)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Anxiety</td>
<td>15.1% n=246</td>
<td>8.6% n=142</td>
</tr>
<tr>
<td>*Depression</td>
<td>9.7% n=159</td>
<td>10% n=165</td>
</tr>
<tr>
<td>*Stress</td>
<td>10.4% n=168</td>
<td>13.9% n=228</td>
</tr>
<tr>
<td>** Co-morbid anxiety, depression and/or stress</td>
<td>Women with anxiety in pregnancy 15.1% (n=246)</td>
<td>Women with anxiety at three months postpartum 8.6%, (n=142).</td>
</tr>
<tr>
<td>Anxiety only (independently of depression and/or stress)</td>
<td>52% n=128</td>
<td>31.7% n=45</td>
</tr>
<tr>
<td>Anxiety and depression</td>
<td>11.4% n=28</td>
<td>11.3% n=16</td>
</tr>
<tr>
<td>Anxiety and stress</td>
<td>13.4% n=33</td>
<td>18.3% n=26</td>
</tr>
<tr>
<td>Anxiety, depression and stress</td>
<td>23.2% n=57</td>
<td>38.7% n=55</td>
</tr>
</tbody>
</table>

*All the women with anxiety alone, all the women with depression alone and all the women with stress alone according to the three DASS 21 subscales. ** Anxiety alone and co-morbid anxiety and depression, anxiety and stress and anxiety, depression and stress according to the DASS subscales.

#### 5.2.6.3 Overlap of anxiety, depression and stress

### In Pregnancy

![Venn Diagram: Overlap of anxiety, depression and stress in pregnancy](image-url)

**Figure 5-4 Venn Diagram: Overlap of anxiety, depression and stress in pregnancy**
At three months postpartum

![Venn Diagram: Overlap of anxiety depression and stress at three months postpartum](image_url)

5.2.7 **Objective 5 - Sociodemographic and clinical factors associated with anxiety in pregnancy and at three months postpartum.**

In the following section, Pearson’s chi-square test of independence was used to explore associations between anxiety, as measured according to the DASS 21 and the EPDS 3A ≥6, and a range of sociodemographic and clinical categorical variables. Percentages are reported across the rows and therefore represent the proportion of women with anxiety in each individual category. This type of analyses reporting is modelled on that used by Yelland et al. (2010).

More sociodemographic factors were found to be statistically significantly associated with anxiety when using the seven-item DASS 21 anxiety subscale than the three-item EPDS 3A in both pregnancy and at three months postpartum. On the other hand, more clinical factors were associated with anxiety according to the EPDS 3A than the DASS 21 anxiety subscale at three months postpartum. Test assumptions were fulfilled unless otherwise stated. The total number of responses from the 1668 women in the study are reported with missing values reported in brackets next to each category (Tables 5.5, 5.6, 5.7 and 5.8).

5.2.7.1 **Sociodemographic factors associated with anxiety in pregnancy**

In this section the sociodemographic factors analysed for association with anxiety are reported and are presented in Table 5.5. Anxiety in pregnancy, as reported according to the DASS 21
anxiety subscale, was found to be significantly associated with almost all the sociodemographic factors assessed, apart from alcohol consumption. Only the woman’s country of maternal birth, educational level and smoking were significantly associated with anxiety according to the EPDS 3A ≥6. Experiencing anxiety (in their lifetime) according to the single item statement was significantly associated with anxiety according to both scales.

Fifteen women reported fear of their partner in pregnancy however, following analyses the chi-square test assumption was violated and for that reason it is not reported here.

5.2.7.1.1 Age

A greater proportion of women aged 18-24 years reported anxiety in pregnancy compared to those in any other age category. The difference in the distribution of women with anxiety according to age categories was statistically significant \((p<0.001)\) when measured using the DASS 21 anxiety subscale, but not according to the EPDS 3A \((≥4)\) \((p=0.40)\).

5.2.7.1.2 Relationship status

Proportionally more women who were single, divorce or widowed or were in a relationship but not living together reported anxiety, compared to those women who were married or living with their partner. A statistically significant association was found for relationship status and relationship status according to the DASS 21 anxiety subscale \((p<0.01)\). Assumption was violated using the EPDS 3A, as 25% of cells in the EPDS 3A analysis had a count of <5.

5.2.7.1.3 Country of birth and ethnicity

In relation to country of birth a greater proportion of women born outside Ireland, particularly those born in non-European countries, reported anxiety. A statistical significant association was found for country of birth and anxiety using both the DASS 21 anxiety subscale \((p<0.001)\) and the EPDS 3A \((p<0.001)\).

Proportionally more of the women from African, Chinese or any other Asian or Black ethnicity reported anxiety \((37%, n=20)\) compared to women describing their ethnicity as Irish \((12.5%, n=143)\). The association between ethnicity and anxiety was statistically significant according to the DASS 21 anxiety subscale \((p<0.001)\), but not the EPDS 3A \((p=0.08)\).

5.2.7.1.4 Educational level

According to the DASS 21 anxiety subscale and the EPDS 3A women with anxiety were less likely to have a degree or higher educational level. Proportionally more women with anxiety did not have a degree than those who did \((20.4%, n=102\) compared to \(12.6%, n=142)\). Similarly, according to the EPDS 3A, \(11.5%\) \((n=59)\) of women with anxiety did not have a degree compared to \(8%\) \((n=94)\) of women with a degree or over. A statistically significant association between
educational level and anxiety was found for both the DASS 21 anxiety subscale \( (p<0.001) \) and the EPDS 3A \( (p=0.04) \).

5.2.7.1.5 Type of health care insurance

A greater proportion of women with anxiety used public health care (19.3%, \( n=196 \)) compared to those with private (9%, \( n=91 \)) and semi-private health care (7.6%, \( n=31 \)) according to the DASS 21 anxiety subscale. The association between type of health care and anxiety was found to be statistically significant according to the DASS 21 \( (p<0.001) \), but not the EPDS 3A \( (p=0.06) \).

5.2.7.1.6 Alcohol

Alcohol consumption was not associated with anxiety in pregnancy according to both measurement scales.

5.2.7.1.7 Smoking

According to the DASS 21 anxiety subscale proportionally more women with anxiety continued to smoke in pregnancy (27.4%, \( n=23 \)) than not (13.4%, \( n=180 \)). Similarly, according to the EPDS 3A, proportionally more women with anxiety continued to smoke in pregnancy (18.6% \( n=16 \)) than not (8.6% \( n=117 \)). A statistically significantly association was found between smoking and anxiety for both the DASS 21 anxiety subscale and the EPDS 3A \( (p<0.001 \text{ and } p=0.006 \) respectively).

5.2.7.1.8 Anxiety according to a single statement

Proportionally more women who reported having experienced intense anxiety (such as panic attacks) in their lifetime had anxiety according to both the DASS 21 anxiety subscale and the EPDS 3A. The finding was statistically significant for both measurement scales \( (p<0.001) \).
Table 5-5 Sociodemographic factors associated with anxiety in pregnancy

<table>
<thead>
<tr>
<th></th>
<th>DASS 21</th>
<th></th>
<th></th>
<th>EPDS 3A</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO &lt;8</td>
<td>YES ≥8</td>
<td>p value</td>
<td>NO &lt;6</td>
<td>YES ≥6</td>
<td>p value</td>
</tr>
<tr>
<td><strong>Categories</strong></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to 24 (n=98)</td>
<td>69 (70.4)</td>
<td>29 (29.6)</td>
<td></td>
<td>89 (87.3)</td>
<td>13 (12.7)</td>
<td></td>
</tr>
<tr>
<td>25 to 29 (n=342)</td>
<td>275 (80.4)</td>
<td>67 (19.6)</td>
<td><em>p &lt; 0.001</em></td>
<td>312 (89.4)</td>
<td>37 (10.6)</td>
<td></td>
</tr>
<tr>
<td>30 to 34 (n=722)</td>
<td>620 (85.9)</td>
<td>102 (14.1)</td>
<td></td>
<td>672 (91.9)</td>
<td>59 (8.1)</td>
<td></td>
</tr>
<tr>
<td>35 to 39 (n=391)</td>
<td>347 (88.7)</td>
<td>44 (11.3)</td>
<td></td>
<td>360 (91.9)</td>
<td>35 (8.9)</td>
<td></td>
</tr>
<tr>
<td>40 and over (n=77)</td>
<td>73 (94.8)</td>
<td>4 (5.2)</td>
<td></td>
<td>69 (88.5)</td>
<td>9 (11.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Total (n=1630)</strong></td>
<td>1384 (84.9)</td>
<td>246 (15.1)</td>
<td></td>
<td>1502 (90.8)</td>
<td>153 (9.2%)</td>
<td></td>
</tr>
<tr>
<td><strong>Relationship status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/Living together (n=1465)</td>
<td>1258 (85.9)</td>
<td>207 (14.1)</td>
<td><em>p &lt; 0.01</em></td>
<td>1356 (91.3)</td>
<td>130 (8.7)</td>
<td></td>
</tr>
<tr>
<td>In a relationship, not living together (n=96)</td>
<td>73 (76.0)</td>
<td>23 (24)</td>
<td></td>
<td>87 (87.0)</td>
<td>13 (13)</td>
<td><em>p = 0.06</em></td>
</tr>
<tr>
<td>Single, divorced, widowed (n=53)</td>
<td>40 (75.5)</td>
<td>13 (24.5)</td>
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<td>44 (83.0)</td>
<td>9 (17)</td>
<td></td>
</tr>
<tr>
<td>Other (n=14)</td>
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<td>1 (7)</td>
<td></td>
<td>14 (100.0)</td>
<td>0 (0)</td>
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<tr>
<td><strong>Total (n=1628)</strong></td>
<td>1384 (85.0)</td>
<td>244 (15)</td>
<td></td>
<td>1501 (90.8)</td>
<td>152 (9.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Country of birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland (n=1143)</td>
<td>1000 (87.5)</td>
<td>143 (12.5)</td>
<td><em>p &lt; 0.001</em></td>
<td>1054 (91.5)</td>
<td>98 (8.5)</td>
<td></td>
</tr>
<tr>
<td>European (non-Irish)(n=376)</td>
<td>300 (79.8)</td>
<td>76 (20.2)</td>
<td></td>
<td>355 (91.3)</td>
<td>34 (8.7)</td>
<td><em>p &lt; 0.001</em></td>
</tr>
<tr>
<td>Non-European (n=92)</td>
<td>67 (72.8)</td>
<td>25 (27.2)</td>
<td></td>
<td>77 (79.4)</td>
<td>20 (20.6)</td>
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</tr>
<tr>
<td><strong>Total (n=1611)</strong></td>
<td>1367 (84.9)</td>
<td>244 (15.1)</td>
<td></td>
<td>1501 (90.8)</td>
<td>152 (9.3)</td>
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</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Irish (n=1219)</td>
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<td><em>p &lt; 0.001</em></td>
<td>1119 (91.0)</td>
<td>110 (9)</td>
<td></td>
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<tr>
<td>Any white background (n=343)</td>
<td>272 (79.3)</td>
<td>71 (20.7)</td>
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<td>322 (91.5)</td>
<td>30 (8.5)</td>
<td><em>p = 0.08</em></td>
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<td>34 (63.0)</td>
<td>20 (37)</td>
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<td>45 (78.9)</td>
<td>12 (21.1)</td>
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<tr>
<td><strong>Total (n=1616)</strong></td>
<td>1375 (85.1)</td>
<td>241 (149)</td>
<td></td>
<td>1486 (90.7)</td>
<td>152 (9.3)</td>
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</tr>
<tr>
<td><strong>Educational level</strong></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>No degree (n=499)</td>
<td>397 (79.6)</td>
<td>102 (20.4)</td>
<td><em>p &lt; 0.001</em></td>
<td>456 (88.5)</td>
<td>59 (11.5)</td>
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</tr>
<tr>
<td>Degree or over (n=1126)</td>
<td>984 (87.4)</td>
<td>142 (12.6)</td>
<td></td>
<td>1040 (91.7)</td>
<td>94 (8)</td>
<td></td>
</tr>
<tr>
<td><strong>Total (n=1625)</strong></td>
<td>1381 (85.0)</td>
<td>244 (15.0)</td>
<td></td>
<td>1496 (90.7)</td>
<td>153 (9.3%)</td>
<td></td>
</tr>
<tr>
<td>Type of health care</td>
<td>Public (n=1014)</td>
<td>Semi-private (n=409)</td>
<td>Private (n=210)</td>
<td>Total (n=1633)</td>
<td>Type of health care</td>
<td>Public (n=1028)</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
<td>---------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>---------------------</td>
<td>----------------</td>
</tr>
<tr>
<td></td>
<td>818 (80.7)</td>
<td>378 (92.4)</td>
<td>191 (91.0)</td>
<td>1387 (84.9)</td>
<td></td>
<td>920 (89.5)</td>
</tr>
<tr>
<td></td>
<td>196 (19.3)</td>
<td>31 (7.6)</td>
<td>91 (9)</td>
<td>246 (15.1)</td>
<td></td>
<td>108 (10.5)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>p = 0.06</td>
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<tr>
<td>Alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Alcohol</td>
<td></td>
</tr>
<tr>
<td>Quit when learnt</td>
<td>876 (85.7)</td>
<td>288 (81.6)</td>
<td>216 (86.4)</td>
<td>1380 (84.9)</td>
<td>Quit when learnt</td>
<td>946 (91.0)</td>
</tr>
<tr>
<td>of pregnancy (n=1022)</td>
<td>146 (14.3)</td>
<td>65 (18.4)</td>
<td>34 (13.4)</td>
<td>245 (15.1)</td>
<td>of pregnancy</td>
<td>94 (9)</td>
</tr>
<tr>
<td></td>
<td>p = 0.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never or quit</td>
<td>1163 (86.6)</td>
<td>149 (78.8)</td>
<td>61 (72.6)</td>
<td>137 (85.0)</td>
<td>Never or quit</td>
<td>1250 (91.4)</td>
</tr>
<tr>
<td>before pregnancy</td>
<td>180 (13.4)</td>
<td>40 (21.2)</td>
<td>23 (27.4)</td>
<td>243 (15)</td>
<td>before pregnancy</td>
<td>117 (8.6)</td>
</tr>
<tr>
<td>(n=1343)</td>
<td>p &lt; 0.001*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>p = 0.006*</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>Never or quit</td>
<td>1102 (89.1)</td>
<td>276 (71.5)</td>
<td>1378 (84.9)</td>
<td>135 (10.9)</td>
<td>Never or quit</td>
<td>1180 (94.1)</td>
</tr>
<tr>
<td>before pregnancy</td>
<td>135 (10.9)</td>
<td>110 (28.5)</td>
<td>245 (15.1)</td>
<td></td>
<td>before pregnancy</td>
<td>74 (5.9)</td>
</tr>
<tr>
<td>(n=1237)</td>
<td>p &lt; 0.001*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>p &lt; 0.001*</td>
</tr>
<tr>
<td>Rarely, occasionally</td>
<td>1110 (90.1)</td>
<td>314 (80.3)</td>
<td>1378 (84.9)</td>
<td>135 (10.9)</td>
<td>Rarely, occasionally</td>
<td>1180 (94.1)</td>
</tr>
<tr>
<td>or often (n=386)</td>
<td>135 (10.9)</td>
<td>110 (28.5)</td>
<td>245 (15.1)</td>
<td></td>
<td>or often (n=391)</td>
<td>74 (5.9)</td>
</tr>
<tr>
<td>Total (n=1623)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total (n=1645)</td>
<td></td>
</tr>
</tbody>
</table>

* statistically significant.

^Assumption for conducting Chi-Sq. test violated; 25% of cells had a count ≤5.

* Intense anxiety as reported by women in the statement “At any point in your lifetime before your pregnancy, have you experienced intense anxiety (such as panic attacks)”. 
5.2.7.1.9  Clinical factors associated with anxiety in pregnancy

The following clinical factors are presented in Table 5.6. Neither fertility treatment nor baby’s birth weight were found to be significantly associated with anxiety for the DASS 21 and the EPDS 3A in pregnancy. BMI and anxiety according to the single statement were found to be significantly associated with anxiety according to the EPDS 3A in pregnancy ($p<0.001$).

5.2.7.1.10  Body Mass Index

BMI was found to be significantly associated with anxiety according to the EPDS 3A ($\geq 6$) ($p<0.001$) but not so according to the DASS 21 ($p=0.09$). Nonetheless, proportionally more of the women in the overweight and obese or severely obese groups reported anxiety (15.2%, $n=44$ and 13.5%, $n=22$ respectively) compared to the women in the underweight and ideal weight brackets.
### Table 5-6 Clinical factors associated with anxiety in pregnancy

<table>
<thead>
<tr>
<th>Categories</th>
<th>DASS-21</th>
<th>Pregnancy</th>
<th>EPDS 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO &lt;8</td>
<td>YES ≥8</td>
<td>n= (%)</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (n=74)</td>
<td>68 (91.9)</td>
<td>6 (8.1)</td>
<td>p = 0.09</td>
</tr>
<tr>
<td>Ideal weight (n=1001)</td>
<td>859 (85.8)</td>
<td>142 (14.2)</td>
<td></td>
</tr>
<tr>
<td>Overweight (n=284)</td>
<td>234 (82.4)</td>
<td>50 (17.6)</td>
<td>p = 0.09</td>
</tr>
<tr>
<td>Obese or severely obese (n=161)</td>
<td>131 (81.4)</td>
<td>30 (18.6)</td>
<td></td>
</tr>
<tr>
<td>Total (n=1520)</td>
<td>1292 (85.0)</td>
<td>228 (15)</td>
<td></td>
</tr>
<tr>
<td><strong>Fertility treatment</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No (n=1453)</td>
<td>1228 (84.5)</td>
<td>225 (15.5)</td>
<td>p = 0.20</td>
</tr>
<tr>
<td>Yes (n=177)</td>
<td>156 (88.8)</td>
<td>21 (11.9)</td>
<td></td>
</tr>
<tr>
<td>Total (n=1630)</td>
<td>1384 (84.9)</td>
<td>246 (15.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Baby’s birth weight</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 2500gms (n=72)</td>
<td>63 (87.5)</td>
<td>9 (12.5)</td>
<td></td>
</tr>
<tr>
<td>2500gms-4500gms (n=1537)</td>
<td>1305 (84.9)</td>
<td>232 (15.1)</td>
<td>p = 0.73</td>
</tr>
<tr>
<td>Greater than 4500gms (n=21)</td>
<td>17 (81)</td>
<td>4 (19)</td>
<td></td>
</tr>
<tr>
<td>Total (n=1630)</td>
<td>1385 (85.0)</td>
<td>245 (15)</td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant.
5.2.7.2 Sociodemographic factors associated with anxiety at three months postpartum.

The following sociodemographic factors are presented in Table 5.7. A statistically significant association with anxiety according to the DASS 21 anxiety subscale, but not the EPDS 3A, was found for age, country of birth, ethnicity, type of health care and smoking. A statistically significant association for anxiety according to both measurement scales was found for educational level, self-reported experiences of intense anxiety (such as panic attacks) in their lifetime, relationship problems with partner or husband, fear of any partner reported at three month postpartum and a need for more emotional support since the birth of the baby.

5.2.7.2.1 Age

Age was found to be associated with anxiety at 3 months postpartum according to the DASS 21 anxiety subscale ($p<0.001$), but not the EPDS 3A.

More women in the 18 to 24 years of age category reported anxiety (17.6%, n=18) compared to 2.5% (n=11) of women in the 35 to 40 years of age category and 6.7% (n=5) of women in the 40 years or more category.

5.2.7.2.2 Relationship status

Relationship status was not found to be significantly associated with anxiety at three months postpartum according to either measurement scale.

5.2.7.2.3 Country of birth and ethnicity

Country of birth was found to be associated with anxiety, according to the DASS 21 anxiety subscale ($p<0.001$), but not the EPDS 3A.

Proportionally more women born in any non-European country reported anxiety (16.1%, n=15) compared to those born in Ireland (7.2%, n=82).

Ethnicity was significantly associated with anxiety according to the DASS 21 anxiety subscale ($p<0.001$), but not the EPDS 3A.

Proportionally more women of African, Chinese or any Black or Asian background reported anxiety (20.8%, n=11) than women of Irish background (7.2%, n=88).

5.2.7.2.4 Educational level

Educational level was significantly associated with anxiety, according to both the DASS 21 anxiety subscale and the EPDS 3A, ($p=0.003$ and $p=0.03$ respectively). According to both the DASS 21 anxiety subscale and the EPDS 3A proportionally more women with anxiety did not have a degree (11.6%, n=59 and 10.9%, n=56 respectively) compared to those with anxiety who did have a degree (7.2%, n=81 and 7.7%, n=87 respectively).
5.2.7.2.5  Type of Health Care

Type of health care insurance used for birth was found to be significantly associated with anxiety according to the DASS 21 anxiety subscale \((p=0.05)\), but not the EPDS 3A \((p=0.20)\). Proportionally more women using the public health care system reported anxiety according to the DASS 21 anxiety subscale \((10.2\%, n=104)\) compared to those using semi-private \((6.1\%, n=25)\) or private health care \((6\%, n=6)\).

5.2.7.2.6  Alcohol

Alcohol was not found to be significantly associated with anxiety according to both scales at three months postpartum.

5.2.7.2.7  Smoking

Smoking was significantly associated with anxiety, according to the DASS 21 anxiety subscale \((p<0.001)\), but not the EPDS 3A \((p=0.23)\). Proportionally more women who quit smoking in pregnancy \((14.4\%, n=27)\) or continued to smoke \((15.5\%, n=13)\) reported anxiety compared to those women who never smoked or quit before the pregnancy \((7.3\%, n=99)\).

5.2.7.2.8  Anxiety according to a single statement

Anxiety according to the single item statement (of experiences of intense anxiety in their lifetime), was significantly associated with anxiety according to both the DASS 21 anxiety subscale and the EPDS 3A, \((p<0.001\) for both). Proportionally more women who reported having experienced intense anxiety (such as panic attacks) in their lifetime had anxiety according to the DASS 21 and the EPDS 3A \((24.1\% n=110 \text{ and } 24.4\% n=112)\).

5.2.7.2.9  Relationship problems with partner (S2D4)

According to both the DASS 21 anxiety subscale and the EPDS 3A there was a significant association between anxiety and experiences of relationship problems with partner or husband after the birth of the baby \((p<0.001)\).

Between 4.2\% \((n=35)\) and 4.8\% \((n=41)\) women with anxiety according to the DASS 21 anxiety subscale and the EPDS 3A reported no relationship problems, but that figure was far greater for those women who reported relationship problems often \((33.3\%, n=16 \text{ and } 36.0\%, n=18)\).

5.2.7.2.10  Fear of any partner

Fear of any partner reported at three months postpartum, was significantly associated with anxiety according to both the DASS 21 anxiety subscale and the EPDS 3A \((p<0.001 \text{ and } p<0.01 \text{ respectively})\).
Proportionally more women reporting fear of any partner had anxiety according to the DASS 21 anxiety subscale and the EPDS 3A (23.2% n= 22 and 15.8% n=15 respectively) compared to those who had no fear of any partner (7.7%, n=119 and 8.3% n=129).

Only four women expressed fear of current partner at three months postpartum and analysis of the data was not possible as 50% of the cells had a count less than five.

5.2.7.2.11 Emotional Support

A significant association was found between women stating that they would have liked more emotional support (e.g. someone who regularly asked how you are, someone happy to listen to how you are feeling) after the birth of the baby and anxiety according to both scales (p<0.001). Proportionally more women who stated they would have liked more support had anxiety than not (DASS 21; 15.1%, n=91 and EPDS 3A; 16.1%, n=98) compared to (4.9%, n=50 and 4.5%, n=46 respectively).
### Table 5-7: Sociodemographic factors associated with anxiety at three months postpartum

<table>
<thead>
<tr>
<th>Categories</th>
<th>Anxiety</th>
<th>DASS-21 Anxiety</th>
<th>EPDS 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No &lt;8</td>
<td>Yes ≥8</td>
<td>p values</td>
</tr>
<tr>
<td>Age Categories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to 24 (n=102)</td>
<td>84 (82.4)</td>
<td>18 (17.6)</td>
<td></td>
</tr>
<tr>
<td>25 to 29 (n=343)</td>
<td>300 (87.5)</td>
<td>43 (12.5)</td>
<td>p &lt; 0.001*</td>
</tr>
<tr>
<td>30 to 34 (n=723)</td>
<td>658 (91)</td>
<td>65 (9)</td>
<td></td>
</tr>
<tr>
<td>35 to 39 (n=398)</td>
<td>387 (97.2)</td>
<td>11 (2.5)</td>
<td></td>
</tr>
<tr>
<td>40 and over (n=75)</td>
<td>70 (93.3)</td>
<td>5 (6.7)</td>
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</tr>
<tr>
<td>Total (n=1641)</td>
<td>1499 (91.3)</td>
<td>142 (8.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>n= (%)</strong></td>
<td><strong>n (%)</strong></td>
<td><strong>p values</strong></td>
</tr>
<tr>
<td>Relationship status</td>
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</tr>
<tr>
<td>Married/Living together (n=1473)</td>
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<td>123 (8.4)</td>
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<tr>
<td>In a relationship, not living together (n=98)</td>
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<td>8 (8.2)</td>
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<tr>
<td>Single, divorced, widowed (n=54)</td>
<td>90 (91.8)</td>
<td>9 (16.7)</td>
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<tr>
<td>Other (n=14)</td>
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<td>Total (n=1639)</td>
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<tr>
<td>Country of birth</td>
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</tr>
<tr>
<td>Ireland (n=1146)</td>
<td>1064 (92.8)</td>
<td>82 (7.2)</td>
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</tr>
<tr>
<td>European (non-Irish) (n=384)</td>
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<td>43 (11.2)</td>
<td>p &lt; 0.001*</td>
</tr>
<tr>
<td>Non-European (n=93)</td>
<td>78 (83.9)</td>
<td>15 (16.1)</td>
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<td>Total (n=1623)</td>
<td>1483 (91.4)</td>
<td>140 (8.6)</td>
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<tr>
<td>Ethnicity</td>
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</tr>
<tr>
<td>Irish (n=1223)</td>
<td>1135 (92.8)</td>
<td>88 (7.2)</td>
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<tr>
<td>Any white background (n=348)</td>
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<td>38 (10.9)</td>
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<tr>
<td>African, Chinese or any other Black or Asian background (n=53)</td>
<td>42 (79.2)</td>
<td>11 (20.8)</td>
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<td>Total (n=1624)</td>
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<td>137 (8.4)</td>
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<td>Educational level</td>
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</tr>
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</tr>
<tr>
<td>Total (n=1635)</td>
<td>1495 (91.4)</td>
<td>140 (8.6)</td>
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</tr>
</tbody>
</table>

**Note:**
- p values indicate statistical significance.
- * indicates significance at the 0.05 level.
- ** indicates significance at the 0.01 level.
<table>
<thead>
<tr>
<th>Type of health care used</th>
<th>Type of Health care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public (n=1018)</td>
<td>Public (n=1030)</td>
</tr>
<tr>
<td>Semi-private (n=410)</td>
<td>Semi-private (n=413)</td>
</tr>
<tr>
<td>Private (n=216)</td>
<td>Private (n=217)</td>
</tr>
<tr>
<td>Total (n=1644)</td>
<td>Total (n=1660)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Quit when learnt of pregnancy (n=1030)</td>
<td>Quit when learnt of pregnancy (n=1029)</td>
</tr>
<tr>
<td>Never or quit before pregnancy (n=369)</td>
<td>Never or quit before pregnancy (n=361)</td>
</tr>
<tr>
<td>Drinks Alcohol (n=251)</td>
<td>Drinks Alcohol (n=254)</td>
</tr>
<tr>
<td>Total (n=1637)</td>
<td>Total (n=1652)</td>
</tr>
<tr>
<td>Smoking</td>
<td>Smoking</td>
</tr>
<tr>
<td>Never or quit before pregnancy (n=1354)</td>
<td>Never or quit before pregnancy (n=1366)</td>
</tr>
<tr>
<td>Quit in pregnancy (n=188)</td>
<td>Quit in pregnancy (n=190)</td>
</tr>
<tr>
<td>Smokes (n=84)</td>
<td>Smokes (n=86)</td>
</tr>
<tr>
<td>Total (n=1626)</td>
<td>Total (n=1642)</td>
</tr>
<tr>
<td>* Intense anxiety, lifetime</td>
<td>* Intense anxiety, lifetime</td>
</tr>
<tr>
<td>Never (n=1162)</td>
<td>Never (n=1176)</td>
</tr>
<tr>
<td>Rarely, occasionally or often (n=457)</td>
<td>Rarely, occasionally or often (n=459)</td>
</tr>
<tr>
<td>Total (n=1619)</td>
<td>Total (n=1635)</td>
</tr>
<tr>
<td>Relationship problems with partner or husband since birth of the baby</td>
<td>Relationship problems with partner since birth of the baby</td>
</tr>
<tr>
<td>Never (n=841)</td>
<td>Never (n=848)</td>
</tr>
<tr>
<td>Rarely (n=443)</td>
<td>Rarely (n=450)</td>
</tr>
<tr>
<td>Occasionally (n=289)</td>
<td>Occasionally (n=289)</td>
</tr>
<tr>
<td>Often (n=48)</td>
<td>Often (n=50)</td>
</tr>
<tr>
<td>Total (n=1621)</td>
<td>Total (n=1637)</td>
</tr>
<tr>
<td>Ever been afraid of any partner</td>
<td>Ever been afraid of any partner</td>
</tr>
<tr>
<td>Yes (n=95)</td>
<td>Yes (n=95)</td>
</tr>
<tr>
<td>No (n=1539)</td>
<td>No (n=1556)</td>
</tr>
<tr>
<td>Total (n=1634)</td>
<td>Total (n=1651)</td>
</tr>
<tr>
<td>Since the birth would you have liked more emotional support</td>
<td>Since the birth would you have liked more emotional support</td>
</tr>
<tr>
<td>Yes (n=601)</td>
<td>Yes (n=607)</td>
</tr>
<tr>
<td>No (n=1022)</td>
<td>No (n=1033)</td>
</tr>
<tr>
<td>Total (n=1623)</td>
<td>Total (n=1640)</td>
</tr>
</tbody>
</table>

* statistically significant. 3 cells (37.5%) have count <5, therefore assumption violated. * Intense anxiety as reported by women in the statement “At any point in your lifetime before your pregnancy, have you experienced intense anxiety
5.2.7.3 Clinical factors associated with anxiety at three months postpartum

The clinical factors reported in this section are presented in Table 5.8. Body mass index (BMI), baby’s birth weight and breastfeeding at three months were all significantly associated with anxiety according to the EPDS 3A, but only breastfeeding was associated with anxiety according to the DASS 21 anxiety subscale. Mode of birth and blood loss at birth were found not to be significantly associated with anxiety according to either measurement scale.

5.2.7.3.1 Body Mass Index

BMI was associated with anxiety according to the EPDS 3A ($p=0.01$), but not the DASS 21 anxiety subscale. Proportionally more women in the obese or severely obese category reported anxiety (15.6%, $n=25$) than in any of the other weight brackets.

5.2.7.3.2 Baby’s birth weight

Birth weight was found to be significantly associated with anxiety according to the EPDS 3A ($p=0.004$), but not the DASS 21 anxiety subscale ($p=0.78$). Proportionally more of the mother of babies in the greater than 4500gms category reported anxiety (25%, $n=6$) than those of babies in the normal birth weight category (8.8%, $n=137$).

5.2.7.3.3 Infant feeding at three months postpartum

Continuation or not of breastfeeding at three months postpartum was found to be statistically significantly associated with anxiety, according to both the DASS 21 anxiety subscale and the EPDS 3A ($p=0.02$ and $p=0.006$ respectively). Proportionally more mother who were no longer breastfeeding their baby reported anxiety (10.1% $n=56$ according to the DASS 21 and 10.7% $n=59$ according to the EPDS 3A) than women who were still breastfeeding their baby (6.7%, $n=54$ and 6.6%, $n=54$ respectively).
Table 5-8 Clinical factors associated with anxiety at three months postpartum

<table>
<thead>
<tr>
<th>Category</th>
<th>Anxiety No &lt;8</th>
<th>Anxiety Yes ≥8</th>
<th>p value</th>
<th>Categories</th>
<th>EPDS 3A No &lt;6</th>
<th>EPDS 3A Yes ≥6</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (n=75)</td>
<td>68 (90.7)</td>
<td>7 (9.3)</td>
<td></td>
<td>Underweight (n=75)</td>
<td>71 (94.7)</td>
<td>4 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Ideal weight (n=1008)</td>
<td>931 (92.4)</td>
<td>77 (7.6)</td>
<td></td>
<td>Ideal weight (n=1021)</td>
<td>937 (91.8)</td>
<td>84 (8.2)</td>
<td></td>
</tr>
<tr>
<td>Overweight (n=287)</td>
<td>259 (90.2)</td>
<td>28 (9.8)</td>
<td>p = 0.187</td>
<td>Overweight (n=289)</td>
<td>266 (92.0)</td>
<td>23 (8)</td>
<td></td>
</tr>
<tr>
<td>Obese or severely obese (n=160)</td>
<td>140 (87.5)</td>
<td>20 (12.5)</td>
<td></td>
<td>Obese or severely obese (n=160)</td>
<td>135 (84.5)</td>
<td>25 (15.6)</td>
<td></td>
</tr>
<tr>
<td>Total (n=1530)</td>
<td>1398 (91.4)</td>
<td>132 (8.6)</td>
<td></td>
<td>Total (n=1545)</td>
<td>1409 (91.2)</td>
<td>136 (8.8)</td>
<td></td>
</tr>
<tr>
<td>Mode of Birth</td>
<td></td>
<td></td>
<td></td>
<td>Mode of Birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal non instrumental birth (n=544)</td>
<td>490 (90.1)</td>
<td>54 (9.9)</td>
<td></td>
<td>Vaginal non instrumental birth (n=550)</td>
<td>509 (92.5)</td>
<td>41 (7.5)</td>
<td></td>
</tr>
<tr>
<td>Vaginal instrumental birth (n=571)</td>
<td>527 (92.3)</td>
<td>44 (7.7)</td>
<td></td>
<td>Vaginal instrumental birth (n=576)</td>
<td>520 (90.3)</td>
<td>56 (9.7)</td>
<td></td>
</tr>
<tr>
<td>Caesarean section (n=514)</td>
<td>473 (92)</td>
<td>41 (8)</td>
<td>p = 0.357</td>
<td>Caesarean section (n=519)</td>
<td>474 (91.3)</td>
<td>45 (8.7)</td>
<td>p = 0.39</td>
</tr>
<tr>
<td>Total (n=1629)</td>
<td>1490 (91.5)</td>
<td>139 (8.5)</td>
<td></td>
<td>Total (n=1645)</td>
<td>1503 (91.4)</td>
<td>142 (8.6)</td>
<td></td>
</tr>
<tr>
<td>Blood loss at birth</td>
<td></td>
<td></td>
<td></td>
<td>Blood loss at birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>up to 499mls blood loss (n=1240)</td>
<td>1131 (91.2)</td>
<td>109 (8.8)</td>
<td>p = 0.71</td>
<td>up to 499mls blood loss (n=1251)</td>
<td>1140 (91.1)</td>
<td>111 (8.9)</td>
<td>p = 0.74</td>
</tr>
<tr>
<td>500mls or greater blood loss (n=403)</td>
<td>370 (91.4)</td>
<td>33 (8.2)</td>
<td></td>
<td>500mls or greater blood loss (n=408)</td>
<td>374 (91.7)</td>
<td>34 (8.3)</td>
<td></td>
</tr>
<tr>
<td>Total (n=1643)</td>
<td>1501 (91.4)</td>
<td>142 (8.6)</td>
<td></td>
<td>Total (n=1659)</td>
<td>1514 (91.3)</td>
<td>145 (8.7)</td>
<td></td>
</tr>
<tr>
<td>Baby’s birth weight</td>
<td></td>
<td></td>
<td></td>
<td>Baby’s birth weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than 2500gms (n=69)</td>
<td>63 (91.3)</td>
<td>6 (8.7)</td>
<td>p = 0.78</td>
<td>less than 2500gms (n=72)</td>
<td>70 (97.2)</td>
<td>2 (2.8)</td>
<td>p = 0.004*</td>
</tr>
<tr>
<td>2500gms-4500gms (n=1550)</td>
<td>1417 (91.4)</td>
<td>133 (8.6)</td>
<td></td>
<td>2500gms-4500gms (n=1563)</td>
<td>1426 (91.2)</td>
<td>137 (8.8)</td>
<td>p = 0.004*</td>
</tr>
<tr>
<td>greater than 4500gms (n=24)</td>
<td>20 (90.9)</td>
<td>3 (12.1)</td>
<td></td>
<td>greater than 4500gms (n=24)</td>
<td>16 (72.4)</td>
<td>6 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Total (n=1641)</td>
<td>1500 (91.4)</td>
<td>142 (8.6)</td>
<td></td>
<td>Total (n=1657)</td>
<td>1512 (91.2)</td>
<td>145 (8.8)</td>
<td></td>
</tr>
<tr>
<td>Breastfeeding feeding at 3 months postnatal</td>
<td></td>
<td></td>
<td></td>
<td>Still breastfeeding at 3 months postnatal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes still breastfeeding (n=810)</td>
<td>756 (93.3)</td>
<td>54 (6.7)</td>
<td>p = 0.02*</td>
<td>Yes still breastfeeding (n=822)</td>
<td>768 (93.4)</td>
<td>54 (6.6)</td>
<td>p = 0.006*</td>
</tr>
<tr>
<td>No longer breastfeeding (n=552)</td>
<td>495 (89.9)</td>
<td>56 (10.1)</td>
<td></td>
<td>No longer breastfeeding (n=552)</td>
<td>493 (89.3)</td>
<td>59 (10.7)</td>
<td></td>
</tr>
<tr>
<td>Total (n=1362)</td>
<td>1252 (91.9)</td>
<td>110 (8.1)</td>
<td></td>
<td>Total (n=1374)</td>
<td>1261 (91.8)</td>
<td>113 (8.2)</td>
<td></td>
</tr>
</tbody>
</table>

* statistically significant.
5.3 Summary of findings in Chapter 5

The sample of women in the study were comparable with the population in terms of relationship status, nationality/country of birth and mode of birth. But, women in the under 24 year old age category were underrepresented (6.2% vs 19.1% NPRS), as were women in public health care (62.1% vs 81% NPRS), women with no degree (31.2% vs 44.7% CSO), and women who choose to formula feed their babies (14.1% vs 53.4% NPRS).

Prevalence of anxiety in pregnancy ranged from 9.3% according to the EPDS 3A (≥6), to 15.1%, according to the DASS 21 (≥8), and up to 26.4% according to the EPDS 3A (≥4). At three months postpartum the prevalence decreased to 8.6%, according to the DASS 21 (≥8), 8.7% according to the EPDS 3A (≥6), and 24.6% according to the EPDS 3A (≥4). Prevalence of anxiety at both time points was lowest according to the EPDS 3A (≥6), and highest according to the EPDS 3A (≥4). While all three measures showed a decrease in prevalence of anxiety between pregnancy and three months postpartum, the prevalence almost halved according to the DASS 21 anxiety subscale, but decreased by only 0.7% and 1.5% according to the EPDS 3A ≥6 and ≥4 respectively. Prevalence of anxiety decreased in all the categories of mild (9.2% to 5%), moderate (3.3% to 1.9%), severe (1.1% to 1%) and extremely severe (1.4% to 0.7%) anxiety according to the DASS 21 anxiety subscale between pregnancy and three months postpartum.

On the other hand prevalence of anxiety, according to the single item statement, increased for each frequency: rarely (from 8.7% to 15.6%), occasionally (from 2.8% to 10.7%) and often (from 0.9% to 1.8%) between pregnancy and three months postpartum.

According to the DASS 21 anxiety subscale 29.2% of women who had anxiety in pregnancy continued to have anxiety at three months postpartum. Similarly, according to the EPDS 3A (≥4) and the EPDS 3A (≥6), 48.8% and 28.1% of women respectively continued to have anxiety at three months postpartum.

According to the DASS 21, the prevalence of anxiety at 15.1% was higher than the prevalence of depression (9.7%) or stress (10.4%) in pregnancy. While the prevalence of anxiety decreased at three months postpartum (15.1% to 8.6%), the prevalence of stress (10.4% to 13.9%) and depression (9.7% to 10%) increased.

In terms of comorbidities; of those 15.1% of women who had anxiety in pregnancy according to the DASS 21, 52.0% (n= 128) had anxiety independently of depression and/or stress. At three months postpartum, of the 8.6% (n=142) of women with anxiety, 31.5% (n=45) had anxiety independently of depression and/or stress. The percentage of women with anxiety and depression remained the same in pregnancy (11.4%) and at three months postpartum (11.3%) but the percentage of women with co-morbid anxiety, depression and stress increased from 23% to 38.7%.
5.3.1.1 Factors associated with anxiety

While many sociodemographic factors were found to be associated with anxiety in pregnancy and at three months postpartum according to the DASS 21 anxiety subscale, fewer socioeconomic factors were associated with anxiety according to the EPDS 3A (≥6). Fewer clinical factors; such as fertility treatment, birth weight and mode of birth, were found to be associated with anxiety according to both measurement scales.

There was a statistically significant association, according to the DASS 21 anxiety subscale, between anxiety in pregnancy and sociodemographic factors (Table 5.5) including; age (p<0.001), country of birth (p<0.001), ethnicity (p<0.001), educational level (p<0.001), type of health care (p<0.001), smoking (p<0.001), experience of intense anxiety (p<0.001) and relationship status (p<0.01). According to the EPDS 3A ≥6 anxiety was significantly associated with country of birth (p<0.001), educational level (p=0.04), smoking (p=0.006) and experience of intense anxiety (p<0.001). Alcohol habit was not significantly associated with anxiety according to both scales. Proportionally, more women with anxiety in pregnancy according to the DASS 21 (15.1%, n=246), were younger, aged 18-24 years (29.6%, n=29), they were from European (not including Ireland) (20.2%, n=76) and Non-European countries (27.2%, n=25), they had no degree (20.4%, n=102), and used public health care (19.3%, n=196), they smoked (27.4%, n=23) and experience of intense anxiety in their life time (28.5%, n=245).

In pregnancy no clinical factors (Table 5.6) including BMI, fertility treatment and baby’s birth weight were found to be associated with anxiety according to the DASS 21 anxiety subscale. However, BMI was found to be significantly associated with anxiety according to the EPDS 3A (p<0.001).

At three months postpartum significant associations were found between anxiety according to the DASS 21 anxiety subscale and sociodemographic factors (Table 5.7) including; age (p<0.001), country of birth (p<0.001), ethnicity (p<0.001), educational level (p=0.003), type of health care used (p<0.05), and smoking (p<0.001). Anxiety, according to the EPDS 3A (>6), at three months postpartum was associated with educational level (p=0.03). According to both the DASS 21 anxiety subscale and the EPDS 3A (≥6) lifetime experience of intense anxiety (p<0.001), relationship problems with partner (p<0.001 and p<0.01 respectively), fear of any partner ever (p<0.001), and a need for more emotional support since the birth of the baby (p<0.001), were all found to be significantly associated with anxiety.

At three months postpartum, proportionally more women with anxiety, (8.7%, n=142) according to the DASS 21 (>8), were under 24 years of age (17.6%, n=18), from a non-European country (16.1%, n=15), of African, Chinese or any other Black or Asian background (20.8%, n=11), had no degree (11.6% n=59) and were smokers (15.5%, n=13). According to both scales, proportionally more women with anxiety reported intense anxiety according to the single
statement, relationship problems with their partner, they reported a fear of any partner in their life time and a need for more emotional support since the birth of the baby.

Over a third, 33.3% (n=16) of women, with anxiety according to the DASS 21, reported relationship problems often, 16.3% (n=47) reported relationship problems occasionally and 9.5% (n=42) of women reported relationship problems rarely, compared to 4.2% (n=35) who reported never having had relationship problems. Just under a quarter of women with anxiety (23.2%, n=22) reported ever having a fear of any partner compared to 7.7%, n=119 who reported never having been afraid of any partner. Women with anxiety were proportionally more inclined to have stated that they would have liked more emotional support since the birth of the baby (15.1%, n=91) than not (4.9%, n=50).

At three months postpartum, clinical factors including fertility treatment, blood loss and mode of birth were not found to be associated with anxiety according to both scales (Table 5.8). Discontinuation of breastfeeding at three months postpartum was associated with anxiety, according to both the DASS 21 ($p=0.02$) and the EPDS 3A ($≥6$) ($p=0.006$). A higher proportion of women with anxiety according to the DASS 21 were no longer breastfeeding (10.1%, n=56) compared to those who continued to breastfeed (6.7%, n=54).

**Brief summary of factors associated with anxiety**

At both time points a significant association was found between anxiety and the single item statement of intense anxiety in a lifetime for both the DASS 21 and the EPDS 3A ($≥6$). In pregnancy a significant association was found between anxiety and country of birth, educational level and smoking for both anxiety scales. At three months postpartum a significant association was found for anxiety and educational level, relationship problems, ever being afraid of any partner, and a need for more emotional support since the birth of the baby. While mode of birth and blood loss at birth were not found to be associated with anxiety, breastfeeding at three months postpartum was significantly associated with anxiety for both the DASS 21 anxiety subscale and the EPDS 3A ($≥6$).
6 Chapter 6 Discussion chapter

6.1 Introduction

In chapter 6 the discussion on prevalence of anxiety, and the differences in prevalence obtained using two different scales, two different cut-off scores and the single item anxiety statement, is contextualised alongside the literature reviewed in Chapter 3. This is followed by a discussion of findings in relation to persistent and new onset anxiety at three months postpartum. In turn the co-morbidities of depression, stress and anxiety at the two time points are explored, both in relation to the prevalence of depression and stress relative to prevalence of anxiety and in relation to the co-morbidities of anxiety and depression and anxiety and stress. The factors associated with anxiety at both time points are then discussed in the context of both the background literature and the characteristics of the women included in this study. The chapter concludes with the study’s key strengths and main limitations as well as the recommendations emerging from the findings. Possible reasons for similarities and differences in the findings are discussed, and suggestions are made based on the understanding of anxiety in Chapter 2.

To the best of my knowledge this is the first study to report prevalence of perinatal anxiety in an Irish setting at two time points. Additionally, to the best of my knowledge, it the first study to report prevalence of anxiety according to the DASS 21 anxiety subscale, the EPDS 3A and a single anxiety statement at both time points. These findings, measured using two scales and one ‘single item statement’, add to the body of international literature on perinatal anxiety which is acknowledged as being under-recognised (Heron et al. 2004, Goodman & Tyer-Viola 2010). In and Irish context, findings contribute to and, in part, address the apparent lack of awareness of the prevalence of perinatal anxiety (Higgins et al. 2016, Higgins et al. 2017, Higgins et al. 2018). As well as raising general awareness of the proportions of women who experience perinatal anxiety, findings may encourage midwives, obstetricians and other maternity healthcare professionals to recognise the need to incorporate assessment of anxiety, as well as depression, in the perinatal period into practice, and broaden their knowledge of perinatal mental health difficulties. Lack of receptiveness to anxiety and recognition of perinatal anxiety perpetuates the belief that midwives and other care maternity healthcare providers are not concerned about mental wellbeing, and this has the potential to leave women feeling uncertain about their mental wellbeing (Hight et al. 2014).

The findings from this study add to the list of other maternal morbidities, including pelvic girdle pain, sexual health and urinary incontinence, that women experience in pregnancy and beyond six to eight weeks postpartum (Daly 2014, Wuytack et al. 2015, O’Malley et al. 2018).
6.1.1 Prevalence of anxiety in pregnancy and at three months postpartum

The prevalence of anxiety in the same sample of women varied greatly, at both time points and according to the two measurement scales and the single-item anxiety statement. In pregnancy, the lowest prevalence of anxiety reported was 9.3% (n=154) according to the EPDS 3A (≥6), increasing to 12.4% (n=206) according to the single statement, and 15.1% (n=246) according to the DASS 21 anxiety subscale, with the highest prevalence at 26.3% (n=438) recorded according to the EPDS 3A (≥4). At three months postpartum prevalence of anxiety decreased to 8.6% (n=142) according to the DASS 21 anxiety subscale, 8.7% (n=145) according to the EPDS 3A (≥6) and 24.6% (n=409) according to the EPDS 3A (≥4). On the other hand prevalence increased to 28.1% (n=462) according to a single statement.

The variations in prevalence of anxiety is acknowledged in the literature and is attributed to a number of factors including method of assessment, and cut-off scores, used to determine the its presence or absence (Newham & Martin 2013, Bandelow & Michaelis 2015, Matthey 2016). However, this is the first study to report the variation in prevalence in the same cohort according to the DASS 21 anxiety subscale, the EPDS 3A and a single statement. In this study, prevalence ranged from above 9% to over 26% in the same sample of women in pregnancy using the EPDS 3A, but with two different cut-off scores. The use of the lower cut-off score of ≥4 resulted in 17.1% (n=284) more women being categorised as anxious compared to the higher cut-off of ≥6.

The high prevalence found using the EPDS 3A (≥4) identified a quarter of women with anxiety in both pregnancy and postpartum similar to the findings from Swalm et al (2010) who recommended using ≥4 as a cut-off stating that it captured the top quartile of their sample. Other studies have reported differences in prevalence based on measurement scales used, which they attribute to the design of the scales and what the scales are measuring, all of which contribute to the wide variations in prevalence (Matthey et al. 2013). Reporting prevalence of anxiety in this study, albeit in the same cohort of women, according to the EPDS 3A (≥4) resulted in 11.3% (n=192) more and 5.8% (n=92) fewer women according to the EPDS 3A (≥6), being categorised as anxious in pregnancy when compared to the prevalence of 15.1% (n=246) according to the DASS 21 anxiety subscale. Variations in prevalence are likely to arise because measurement scales differ considerably in the number of items in each scale and the inclusion of somatic symptoms. The inclusion of somatic symptoms in the DASS scales has the potential to conflate normal physiological changes associated with pregnancy with anxiety symptoms (Newham & Martin 2013). In pregnancy, the physiological changes in the respiratory and cardiac systems mean women experience changes in their breathing pattern and heart rate (Henderson & Macdonald 2004) thus including physical symptoms in anxiety measurement scales can lead to invalid results in a perinatal sample of women. The seven item DASS 21 anxiety subscale measures being worried (item 9), feeling close to panic (item 15) and feeling scared (item 20) as
well as physiological responses to anxiety including dryness in the mouth (item 2), breathing difficulties (item 4) and awareness of action of the heart (item 19). While the EPDS 3A also measures feelings of worry (item 4), and panic (item 5) it does not include measures symptoms of physiological arousal that are associated with the autonomic response to anxiety, such as an increase in heart rate or breathing difficulties. During the development of the original 10-item EPDS for postnatal depression, Cox et al. (1987) purposely omitted somatic symptoms because they can relate to normal physical symptoms associated with being a new mother such as fatigue and sleep deprivation. Consequently, there are no somatic symptoms in the EPDS 3A either. Including physiological symptoms could lead to the variation in prevalence of anxiety seen between pregnancy and postpartum according to the DASS 21.

Furthermore, acceptable reliability of the DASS 21 anxiety subscale has been found in the perinatal sample in this study ($\alpha=0.75$ in pregnancy and $\alpha=0.75$ postpartum). This is the first study, to the best of my knowledge that reports reliability of the DASS 21 anxiety subscale in pregnancy. Others have reported reliability in mothers of young children (Duc Tran et al. 2013, Lovell et al. 2015). In addition, while the complete DASS 21 has been validated in a general population, there is no available evidence to demonstrate that it has been validated for use in the perinatal population. The EPDS 3A was found to have acceptable reliability in this study ($\alpha=0.74$ in pregnancy and $\alpha=0.73$ postpartum) which is similar to another perinatal sample Swalm et al. (2010) ($\alpha=0.74$). Validity of the EPDS 3A has been demonstrated in the literature (Simpson et al. 2014 and Matthey 2008 and Phillips et al. 2009). Using a measurement scales like the DASS 21 anxiety subscale, that has not been validated against other anxiety screening tools or a diagnostic interview in pregnancy for the pregnant population might account for the higher prevalence of anxiety reported in pregnancy compared to postpartum. The wide change in prevalence was not identified by the EPDS 3A according to both the cut-off scores, even though it is reported that anxiety in pregnancy is higher than postpartum. It is also reported that anxiety scores are 1.6 times higher for first time mothers postpartum (Swalm et al. 2010).

### 6.1.1.1 Difference in prevalence of anxiety between pregnancy and postpartum in the context of the literature reviewed.

The findings in this study are replicated in the literature where higher prevalence of anxiety in pregnancy compared to postpartum has been reported using anxiety measurement scales (Heron et al. 2004, Figueiredo & Conde 2011). There is an argument in the literature that anxiety in pregnancy is pregnancy specific, and that women in pregnancy have very specific worries in relation to becoming a parent in the first trimester, impeding childbirth in the third trimester as well as to their or their baby’s health and well-being (Huizink et al. 2016, Matthey 2016, Figueiredo & Conde 2011).
6.1.1.2 Prevalence of anxiety according to the DASS 21 anxiety subscale in pregnancy

Prevalence of anxiety in pregnancy according to the DASS 21 anxiety subscale was found to be consistently lower in this study compared to the literature reviewed in chapter 3. It is suggested that sociodemographic factors, including education, age, time point in pregnancy and culture, might contribute to some of the variance. The prevalence according to the DASS 21 in this study was lower at 15.1% (n=246) compared to 24% in Reid et al. (2009) study, 47.4% in Jonsdottir et al. (2017) and 42% in Din et al. (2016). When the cut-off used by Huang et al. (2014) (DASS 21 ≥10) was applied in this study, prevalence of anxiety was lower at 5.8% compared to 12.4%. Reid et al. (2009) study population also reported more anxiety in the moderate and extremely severe categories (2.3% and 5.3%) compared to the women in this study (1.1% and 1.4%). Not only does Reid et al. (2009) mixed parity study population differ compared to the nulliparous women in this study, but they also differ in terms of education: 33% of women compared to 68.8% of women in this study had a primary or higher university degree. Jonsdottir et al. (2017) sample of women are not comparable with the women in this study, because they were allocated to the pregnancy distress group. Women in the pregnancy distress group were categorised after recruitment and following screening on either the DASS or the EPDS.

Multiparity (Ibanez et al. 2012) and young age (Ibanez et al. 2012, Rubertsson et al. 2014) are found to be associated with anxiety in pregnancy, as is the third trimester of pregnancy (Dennis et al. 2017). Anxiety is recognised as being more prevalent in the younger age group in both perinatal and general literature (Alonso et al. 2004, Ibanez et al. 2012, Rubertsson et al. 2014). In this study age was a factor significantly associated with anxiety according to the DASS 21 in pregnancy and at three months postpartum (p<0.001). The prevalence of anxiety amongst the younger women in this study was higher than that in the older with 29.6% of 18-24 year olds having reported anxiety compared to 5.2% of women aged 40 years or more according to the DASS 21 in pregnancy. The Reid et al. (2009) sample of women had a younger mean age than this study (29.2 years SD 5.6, compared to 31.9 years SD 4.5) which may have contributed to the higher prevalence of anxiety in their sample.

Compared to the 12.4% of women in Huang et al. (2014) study who reported anxiety only 5.8% of women in this study reported anxiety. More women in Huang et al. (2014) study had a college degree or higher (89.8%) than in this study (68.8%). While low levels of education are reported to be associated with anxiety in some literature (Yelland et al. 2010, Ibanez et al. 2012, Rubertsson et al. 2014), others contest that finding and report that higher education level are associated with anxiety (Bener et al. 2012, Field 2018). In the general population Alonso et al. (2004) reported that prevalence of anxiety for those with 0–4 years of education, and 13+ years of education is the same (6%). Although, Nasreen et al. (2011) observes that higher education helps increase self-esteem and self-worth, the findings in the literature are inconclusive in relation to educational levels and anxiety. Nonetheless, in this study educational level was significantly
associated with anxiety in pregnancy, for the DASS 21 \( (p<0.001) \) and the EPDS 3A \( \geq 6 \) \( (p=0.04) \) and at three months postpartum for the DASS 21 \( (p<0.001) \) and the EPDS 3A \( (p=0.03) \).

The literature is unanimous in reporting that the course of anxiety in pregnancy follows a u-curve, where rates are higher in the first and third trimester and lowest in the second trimester (Heron et al. 2004, Figueiredo & Conde 2011, Newham & Martin 2013, Bayrampour et al. 2015b). Nearly half of the women in Reid et al. (2009) study were in the third trimester compared to just 3% \( (n=46) \) in this study (recruitment outcome section 4.2.2.4), a factor that might well result in the higher prevalence in studies reporting anxiety in the third trimester. In this study the majority of women were in the second trimester of pregnancy \( (84.7\% \ n=1335) \), this might account for the lower prevalence of anxiety reported.

The high prevalence reported in women in Pakistan \( (42\% \ n=96) \) might also be explained by the women being in the third trimester of pregnancy, combined with both age, socioeconomic and cultural factors (Din et al. 2016). Din et al. (2016) reported that women with distress according to the entire DASS 21 were more likely to be of a younger age group, primiparous, having a lower monthly income and live in rented accommodation. Lower income is reported as a contributing factor to anxiety (Wenzel 2011). In addition a higher prevalence of perinatal anxiety has been identified in women from lower income (Nasreen et al. 2010) and middle income countries (Dennis et al. 2017).

6.1.1.3 Prevalence of anxiety according to the EPDS 3A in pregnancy in the context of the literature

As with prevalence of anxiety according to the DASS 21 Prevalence of anxiety according the EPDS 3A was lower than that reported in the literature. Two studies provided comparison for prevalence of anxiety according to the EPDS 3A \( (\geq 6) \), but no studies were identified that reported prevalence according to the EPDS 3A \( (\geq 4) \). Compared to prevalence of 9.3% in this study, Luoma et al. (2015) reported a prevalence of 17% in nulliparous women in the third trimester of pregnancy, measured using a Finnish translation of the EPDS 3A scale. Signal et al. (2017) found higher prevalence of anxiety, between 20% and 25%.

Different cultural values, societal values and isolation from family are all factors recognised as complex cultural differences in the adjustment to pregnancy and to the postpartum periods which can contribute to anxiety (Onoye et al. 2016). Signal et al. (2017) found higher prevalence of anxiety, between 20% and 25% in Non-Maori and Maori women respectively, and both of mixed parity and in the third trimester of pregnancy. Signal et al. (2017) findings echo these findings reporting that younger women reported anxiety as did those with a previous history of depression and women of Maori ethnicity. Ethnicity was also found to be a factor significantly associated with anxiety in this study, both in pregnancy according to the DASS 21 \( (p<0.001) \) and the EPDS 3A \( (p=0.04) \) and at three months postpartum according to the DASS 21 \( (p<0.001) \). Research into
ethnicity is welcome in particular given that Wenzel (2011) reports that there is virtually no research on the prevalence of perinatal anxiety and culture and ethnicity.

6.1.1.4 Prevalence of anxiety according to the DASS anxiety subscale at three months postpartum in the context of the literature reviewed.

In this study, the findings show that prevalence of anxiety according to the DASS 21 anxiety subscale was lower at 8.6% at three months postpartum compared to Bener et al. (2012) (13.1%) and Miller et al. (2006) (12.6%). In addition compared to the findings in this study a higher percentage of women in Miller et al. (2006) study had moderate anxiety (3.7% vs 1.9%) and extremely severe anxiety (3.0% vs 0.7%), but comparable percentage of women had mild (4.7% vs 5.0%) and severe anxiety (1.2% vs 1.0%). Both Bener et al. (2012) and Miller et al. (2006) reported anxiety up to 6 months postpartum and not at three months postpartum. Higher prevalence of anxiety has been reported in the first week postpartum (Giakoumaki et al. 2009) (Figueiredo & Conde 2011), but it continues to decrease between 0-6 months postpartum (Bayrampour et al. 2016). So one might have expected the prevalence to be lower in the Miller et al. (2006) and Bener et al. (2012) studies compared to this study.

The characteristics of women in Miller et al. (2006) study were comparable in terms of parity (nulliparous) and educational level; insofar as 67.9% had a degree or higher qualification compared to 68.8% in this study. The mean age was also similar; Miller et al. (2006) sample mean age was 32 years (SD= 4.6) compared to 31.9 years (SD = 4.5) in this study. Miller et al. (2006) sample were recruited from a larger cross sectional study who self-selected to participate. But Miller et al. (2006) sample size was smaller than this study (n=325 vs n=1644) and self-selection may introduce selection bias (Polit & Beck 2008).

In Bener et al. (2012) study in Qatar, 40.3% of women were under 30 years of age compared to 27.3% in this study, and 41.8% had a university degree or higher compared to 68.8% in this study. However, it is most probable that cultural differences including living situations contributed to high anxiety prevalence, over three quarters of Bener et al. (2012) women with anxiety (78.9%) reporting a poor relationship with their mother-in-law.

6.1.1.5 Prevalence of anxiety according to the single statement in the context of the literature

A direct comparison to the single statement was possible, as Woolhouse et al. (2009) reported prevalence of anxiety in nulliparous women in early pregnancy (n=1 507) and at three months postpartum (n=1 427), in the Maternal Health Study in Australia, using the same single statement at the same time points as this study.

In this study fewer women reported anxiety ‘occasionally and often’ since the start of pregnancy (3.7%, n=62) compared to the postpartum period (since the birth of the baby) (12.5%, n=205). Woolhouse et al. (2009) had similar findings to this study insofar as fewer women reported
anxiety occasionally and often in pregnancy (7.3% n=110) than in the postpartum period (15.7% n=224). In spite of both cohorts of women in both studies being nulliparous, enabling reduced
confounders, the findings are similar to those found according to the measurement scales; the
women in this study reported lower levels of anxiety at both time points.

Age might explain the difference in prevalence reported between the two studies as this study
included 6.2% of women aged 18-24 years whereas Woolhouse et al. (2009) study had 14.1% of
women aged 18-24 years. In addition, 46% of women in the Australian study had a primary or
higher university degree compared to 68.8% of women in this study. Relationship status was
comparable between the two studies.

The increase in anxiety between pregnancy and the postpartum period according to the single
statement might be attributed to women equating stress to anxiety. This suggestion is made based
on the findings in this study which showed that the prevalence of stress increased (10.4% to
13.9%) between pregnancy and three months postpartum. While Woolhouse et al. (2009) did not
offer an explanation they did report that the anxiety levels decreased at 9 months postpartum to
8.6% in this nulliparous sample of women. Dipietro et al. (2008) reported a similar finding in a
nulliparous sample, they found that anxiety levels were similar by two years postpartum for both
nulliparous and multiparous women. In this study prevalence beyond three months postpartum is
not reported.

6.1.1.6 Prevalence of anxiety according to the DASS 21 anxiety categories

The findings show that fewer women in this study in each category of anxiety (i.e., mild,
moderate, severe, extremely severe) according to the DASS 21 reported anxiety at three months
postpartum. There was very little difference in the proportion of women with severe anxiety
between pregnancy and postpartum (1.1% to 1.0%), but the percentage of women with mild (9.2%
to 5%), moderate (3.3% to 1.9%) and extreme anxiety (1.4% to 0.7%) almost halved postpartum.

While it is difficult to say exactly why the prevalence decreased according to the DASS 21
categories, the greatest drop in anxiety was in the mild and moderate rates of anxiety, that might
be explained by the literature that states that the emotional state of anxiety is transitory (Makari
2012) and necessary for adaptation to motherhood (Wenzel 2011). Anxiety is prevalent in
pregnancy when mothers are concerned for their own well-being and that of the baby (Pariante et
al. 2014), and more prevalent in the third trimester when labour and birth are imminent
(Figueiredo & Conde 2011, Brunton et al. 2015). While the emotion state of anxiety is transient
for a large group of women and considered a normal part of pregnancy and adaptation,
nonetheless, for a number of women, anxiety persists and continue into motherhood (Glover
2014) and this may be so for the women with severe anxiety in pregnancy and at three months
postpartum.
6.1.2 Ongoing and new onset anxiety reported at three months postpartum

Findings related to ongoing anxiety at three months postpartum are similar to those reported in the literature. According to the DASS 21 and both EPDS 3A $\geq 4$ and $\geq 6$, between 28.1% and 48.8% of women who had anxiety in pregnancy reported anxiety at three months postpartum. However, between 5% and 15.8% of women, who had not reported anxiety in pregnancy, did report anxiety at three months postpartum. According to the DASS 21 anxiety subscale 29.2% of women reported ongoing anxiety. According to the EPDS 3A ($\geq 4$), 48.8% of women reported ongoing anxiety. According to the EPDS 3A ($\geq 6$), 28.1% of women reported ongoing anxiety. Five percent of women reported new onset anxiety according to the DASS 21, 15.8% according to the EPDS 3A ($\geq 4$) and 6.6% according to the EPDS 3A ($\geq 6$).

Heron et al. (2004), had a similar finding and reported that eight weeks postpartum 29.6% of women had ongoing anxiety and 4.5% of women had new onset anxiety. Although the findings in this and Heron et al.’s (2004) study show that between 28.1% and 48.8% of women had ongoing anxiety, others have shown that anxiety in pregnancy is strongly predictive of anxiety postpartum (Grant et al. 2008). Nonetheless, the findings in this study show that there are a proportion of women who did not report anxiety in pregnancy but did report anxiety in the postpartum period. This finding of new onset anxiety is supported by the literature (Heron et al. 2004, Bayrampour et al. 2015b).

6.1.3 Comparison of prevalence of anxiety, depression and stress at both time points

In this study, the prevalence of anxiety in pregnancy was higher (15.1%) than depression (9.7%) and stress (10.4%) according to the DASS 21 anxiety subscale which is similar to findings in the literature (Huang et al. 2014, Din et al. 2016, Jonsdottir et al. 2017, Signal et al. 2017). At three months postpartum, the findings show that prevalence of anxiety (8.6%) was lower than stress (13.9%) or depression (10%). Prevalence of anxiety decreased by 6.5% between pregnancy and the postpartum period for the entire sample in this study. On the other hand, between pregnancy and three months postpartum prevalence of depression increased, albeit marginally, by 0.3%, and prevalence of stress increased by 3.5%. Others have also found anxiety was less prevalent than depression in the postpartum period, but contrary to the findings in this study they found that anxiety was more prevalent than stress in the postpartum period (Miller et al. 2006, Bener et al. 2012). The differences may be attributed to the sample of women with the self-selection recruitment process used by Miller et al.’s (2006) and the cultural differences identified for Bener et al.’s (2012) women. Both the possibility of self-selection bias and cultural differences have been discussed in section 6.1.1.3.
The literature searched, and reviewed, for this study did not identify any study that reported the co-morbidities of anxiety, depression and stress in pregnancy according to the DASS 21, so the findings in this study are new. The DASS has not been validated for use in the perinatal population but unlike other measurement scales, the DASS 21 measures anxiety, depression and stress. In this study, according to the full DASS 21, 52% of the 15.1% of women in pregnancy with anxiety had anxiety independent of depression and/or stress, and 23.2%, had co-morbid anxiety, depression and stress. In pregnancy anxiety alone (52%, n=128) was more prevalent than anxiety and comorbid depression (11.4%, n=28), anxiety and stress (13.4%, n=33) and anxiety, depression and stress (23.2%, n=57).

The comorbidity of anxiety with depression in the postpartum period is reported in the literature (Wenzel et al. 2005, Austin et al. 2010, Field 2018). While no studies were identified that reported co-morbidities of anxiety depression and stress in pregnancy, Bener et al. (2012) reported co-morbidity according to the DASS 21 in the postpartum period. However, the findings differed when compared to this study. Unlike the findings in the Bener et al. (2012) study, in which more women had anxiety (61.9%, n=135) independent of stress and depression in the postpartum period, most women in this study had comorbid anxiety, depression and stress (38.7% n=55). Of the 8.6% (n=142) of women in this study who had anxiety at three months postpartum, 38.7% (n=55) had anxiety with comorbid depression and stress, and 31.7% (n=45) had anxiety alone (Table 5.4). In a narrative review of postnatal anxiety Field (2018) recommends that the assessment of postnatal women should be broader and encompass both anxiety and depression.

6.1.3.2 Assessment

Given the findings in relation to prevalence of the co-morbidities of anxiety, depression and stress women need to be assessed for all three and not just anxiety, depression or stress. The need to assess women for anxiety and the co-morbidities of depression and anxiety is endorsed in the literature (Miller et al. 2006, Goodman & Tyer-Viola 2010). Moreover, Woolhouse et al. (2009) found that women with anxiety were less likely to seek help that those with depression and anxiety and those with depression alone. They also found that considerably more women with anxiety (with or without depression) reported that there was no one they felt comfortable talking to or that they were too embarrassed to seek help compared to those who experienced depression alone (25% compared to 1%). Goodman & Tyer-Viola (2010) reported that only 15% of women who screened positive for an anxiety disorder (PHQ) or depression (EPDS) in pregnancy had any evidence of mental health treatment in their electronic patient record. Similarly, they found that only 25% of women with positive screening in the postpartum period were referred for treatment. The need to ask women about their mental health including anxiety is further emphasised. In response to the question if participants felt they needed help for anxiety or depression Goodman...
& Tyer-Viola (2010) found that 25% (n=121) of women responded positively in the third trimester and 14% (n=42) of women responded positively at six weeks postpartum. Furthermore, just over half of those women who felt they needed help in pregnancy screened positive for anxiety or depression (53%, n = 64) (Goodman & Tyer-Viola, 2010). They concluded that these findings demonstrate the lack of enquiry and screening for anxiety or depression by health care providers in the perinatal period. The lack of assessment and screening recognised in Ireland (Higgins et al. 2017) and has been recognised internationally with 34% of women those who screened positive and said they needed help in pregnancy for anxiety and/or depression receiving no treatment or referral (Goodman & Tyer-Viola, 2010). The findings emphasise the unmet and unrecognised needs of women in the perinatal period both nationally and internationally.

Goodman & Tyer-Viola (2010) report that a high proportion of women endorsed significant anxiety symptoms at both time points on the self-report PHQ but they did not meet diagnostic criteria. There is a recognised limitation in this study and others of not using a clinical interview to differentiate normal anxiety levels from anxiety disorders (Heron et al. 2004, Henderson & Redshaw 2013). But there is also a recognition that women who report needing help for anxiety and/or depression are not being captured by screening tools (Goodman & Tyer-Viola 2010) suggesting that women need to be asked if they would like help for anxiety.

### 6.1.3.3 Summary in relation to anxiety and depression.

For too long anxiety has been in the shadow of depression (Barry 2016). Furthermore, differentiating anxiety symptoms from depression has been problematic (Highet et al. 2014). In a qualitative study it has been found and reported that women experienced confusion around their experiences of excessive worry and impaired social function as they went unrecognised due to lack of awareness of anxiety (Highet et al. 2014). Highet et al. (2014) concluded that the profile and awareness of perinatal anxiety needs to be increased. In addition women with postpartum anxiety have been found to be less inclined to seek help (Woolhouse et al. 2009). Ignoring either anxiety or depression at the expense of the other is unhelpful and can result in missing those women who have anxiety independently of depression and visa versa. The broader criterion of postnatal anxiety and depression warrant attention and neither one should take precedence over the other but rather be seen as separate entities that can also occur together (Miller et al. 2006).

### 6.1.4 Factors associated with anxiety

According to the DASS 21 anxiety subscale there was a significant association with age ($p<0.001$), country of birth ($p<0.001$), ethnicity ($p<0.001$), smoking ($p<0.001$), and intense anxiety (single statement) ($p<0.001$), in pregnancy and at three months postpartum. Relationship status was associated with anxiety in pregnancy ($p<0.01$), but not at three months postpartum ($p=0.17$). Educational level was also found to be associated with anxiety in pregnancy ($p<0.001$),
and at three months postpartum ($p=0.003$) according to the DASS 21. Type of health care used was also found to be associated with anxiety in pregnancy ($p<0.001$), and at three months postpartum ($p \leq 0.05$) according to the DASS 21. In pregnancy country of birth ($p<0.001$), ethnicity ($p=0.08$), educational level ($p=0.04$), smoking ($p=0.006$) and intense anxiety (single statement) ($p<0.001$) were all associated with anxiety according to the EPDS 3A ($\geq 6$). At three months postpartum educational level ($p=0.03$) and intense anxiety (single statement) ($p<0.001$) were associated with anxiety according to the EPDS 3A ($\geq 6$). Fertility treatment and baby birth weight were not associated with anxiety in pregnancy and mode of birth and blood loss at time of birth were not associated with anxiety at three months postpartum according to both scales. At three months postpartum; relationship problems with partner ($p<0.001$); fear of any partner ever ($p<0.001$); and an expressed need for more emotional support since the birth of the baby ($p<0.001$); were all significantly associated with anxiety according to both the DASS 21 and the EPDS 3A ($\geq 6$).

6.1.4.1 Factors associated with anxiety in pregnancy

Age has also been reported as significantly associated with anxiety according to the DASS 21 by Signal et al. (2017), particularly for those under the age of 24 years. Lower educational levels and cigarette smoking (Ibanez et al. 2012, Rubertsson et al. 2014) and ethnicity (Rubertsson et al. 2014) (Signal et al. 2017) are also reported as being associated with anxiety. Country of birth and ethnicity were significantly associated with anxiety for both scales in pregnancy. Others have found an association between anxiety and immigration in the past five year in pregnancy (Falah-Hassani et al. 2016) and country of birth and anxiety in the postpartum period (Yelland et al. 2010).

Unlike in this study, birth weight has been associated with anxiety, particularly low birth weight, in a systematic review of anxiety and low birth weights (Ding et al. 2014). It may be that this study did not have a similar finding because of one exclusion criterion. In this study mothers of babies who were ill in NICU were excluded, which may have resulted in babies born with a low birth weight being excluded.

Similarly, fertility treatment was not found to be associated with anxiety in this study which contradicts the findings of others McMahon et al. (1997), (Bayrampour et al. 2015a). McMahon et al. (1997) used the extensive 40 item State Trait Anxiety Inventory (STAI) (Spielberger & Reheiser 2009) and (Bayrampour et al. 2015a) used the 20 item STAI-state subscale. In the McMahon et al. (1997) study specific anxiety questions related to pregnancy and the baby were asked, unlike the DASS 21 anxiety subscale or the EPDS 3A; neither of which assess any specific pregnancy or baby related anxiety.
Type of health insurance was associated with anxiety in this study which is consistent with findings in an Australian study, in which it was found that those in public health care were significantly more likely to report anxiety (OR 2.26 1.8-2.8) (Yelland et al. 2010).

Finally, women who answered yes to the single statement related to experiences of anxiety were more likely to have anxiety according to the DASS 21 and the EPDS 3A at both time points. This seems obvious, but nonetheless is very worthwhile acknowledging that women already know if they are or are not anxious. This finding may suggest that measurement scales be accompanied by a single statement question to identify women with anxiety perinatally and to aid assessment of that anxiety is transient and/or enduring.

6.1.4.2 Factors associated with anxiety in the postpartum period

Age was also found to be associated with postpartum anxiety (DASS 21 anxiety subscale). Others have found that younger age is associated with anxiety (Yelland et al. 2010, Bayrampour et al. 2015a). Consistent with the findings in this study in relation to an association between anxiety and relationship problems (p<0.001), and an expressed need for more emotional support since the birth of the baby (p<0.001), others have reported similar findings according to the DASS 21 anxiety subscale (Bener et al. 2012) and the STAI-state (Bayrampour et al. 2015a).

Clinical factors including BMI, mode of birth, blood loss at birth and baby’s birth weight were not found to be associated with anxiety according to the DASS 21 and the EPDS 3A. Similar to this study, Ibanez et al. (2012), who reported anxiety in pregnancy according to a French version of the STAI-state scale (Spielberger & Reheiser 2009), also reported that birth weight was not associated with anxiety. Mode of birth was not associated with anxiety in this study and that finding was also reported by Floris et al. (2016) in a nulliparous sample of 79 women at four months postpartum, using the longer 20 item STAI-state scale. Similarly, Bell et al. (2016), in a sample of 4901 women at two months postpartum, using the CCEI (Crown & Crisp 1966), also reported that type of birth defined as physiological and non-physiological was not associated with postpartum anxiety. Consistent with the finding in this study where breastfeeding at three month postpartum was found to be associated with anxiety according to both the DASS 21 (p=0.02) and the EPDS 3A (p=0.006), Field (2018) found in a systematic review of anxiety postpartum that there is a relationship between breastfeeding and anxiety. They found that those with anxiety were less likely to initiate breastfeeding, had more breastfeeding difficulties and they were more likely to terminate breastfeeding earlier.

6.2 Limitations and strengths of the study

The following limitations of this study are acknowledged. Firstly, prevalence of anxiety may have been even higher in this study if it included more women of a younger age, as well as those under 18 and women who could not read or understand English.
Secondly, prevalence may have been higher if the sample had included more women with a lower level of education and women receiving public health care.

In addition, the measurement scales used to report the prevalence of anxiety, depression and stress are not diagnostic tools and no formal interview, sometimes referred to as a gold standard interview was undertaken to confirm if the women had clinical anxiety, depression or stress.

Finally, of the women who were offered the information pack to join the study 40% accepted. This rate is offset by the high retention rate at three months postpartum (85%), the longitudinal design, large sample size, the range of factors available for analysis as associated factors and the three assessment tools used to report anxiety.

The following strengths are acknowledged. Ultimately to the best of this researchers knowledge this is the first longitudinal study in Ireland to report data in relation to anxiety in pregnancy and postpartum in the same sample serving to fill a gap and add to the growing international data available on perinatal anxiety. Aside from that fact the strengths of the study are threefold. Firstly, the data for this study are drawn from a larger study (MAMMI study) resulting in a sample size of 1668 women with between 96.7% (n=1633) and 99.5% (n=1660) of the women completed both measurement scales at both time points. Because this study included data from a larger study, variables from the larger study were available and allowed for associations with anxiety in pregnancy and postpartum to be assessed through statistical analyses. Secondly, the women in this study were assessed at two time points, once in pregnancy and again at three months postpartum allowing for changes in anxiety to be observed and reported over time. Thirdly, as well as using a single statement, anxiety was measured using two measurement scales; the DASS 21 anxiety subscale and the EPDS 3A. The latter is reported to have good reliability and validity in the perinatal population and the former good reliability in the general population and validity in the postnatal population. Using two measurement scales and the single statement allowed for a direct comparison within the same sample of women. This enabled a clear demonstration on the wide variance in the prevalence of anxiety reported in the same study population and furthered a discussion on the possible explanations.

### 6.3 Recommendations.

#### 6.3.1 Research

Following the findings from this study it is suggested that;

The validity of the DASS 21 in a pregnancy sample is researched. The tools does assess the three emotional states of anxiety, depression and stress for that reason it might have potential value as an assessment tool in the perinatal period.

The EPDS cut-off of $\geq 4$ is used in further research as this cut-off did capture more women with ongoing anxiety at three months postpartum than the EPDS 3A $\geq 6$.  

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Further analysis of the factors associated with anxiety including logistic and multiple regression.

6.3.2 Policy

Firstly, given the prevalence of anxiety according to measurement scales used to report anxiety in this study in pregnancy (9.3% and 26.4%) and at three months postpartum (8.6% and 28.1%) it is recommended that all women in the maternity care services nationally are assessed for anxiety at both time points.

Secondly, given the prevalence of anxiety reported by women according to a single statement in pregnancy (12.4%) and postpartum (28.1%) it is recommended that all women in the maternity services nationally are asked if they have anxiety at both time points.

Thirdly, given the co-morbidity of anxiety depression and stress it is recommended that all women in the maternity services nationally are assessed for anxiety, depression and stress in pregnancy and at three months postpartum.

Given that the prevalence of perinatal anxiety reported in this study in it is recommended that future national publication, including The Specialists Perinatal Mental Health Services: model of care for Ireland report (Health Service Executive 2017), consider including these figures in any future publications.

Create an awareness of the factors associated with anxiety among maternity care providers

Create a national document indicating the sociodemographic factors associated with anxiety in pregnancy and postpartum.

6.3.3 Screening for perinatal anxiety.

The Specialist Perinatal Mental Health Services Model of care for Ireland report recommends that all women are asked the Whooley Questions (Health Service Executive 2017, p. 54) at their first pregnancy booking visit. However, these questions focus solely on depressive symptoms.

Based on the findings from this study that anxiety is more prevalent than depression in pregnancy, 15.1% compared to 9.7% according to the DASS 21 anxiety subscale, the following screening recommendations are made;

(i) Broaden the focus beyond depression

The focus is expanded to include anxiety and that all pregnant women nationally are offered a screening tool to assess for anxiety at their booking visit.

(ii) Expand the assessment times postpartum.

Given the findings in relation to new onset anxiety at three months postpartum (4.2% and 11.6%), it is recommended that women are assessed again at three months postpartum. Similar to the other morbidities recognised in the postpartum period in the MAMMI study (Daly 2014, Wuytack et al. 2015, O’Malley et al. 2018) these finding add to that body of knowledge and further emphasise
the need to implement the recommendation that postnatal care services are increased from six weeks to three months postpartum (DoH 2016).

(iii) Use other forms of assessment
Given that more women reported anxiety according to the single statement than according to the measurement scales it is recommended that midwives ask women if they have anxiety according to a single statement and not rely entirely on a measurement scale.

(iv) Introduce an assessment tool that differentiates anxiety, depression and stress.
It is suggested that women are assessed for the broader morbidities of anxiety, depression and stress in pregnancy and up to at least three months postpartum. An instrument such as the DASS 21 with validation could be useful for this purpose.

(v) Create awareness of the anxiety subscale in the EPDS
Given the findings that women can have anxiety independent of depression it is recommended that that clinicians be educated in the use of the anxiety subscale within the full EPDS. Recognition and use of the anxiety subscale will aide identification of those who could be missed if assessed for anxiety alone.

(vi) Create an awareness of the factors associated with anxiety among maternity care providers
Create a national document indicating the sociodemographic factors associated with anxiety in pregnancy and postpartum.

6.3.4 Dissemination
It is recommended that the findings in this study are shared with national education programmes targeted at all healthcare clinicians caring for women in the perinatal period. Dissemination of these findings through poster presentation, journal papers and conference proceedings will be employed to achieve these goals.

6.4 Conclusion
The findings in this study are the first in Ireland, to the best of this researchers knowledge, to report prevalence of anxiety in the same cohort of women at two time points using two measurement scales and a single statement. The findings are also the first to report perinatal anxiety according to both the DASS 21 anxiety subscale, the EPDS 3A with two cut-off scores and a single anxiety statement in the same cohort internationally, to the best of this researchers knowledge. Nonetheless, and similar to other studies in the literature, prevalence of anxiety varied depending on the measurement scale used, the cut-off scores applied, the single statement reporting anxiety and the time points. Between 9% and 26% of women reported anxiety in pregnancy and between 8% and 28% of women report anxiety at three months postpartum. Prevalence of anxiety reported according to the three item EPDS 3A, using two different cut-off scores, did not change as much as that reported according to the seven item DASS 21 anxiety
subscale between pregnancy and three month postpartum. According to the DASS 21 prevalence of anxiety of 15.1% in pregnancy decreased to 8.6% at three months postpartum. While both scales measure symptoms of anxiety the DASS 21 includes somatic symptoms which can also change as a result of the physical and biological changes associated with pregnancy. Unlike the EPDS 3A which has been validated in pregnancy and postpartum the DASS 21 needs to be validated for use in pregnancy. Both scales were found to have satisfactory reliability in this study. Prevalence of anxiety increased according to a single statement from 12.4% in pregnancy to 28.1% postpartum. Prevalence of anxiety was higher at three months postpartum than at any of the other four time points measured according to the single statement.

While women with anxiety in pregnancy were more likely to report anxiety at three months postpartum, a similar number of women, albeit a smaller proportion of women who did not report anxiety in pregnancy, reported anxiety at three months postpartum. This finding emphasis the need for assessment of anxiety both in pregnancy and at three month postpartum.

In relation to the prevalence of anxiety, depression and stress; anxiety was more prevalent than depression and/or stress in pregnancy while postpartum stress and depression, in that order, were more prevalent than anxiety. Furthermore, in relation to co-morbidities of anxiety, depression and stress, over half of those women with anxiety in pregnancy were found to have anxiety alone, while postpartum just over a third had anxiety alone and almost 40% had anxiety with comorbid depression and stress. This finding further demonstrates that while anxiety is more prevalent in pregnancy than co-morbid anxiety, depression or stress, there is a higher co-morbidity of anxiety, depression and stress in the postpartum period.

A number of sociodemographic factors including country of birth, educational level and smoking were significantly associated with anxiety according to both the DASS 21 and the EPDS 3A (≥6) in pregnancy. Age, ethnicity and type of health care used were found to be significantly associated with anxiety according to the DASS 21 in pregnancy but not the EPDS 3A (≥6). In pregnancy alcohol, fertility treatment and baby’s birth weight were not found to be significantly associated with anxiety for both scales.

Reporting intense anxiety in their life time according to the single item statement was significantly associated with anxiety for both scales at both time points.

At three months postpartum educational level, relationship problems with their husband since the birth of the baby, ever been afraid of any partner, a need for more emotional support and breastfeeding were all significantly associated with anxiety for both scales.

At three months postpartum age, country of birth, ethnicity, type of health care used and smoking were significantly associated with anxiety for the DASS 21 but not the EPDS 3A (≥6). Relationship status, alcohol, mode of birth and blood loss at birth were not significantly associated with anxiety for both scales at three months postpartum.
## 7 Appendices

### Appendix 1: Systematic Search of Five Electronic Databases

Systematic Search of Five Electronic Databases, TCD, up to 21st March 2017.

<table>
<thead>
<tr>
<th>Database</th>
<th>Date of Search</th>
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</tr>
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<td>(DASS AND maternity) ( TI ( maternal OR maternity OR mother OR mothers OR motherhood OR pregnant OR pregnancies OR gestational OR gestation OR antenatal OR “ante-natal” OR “ante natal” OR prenatal OR “pre-natal” OR pre natal OR intranatal OR “intra-natal” OR “intra natal” OR peripartum OR “peri-partum” OR “peri partum” OR postnatal OR “post-natal” OR post natal OR “post partum” OR “post partum” OR puerperium OR perinatal OR “peri-natal” OR “peri natal” OR parturient OR birth OR childbirth ) ) AND ( AB ( “DASS” OR “Depression Anxiety Stress Scale” OR “Depression Anxiety and Stress Scale” OR “Depression Anxiety Stress Scales” OR “Depression Anxiety and Stress Scales” OR “DASS-21” OR “DASS-42” OR “DASS21” OR “DASS42”) )</td>
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### Appendix 2 Excluded studies

Final reason for exclusion of studies (in **Bold**) following full text review in March 2017

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<tr>
<th>Author</th>
<th>P-participant s.</th>
<th>E-Exposure</th>
<th>O-Outcome</th>
<th>S - study design</th>
<th>Ex-Exclusion criteria</th>
<th>Comment</th>
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<tr>
<td>1. Adouard F., Glangeaud-Freudenthal N.M.C. &amp; Golse B. (2005) Validation of the Edinburgh postnatal depression scale (EPDS) in a sample of women with high-risk pregnancies in France.</td>
<td>high risk</td>
<td>EPDS-two factors identified</td>
<td>O-Major Depression</td>
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<td>2. Austin M.-P.V., Hadzi-Pavlovic D., Priest S.R., Reilly N., Wilhelm K., Saint K. &amp; Parker G. (2010) Depressive and anxiety disorders in the postpartum period: How prevalent are they and can we improve their detection?</td>
<td>6-8 months post partum</td>
<td>EPDS and CIDI interview</td>
<td>O- Depression But 44% also had anxiety</td>
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<td>Reference</td>
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<td>(2014)</td>
<td>Brain &amp; Cognition 84(1), 76-84.</td>
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<td>Study Details</td>
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<td>46. Mitchell A.J. (2009)</td>
<td>The 3 item anxiety subscale of the Edinburgh Postpartum Depression Scale may detect postnatal depression as well as the 10 item full scale. Led to Kabir et al 2008- in write up</td>
<td>S- Commentary paper.</td>
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<td>Findings</td>
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<td>51. Rallis S, Skouteris H, McCabe M, Milgrom J. The transition to motherhood: towards a broader understanding of perinatal distress. Women Birth 2014;27 (1):68–71.</td>
<td>DASS-21 No cut off stated at T1=16, T2=20 and T3=24 weeks gestation. EPDS-depression</td>
<td>EXCL. Mean scores reported.</td>
<td>E-mail sent requesting prevalence on maternity leave</td>
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<td>53. Ross L.E., Evans S.E.G., Sellers E.M. &amp; Romach M.K. (2003) Measurement issues in postpartum depression part 1: Anxiety as a feature of postpartum depression. Archives of Women's Mental Health 6(1), 51-57.</td>
<td>EPDS 3A 6 weeks and 16 weeks postpartum</td>
<td>S-Factor structure of EPDS 3-A. Anxiety reported as a fraction of the total EPDS: 47% of total score in pregnancy &amp; 38% at 6 weeks &amp; 43% at 16 weeks postpartum</td>
<td>E-mail sent requesting prevalence - no reply.</td>
<td></td>
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<tr>
<td>61. Yelland J., Sutherland G. &amp; Brown S.J. (2010)</td>
<td>Postpartum anxiety, depression and social health: findings from a population-based survey of Australian women.</td>
<td>P-6 months postpartum</td>
<td>DASS-21</td>
<td>Anxiety and Depression</td>
<td>E-mail sent to discuss same on 4th October-no reply</td>
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</table>

| P=6 | E=10 | O=21 | S= 20 | excl = 4 | Total = 61 |
Appendix 3 DASS 21 measurement scale as it appears in survey 1 and survey 2

Items 2, 4, 7, 9, 15, 19 and 20 account for the anxiety subscale.

D3 Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers.

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<th>Item</th>
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<tbody>
<tr>
<td>1</td>
<td>I found it hard to wind down</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I was aware of dryness of my mouth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I couldn't seem to experience any positive feeling at all</td>
<td></td>
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<tr>
<td>4</td>
<td>I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)</td>
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<tr>
<td>5</td>
<td>I found it difficult to work up the initiative to do things</td>
<td></td>
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<tr>
<td>6</td>
<td>I tended to over-react to situations</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td>I experienced trembling (e.g., in the hands)</td>
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<tr>
<td>8</td>
<td>I felt that I was using a lot of nervous energy</td>
<td></td>
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<tr>
<td>9</td>
<td>I was worried about situations in which I might panic and make a fool of myself</td>
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<tr>
<td>10</td>
<td>I felt that I had nothing to look forward to</td>
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<tr>
<td>11</td>
<td>I found myself getting agitated</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>I found it difficult to relax</td>
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<tr>
<td>13</td>
<td>I felt down-hearted and blue</td>
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<td></td>
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<tr>
<td>14</td>
<td>I was intolerant of anything that kept me from getting on with what I was doing</td>
<td></td>
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<tr>
<td>15</td>
<td>I felt I was close to panic</td>
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<tr>
<td>16</td>
<td>I was unable to become enthusiastic about anything</td>
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<tr>
<td>17</td>
<td>I felt I wasn't worth much as a person</td>
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<tr>
<td>18</td>
<td>I felt that I was rather touchy</td>
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<td>19</td>
<td>I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)</td>
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<td>20</td>
<td>I felt scared without any good reason</td>
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<td>21</td>
<td>I felt that life was meaningless</td>
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</table>
Appendix 4 DASS 21 Severity ratings and scoring instructions

DASS-21 Scoring Instructions

The DASS-21 should not be used to replace a face to face clinical interview. If you are experiencing significant emotional difficulties you should contact your GP for a referral to a qualified professional.

Depression, Anxiety and Stress Scale - 21 Items (DASS-21)

The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.

Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest / involvement, anhedonia and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient. Scores for depression, anxiety and stress are calculated by summing the scores for the relevant items.

The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety and the stress experienced by normal subjects and clinical populations are essentially differences of degree. The DASS-21 therefore has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classificatory systems such as the DSM and ICD.

Recommended cut-off scores for conventional severity labels (normal, moderate, severe) are as follows: NB Scores on the DASS-21 will need to be multiplied by 2 to calculate the final score.

<table>
<thead>
<tr>
<th></th>
<th>Depression</th>
<th>Anxiety</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0-9</td>
<td>0-7</td>
<td>0-14</td>
</tr>
<tr>
<td>Mild</td>
<td>10-13</td>
<td>8-9</td>
<td>15-18</td>
</tr>
<tr>
<td>Moderate</td>
<td>14-20</td>
<td>10-14</td>
<td>19-25</td>
</tr>
<tr>
<td>Severe</td>
<td>21-27</td>
<td>15-19</td>
<td>26-33</td>
</tr>
<tr>
<td>Extremely Severe</td>
<td>28+</td>
<td>20+</td>
<td>34+</td>
</tr>
</tbody>
</table>
Appendix 5 EPDS as it appears in the survey 1 and survey 2
Items c, d and e correspond to items 3, 4 & 5 for the EPDS 3A.

Section D: This section is about your emotional health and well-being NOW

D1 Please look at the following statements and for each one think about how you have been feeling in the last week:

a. During the last week I have been able to laugh and see the funny side of things:

   As much as I always could □ 1
   Not quite so much now □ 2
   Definitely not so much now □ 3
   Not at all □ 4

b. During the last week I have looked forward with enjoyment to things:

   As much as I ever did □ 1
   Rather less than I used to □ 2
   Definitely less than I used to □ 3
   Hardly at all □ 4

c. During the last week I blamed myself unnecessarily when things went wrong:

   Yes, most of the time □ 1
   Yes, some of the time □ 2
   Not very often □ 3
   No, never □ 4
d. During the last week I have felt worried and anxious for no very good reason:

No, not at all ✑ 1
Hardly ever ✑ 2
Yes, sometimes ✑ 3
Yes, very often ✑ 4

e. During the last week I have felt scared or panicky for no very good reason:

Yes, quite a lot ✑ 1
Yes, sometimes ✑ 2
No, not much ✑ 3
No, not at all ✑ 4

f. During the last week things have been getting on top of me:

Yes, most of the time I haven’t been able to cope at all ✑ 1
Yes, sometimes I haven’t been coping as well as usual ✑ 2
No, most of the time I have coped quite well ✑ 3
No, I have been coping as well as ever ✑ 4

g. During the last week I have been so unhappy I have had difficulty sleeping:

Yes, most of the time ✑ 1
Yes, sometimes ✑ 2
Not very often ✑ 3
No, not at all ✑ 4
h. **During the last week I have felt sad or miserable:**

- Yes, most of the time  
  ![ ]
- Yes, quite often  
  ![ ]
- Not very often  
  ![ ]
- No, not at all  
  ![ ]

i. **During the last week I have been so unhappy I have been crying:**

- Yes, most of the time  
  ![ ]
- Yes, quite often  
  ![ ]
- Only occasionally  
  ![ ]
- No, never  
  ![ ]

j. **During the last week the thought of harming myself has occurred to me:**

- Yes, quite often  
  ![ ]
- Sometimes  
  ![ ]
- Hardly ever  
  ![ ]
- Never  
  ![ ]
Appendix 6 EPDS scoring template

Edinburgh Postnatal Depression Scale\(^1\) (EPDS)

Postpartum depression is the most common complication of childbirth.\(^2\) The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a valuable and efficient way of identifying patients at risk for “perinatal” depression. The EPDS is easy to administer and has proven to be an effective screening tool.

 Mothers who score above 13 are likely to be suffering from a depressive illness of varying severity. The EPDS score should not override clinical judgment. A careful clinical assessment should be carried out to confirm the diagnosis. The scale indicates how the mother has felt during the previous week. In doubtful cases it may be useful to repeat the tool after 2 weeks. The scale will not detect mothers with anxiety neuroses, phobias or personality disorders.

Women with postpartum depression need not feel alone. They may find useful information on the websites of the National Women’s Health Information Center <www.nlm.nih.gov> and from groups such as Postpartum Support International <www.postpartum.com> and Depression after Delivery <www.depressionafterdelivery.com>.

**SCORING**

**QUESTIONS 1, 2, & 4 (without an *)**
Are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.

**QUESTIONS 3, 5-10 (marked with an *)**
Are reverse scored, with the top box scored as a 3 and the bottom box scored as 0.

<table>
<thead>
<tr>
<th>Maximum score:</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible Depression:</td>
<td>10 or greater</td>
</tr>
<tr>
<td>Always look at item 10 (suicidal thoughts)</td>
<td></td>
</tr>
</tbody>
</table>

Users may reproduce the scale without further permission, providing they respect copyright by quoting the names of the authors, the title, and the source of the paper in all reproduced copies.

**Instructions for using the Edinburgh Postnatal Depression Scale:**

1. The mother is asked to check the response that comes closest to how she has been feeling in the previous 7 days.

2. All the items must be completed.

3. Care should be taken to avoid the possibility of the mother discussing her answers with others. (Answers come from the mother or pregnant woman.)

4. The mother should complete the scale herself, unless she has limited English or has difficulty with reading.

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Appendix 7 Letter of introduction to the MAMMI study

School of Nursing and Midwifery
Trinity College Dublin
24 D'Olier Street
Dublin 2

15th January 2014

Dear Mother-to-be

We are Deirdre, Francesca and Deirdre, three PhD students in the School of Nursing and Midwifery, Trinity College Dublin.

We are doing a study in the Rotunda Hospital called The MAMMI Study about the health and health problems, if any, women experience during pregnancy and for the first year after the birth of their first baby.

We know that some women really enjoy becoming mothers for the first time and experience the joy and fulfilment that motherhood brings. Other women experience health problems. Some of these problems may be physical, such as backache or pain if they have had stitches or wounds after the birth. Some women may have problems controlling when they pass urine (water) and some women may have emotional/mental health problems such as low mood or depression.

We are doing the MAMMI Study because we know very little about women’s health once they leave the maternity hospital after giving birth in Ireland.

We would like to ask you to consider taking part in the study. If you feel this is something that would interest you, we should be grateful if you would read the study information in this pack please.

Thank you for taking the time to consider our request and please feel free to contact us on the study mobile number 087 1956441 or email contact@mammi.ie

We look forward to hearing from you and wish you well with your pregnancy.

Yours sincerely,

The MAMMI Study Team

Telephone: 087 1956441
Email: contact@mammi.ie

The MAMMI Study team members are:
Professor Cecily Begley & Professor Mike Clarke, Principal Investigators
Deirdre Daly, PhD student, HRB Research Fellow,
Deirdre O Malley, PhD student, HRB Research Fellow
Francesca Wuyltack, PhD student
Your invitation to join

The MAMMI Study

A study to find out more about the health and health problems of first-time mothers during pregnancy and during the first year after the baby’s birth.

The MAMMI study has been approved by the Research Ethics Committees of the Rotunda Hospital Dublin and the Faculty of Health Sciences, Trinity College Dublin. MAMMI stands for Maternal health And Maternal Morbidity in Ireland.

If you have any questions about this study, please contact researcher Deirdre Daly at 087 195 6441.
Why have I been given this booklet?
You were given this booklet because you are having your first baby. This booklet tells you about the MAMMI study and what it means if you decide to take part.

What is the MAMMI study?
MAMMI stands for Maternal health And Maternal Morbidity in Ireland. It is a study to look into the health and health problems of first-time mothers during pregnancy and during the year after the birth.

Why are you doing the study?
We want to find out:
- what health problems, if any, women experience during pregnancy and after the birth of their first baby;
- what health services, if any, pregnant women use; and
- how to improve women’s health during and after pregnancy.

What sort of questions will you ask me?
We will ask you about:
- your general health and whether you have any medical conditions or have had any operations;
- any problems you have passing urine (water);
- any problems you have with your bowel movements such as soiling yourself or passing wind when you don’t mean to;
- any problems or pain you may have during sex;
- your relationship with your partner and if you are worried about or experiencing violence in the home;
- how often you talk to a doctor, nurse or midwife about your health problems;
- your work or study; and
- the type of flat, apartment or house you live in.
Who else is taking part in this study?
We are inviting women, aged 18 and over, who are having their first baby to take part in the study. We are also asking women who may have had miscarriages or abortions to take part. Altogether, we are asking 1,600 women to take part.

What does taking part in this study mean for me?
We are asking you to complete five surveys. You should fill out the first survey (which came with this booklet) while you are pregnant. You complete the other four surveys at 3, 6, 9 and 12 months after you have given birth. We will post these surveys to you closer to the time. The surveys are also on the website, www.MAMMI.ie. Each survey takes about 45 minutes to complete.

If you have problems when you pass urine (water), we may invite you to talk to a midwife in confidence around six months after your baby’s birth.

If you decide to take part in the study, we will ask you to:
• sign the consent form which came with this booklet;
• fill out the survey form that came with this booklet while you are pregnant;
• complete four surveys about your health and health problems at 3, 6, 9 and 12 months after your baby’s birth; and
• agree to let the research team have access to your and your baby’s medical records held by the Rotunda Hospital.

Are there any risks for me or my baby?
We do not see any risks with taking part in this study. However, if we find out during the study that a woman or her baby is being harmed or that there may have been a problem with the care a woman received, we must tell the Study Data Monitoring Group.
What is the Study Monitoring Group?
The Study Data Monitoring Group has been set up to:

- guide the research team;
- manage any problems that may arise during the study; and.
- deal with complaints.

If you raise a serious complaint, the group will discuss it. They won’t know who you are. If they decide that your complaint should be brought up with midwives or medical regulatory authorities, they will ask your consent to share your personal details but can no longer protect your identity. The regulatory bodies need to know who they are representing.

The group is made up of senior staff from the Rotunda Hospital and Trinity College Dublin.

Are there any benefits for me or my baby?
The study will not benefit you personally. The information you give will be pooled with the information given by all the other women in the study. This will help us to better understand some of the health problems that women experience during pregnancy and after birth and what can be done to help them.

By taking part in the study you will be helping other mothers and their babies in the future.

Can anyone take part in the study?
To take part in the study you must be aged 18 or over and able to read and understand English.

How will you protect my personal information?
- We will keep all the information you give us private and confidential.
• We will give your survey information a unique number (a code). We will also remove your personal details from the first survey. This means that your answers will not be linked to your personal details.

• We will store your personal details and your code number securely and separately from the completed surveys. They will be kept in a locked cabinet, in a locked office in an area where few people have access.

• Paper copies of the information you give on the surveys will be identified by your code.

• We will keep an electronic version of the information you give us on a computer. Only the research team will have access to this information. We will use passwords, encryption (special software to scramble the information so it cannot be read) and anti-virus software to protect the information on the computer.

• If we do a face-to-face interview with you, we will record the interview. We will make a paper copy of the recording and show it to you so that you can confirm it is an accurate copy of the interview. We will then destroy the recording. We will use your code number to identify you on the paper copy. We will store the paper copy in a locked cabinet, in a locked office in an area to which few people have access.

• All members of the study team who have access to your information must sign a confidentiality agreement form.

• We will only disclose your personal details in exceptional circumstances for example if you or your baby is being harmed or you complain about the researchers (for more information see ‘What is the Study Data Monitoring Group’ on page 6).

What happens to the information at the end of the study?
We will publish the findings from the study and may give talks about the findings at healthcare conferences. It will not be possible to identify you or your answers in these publications or talks.

The information from the surveys may also be used in future research projects. However, the researchers will not contact you unless you give your consent to future contact. This is explained below.

**What do the options on the consent form mean?**

The consent form asks you to sign your name to show that you agree to take part in this study.

The consent form also asks you to agree to the following options:

- **Paragraph 5** lets you say if you want a member of the research team to call you after your baby’s birth. If you say yes, they will contact you and invite you to take part in an interview.

- **Paragraph 9** lets you agree to information collected from you as part of this study being used for future research studies.

- **Paragraph 10** lets you say if you want your personal details such as your name and address to be destroyed after stage 1 of this research. If you say yes, the research team will not be able to contact you when this stage of the research is over.

- **Paragraph 11** lets you to agree to us keeping your personal details for five years after the end of the first stage of this research. If you say yes, the research team will contact you and invite you to take part in future studies.

Remember, **you do not have to agree to any of these options.** However, if you do agree, you will help us to continue our study of the health problems of pregnant women, mothers and their babies.
What do I do next?
1. Sign the consent form.
2. Keep a copy for yourself.
3. Post the original signed consent form and your completed survey form using the stamped address envelope that came with this booklet.

Can I leave the study?
Taking part in the study is voluntary. You can withdraw from the study at any time without giving a reason. This will not affect the care you or your baby receives.

How can I keep in touch with you?
My name is Deirdre Daly and you can contact me on (087) 195 6441. Either myself or Deirdre O’Malley, a midwife and member of the research team from Trinity College Dublin, will be in the antenatal clinics for most of the time during the study. We will be happy to answer any questions you may have.

You can also get information on our website, www.mammi.ie.
CONSENT FORM
Research title: Maternal health And Maternal Morbidity in Ireland (The MAMMI study)
Researcher: Deirdre Daly Tel: 087 1956441

DECLARATION by participant: Please tick (X or ✓) and provide your initials

1. I have read the information booklet for this research study and I understand the contents. Yes [ ] No [ ] initials [ ]

2. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. Yes [ ] No [ ] initials [ ]

3. I fully understand that my participation is completely voluntary and that I am free to withdraw from the study at any time (prior to publication) without giving a reason and that this will not affect my care or the care that my baby receives in any way. Yes [ ] No [ ] initials [ ]

4. I agree that my medical records and those of my baby will be accessed by the research team for the purpose of this research. Yes [ ] No [ ] initials [ ]

5. I understand that I may be contacted by a member of the research team and requested to participate in an interview(s) on one or more topics covered by this research and I consent to this. Yes [ ] No [ ] initials [ ]

6. I understand that I will be given an opportunity to review the transcript of such an interview(s) to confirm accuracy. Yes [ ] No [ ] initials [ ]

7. I understand that the transcript will not identify me by name but will use the study code and that the original digital recording will be erased once the accuracy of the transcript has been confirmed. Yes [ ] No [ ] initials [ ]

8. I understand that information from this research will be published but that I will not be identified as a participant in this research in any publication. Yes [ ] No [ ] initials [ ]

Trinity College Dublin
9. I agree that information obtained from me in this research which has been coded so as not to identify me may be stored and used for the purpose of future research which will have obtained Research Ethics Committee approval without the need for further consent from myself. Yes [ ] No [ ] initials [ ]

10. I understand that my personal details (name and address and other identifying information that links my identity to the study data) will be destroyed when this study is complete unless I have agreed to its retention after that date and to being contacted about future research. Yes [ ] No [ ] initials [ ]

11. I consent to my personal details being retained for a further period of 5 years after this study has been completed and used to invite me to participate in future research in accordance with this consent. Yes [ ] No [ ] initials [ ]

12. I consent to being contacted in the future regarding participation in research relating to the topics covered by this research which will have Research Ethics Committee approval. Yes [ ] No [ ] initials [ ]

13. I consent to being contacted in the future in relation to participation in research unrelated to topics covered by this research which will have Research Ethics Committee approval. Yes [ ] No [ ] initials [ ]

14. I understand that the researchers undertaking this research will hold in confidence and securely all collected data and other relevant information. Yes [ ] No [ ] initials [ ]

15. I freely and voluntarily consent to participating in this research study. Yes [ ] No [ ] initials [ ]

PARTICIPANT’S NAME ………………………………………………………………………………………………………
Contact Address ………………………………………………………………………………………………………
……………………………………………………………………………………………………
Phone number: ……………………………………. Email: ………………………………
Participant’s signature: ……………………………… Date: ………………………………
Name of person taking consent: ……………………………… Signature: ……………………………… Date: ………………………………
Researcher: ……………………………… Signature: ……………………………… Date: ………………………………
Appendix 10 Reliability and validity of the MAMMI survey tools

Validity of MAMMI survey

Face and content validity of the surveys was tested following modification of the surveys to the Irish setting (Daly 2014). The following is a description of the content and face validity of the MAMMI survey.

Content validity

Content validity is concerned with the extent to which the questions are representative of what is known about the specific topics (McLaren 2013). As such experts in the relevant areas were deemed best placed to provide content validity. Eighteen experts assessed the content validity for survey 1 (antenatal) and 2 (3 months postnatal), using a 4-point relevance rating scale. The mean scale content validity index (S-CVI) for individual survey items was 0.97 (range 0.73-1.0) for survey 1 and 0.97 (range 0.80-1.0) for survey 2 (Daly 2014).

Face validity

Fifteen women who were pregnant or had recently given birth assessed the surveys for face validity (Daly 2014). Face validity refers to whether the instrument looks as though it is measuring what it is intending to measure (Polit & Beck 2008). Although it is said that face validity is no longer accepted as evidence of validity (Burns & Grove 2012) others argue that it is an important aspect of the usefulness of an instrument. As such validity can demonstrate the accessibility of the survey and the willingness of the participants to complete it (Polit & Beck 2008).

Reliability of the MAMMI survey.

Reliability is defined as the consistency of the tool in terms of stability and dependability with which it measures a variable (Burns & Grove 2012). Having recruited ten participants in an antenatal clinic, survey 1 was completed at two intervals two weeks apart (Daly 2014). Test-rest reliability was measured using the statistical tool Cohen’s Kappa, k, on eleven nominal variables that were chosen for their expected stability over two weeks. Different standards are proposed for Cohen’s Kappa, but there is some agreement that the value of k = 0.75 or over is excellent while k = 0.60 is acceptable (Daly 2014). The data was analysed using SPSS. The resulting Cohen’s kappa ranged from k = 0.87 to 1.0 indicating excellent agreement between the chosen variables at the two time points (Polit & Beck 2008).
Appendix 11 Ethical approval from the Faculty of Health Sciences Research Ethics Committee, TCD

Louise Rafferty,
School of Nursing and Midwifery, Trinity College Dublin,
2 Clare Street,
Dublin
D02 CK80

Ref: 161205

**Title of Study:** Maternal Health and Maternal Morbidities in Ireland (MAMMI) Study - mental health strand: prevalence of anxiety before and during pregnancy and up to 3 months postpartum in nulliparous women

Dear Louise,

Further to a meeting of the Faculty of Health Sciences Ethics Committee held in January 2017, we are pleased to inform you that the above project has been approved without further audit.

Yours sincerely,

Prof. Brian O’Connell
Chairperson
Faculty Research Ethics Committee
Appendix 12 Ethical approval from the Rotunda Hospital

28th October, 2011.

Ms. Deirdre Daly,
Lecturer in Midwifery/Research Fellow,
School of Nursing & Midwifery,
24 D'Olier Street,
Dublin 2.

Re: The MAMMI Study (Maternal health And Maternal Morbidity in Ireland)

Dear Deirdre,

Just a note to confirm that the Research Ethics Committee of the Hospital are now happy for you to commence the above study. We wish you well with this work.

Kind regards,

Yours sincerely,

[Signature]

Dr. Michael Geary,
Chairman,
Research Ethics Committee.
Appendix 13 Ethical approval from University College Hospital, Galway.

Professor Declan Devane  
Chair of Midwifery  
Aras Moyola  
School of Nursing & Midwifery  
National University of Ireland  
University Road  
Galway.

Ref: C.A. 900 – Maternal Health and Maternal Morbidity Ireland (MAMMI)

Dear Professor Devane,

I have considered the above project, and I am happy to grant Chairman’s approval to proceed.

Yours sincerely,

[Signature]

Dr. Shaun T. O’Keeffe  
Chairman Clinical Research Ethics Committee.

c.c. Professor Cecily Begley, Chair of Nursing & Midwifery, Trinity College Dublin,  
24 D’Olier Street, Dublin 2.

Profess John Morrison, Chair of Obstetrics, National University of Ireland,  
Galway.

Merlin Park University Hospital, Ospidéal na h-Ollscoil, Páirc Mheirfinne,  
Galway, Ireland. Tel: 00 353 (0)91 757631
Appendix 14 Sources of support for emotional health and wellbeing

If you are experiencing any problems with your emotional health and wellbeing and wish to talk to someone, you can telephone the **mental health midwife** at the Rotunda hospital. The midwives are: Margaret Sheridan or Louise Rafferty, telephone: 01- 8730700 bleep 472

Or you can call the Aware (Depression) Helpline on 1890 303 302

**TEXT MESSAGING**
Information on where to go for help in a crisis is now available through your mobile phone. Text the word HeadsUp to 50424. The HeadsUp text service is run by RehabCare and sponsored by Meteor.

**ONLINE information and support**
A number of support services are now using the internet to reach out to people. For example, [www.yourmentalhealth.ie](http://www.yourmentalhealth.ie)
Appendix 15 Women’s reported experience of intense anxiety.

Women’s experience of intense anxiety (such as panic attacks) in their lifetime, in the 12 months before pregnancy, since the start of the pregnancy and since the birth of the baby.
Appendix 16 Venn Diagram 1, relationship between anxiety, depression and stress in pregnancy.

Venn diagram illustrating numbers of women with anxiety 15.1%, n=248/1633, depression 9.7%, n=159/1632, and stress 10.4%, n=168/1622, and the overlap of anxiety with depression (11.2%, n=28), anxiety with stress (13.1%, n=33) and anxiety, depression and stress 23%, n=57.
Appendix 17 Venn Diagram 2, relationship between anxiety, depression and stress at three months postpartum.

Venn diagram illustrating numbers of women with anxiety 8.6%, n=146/1644, depression 10%, n=165/1632, and stress 13.9%, (n=228/1636) and the overlap of anxiety with depression (11.3%, n= 16), stress (18.3%, n=26) and depression and stress (38.7%, n=55).
8 References


Horwitz A. & Wakefield J. (2012) *All We Have to Fear; Psychiatry's Transformation of Natural Anxieties into Mental Disorders*. Oxford University Press, New York.


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