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«Associations between symptoms of depression and sociodemographic factors and pregnancy-related complaints among pregnant women in urban and rural Nepal. »

A quantitative study.

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This thesis is first and foremost dedicated to the mothers of Nepal, who make the most of every day to provide for a better tomorrow.

Abstract

Background: Maternal morbidities such as depression, pelvic girdle pain (PGP), low back pain (LBP) and pelvic organ prolapse (POP) appear to occur differently in developing countries. Nepal is a predominantly rural country with 44% of households living below the poverty line and strong emigrational tendencies among the male population. This leaves pregnant women exposed to higher workloads, which has been linked to PGP, LBP and POP. There is limited knowledge as to the adverse effects these factors may have on antenatal depression. Considering the maternal and neonatal risk-factors that have been associated with antenatal depression, such as premature birth, low birth weight and intrauterine growth restriction, it is important to understand and target the factors that may affect antenatal depression.

Purpose: To investigate the impacts of sociodemographic factors and pregnancy-related complaints on symptoms of depression among pregnant women in Nepal.

Material and methods: A cross sectional study using standardized condition-specific questionnaires with response from 1284 pregnant women who were attending antenatal check-ups in two hospitals in urban and rural Nepal. Multivariate logistic regression analysis was used to determine variables associated with symptoms of depression.

Results: Twenty-two percent of the women presented with symptoms of depression, while 29% of the women with LBP and/or PGP showed symptoms of depression. Being housewife, having to fetch water and having symptoms of POP was associated with symptoms of depression, while women who live with their husband had lower odds of having depressive symptoms. For women with LBP and/or PGP, having symptoms of POP, moderate to high pain intensity and self-reported severe disability was associated with symptoms of depression, while women who live with their husband had lower odds of depressive symptoms.

Conclusion: The results indicate that the experience of social support may act as a protective factor, while certain work load characteristics may involve adverse impacts on symptoms of depression. Furthermore, for pregnant women with LBP and/or PGP the results suggest that the presence of depressive symptoms may impact on the experience of pain intensity and disability or vice versa.

Key words: Maternal health, antenatal depression, Nepal, pelvic organ prolapse, pelvic girdle pain, low back pain.

Sammendrag

Bakgrunn: Svangerskapsplager som depresjon, bekkenleddsmerter, lave ryggsmerter og underlivsprolaps ser ut til å forekomme annerledes i utviklingsland. Nepal er et land med sterke emigrasjonstendenser blant den mannlige befolkningen, hvor hovedparten av innbyggerne er bosatt i landlige områder og 44% av husstandene lever under fattigdomsgrensa. Dette eksponerer gravide kvinner for høyere arbeidsbyrder, hvilket har vært assosiert med bekkenleddsmerter, lave ryggsmerter og underlivsprolaps. Kunnskap om de negative konsekvensene dette kan medføre for utviklingen av depresjon i svangerskapet er ukjent. Tatt i betraktning de uheldige risikofaktorene svangerskapsdepresjon kan medføre, er det viktig å forstå hvordan slike faktorer kan påvirke depresjon i svangerskap.

Formål: Å undersøke assosiasjoner mellom sosiodemografiske faktorer og svangerskapsplager og symptomer på depresjon blant gravide nepalske kvinner.

Materiale og metode: En tverrsnittstudie med standardiserte sykdomsspesifikke spørreskjema besvart av 1284 gravide kvinner som deltok på svangerskapskontroll ved to nepalske sykehus; ett i byen og ett på landsbygda. Multiple logistiske regresjonsanalyser ble brukt til å finne variabler som var assosiert med symptomer på depresjon.

Resultat: Tjueto prosent av kvinnene hadde symptomer på depresjon, mens 29% av de med bekkenleddsmerter og/eller lave ryggsmerter hadde symptomer på depresjon. Å være husfrue, å måtte hente vann og å ha symptomer på underlivsprolaps var assosiert med symptomer på depresjon, mens de som bodde med mannen sin hadde lavere odds for symptom på depresjon. For kvinner med lave ryggsmerter og/eller bekkenleddsmerter var det å ha symptomer på underlivsprolaps, å ha moderat til høy smerteintensitet og alvorlig redusert funksjon grunnet rygg- og/eller bekkenplager assosiert med symptom på depresjon, mens de som bodde med mannen sin hadde lavere odds for symptom på depresjon.

Konklusjon: Resultatene indikerer at opplevelsen av sosial støtte kan virke beskyttende, mens visse arbeidsrelaterte faktorer kan medføre negative utfall for depresjon under graviditet. For kvinner med lave ryggsmerter og/eller bekkenleddsmerter kan symptomer på depresjon se ut til å påvirke opplevelsen av smerte og funksjon eller motsatt.

Nøkkelord: kvinnehelse, svangerskapsdepresjon, Nepal, underlivsprolaps, bekkenleddsmerter, lave ryggsmerter.

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1.0 BACKGROUND

Pregnancy is usually a happy and exiting event in a woman's life. However, many women experience maternal co-morbidities in relation to pregnancy and the postpartum period (1). Maternal morbidities such as pregnancy-related pelvic girdle pain (PGP), low back pain (LBP) and pelvic floor disorders, for instance pelvic organ prolapse (POP) and urinary incontinence (UI) as well as pregnancy-related depression occurs among women globally (2-9). Consequences of such maternal morbidities may include higher rates of functional disability and compromised employability (2, 10-13). Furthermore, there is evidence suggesting a co-occurrence of pain from the lower back and pelvic region and the risk of depression in pregnant women, indicating a co-morbid relation between these complaints (13). The prevalence and symptom severity of PGP, LBP, pelvic floor disorders and pregnancy-related depression seem to vary in different parts of the world (2, 6, 7, 14-17). Several underlying causes for this have been suggested, among others ethnicity, sociodemographic factors and consequently, different exposure to risk factors (2, 5, 7, 8, 16).

Nepal is a diverse country with inhabitants of different ethnicities, caste affiliations and sociodemographic backgrounds. Whilst the country encounters increasing urbanization, it is still predominantly rural with 84% of women informally employed in agriculture (18). Due to high rates of emigration among the male population, women carry an increasing share of responsibility in relation to agricultural work and family chores (19). This amplifies the unfortunate practise where women are expected to work during pregnancy and resume their work duties shortly after giving birth (20). Furthermore, depression and anxiety are highly prevalent in Nepal and reported to be major contributors to poor public health, as well as being associated with psychosocial burden (21). The consequences of this strenuous burden of work for women has been directly linked to the risk factors for depression as well as PGP, LBP and pelvic floor disorders such as POP and UI (11, 18-20, 22-25). Although POP and UI are typically recognized as two different conditions (26) whose symptoms may appear somewhat similar (27, 28), in Nepal UI is often regarded as a part of POP (29). Therefore, in the following chapters UI will not be discussed, whereas POP will be further elaborated.

1.1 Aim and research questions

In this study we want to investigate the impacts of sociodemographic factors and pregnancy-related complaints such as PGP, LBP and POP on symptoms of depression during pregnancy. To our knowledge, no previous studies have investigated the impact of pregnancy-related complaints and sociodemographic factors on symptoms of depression in pregnant women in Nepal. Secondly, we want to investigate the impacts of sociodemographic factors and POP on symptoms of depression among pregnant women with LBP and/or PGP in Nepal. Consequently, the research objectives to be investigated are:

"What is the impact of sociodemographic factors and pregnancy-related complaints on symptoms of depression among pregnant women in urban and rural districts of Nepal?"

"What is the impact of sociodemographic factors and pregnancy-related complaints on symptoms of depression in pregnant women with LBP and/or PGP in urban and rural districts of Nepal?"

1.2 Project affiliation

The data that is used to conduct analysis in the present thesis were already collected by Ranjeeta Shijagurumayum Acharya for her PhD project over the course of one year, from May 2016 to May 2017. Decisions regarding which self-reported questionnaires that was to be included in the study as well as the translations of such, were made before the data sampling begun.

The PhD project is affiliated to the University of Oslo and the Dhulikhel Kathmandu University hospital, an independent non-profit and non-government institution. Both the PhD project of Ranjeeta Shijagurumayum Acharya and this master thesis is supervised by Britt Stuge and Anne Therese Tveter.

2.0 THEORY

Globally, the reduction of maternal mortality has been an important target in the pursuit of improving maternal health. In fact, maternal mortality ratio is considered one of the most important indicators of a country's health status. However, for every maternal death it is estimated that 20-30 women experience chronic morbidity and sequelae due to pregnancy and delivery (1). This may leave women impaired in functions of the physical, mental and sexual health domain, as well as compromising their body image, social and economic status, and their ability to participate in society. The burden of maternal morbidity is estimated to be highest in low- and middle income countries, especially affecting the poorest women (1). Consequently, as measures to improve maternal mortality rates gradually succeed, it becomes imperative to acknowledge the burden of maternal morbidity and initiate strategies to reduce it.

The World Health Organization (WHO) Maternal Morbidity Working Group (MMWG) has launched the following definition of maternal morbidity "any health condition attributed to and/or complicating pregnancy and childbirth that has a negative impact on the woman's wellbeing and/or functioning" (1, 30). Embedded in this definition is pregnancy-related depression, PGP and LBP and POP. In the following chapters, these maternal morbidities will be elaborated based on the availability of current research. Subsequently, I will attempt to elaborate these maternal morbidities in the light of the sociodemographic and topographic settings of Nepal.

2.1 Depression during pregnancy

2.1.1 Epidemiology

Depression during pregnancy, also known as antenatal or prenatal depression, is regarded a common maternal morbidity. The mean prevalence in the antenatal period is reported to be 10.8% and the point prevalence ranges from 7.4% in the first trimester, 12.8% in the second trimester, to 12.0% in the third trimester (9, 31-33). Other estimates have reported a period prevalence of 18.4% during the nine months of pregnancy (9). Incidents of depression during pregnancy is associated with depression during the postpartum period, and it is estimated that 13-20% of women experience depression or anxiety during the postpartum period (9, 16, 34, 35). However, a study conducted on a Norwegian population (n= 416) concluded that there

was no particular time during pregnancy and the postpartum year that was distinguished by a higher depression prevalence, thus challenging the perception of antenatal and postpartum depression as different concepts (36).

2.1.2 Clinical presentation and definitions

Pregnancy represents a major life changing event and emotional upheaval in a woman's life and is usually associated with happiness and eager expectations (36, 37). However, some women experience symptoms of depression during pregnancy and/or the postpartum period. Although the presence of some depressive symptoms such as the postpartum blues, is regarded as normal during this time (38), some women go on to develop a depressive disorder. According to the World Health Organization's International Classification of Diseases 11th edition (ICD-11), a depressive disorder is defined accordingly:

> *Depressive disorders are characterized by depressive mood (e.g., sad, irritable, empty) or loss of pleasure accompanied by other cognitive, behavioural, or neurovegetative symptoms that significantly affect the individual's ability to function. A depressive disorder should not be diagnosed in individuals who have ever experienced a manic, mixed or hypomanic episode, which would indicate the presence of a bipolar disorder* (39).

Subsequently, the ICD-11 defines mental or behavioural disorders associated with pregnancy, childbirth and the puerperium as follows:

> *A syndrome associated with pregnancy or the puerperium (commencing within about 6 weeks after delivery) that involves significant mental and behavioural features, most commonly depressive symptoms. The syndrome does not include delusions, hallucinations, or other psychotic symptoms. If the symptoms meet the diagnostic requirements for a specific mental disorder, that diagnosis should also be assigned. This designation should not be used to describe mild and transient depressive symptoms that do not meet the diagnostic requirements for a depressive episode, which may occur soon after delivery (so-called postpartum blues)* (40).

It is clinically relevant to differentiate between depressive symptoms and a depressive disorder during pregnancy, as a major depressive disorder requires treatment to achieve remittance (41). An appropriate screening tool for depressive symptoms, such as the Edinburgh Postnatal

Depression Scale, can indicate probable presence and severity of depressive symptoms although it is not diagnostic and cannot substitute clinical assessment (36, 38, 42, 43). Pregnancy-related depression is associated with some identifiable and clinically relevant risk factors, suggesting the importance of assessing exposure to risk factors (41).

2.1.3 Aetiology and associated maternal and neonatal risk factors

A systematic review identified among others maternal anxiety; life stress; prior depression; lack of social support; single status; domestic violence; lower education; unintended pregnancy and relationship factors as associated risk factors for depressive symptoms during pregnancy. Out of these factors, life stress, lack of social support, and domestic violence continued to be associated with antepartum depressive symptoms in multivariate analyses (44). These findings are consistent with a more recent systematic review that identified lack of partner or social support; history of abuse or domestic violence; personal history of mental illness; unplanned or unwanted pregnancy; adverse events in life and high perceived stress; present and/or past pregnancy complications and pregnancy loss as the most relevant risk factors of antenatal depression (45).

There is evidence that the risk factors associated with depression during pregnancy is not so different from those of non-parous women. A Norwegian study included a total of 2730 women 18-40 year out of which 416 were in the postpartum period (46). They found a higher prevalence of depression among the general population of women than among the postpartum women. Interestingly, both among the non-parous women and the postpartum women the identified risk factors for depression were consistent on high score on the life event scale, prior depression, somatic disease and poor partner-relationship. The study further suggests that the aetiology of depression in the postpartum period and other periods of life may be similar (46).

Although depression may not be more prevalent in relation to pregnancy, the consequences of depression in relation to pregnancy may be severe. Depression during pregnancy has been associated with low birth weight, premature birth and intrauterine growth restriction (31, 47), which in turn is linked to neonatal, infant and childhood morbidity, mortality and developmental issues (31).

The occurrence of depression during pregnancy has been linked to other maternal morbidities such as PGP, LBP and POP (13, 48, 49). Firstly, it appears that pain and disability of the low

back pelvic region is associated with an increased risk of depression and anxiety during pregnancy (13).Virgara et al. included ninety-six nulliparous women in gestation week 28 with or without increased risk of depression and/or anxiety, as well as with or without LBP and/or PGP. They concluded that women who reported higher levels of depression and/or anxiety appeared to experience more functional disability in relation to their LBP and/or PGP, than women with lower depression and/or anxiety symptoms and LBP/or PGP (13). This suggests that depressive symptoms may have a negative effect on pain tolerance and disability. Secondly, there seems to be associations between symptoms of depression and POP (49). A study conducted in Ethiopia included 306 women who attended a gynaecological outpatient clinic. The study found that 67,7% of women with advanced POP (stage 3 or 4) showed symptoms of depression according to Beck's Depression Inventory score (48).

2.1.4 The impact of sociodemographic factors

As previously mentioned, the increasing focus on the global burden of maternal morbidity has highlighted the issue of mental disorders as co-morbidities to pregnancy, also in low-income countries (16). A systematic review of the prevalence and determinants of non-psychotic common perinatal mental disorders (CPMDs) in low- and lower-middle-income countries reported a mean prevalence of 15.6% (CI, 15.4, 15.9). This suggests a higher prevalence of common perinatal mental disorders such as depression and anxiety in low-income countries where women generally have lower sociodemographic status (9, 16, 31). Moreover, some studies have specified that being a housewife or unemployed exposes expectant mothers to higher risk of antenatal depression (50, 51). These associations have been suggested for women in both Canada and Ethiopia (50-54), suggesting that such exposures affect the risk of antenatal depression regardless of the country's economic status.

The prevalence of pregnancy-related depression in some Western populations also seems to increase in groups with lower sociodemographic status (31). Studies of US American populations specify that poor urban women from minority backgrounds are twice as likely as middle-class women to meet the diagnostic criteria for major and minor depression during pregnancy and the postpartum period (20%–25% vs. 9%–13%, respectively) (31). This is consistent with associations between depression and lower socioeconomic status (55).

2.2 Pregnancy-related pelvic girdle pain and low back pain during pregnancy

2.2.1 Epidemiology

Pregnancy-related PGP and LBP are considered common musculoskeletal problems among pregnant women. The prevalence during pregnancy is inconsistent in the published literature, ranging from 4-90% (56) or more specifically, 20% for PGP and 50% for LBP and/ or PGP (5, 56-58). One study reported the point prevalence of PGP to be 63% in gestation week 30., 31% three months postpartum and 30% one year after giving birth (59). Symptoms usually appear in the second half of gestation with higher levels of pain intensity between the 6^{th} and 9^{th} month of pregnancy (56). Although most women recover after birth, about a third of women still report symptoms three months postpartum, and 8,5% have significant symptoms two years after giving birth (10, 60-62).

2.2.2 Clinical presentation

PGP is defined as pain between the iliac joint and gluteal fold, with or without additional pain in the symphysis, whereas LBP is defined as pain between the twelfth rib and the gluteal fold (5). Women with PGP and/or LBP typically demonstrate reduced capacity for prolonged standing, sitting and walking, and frequently report difficulty with activities such as housework, exercise, activities with their children, employment, leisure, hobbies, personal relationships, married life and sexual intercourse (5, 56, 57).

PGP and LBP that occur in relation to pregnancy were previously considered the same condition, however according to the European Guidelines, PGP should be considered a specific form of LBP due to differences in management and prognosis (5, 56, 57, 63). The common denominator is pain, and the two conditions appear to inflict different pain characteristics, intensity and consequently, disability on the individual (12, 56, 57, 64). Furthermore, it has been suggested that pain intensity during pregnancy is higher among women with PGP, whereas the pain intensity postpartum is higher among women with LBP (10, 12, 57, 58, 65).

Differentiating PGP from LBP involves investigating the pain intensity and character, the location of the pain, provoking factors, pain provocation tests and resulting disability (57). Several of the pain provocation tests described have demonstrated a low sensitivity rate (5, 57). The European Guidelines recommend The Posterior Pelvic Pain Provocation Test, Patrick Faber's test and palpation of the long dorsal sacro-iliac ligament for the diagnosis of pain from

the posterior sacro-iliac joint (5). Furthermore, the Posterior Pelvic Pain Provocation Test is recommended as an appropriate test to exclude lumbar causes, as it has demonstrated high sensitivity and specificity for PGP (60). Recommended tests for pain in the symphysis include palpation of the symphysis and the modified Trendelenburg's test of the pelvic girdle (5). In contrast to these pain provocation tests, the Active Straight Leg Raise test is associated with functional impairment and disability due to posterior PGP (12). The test is intended to reveal impaired load transfer between the spine and legs, suggesting insufficient motor control in stabilizing muscles (66, 67). However, studies investigating muscle activation during performance of the active straight leg raise test reveal puzzling results. A recent study detected an increased activity in the transversus abdominal muscle in women with PGP during the performance of the active straight leg raise test compared to healthy controls (68). Another study however, found no difference in the automatic activation of the pelvic floor muscles in women with PGP during the performance of the active straight leg raise test compared to controls (69).

2.2.3 Aetiology and risk factors

The causality of PGP and LBP remains poorly understood and is most likely multifactorial. Although it is agreed that the two conditions should be differentiated, the various explanations of causality seem to resemble each other (5, 57, 58, 70). The most plausible hypothesis for causality seem to be mechanical and hormonal factors (57). During pregnancy the production of the hormone relaxin increases in the corpus luteum and the uterine decidua and affects the laxity of the ligaments in the pelvic girdle and in the rest of the body. This results in a slightly increased range of motion, which may affect the load transmission and shear forces on the joints of the pelvic girdle (5, 57, 58, 70). However, there is no strong evidence that suggests a positive association between levels of relaxin and PGP (71).

Research investigating risk factors for PGP and/or LBP during pregnancy remains inconsistent. However, history of PGP and/or LBP and previous history of trauma to the pelvis appears consistent in systematic reviews (5, 56-58). Wu et al. and Vermani et al. additionally concludes that strenuous work represents a risk factor, whereas Vleeming et al., Bjelland et al. and Katonis et al. propose a possible association to pluripara (5, 58, 72). Factors that have been rejected to impose risk, include contraceptive pills, time interval since last pregnancy, height, weight, smoking and most probably age (5, 57). In terms of smoking however, more recent studies

within the Danish National Birth Cohort have revealed associations between smoking and PGP that persisted after the adjustment for factors such as age, parity, BMI, age at menarche, socio-occupational status, physically strenuous work, self-rated health, concern about giving birth and about the health of the child (73). The association was stronger with increasing intensity of smoking, suggesting that smoking is in fact related to PGP in some way (73). Another publication from the Danish National Birth cohort concluded that both physically and psychosocially demanding work such as physically strenuous work, rotating shift work and high job strain were associated with increased reports of PGP in pregnancy (74).

Women with a high number of positive pain provocation tests, i.e. pain in both sacro-iliac joints and the symphysis, as well as a high level of pain intensity recorded on a Numeric Rating Scale, were at greater risk of persistent complaints two years postpartum (10). The number of positive pain provocation tests and number of pain sites during pregnancy has also been suggested a significant risk factor for pain intensity three months postpartum (75). This may suggest that pain is somehow related to the perpetuation and intensity of complaints.

2.2.4 The impact of psychosocial and sociodemographic factors

The burden of pain and disability during the emotionally vulnerable journey of pregnancy and motherhood can be severe. A systematic review of qualitative research on the impacts of PGP identified five recurring themes through a meta-synthesis. These were the effect of PGP on daily life, the effect of PGP on identity, the effect of PGP on the mothering role, emotional and psychological effects of PGP, and coping with pain (76). Engeset et al. discussed the challenge of balancing the mothering role and living with a chronic complaint, unravelling emotions such as discouragement, isolation and loneliness (77).

There have been some debate that PGP may be a Scandinavian problem due to the amount of research conducted on Scandinavian populations, however a number of studies conducted in the Netherlands, U.S.A., U.K. Norway, Sweden, Canada, Africa, Iran, Israel and Nepal indicates that PGP and LBP are universal complaints among pregnant women (2, 4, 6, 14, 17, 57, 78-82). As previously noted, some of the factors associated with the onset of PGP and/ or LBP are strenuous work and pluripara (5, 56-58, 74). This suggests that women's exposure to such factors may vary depending on the impact of sociodemographic factors.

2.3 Symptoms of pelvic organ prolapse during pregnancy

2.3.1 Epidemiology

POP is relatively common conditions among parous women, with urinary incontinence presenting as one of the most common symptoms (28). The estimated prevalence of POP ranges from 10-50% and increases significantly with age (83-85). Out of these women, approximately 12% experience symptoms, whereas the life-time risk of surgery due to POP is 11% in the general female population (27, 85). The prevalence of POP among women who have had a hysterectomy performed is approximately 38% (84). POP that develops during pregnancy is however relatively rare, with an estimated occurrence of 1 per 10 000 to 15 000 deliveries (85). Interestingly, mild POP that exists before pregnancy appears to be transitory and usually resolve by the end of second trimester (27).

2.3.2. Clinical presentation

The definition of POP has proven somewhat problematic in its duplexity – on one side referring to the symptoms associated with POP, on the other side referring to the anatomical degree of POP based on examination (86). This ambiguity may challenge and compromise the opportunity to compare across studies, as symptomatic POP and clinically examined POP appear to provide different estimates of prevalence (86, 87). In the subsequent sections, anatomical definitions and symptoms will be elaborated according to current research.

POP may protrude in different compartments of the pelvic organ. This include prolapse of the anterior vaginal wall (urethrocele, cystocele), prolapse of the posterior vaginal wall (enterocele, rectocele) and prolapse of the apical segment of the vagina (uterine/cervix or vault/cuff prolapse) (86). Cystocele is the most common type of prolapse and is seen in 34.3%, whereas uterine prolapse and rectocele is seen in 14.2% and 18.6%, respectively (84). Among women who have had a hysterectomy performed, cystocele is seen in 32.9% and rectocele in 18.3% (84). Approximately 20% of women present with prolapse in one or more of these compartments (84, 86).

Frequently reported symptoms of POP include the experience of pelvic heaviness, dragging sensation in the vagina, protrusion coming down from the vagina, abdominal pain, backache as well as vaginal pain. Bladder and bowel incontinence symptoms and sexual dysfunction due to

pain and discomfort during intercourse are also often present, as well as difficulty in walking, sitting, lifting and squatting (86, 88, 89).

Two frequently used assessment tools for POP are the clinically Pelvic Organ Prolapse Quantification system (POP-Q) and the self-reported Pelvic Organ Prolapse Symptom Score (POP-SS). The POP-SS will be further elaborated in the method chapter.

The POP-Q provides a system for assessing the degree of prolapse and was launched by the International Continence Society to ensure valid standardization in terminology and definition of pelvic organ prolapse (90, 91). It proposes five stages of pelvic support to describe the level of pelvic support and/or prolapse. Stage 0 means no prolapse is demonstrated. Stage 1 is where the criteria for stage 0 is not met, but the most distal part of the prolapse is >1 centimetre above the level of the hymen. A stage 2 prolapse means that the most distal part of the prolapse is ≤ 1centimetre proximal to or distal to the plane of the hymen. Stage 3 is where the most distal part of the prolapse is > 1 centimetre below the plane of the hymen but does not protrude more than 2 centimetres less than the total vaginal length. Finally, a stage 4 prolapse represents a complete eversion of the total length of the lower genital tract, where in most cases the leading edge will be the cervix or vaginal cuff scar (91).

Although the POP-Q provides a system for grading the degree of anatomical POP, it should be noted the POP-Q is based on the anatomy of the nulliparous pelvic organ, thus excluding what may be considered normal in multiparous women (86). Furthermore, it has been argued that the POP-Q would benefit a revision as there is evidence that a stage ≤ 1 prolapse of the anterior or posterior wall is within the normal range and often asymptomatic, whereas a stage 1 uterine prolapse is likely to be symptomatic, thus suggesting that prolapse of different compartments impose different symptom severity (92).

Moreover, the presence of symptoms is not considered in the POP-Q assessment, although symptoms of POP such as urinary and/or faecal incontinence and sexual problems have been frequently reported with little relation to a POP-Q value or prolapse compartment (90). It has however been suggested that women with POP stage 2-3 report more frequent and bothersome symptoms of POP (93).

2.3.3 Aetiology and risk factors

POP is regarded as a symptom of a pelvic floor dysfunction (90). The aetiology is complex and likely multifactorial, and it is assumed that anatomical, physiological, lifestyle and reproductive factors interact during a woman's lifespan to cause a pelvic floor dysfunction (27). The increasing prevalence parallel to age has resulted in theories involving hormonal and menopausal effects on the connective tissue of the pelvic floor. However, the rate of injury to the pelvic floor is higher among menopausal women with a history of multipara than nulliparous women of the same age group, suggesting that obstetric trauma pose an increased risk of pelvic floor injury and dysfunction (83). One such trauma is the injury of the levator ani muscle during labour, which has been strongly associated to the occurrence of cystocele and uterine prolapse (83, 94). Among the most plausible risk factors for developing levator ani muscle injury are prolonged labour and forceps delivery, however an association between advanced maternal age at the first delivery has also been linked to levator ani muscle injury (83).

In the cases of pregnant women presenting with a significant POP (grade 2 or higher), symptoms may progress to urinary retention, cervical ulceration and bleeding or in more severe cases preterm labour or miscarriage. Moreover, there have been reports of women with significant POP or severe uterine or cervical descent proceeding to a high-risk delivery, as reports of still birth have been presented in co-occurrence to POP (85).

Evidence for some of the suggested risk factors for POP is rather consistent in published literature. A large observational cohort study from the UK found that high vaginal parity increased the relative risk of POP by 8.4 for women who had delivered two children, and 10.9 for someone with four or more children (95% CI 4.7, 33.8) (95). Vaginal delivery and parity were also among the highly associated risk factors in other publications, as well as age and body mass index (BMI) (27, 83-85, 88). Interestingly, though POP is widely associated with pregnancy and parturition, the condition may also present in nulliparous women. Therefore, pregnancy and parturition cannot account for the development of POP in its entirety (85).

2.3.4 The impact of psychosocial and sociodemographic factors

The psychosocial impact of living with POP has not been described in depth in the preliminary literature. A recent scoping review included 103 published articles that focused on psychosocial experience of living with POP and concluded that the majority of research focuses on change

in quality of life outcomes and sexual function (96). Moreover, the review amplifies the importance of further research on the impacts of psychological distress, knowledge of POP and protective psychosocial factors (96).

A systematic review of the prevalence of POP among women living in development countries, found a prevalence ranging from 3,4%-56,4%. The review included approximately 83 000 women of all ages (88). These estimates are considerably higher than those of women in Western populations (83-85).

It seems plausible that the different living conditions experienced by women across the world may appear protective or exposing to some of the risk factors mentioned above. One study based on data from the Women's Health Initiative in the USA concludes that ethnicity affects the risk of POP, suggesting that Asian women has a higher risk of cystocele and rectocele, although not uterine prolapse (84). Furthermore, a systematic review of POP in developing countries found that early age at marriage and first delivery, poor nutrition and anaemia were likely to contribute to the high rates of prolapse (88). They also identified manual work involving heavy lifting during pregnancy and having to return to such work shortly after delivery as a strong predisposing factor (88). These findings amplify the current understanding that the causes of POP are likely multifactorial and may therefore unfold differently in different parts of the world.

2.4 Pregnant women in Nepal

2.4.1 Sociodemographic characteristics of work burden and maternity

Nepal had an estimated population of 26.6 million in 2011 and a projected growing rate of 1,4% (97). Estimates reveal that nearly 88% of the population live in rural areas, while 44% of households live below the poverty line (98). However, the rate of urbanization is expanding and the percentage of inhabitants living in cities has increased from 14% in 2001 to 17% in 2011 (97). Nevertheless, the country is still regarded as predominantly rural, which poses a challenge in making health care facilities accessible to inhabitants regardless of topographic residence. It is estimated that 30-40% of people from the mountain and hilly regions travel approximately 1-4 hours to reach the nearest health post. In urban areas the challenges in providing sufficient public health programs such as antenatal care, have been acknowledged and targeted (97).

The Nepal Demographic Health Survey (the 2016 NDHS) conducted in 2016 is the fifth survey of demographic and health in Nepal since 1996. The survey is initiated by the Ministry of Health of Nepal and provides a snapshot of the country's health and sociodemographic characteristics. The 2016 survey included a nationally representative sample of 12,862 women and 4,063 men aged 15-49, residing in 11,040 surveyed households. It reveals that approximately one-third (34%) of the country's population is under age 15 (19). Simultaneously, there are strong migration tendencies among the population with a considerable share of men in their 20s emigrating for work (19). This leaves 84% of Nepal's women informally employed in agriculture and imposes an increased work burden on women who must manage agricultural work in addition to taking care of household and children (18, 99)

Since 1996, the average fertility has decreased from 4.6 children per woman to 2.3. The fertility rate varies with different sociodemographic indicators. It increases with lower educational and economical status and in rural areas and correspondingly decreases in urban areas and among women with higher educational and economical status (19). For some, the journey of motherhood initiates during late adolescent years, as 17% of Nepalese females aged 15-19 have already begun childbearing. Teenage childbearing follows the same sociodemographic patterns as those of the fertility rate. According to statistics from the 2016 NDHS, the onset of reproductive behaviour for adolescent females occurs within the frames of marriage (19).

Maternal and neonatal mortality rates appear to have decreased significantly over the course of two decades (19, 100). In the time interval between 2011-2016 the maternal mortality rate was 239 per 100,000 live births (100), whereas the neonatal mortality rate over the same period was 21 deaths per 1000 live births (19). Approximately 84% of women received antenatal care from a doctor, midwife or auxiliary nurse and 57% of the deliveries took place in a health care facility. However, 4% of the deliveries took place at home, in which one out of ten deliveries were not assisted (19). As part of the WHOs The Safe Motherhood Initiative, Nepal has initiated measures to increase attendance at antenatal check-ups and deliveries at health care facilities. One such measure is the financial compensation that women receive upon attending health care check-ups and examinations during pregnancy and delivery (101-104). Women report several obstacles that limit their access to health care facilities. Recurrent themes are concerns about financial costs and geographical distance. Women are also concerned that there will not be a female health service provider at the facility and 68% report that they will not go alone.

Numbers from the 2016 NDHS revealed that 74% of women between the age of 15-49 wanted no more children, regardless of how many children they already had. Paradoxically, 28% of the

women from 2016 survey reported that they did not take part in decision making regarding their own health or family planning (19), indicating that the choice of childbearing and pregnancy does not always rely on the woman.

2.4.2 Depression during pregnancy among Nepalese women

Although the prevalence and risk factors of postpartum depression among Nepalese women have been studied to some extent (105-110), the prevalence of depression among pregnant women in Nepal seems to be poorly investigated. However, existing evidence indicate that depression with or without the co-occurrence of pregnancy seems to be linked to caste affiliation, socioeconomical and topographical factors, as well as psychosocial burden, social structure and traditional family structures (21, 105, 111, 112). Two recent studies were identified that have investigated the prevalence of depression during pregnancy in Nepal (111, 113). The first study investigated the indicative prevalence of common mental disorders such as depression and anxiety, among 497 women in Bhaktapur who had been pregnant during the 2015 earthquake (113). The women completed the EPDS-10 six months after the earthquake, revealing that 21.9% (CI 18.4, 25.8) of the women scored > 12 on the EPDS-10, indicative for clinically significant common mental disorder symptoms (113). Moreover, the experience of intimate partner violence was found to increase risk, whereas having a kind and encouraging partner was protective against higher EPDS-10 score, indicating the significance of supportive partner relationships (113). The second study was carried out in the rural mountain district of Sindhupalchowk and included 778 women out of which 164 were pregnant. The study found that 23.8% of pregnant women had higher levels of depression compared to normal levels of depression measured with the HSCL 25 14-item depression subscale (cut-off normal level of depression ≤ 24,5) (111). Women associated with lower castes such as the Dalit caste, were subjected to nearly five times higher odds of depression than women from the higher castes (111). This suggests that pregnancy is a sensitive period with regards to the risk of depression, and that women of lower social status are as greater risk. Moreover, these findings from Nepalese populations are consistent with existing evidence from other low-income countries and Western populations (9, 16, 31, 55).

Another study carried out on first-time Nepalese mothers giving birth in a Kathmandu hospital, found associations between the presence and support of the husband during labour and the women's perceived postnatal support, which in turn was associated with reduced maternal

anxiety (114). The study further revealed lower levels of depression six to eight weeks postpartum in women with low levels of maternal anxiety (114). These findings emphasise the importance of a husband's presence and support during labour to reduce postpartum anxiety and/or depression. Furthermore, the conclusion of this study is consistent with another study conducted on Nepalese primiparous women five to six weeks postpartum in a Kathmandu hospital. The study revealed associations between anxiety and self-reported support from husband and mother-in laws, indicating higher levels of anxiety among those with low perceived support (115). Moreover, higher socio-economic status, maternal education and knowledge of new-born care were associated with reduced postpartum anxiety (115).

Based on the preliminary research of pregnancy-related depression among Nepalese women, the most frequent risk factors appear to be level of perceived social support, especially from the husband, level of maternal anxiety, socio-economic and socio-cultural status, as well as maternal education (21, 111, 114, 115). These factors seem to be consistent with those reported from other populations (44, 45, 111, 114, 115).

2.4.3 Pregnancy-related musculoskeletal complaints

The global focus on reducing maternal mortality has indisputably been called for. However, as previously noted there is reason to believe that the burden of maternal mortality only represents a fraction of the burden of maternal co-morbidities (1, 116). Although not detrimental, the effect of maternal morbidities such as PGP and LBP and other pregnancy-related pain conditions, may be highly disabling on several levels of a woman's life (116).

The evidence as to the prevalence and severity of pregnancy-related LBP and PGP in Nepal, is limited. One study from Western Nepal included 275 pregnant women diagnosed with complications and found that almost 25% of the women suffered from various types of pain (back, abdominal, lower abdominal, neck, pelvic pain) (25). However, the inclusion of women to the study was based of the individual assessment by a doctor and consequently what the doctor classified as a complication (25). This provides the risk of interviewer bias and outcome misclassification. Furthermore, the study sample is relatively small to consider associations between complications, demographic details and gestation week. The women included were all recruited from the Obstetrics and Gynaecology ward of a tertiary hospital and cannot be accounted as representative for the general population of reproductive women (25).

A more recent cross-sectional study of pregnant women in Nepal carried out by Acharya et al., has investigated the prevalence and severity PGP and LBP (82). The study included 1284 women attending antenatal control in two district hospitals and is the very same study that generated the data set that is used in the present thesis. Out of the study sample 34% of the women reported pregnancy related PGP and/or LBP. The presence of POP symptoms, increased BMI and having a husband with higher education was significantly associated with having PGP and/or LBP. The women reported severe pain intensity and poor beliefs in recovery, however the reported disability was intriguingly low. The authors argue that different living conditions and challenges in accommodating basic needs may result in different coping mechanisms for pain in populations in low-income settings (82).

The prevalence of the two studies from Nepal is consistent with each other, although they appear to be lower than the overall reported prevalence of developed countries (5, 56-58, 82). Furthermore, preliminary publications on pregnancy-related PGP and LBP are inconclusive also in terms of predisposing factors and demographic characteristics. This emphasises the fact that attempts to predict possible outcomes for Nepalese populations based on the current knowledge remains speculative, and that more research is required on musculoskeletal co-morbidities among pregnant women in Nepal.

2.4.4 Pregnancy-related pelvic organ prolapse

In contrast to the modest number of publications on pregnancy-related musculoskeletal complaints in Nepal, there are several publications addressing the issue of POP. The prevalence of POP in Nepal has been estimated to affect 6-37% of women and 10% of reproductive women (age 15- 45), indicating incidence at a younger age than that of Western population studies (11, 20, 117). Attempts have been made to determine the occurrence of POP within different ethnic groups and castes of different regions, suggesting a higher prevalence among women in the lowland Terai region than in hilly and mountainous regions (118). In fact, the prevalence of uterine prolapse among reproductive women in some districts of the Terai have been reported in up to 30-42% of women (119). Evidence as to why these reports vary so much between different districts is limited. However, suggestions have been made that the different practices in relation to gender discrimination and community maternal care varies between the different castes and communities (20). For instance, it is implied that women of the Sherpa community

experience higher levels of codetermination and maternal care, whereas women of the Dalit community experience higher levels of gender discrimination (20).

The risk factors for POP in Nepal appear to be somewhat different from those reported from Europe and USA (24). Frequently reported risk factors associated with pregnancy-related POP in the Nepalese population are extensive physical work during pregnancy and shortly after delivery, early marriage and adolescent pregnancy, delivery practices with unskilled birth attendant or self-assisted delivery, frequent pregnancies, poor nutrition and low maternal birth weight (24, 118, 119). This is consistent with reports from a systematic review investigating POP in low-income countries, which concluded that poor nutrition and heavy work were important risk factors, in addition to the consistently reported risk factors for women from affluent countries (88). Furthermore, a common perception of causality in the Western population is that POP arises because of weak pelvic floor muscles (7, 94). However, a recent study carried out in general gynaecology outpatient clinic in Kathmandu found that less than 2% of the non-pregnant patients showed signs of major levator trauma, while 60% of the women had a retroverted uterus (7). The study further concludes that injury to the levator muscle cannot be a major aetiological factor in Nepal, whereas retroversion uteri may be an associated aetiological factor (7).

The estimated risk factors of Nepalese populations coincide with the existing evidence of Western populations in terms of both vaginal delivery, parity and prolonged delivery (27, 83-85, 88, 95). However, the pregnancies and deliveries of Nepalese women typically occur at a younger age and often without the support of a skilled birth attendant, which presumably contributes to an increased risk of prolonged delivery and complications (19, 20, 117, 120). Moreover, only 53% of married women of reproductive age use family planning methods according to the Nepal Demographic Health Survey of 2016. This stands as a paradox when a significant amount of married women have reported that they do not wish to have more children (19). It has been acknowledged that women have little autonomy regarding matters of their own health (11, 19, 121), thus involving the possibility that women may be exposed to a frequent succession of pregnancies without the granted opportunity of family planning, thus exposing them to increased risk of POP (24, 118, 119). According to the comprehensive Amnesty International report "*Unnecessary Burden: gender discrimination and uterine prolapse in Nepal"* published in 2014, the absence of decision making power for some women in terms of parity, seeking medical assistance and family planning is directly linked to the continuation of the high prevalence and early onset of POP (20).

Another factor that has been highly associated with POP in Nepalese studies, is the fact that rural women often return to strenuous agricultural work prematurely (20, 24, 119). The underlying reasons for this practise are complex and partially rooted in a reality where physical agricultural work translates into food and accommodation of basic needs. Moreover, the early return to extensive physical work may be enforced by factors such as the increased work burden imposed on women due to emigrational trends, but also due to the absence of paid maternity leave and social security for women who are informally employed in agriculture (18, 119).

In 2008 the Supreme court in Nepal declared POP a human rights issue, following a series of appeals from women's rights activists. The courts verdict stated that the Ministry of Health and Population and Ministry of Women, Children and Social Welfare had to initiate effective interventions to prevent and treat the condition. In response to these proceedings and a report from the United Nations Population Fund (UNPF) stating that approximately a third of women with POP were in urgent need of surgical intervention, the Ministry of Health and Population conceded to provide free surgery and mobile surgery clinics with the objective of reducing prevalence (117). However, this strategy has been criticized on two key points. The first is the absence of adequate follow-up consultations and the increased risk of postoperative complications in the rural setting (11). The second critique concerns this policy's failure to induce prevention-based interventions and address the social structures and gender-based discrimination which underlies the risk factors for this condition (11, 20). Awareness and increased knowledge of risk factors especially among women in the rural setting are considered important measures of a preventative strategy. Furthermore, community health workers need more active involvement in creating awareness for prevention of POP among rural Nepalese women (20, 119).

3.0 METHOD

3.1 Design and data sampling

3.1.1 Study design and setting

This study is a cross-sectional study. One thousand, two hundred eighty-four pregnant women were recruited successively from two hospitals in Nepal; KIST Teaching Hospital in Lalitpur in Kathmandu, and Kathmandu University Dhulikhel Hospital (KUDH) located 30 kilometres northeast of Kathmandu in Karveplanchowk district.

3.1.2 Participants

The women included in this study came to the hospitals for routinely antenatal check-ups. Inclusion criteria were being able to speak and understand Nepali, whereas the exclusion criteria included history of previous spine fracture or surgery.

3.1.3 Data sampling

The data were acquired by Ranjeeta S. Acharya for her PhD project, as well as two female research assistants who administered the questionnaires. The collection of data took place over the course of one year, from May 2016 to May 2017. The women were asked whether they would like to participate while they were waiting for their antenatal check-up.

The administration of the questionnaires in the present study was performed by one of two research assistants. The questions were read aloud by the research assistants, who then registered the women's answer to each item on a Samsung tablet with an open data kit software.

3.2. Dependant variable

3.2.1. The short five-item Edinburgh Depression Scale

A short version of the original 10-item Edinburgh Depression Scale (EDS-10), the 5-item Edinburgh Depression Scale (EDS-5) was used as a measure to screen for symptoms of

depression among the women in this study. The 10-item EDS is also known as the Edinburgh Postnatal Depression Scale (EPDS-10) and was originally constructed to screen for postnatal depression (122). However, it has been deemed useful in screening for depressive symptoms in non-postpartum populations and is therefore also known as the EDS-10 to reflect its broad use (122). The EDS-10 has been validated for pregnant populations (123).

The short version of the EDS-10, the EDS-5, was developed in 2007 to accommodate depression screening in large health surveys where the competition for space in questionnaires is often strong (122). Each item has four alternative answers which are scored from 0 (no, never) to 3 (yes, most of the time) where a total score of 15 represents the highest severity of depressive symptoms. The short form demonstrates high correlation to the original EDS-10 and satisfactory sensitivity and specificity for women in the reproductive period of life (n=2730, age 18-40) (46, 122). The elimination of five items from the original EDS-10 resulted in a small decrease in Cronbach's alpha from 0.81 for the 10-item EDS to 0.76 for the 5-item EDS, suggesting that the EDS-5 is a reliable measurement (122). Recommended cut-off values of $\geq$ 8 for high symptom level of depression and $\geq$ 7 for moderate symptom levels, demonstrates high levels of specificity of respectively 94% and 92% (122). Although sensitivity of 100% is achieved at $\geq$ 5, a loss of precision has been observed when cut-off levels are low. The prediction of severe cases seems to be intact regardless of the exactness of cut-off levels (122). The measurement has been validated against the Hopkins Symptom Check List (122), but the authors argue that it should be further tested in other samples and compared to other measures of depression (122). The EDS-10 has been translated and validated to Nepali for postpartum populations (110), however the 5-item EDS has not formally undergone translation and cross-cultural validation to Nepali. In this study the EDS-5 was translated to Nepali by an official translator. This translation was compared to the five items extracted from the Nepali version of 10-item EDS by two bilingual physiotherapists. Although the English version of the EDS-5 has demonstrated adequate psychometric properties for the five items extracted from the original 10-item questionnaire for reproductive women (122), the same translation and validation procedure has not been performed for Nepali language.

3.3 Independent variables

3.3.1 Sociodemographic variables

The women answered questionnaires on sociodemographic, pregnancy and workload characteristics. Sociodemographic data included: age (years), height (centimetres), weight (kilograms), BMI (classification according to the WHO (124)), ethnicity, education (year 1-8, year 9-12, more than 13 years (bachelor and above), monthly income in United States Dollars, $ (no income, less than $76, $76-153, > $153), occupation, marital status (living with husband, husband living away from home, divorced) and family type ("nuclear"- husband and children; "joint"- parents in law, husband and children; "extended"- grandparents and parents in law, husband and children). Workload information included fieldwork and household work (childcare, animal care, fetching water) and whether the women took rest during work.

3.3.2 Pregnancy-related variables

The pregnancy characteristics were number of previous pregnancies and parities, and weeks of gestation. Women who reported presence of musculoskeletal pain were asked to mark the pain location on a body chart, which in turn was validated by asking them to point out the pain location on their body. The women were considered having LBP or PGP if they pointed towards their lower back or pelvis, in which case they were referred to a clinical examination performed by a physical therapist. These women also answered questions regarding pain frequency (experience pain on some days/experience pain on most days), pain location (one or both sacroiliac joints and the symphysis), whether they believed that PGP or LBP would disappear after delivery (yes/no/don't know) and pain intensity measured on a numeric rating scale (NRS). For the latter, the NRS-11 was used with endpoints 0-10 where 0 represents "no pain" and 10 is "pain as bad as you can imagine" (125). The NRS-11 has been recommended for use in assessment of pain intensity within clinically meaningful time frames (125). Cut-off values for the NRS-11 was set to ≤ 5 for mild pain-related interference with functioning and ≥ 6 for moderate to severe interference (126). For the pain intensity assessment of women in this study, a translated and culturally adapted version of the NRS to Nepali was utilized (127). The Nepali NRS for pain intensity has demonstrated satisfactory psychometric qualities and is considered appropriate to assess musculoskeletal pain intensity in the general Nepalese population (127). Women with musculoskeletal pain from the lower back and/or pelvic area were also requested

to complete two standardised condition-specific questionnaires related to PGP and LBP, The Pelvic Girdle Questionnaire and The Oswestry Disability Index, respectively (128, 129).

3.3.3 The Pelvic Girdle Questionnaire

The Pelvic Girdle Questionnaire (PGQ) is a condition-specific patient-reported measure for PGP and was published in 2011. The PGQ is considered appropriate for both pregnant and postpartum populations (128, 130). It consists of two subscales; one assessing activity limitations in 20 items and the other assessing symptoms in 5 items. Each item has a 4-point response scale (0-3), with a maximum score of 75 points. The total score is subsequently recalculated into percent ranging from 0 % = no disability to 100 % = severe disability (128, 130). The PGQ includes items related to both functional disability, physical symptoms, pain and sleep (128) and has demonstrated satisfactory discriminant validity and overall construct validity, internal consistency and test-retest reliability for pregnant and postpartum women with PGP (130, 131). The subscales of activity and disability has revealed Cronbach's alpha values of 0.86 and 0.85, respectively, indicating a good internal consistency for these subscales (131). The PGQ has demonstrated an intraclass correlation coefficient (ICC) of 0.93 (CI 0.87, 0.96) indicating satisfactory test-retest reliability (131). The PGQ has undergone translation according to the Guillemin guidelines (132) and cross-cultural validation to Nepalese populations, and this version is used to assess women in the current study. The Nepali version of the PGQ further demonstrated acceptable psychometric properties, with a Cronbach's alpha coefficient of 0.83 and ICC of 0.72 for pregnant populations presenting with PGP/LBP (133).

3.3.4 The Oswestry Disability Index

The Oswestry Disability Index (ODI) version 2.1a is a condition specific patient-reported disability measure for LBP (129, 134). It consists of 10 sections, each section scoring from 0 to 5 points (5 = greatest disability) (129). The final score is expressed though percentage, where a score of 100 percent represents maximum disability (129). It has been argued that a linear correlation between the ODI-score and disability seems unlikely, and a categorical system based on percentage score has been suggested (129). Accordingly, categories of 0-20%, 21-40%, 41-60%, 61-80% and 81-100%, represents minimal disability, moderate disability, severe disability and crippled, respectively (129). Another method of classifying samples that has

been used in some studies, is dividing the selection into two groups with a cut-off value of 40% (129). It appears that the ODI has not been specifically validated for pregnant women presenting with LBP, although it has been psychometrically assessed in relation to PGP (131). Normative values for the general population have been reported between 17.5-22%, indicating some variations in what is considered normative levels of disability due to LBP (129, 135). A more recent study found a score of ≤ 22% to be a representative cut-off for patient acceptable symptom state (136). However, the study sample consisted of patients who had undergone elective spine surgery for degenerative lumbar spine disorders and the cut-off value may therefore not be valid for patients who have received conservative treatment, or in this case for pregnant women with LBP and/or PGP (136). A review of ODI version 2.1a concluded that the measure has proven acceptable in terms of psychometric qualities in populations with and without LBP and other back disorders (129). Internal consistency designated by Cronbach's alpha for version 2.a ranges from 0.76-0.87 for LBP (129, 137), and 0.83 in female populations with PGP (131). Moreover, the ODI version 2.a showed a test-retest reliability designated by ICC of 0.93 (CI 0.87, 0.96) in female selections with PGP (131).

The Nepali version of the ODI version 2.1a that is used in this study, was published in 2014 and validated for the Nepalese general population (138). It demonstrated a Cronbach's alpha of 0.72 and ICC of 0.88, hence indicating acceptable internal consistency, test-retest reliability, as well as satisfactory cross-cultural validity and comprehensibility (138). However, the authors argued that external validation in relation to other translated Nepali LBP disability measures was not possible, as such standardized measurements has not been translated and culturally adapted to Nepali language and culture. Moreover, it appears that the Nepali version of the ODI has not been specifically validated for pregnant populations.

3.3.5 The POP Symptom Score and the International Consultation on Incontinence Questionnnaire-UI Short Form

The POP-SS has been utilized to reveal symptoms of POP, where women also indicate which one of the symptoms causes them most trouble (139). The questionnaire consists of 7 items with a 5-point response scale ranging from 0 (never) to 4 (all the time) and a maximum score of 28 points indicating maximum high symptom level (139). The POP-SS has demonstrated satisfactory construct validity, sensitivity to clinical change and internal consistency with a Cronbach's alpha value ranging from 0.72-0.83 for populations both with and without

symptoms, 12-year postnatal populations and women who have undergone prolapse surgery (139). The relation between POP-SS, POP-Q and what is clinically relevant scores and symptoms, is not clearly defined in published literature (92, 139). However, it has been reported that women with POP stage ≥ 1 experience more frequent and bothersome symptoms of POP (93).

For this study the POP Symptom Score (POP-SS) was translated into Nepali language using the method of forward-translation and back-translation according to the Guillemin criteria (132). Forward translation was done by three bilinguals – one physiotherapist, one nurse and one person with no medical background. Back-translation was performed by two physiotherapists and a person with no medical background, all three bilinguals.

As UI is typically regarded as a symptom of POP in Nepal (29), all women in this study were requested to answer a self-reported measure that has been specifically developed for the assessment of symptoms of UI, in addition to the POP-SS. The International Consultation on Incontinence Questionnaire-UI Short Form (ICIQ-UI SF) is an outcome measure developed to assess prevalence, severity, impact on quality of life and type of UI (140). It has 3-items with a 5-point, 6-point and 10-point response scale respectively, and a maximum score of 21 points indicating highest symptom level. A fourth self-diagnostic item with no scoring is thought to be useful to understand the patients' perception of the cause and type of leaking in a clinical setting (141). The short form has demonstrated satisfactory validity, reliability and sensitivity for 1812 Norwegian women (mean age 36) who participated in an Internet based study (140). A categorization of score values based on severity of UI has been proposed accordingly; 1-5points, 6-12 points, 13-18 points and 19-21 points, representing "slight", "moderate", "severe" and "very severe" symptoms, respectively (141). A translation of the ICIQ-UI SF to Nepali language was performed in conjunction with this study, using the method of forward-translation and back-translation according to the Guillemin criteria (132). Forward translation was done by three bilinguals – one physiotherapist, one nurse and one person with no medical background. Back-translation was performed by two physiotherapists and a person with no medical background, all three bilinguals.

3.4 Ethical considerations

3.4.1 Informed consent

Women who agreed to participate in this study were informed about the purpose, potential advantages or disadvantages, voluntary participation and the right to withdraw from the study at any point. The women received this information by one of the research assistants and from the formal written request of participation. The women who agreed to participate gave their written consent on a formal document on which the research assistant responsible for providing the information also signed. The formal request of participation is enclosed.

3.4.2 Ethical approval

Ethical approval was granted by the Norwegian Regional Ethics Committee (REK Nord, 2015/2209), the Nepal Health Research Council (112/2016), the Institutional Review Committee at Kathmandu University School of Medical Sciences, and Dhulikhel University Hospital (25/16).

3.4.3 Retention of data

The data was anonymised before the processing and analysis of data commenced. Anthropometrical information such as weight and height were translated into BMI values, and information about which of the two hospital the women sought were anonymised.

3.5 Statistical analysis

The statistical tests were run in the IBM Statistical Package for the Social Sciences (SPSS) 25 software programme. An a priori level of statistical significance of $p < 0.05$ was chosen. The data were initially examined for duplicates, outliers and missing data. Descriptive data are presented as mean (standard deviation) if normally distributed or median (interquartile range, IQR; 25^{th} and 75^{th} percentile) if skewed. Categorical data are presented as frequencies (percentage).

Logistic regression analysis with odds ratio (OR) and 95% confidence intervals (CIs) were applied to reveal any associations between the independent variables and the dependant variable.

To enhance interpretation, variables where dichotomised if possible according to cut-off values from preliminary literature. EDS-5 scores were dichotomised into < 7 = mild symptom level and ≥ 7 = moderate to high symptom level (122). The dichotomization of the ODI scale was based on a cut-off value of a 40% score (129), a score of ≤ 40% indicating mild to moderate disability due to LBP whereas a score over 40 % was considered indicative of severe disability. For POP-SS, cut-off was established at > 3, representing the 75th percentile, since no suggested cut-off value could be identified in the literature. For NRS-11, cut-off values were set to ≤ 5 for mild pain-related interference with functioning and ≥ 6 for moderate to severe interference with functioning (126).

Initially, bivariate logistic regression analyses with the EDS-5 as the dependant variable were conducted. An inclusion limit of $p < 0.10$ was established to determine which variables would be included in the multivariate logistic regression analysis. The variables included were then investigated for multicollinearity (142) and the number of variables in each category was controlled with crosstabs as each category should have more than ten women.

Variables were then removed from the multivariate logistic regression analysis by backwards removal. Accordingly, variables that were not statistically significant according to the a priori level of significance were removed stepwise. Finally, only variables with statistically significant OR were left in the model. Model of fit was examined by Hosmer & Lemenshow test.

4.0 RESULTS

4.1 Sociodemographic and pregnancy characteristics of the women

As displayed in Table 1, most of the women were married and living with their husband. Over 90 percent of the women had gone to school and specified their status of employment as “housewife”. Most of the women had no monthly income of their own and lived in families with between 1-6 family members. Although most of the women answered that they had different housework chores such as fieldwork, taking care of children, animal care and fetching water, less than half of the women replied that they would rest during work. Moreover, only a small fraction of the total number of women answered that they were employed in agriculture.

Table 1. Sociodemographic characteristics of women attending antenatal check-ups in two hospitals in Nepal.
Variables are shown with mean (standard deviation) and frequency (percentage) if otherwise not indicated, n= 1284.

Characteristics	n (%)	mean (SD)
Age	1283	24.5 (4.3)
Age at marriage	1283	20.6 (3.6)
Ethnicity		
Brahamin	244 (19)	
Chetri	231 (18)	
Newar	283 (22)	
Tamang	267 (21)	
Magar	54 (4)	
Dalit	74 (6)	
Other	131 (10)	
Marital status		
Living with husband	1161 (90)	
Husband is living away from home	121 (9)	
Divorced	2 (0.2)	
Family type		
Nuclear	593 (46)	
Joint	645 (50)	
Extended	46 (4)	
Education		
Never went to school	113 (9)	
Year 1-8	322 (25)	
Year 9-12	644 (50)	
More than 13 years (bachelor and above)	205 (16)	
Employment		
Housewife	1160 (90)	
Business	144 (9)	
Privately employed	100 (8)	
Agriculture	54 (4)	
Government	24 (2)	
Other (student, labour, retired)	26 (2)	
Personal monthly income		
No income	1100 (86)	
≤ $ 76	55 (4)	
Between $ 76-153	72 (6)	
≥ $ 153	57 (4)	
Housework		
Fieldwork	195 (15)	
Taking care of children	451 (35)	
Animal care	207 (16)	
Fetching water	463 (36)	
Do you take rest during work?		
Yes	436 (34)	
No	848 (66)	

Most of the women were in the second trimester of pregnancy (Table 2). Twenty-two percent were classified as having moderate to high levels of symptoms of depression. A majority of women were nulliparous, although half of the women reported having been pregnant before. Whilst a third of the study population had gone through one parity, only a small group of women classified as multiparous.

Table 2. Pregnancy characteristics of women attending antenatal check-ups in two hospitals in Nepal.
Variables are shown with median (interquartile range) and frequency (percentage) if otherwise not indicated, n=1284.

Characteristics	n (%)	median (IQR)
Gestation, week [1]		23.0 (15.3-32.0)
First trimester	207 (16)	
Second trimester	611 (48)	
Third trimester	451 (35)	
Pregnant before		
Yes	664 (52)	
No	620 (48)	
Parity		
Nulliparous	751 (59)	
Primiparous	461 (36)	
Multiparous	72 (6)	
Body Mass Index [2]		24.3 (22.0-26.6)
Underweight (≥ 18.5)	27 (2)	
Normal weight (18.5 < 25)	748 (55)	
Overweight (25 < 30)	418 (33)	
Obesity (≤ 30)	83 (7)	
The Short five-item Edinburgh Depression Scale		3.0 (2.0-5.0)
Low symptom level of depression, < 7	1000 (79)	
Moderate to high level of depression, ≥ 7	276 (22)	
The Pelvic Organ Prolapse Symptom Score		0.0 (0.0-3.0)
Lower score ≥ 3	992 (77)	
Increasing score > 3	292 (23)	
The International Consultation on Incontinence Questionnaire-UI Short Form		0.0 (0.0-0.0)

[1] n= 1268
[2] n= 1276

4.2 Pain characteristics and EDS-5 scores of women with LBP and/or PGP

Of all the women included in this study, six hundred and twenty-four reported experiencing musculoskeletal pain over the past four weeks. Out of these, four hundred and thirty-two women were classified as having LBP and/or PGP (Table 3). Twenty-nine percent scored above the cut-off for moderate to high symptom level of depression on the EDS-5. The mean pain intensity for the past four weeks was of 5.4. Most of the women experienced pain located to one or both sacroiliac joints, and around half of the women who had LBP or PGP believed that the pain would disappear after giving birth.

Table 3. Pain characteristics and EDS-5 scores of pregnant women with LBP or PGP attending antenatal check-ups at two Nepalese hospitals.
Variables are shown with median (interquartile range) and frequency (percentage) if otherwise not indicated, n=432.

Characteristics	n (%)	median (IQR)
Pain frequency		
On some days	285 (66)	
On most days	102 (24)	
Everyday	45 (10)	
Pain intensity past four weeks (NRS, 0-10)		5.0 (4.0-6.0)
Pain location[1]		
Symphysis	56 (13)	
One or both sacroiliac joints	281(65)	
All three joints	31 (7)	
Belief that LBP and/or PGP will disappear after giving birth?[2]		
Yes	224 (52)	
No	116 (27)	
Don't know	89 (21)	
The Pelvic Girdle Questionnaire (0-100%)		20.3 (9.8-31.8)
The Oswestry Disability Index version 2.1a (0-100%)		30.0 (20.5-38.0)
Mild/moderate disability, ≤ 40%	329 (26)	
Severe disability, > 40%	103 (8)	
The Short five-item Edinburgh Depression Scale		
Low symptom level of depression, < 7	305 (71)	
Moderate to high level of depression, ≥ 7	127 (29)	

[1] n = 368
[2] n = 429

4.3 Impact of sociodemographic factors and pregnancy-related complaints on symptoms of depression in pregnant women in Nepal

Table 4. Logistic regression analysis for variables that impacts depression among pregnant women attending antenatal check-ups in two Nepalese hospitals.
Results are presented as odds ratio (OR) with 95% confidence intervals (CI), n=1284.

	Unadjusted estimates		Adjusted estimates	
Model variable	OR (95%CI)	p	OR (95%CI)	p
Being housewife	0.3 (0.2, 0.6)	< 0.001	2.6 (1.3, 5.2)	0.005
Fetching water	2.1 (1.6, 2.8)	< 0.001	1.9 (1.4, 2.5)	< 0.001
Living with husband	0.6 (0.4, 0.8)	0.01	0.6 (0.4, 0.9)	0.008
Pelvic Organ Prolapse Symptom Score > 3	4.6 (3.4, 6.1)	< 0.001	4.3 (3.2, 5.7)	< 0.001
Attended school	0.6 (0.4, 1.0)	0.03		
Private employment	1.9 (1.1, 3.5)	0.03		
Pregnant before	1.3 (1.0, 1.7)	0.04		
Doing field work	1.5 (1.1, 2.1)	0.02		
Reporting pelvic girdle pain And/or low back pain	2.0 (1.5, 2.6)	< 0.001		

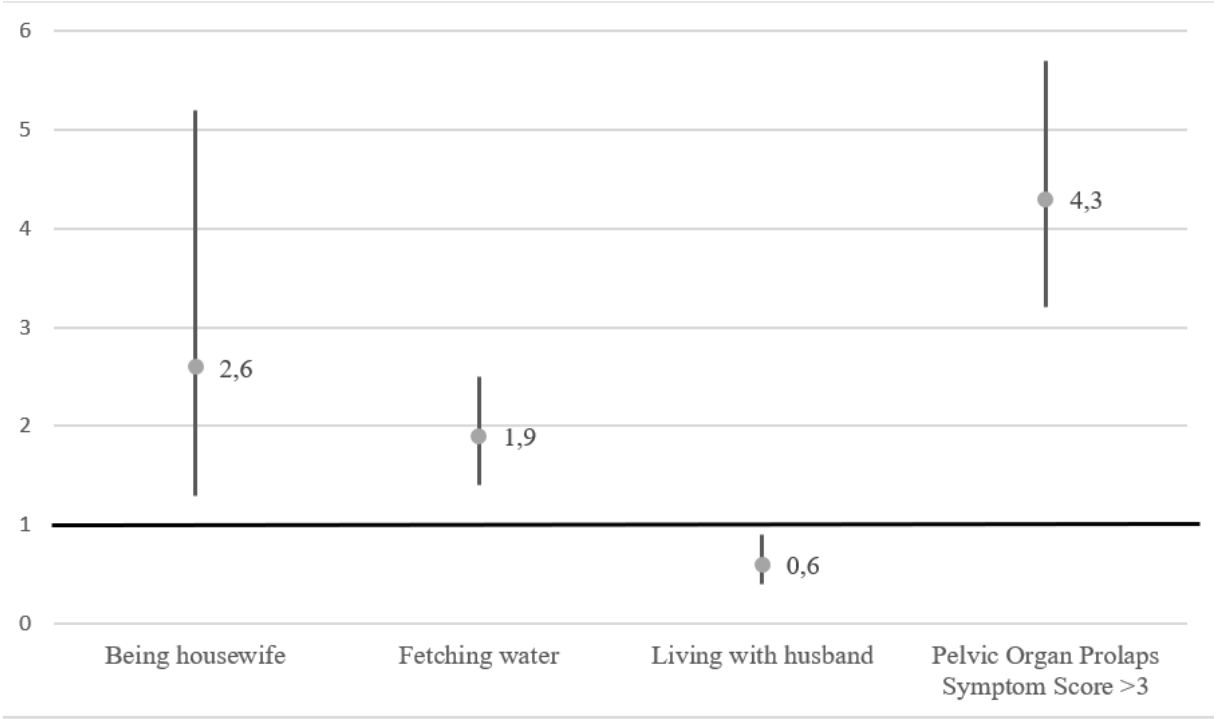

Figure 1. Stock chart illustrating the adjusted OR with CIs of depressive symptoms.
The grey circle indicates the OR value, whereas the black line indicates the width of the CIs, n =1284.

The variables that met the inclusion limit for the first model were “being housewife”, “fetching water”, “living with husband”, POP-SS > 3, “attended school”, “private employment”, “pregnant before”, “doing field work” and “reporting PGP and/or LBP. These variables are presented as unadjusted estimates.

Variables presented as adjusted estimates represent the final model (Table 5). It suggests that being a housewife, having to fetch water and a POP-SS score > 3 exposes women to higher odds of symptoms of depression. Furthermore, women who live with their husband have lower odds of symptoms of depression. The model showed goodness of fit with by Hosmer & Lemenshow test and Nagelkerke R Square of 0.16, indicating that the model explains 16% of the variation in EDS-5 score.

4.4 Impacts of sociodemographic factors and pregnancy-related complaints on symptoms of depression in pregnant women with LBP and/or PGP in Nepal

Table 5. Logistic regression analysis for variables that impacts symptoms of depression in pregnant women with LBP and/or PGP attending antenatal check-ups in two hospitals in Nepal. Results are presented as odds ratio (OR) with 95% confidence intervals (CI), n=432.

	Unadjusted estimates		Adjusted estimates	
Model variable	OR (95%CI)	p	OR (95%CI)	p
Living with husband	0.6 (0.4, 0.8)	0.01	0.4 (0.2, 0.8)	0.01
Pelvic Organ Prolapse Symptom Score > 3	4.6 (3.4, 6.1)	< 0.001	2.9 (1.8, 4.7)	< 0.001
Oswestry Disability Index score > 40% Severe disability	3.4 (2.2, 5.5)	< 0.001	2.1 (1.2, 3.5)	0.01
Moderate to high pain intensity past four weeks	4.9 (3.1, 7.6)	< 0.001	3.5 (2.1, 5.6)	< 0.001
Attended school	0.6 (0.4, 1.0)	0.03		
Private employment	1.9 (1.1, 3.5)	0.03		
Pregnant before	1.3 (1.0, 1.7)	0.04		
Doing field work	1.5 (1.1, 2.1)	0.02		
Pain frequency, pain on most days	1.9 (1.2, 2.9)	0.01		
Pain in one or both sacroiliac joints	1.8 (1.1, 2.8)	0.01		
Pelvic Girdle Questionnaire (0-100%)	1.0 (1.0, 1.0)	< 0.001		

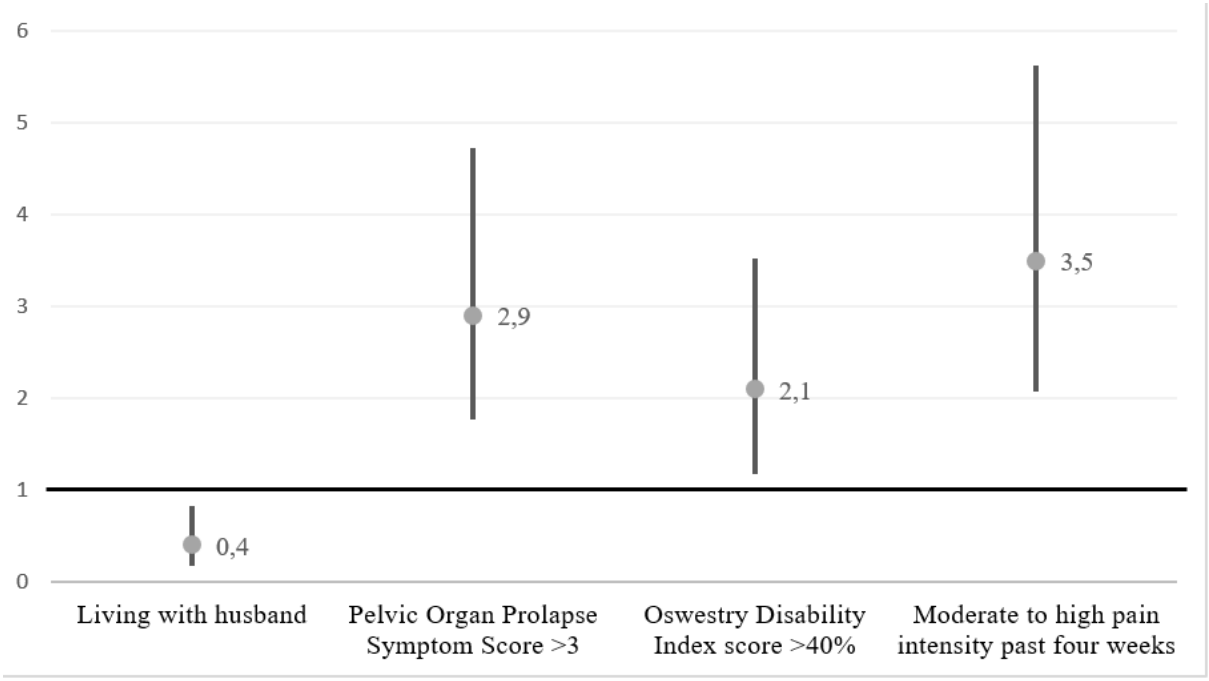

Figure 2. Stock chart illustrating the adjusted OR with CIs of depressive symptoms.
The grey circle indicates the OR value, whereas the black line indicates the width of the CIs, n =1284.

The variables that met the inclusion limit for the second model were “living with husband”, POP-SS > 3, ODI > 40%, “pain intensity past four weeks”, “attended school”, “private employment”, “pregnant before”, “doing field work”, “pain frequency”, “pain in one or both sacroiliac joints” and PGQ score (increasing). These variables are presented as unadjusted estimates.

Variables presented as adjusted estimates represent the final model. It suggests that POP score > 3, moderate to high pain intensity and self-reported severe disability (ODI > 40%) was associated with higher odds of symptoms of depression, while living with husband resulted in reduced odds of having symptoms of depression in women reporting LBP and/or PGP. The model showed goodness of fit with by Hosmer & Lemenshow test and Nagelkerke R Square of 0.27, indicating that the model explains 27% of the variation in EDS-5 score.

5.0 DISCUSSION

The main purpose of this study was to investigate the impacts of sociodemographic factors and pregnancy-related complaints on symptoms of depression among pregnant women in Nepal. Almost twenty-one and a half percent of the total sample scored above the cut-off value for moderate to high symptom level of depression. Being housewife, fetching water and having a POP-SS score > 3 (above the 75th percentile) was associated with higher odds of having symptoms of depression in the final model estimate, while living with husband appeared to be protective, as it gave lower odds of having symptoms of depression. For women with LBP and/or PGP, 29% scored above the cut-off value for moderate to high symptom level of depression. Having a POP-SS score > 3, scoring above 40% on ODI and reporting moderate to high pain intensity the past four weeks was associated with higher odds of having symptoms of depression in the final model estimate, while living with husband appeared as protective, as it gave lower odds of symptoms of depression.

This summary of results represents the key findings of the current study. To accommodate the ambition of this study to investigate what impacts symptoms of antenatal depression, it was deemed necessary to initially include a relatively high number of variables. For this reason, not all of the initial variables will be relevant to the following discussion and therefore some of the variables are left out. In the subsequent chapter the key findings will be discussed with regards to methodological factors, strengths and limitations. Then, the results will be discussed with regards to sociodemographic factors, pregnancy-related factors and preliminary literature.

Furthermore, I will attempt to bring some of these different factors together into a context that makes sense not only in relation to preliminary literature, but also in the perspective of overall societal structures in Nepal.

5.1 Discussion of method

5.1.1 Study design

This was a quantitative cross-sectional study that was based on self-reported standardized questionnaires in addition to questions regarding sociodemographic and pregnancy-related factors and pain characteristics. Cross-sectional study designs represents an efficient way of acquiring data from big samples and is considered suitable for studies where prevalence and

associations between different variables are the objects of interest (143, 144). Moreover, it can sustain many variables, provided that the sample is big enough. It may thus be considered an appropriate design to generate knowledge and hypotheses in pioneering research fields. However, a cross-sectional data set has certain important limitations. First, it cannot provide information to establish a cause-and-effect relationship as there is only one point of measurement. This also means that such designs cannot produce any hints as to the natural course of symptoms or characteristics. Secondly, this design is not fit for rare diseases or conditions that are short-lived (144). Although depression during pregnancy can be a transitory and short-lived condition, it does not appear as rare considering overall reports from systematic reviews (9, 16, 38). Considering these different aspects, a cross-sectional design is suitable to the objectives of this study and may further contribute to generate hypotheses to a research field that has yet to be explored.

5.1.2 Study setting

One of the hospitals is urbanely located in Latipur in Kathmandu, whereas the other hospital is located in more rural surroundings in Dhulikhel, 30 kilometres northeast of Kathmandu in the Karveplanchowk district. The hospital in Dhulikhel is located an hour away from the capital by bus and is within close proximity to urban Kathmandu. Although Dhulikhel is a town and the municipality of the Karveplanchowk districts, its surrounding areas are predominantly rural. Moreover, the hospital's proximity to the China-Nepal and Banepa Bardibas Highway enables people from other rural and possibly more remote regions to attend this hospital. According to the hospital official website, it serves 2.7 million patients from seven different districts each year (https://www.dhulikhelhospital.org/). One of the intentions of including women from the two hospitals, was to investigate sociodemographic factors such as urban versus rural residence in relation to maternal morbidities such as LBP, PGP, POP and depression. However, according to Acharya et al. the difference in sociodemographic factors and pregnancy-related complaints were relatively similar between women attending these two hospitals (82). Moreover, Acharya et al. argued that the current study population might not be representative for women residing in remote areas. Considering these aspects, the basis of the present study to use the designations "rural" and "urban" seems relatively legit, if still somewhat imprecise.

Another non-negligible aspect of the setting in the current study is the series of earthquakes that struck Nepal in April and May 2015. One of the earthquakes epicentres struck on the border between Dolakha and Sindupalchowk district, thus the same province as Kathmandu and Karveplanchowk belongs to. According to a WHO report, the earthquake destroyed nearly a

million houses and displaced 2.4 million people (145). Therefore, presumably most of the women in the current study had in fact experienced the earthquake and its devastations. The effects of such disasters, be it the loss of loved ones, losing a house or displacement from familiar communities, qualifies as a life stress event that exposes individuals to possible adverse outcomes. In fact, life stress events have been consistently acknowledged as risk factors for antenatal depression in more than one systematic review (44-46). Although there is no information in the current study about the extent to which the women may have been affected by this event, the earthquake constitutes an important perspective to the current study setting, especially when considering the magnitude of devastation it inflicted on Nepal's most densely populated districts (113, 145).

5.1.3 Study sample

The study sample included 1284 pregnant women. This is regarded as a relatively robust sample in terms of sample size. The significance of sample variation and the risk of making type-II errors are reduced by the increasing sample size (143). On the other hand, the risk of making type-I errors and falsely accepting the alternative hypothesis increases in very big samples. However, the current sample is of a magnitude where the risk of both type-I and type-II errors seem reduced, although one can never fully eliminate the risk of such statistical errors.

The high number of recruited participants of the present study is likely explained by the fact that the included women agreed to participation upon the arrival at the antenatal control, that the questionnaires were fulfilled at the control or during latency and there were no follow-up questionnaires. Moreover, as part of the WHOs Safe Motherhood Initiative and Nepal's efforts to reduce maternal mortality and morbidity, women attending antenatal check-ups receive a compensatory sum of $5-15, depending on the region (101, 104). This may encourage more women to attend routinely antenatal check-ups, although it is reasonable to assume that the attendance may also be influenced by the length of the commute. Because of Nepal's topography, the hospital travel length may vary quite radically depending on the location of residency, thus possibly compromising the ability and motivation to follow the recommended antenatal check-ups. Moreover, it is not just the length of the commute that may affect remote women's refrain from maternal health consultations, but also the inconvenience such travel may pose to the performance of everyday chores. Although one should always bear in mind that

some participants may have agreed to participate because they were hesitant to refuse out of respect for the health professionals, an intriguing aspect of the participants in this study is that not only did they attend the antenatal check-ups, but they were also willing to participate in a study concerning women's health during pregnancy. One may assume that this may be indicative of a group of women who are relatively interested in their pregnancy and concerned about their health and well-being. Finally, the fact that participants were recruited from a hospital setting constitutes an obstacle to the generalizability of the findings to pregnant Nepalese women who do not attend antenatal check-ups. This may represent a limitation to the current study, as pregnant women who for different reasons do not attend antenatal check-ups are not accounted for. However, as the 2016 NDHS report that 84% of Nepalese women aged 15-49 receive antenatal care, the current sample can be regarded as representative for a large part of Nepalese pregnant women (19).

Most of the women were in their mid-20s and had some level of education. In fact, the majority had completed between 9-12 years of school and 16% held a bachelor level of education or more. However, it is important to add that a small share of the recruited women were hospital staff, thus possibly affecting the number of women with a university level degree. The level of education of women in the current study is higher than reports from the 2016 NDHS, while personal income seems to be lower than reports from the 2016 survey (19). The fact that most women in the sample had completed primary school or more, may be because the they were recruited from mostly urban areas and therefore may have come from more modernized socio-cultural backgrounds. This rationale is also coinciding with the fact that half of the sample reported living in nuclear family structures. It is plausible that the accessibility to schools is better in urban areas than rural or remote regions. Moreover, it is also important to acknowledge that educated populations are more likely to consult health care facilities, as discussed in another study investigating barriers to utilization of maternal health care services in Nepal (146). In fact, raising utilization of maternal health services among poorer women, those with less education and those in remote areas has been targeted as important social determinants of inequalities in use of maternal health services in Nepal (146). Strategical measures such as the Safe Motherhood Initiative, contribute to reducing the significance of economic barriers to utilization of maternal care and may encourage attendance among women such as the ones in the current sample (147). As utilization increases with level of education and from remote via rural to urban areas, the current sample appears to coincide with these characteristics of women who make use of maternal health care services (146).

Another interesting aspect of educational level of women in Nepal is that the fertility rate has been reported to decrease with increasing level of education and is reported to be lower in urban areas than rural and remote settings (19). Most of the women in the current sample were in their mid-twenties and quite evenly distributed between nulliparous and primiparous women. Only a small fraction of the sample were multiparous women. According to the 2016 NDHS the mean age for giving birth to the first child was 20.4, thus indicating a somewhat later onset of motherhood for women in the present sample compared to national reports (19).

Considering the descriptive characteristics of this sample, there are a few perspectives that should be highlighted. First, the sample consists of young women with a relatively high level of education, who are mainly nulliparous, thus deviating from the average national reports (19). This may reflect societal progress and development, such as increased accessibility to education for girls and consequently increased knowledge and awareness of the importance of maternal health care (146). If so, it is essential to consider whether this is representative for all of Nepal, or just our sample of women. The current study was conducted in a relatively densely populated area of Nepal, and it is possible that the average sociodemographic characteristics of Nepalese women vary between different districts and areas of the country, depending amongst others on the remoteness of the area. It may also be that women who are multiparous consider themselves as more "experienced" at giving birth, and that this makes them less inclined to attend the recommended antenatal check-ups. Overall, it appears that the sample consist of relatively well-educated women who have few children for their age when compared to preliminary reports. This may be characteristic of women from a more densely populated area of Nepal.

Although a western notion typically assumes that employment coincides with level of education and consequently personal income, the majority of women in this study reported that they were housewives and that they had no income of their own. In fact, the reported level of employment amongst women in our sample is relatively low compared to reports from the 2016 NDHS (19). However, the NDHS reported that merely half of employed women were paid in cash for their work, revealing the paradox of what is defining of employment if it is not a matter of being paid to perform work. It seems plausible that the concept of employment for women in Nepal may differ from a typical westernized perception of employment. Firstly, approximately 84% of women in Nepal are informally employed in agriculture and largely involved in unpaid self-sustaining labour (99). This may serve as a partial explanation as to why only a small fraction of our sample answered that they were employed in agriculture. The women may not report themselves as "agricultural workers", since self-sustaining agricultural chores is an obvious part

of everyday life. Secondly, this rationale is supported by the relatively high frequency of chores related to the agricultural domain that the women reported performing on a day-to-day basis (Table 1). For instance, the women specified that their housewife chores included taking care of children, fetching water, doing some field work and taking care of livestock. This represents an important ambiguity of results in this study, as the women although not classifying themselves as employed, reported having several chores as housewives that are related to agricultural activity and increases overall work load.

Considerations of workload and employment such as the ones above, are especially interesting for the nearly 10% of women who reported that their husband was living away from home (Table 1) and because of the well-reported emigrational trends among the male population in Nepal (18, 19, 99). In fact, nearly fifty percent of households have a male relative who has emigrated to find work abroad within the past ten years (19, 99), and migration tendencies have been reported to be generally stronger in remote and rural areas (99). Meanwhile, women residing in rural and remote Nepal are more likely to be involved in agricultural work than women in urban areas of the country, as remote, rural and urban living requires different efforts in terms of obtaining food and other necessities. This may potentially skew the balance of work load towards women in remote and rural settings. In fact, these migration tendencies have been increasingly acknowledged to impose several profound effects on women's roles and burden of work, as well as the development of modernized agriculture and overall economic growth of the country (18, 19, 99). The subgroup of women in the current sample who had husbands living away from home may be particularly exposed to adverse effects, as most of the women reported having physically demanding household chores and that they would not take any rest during their day of work. This may be indicative of an unfortunate burden of work during pregnancy, especially considering that more than a third of the women were pregnant in the third trimester and therefore growing more heavily pregnant.

Furthermore, strenuous work burden has been consistently reported as a risk factor for PGP and/or LBP, leaving these women vulnerable to such maternal co-morbidities (56, 57). This unfortunate relationship between work burden and pregnancy, especially during the peripartum period, has also been acknowledged as an important risk factor for POP, according to several studies from Nepalese settings (20, 88, 119). Although the occurrence POP-related symptoms were low in this sample, it appeared to show adverse effects on the outcome of depression, as will be further discussed.

In summary, preliminary literature recognises that the work burden of agricultural labour is increasingly skewed towards the female population because of migration tendencies, and that this may have adverse effects on child bearing and maternity. This complies with findings from the current study on two points. First, that the women reported having several physically demanding household chores and that they would take little rest during the day. Secondly, that a small, but not insignificant share of the women in this sample had husbands who were working away from home, which may possibly add to the total amount of daily work load exposures for these women.

5.1.4 Data sampling

An important strength of the current study is the few missing data. Moreover, the strength of questionnaire-based studies is that they are standardized, meaning that all respondents answer the same questions. The administration of the questionnaires in the present study was performed by one of two research assistants who collected data on a Samsung tablet after verbally presenting the questions to the women. This represents a potential risk of bias from interactions between the women and research assistant, as well as the risk of misclassification in the electronic data registration of response. A possible explanation to the low amount of missing data may be that the research assistants were unable to proceed in fulfilling the electronic questionnaires if items remained blank. As data were electronically transferred from the tablet software to the SPSS software, the risk of error in data registration at this stage is considered low.

As the women's answers to the questions were recorded electronically and successively by the research assistants, the women would have to share some personal and even intimate information, consequently introducing the risk of false or dishonest answers. A combination of socio-cultural structures such as shyness, negligence, illiteracy, superstition and family structures have been acknowledged as important barriers to women's seeking health care service in Nepal (147). Furthermore, over two thirds of women report that they worry about going alone to a health-care facility and that they are concerned about being assessed by a male health-care provider, according to the 2016 NDHS (19). It seems plausible that such factors may also be present during the antenatal check-up and affect the answers given by women who attended this study. Although both research assistants were women, none of them were trained to perform interviews regarding such personal and possibly sensitive circumstances. However,

a recent review could not detect evidence of bias due to self-completed versus assisted administration of patient-reported outcomes, thus supporting the current methodological choice of assisted administration of questionnaires (148).

Another possible source of information bias is represented by the presence of a husband or mother-in-law at the consultation. It has been acknowledged that many women in Nepal experience limited autonomy in decisions regarding their own health (19, 121). This practise may become apparent when women are accompanied to health care consultations by someone in their close family, often a husband or a mother-in-law, although this may also be an act of concern and support. Nonetheless, the presence of someone in the close family, possibly someone of higher social rank, may influence the honesty of answers. For instance, the PGQ and ODI involve items concerning sex life and to what extent the complaints related to PGP or LBP compromises or prevent a normal sex life. In the present study, a majority of women could not or would not answer these specific items. It is assumable that the presence of a close relative at the consultation may influence the response to items regarding such personal and private issues (149).

5.1.4 Measurement

To measure depression, the EDS-5 was used. It is important to emphasise that this questionnaire can only detect the level of symptoms of depression and that it cannot substitute a clinical assessment that is the result of an interaction between the patient and a trained practitioner. Therefore, in the following the women who scored above the cut-off for high symptom level of depression will be discussed as women who had symptoms of depression.

The EDS-5 consists of the five items extracted from the original EDS-10 (122) and was originally constructed for large-scale health surveys to accommodate the high demands for space. The authors argue that the original EDS-10 should still be preferred in the clinical setting and emphasise that the reduction of the EDS-10 to the EDS-5 require further assessment of construct validity and validation for other populations and measures of depression. Given that the dependable variable and outcome of interest in the study were symptoms of depression among pregnant women, it may be argued that the EDS-10 should in fact have been the favoured measure to answer the current objective. This is also relevant considering that the EDS-10 has been validated for pregnant populations (123), whilst the EDS-5 has not. However, as the construction of the current survey and the inclusion of standardized measures were originally

developed to answer other objectives, this has not been expedient. Furthermore, as the current study sample is large, it does fit the profile of sample size that was originally recommended for the use of the EDS-5, as a means to assess depression in large-scale health surveys (122). Although only the EDS-10 has been validated for pregnant women, the elimination of five items from the original 10-item EDS resulted in just a small decrease in Cronbach's alpha from 0,81 to 0,76 for the 5-item EDS, thus indicating an intact internal consistency (122). Moreover, sensitivity has remained high for the recommended cut-off values in samples of women of reproductive age, that were also used in this study (122). This suggests that the general construct of interest is intact in the EDS-5 and that it can register women presenting with symptoms of depression.

For Nepali language, only the 10-item EDS has undergone translation and cross-cultural validation based on a selection of postnatal women (110). Although the five items of the EDS could easily be extracted from the translated 10-item EDS, it cannot further be assumed that the Nepali 5-item EDS would harbour the same psychometric qualities for validity and reliability. Considering this, the translation of this questionnaire was performed by an official bilingual translator, although it did not undergo the more comprehensive method of forward- and back-translation. Translation method set aside, it must however be regarded as a strength that the women were presented with the items of the EDS-5 in their mother tongue.

Altogether, there are two objections regarding the EDS-5 and its validity and reliability in this study. The perhaps most troublesome limitation is that neither the Nepali version of EDS-10 nor the English version of EDS-5 has been validated for pregnant populations. The other objection concerns the absence of a translation and cross-cultural validation specifically for the EDS-5. Despite these objections, it must be accentuated that the EDS-5 has in fact been recommended for large-scale health surveys to assess overall symptoms of depression, hence coinciding with the objectives of the current study. Moreover, the EDS-10 has been validated for pregnant populations (123), and the elimination of five items from the original 10-item EDS has resulted in only a small decrease in the effect size of internal consistency, hence indicating that the measure of the general construct of symptoms of depression is intact. Considering these factors, the utilization of the EDS-5 to address the current objectives of describing associations between different measures and symptoms of depression, seems legit.

Although a growing number of studies are added to the research field of maternal morbidities in Nepal, the discussion of the remaining measures in the current study is characterized by an early emerging research field. There is still a limited number of standardized measures that have

been translated and validated to the Nepali language and target populations. This further delays the process of generating a basis of reference for the prevalence of these morbidities in different sub-groups of the population. For instance, the development of a Nepali version of the PGQ is most valuable in the process of establishing prevalence of PGP during pregnancy for Nepalese women and further enabling the comparison against other populations, settings and countries. The translation further reveals recurring tendencies of the study sample to avoid specific topics, appearing through the refraining answers to items concerning sex life and sporting activities. The authors that completed the translation and validation of the PGQ from English to Nepali have accounted for this tendency in advance, by adding the possibility of answering "not applicable" for these items (133). The authors' knowledge and awareness of Nepali culture and taboos in advance, is thus quite indispensable to the planning and implementation of such pioneering research.

Similarly, the Nepali version of the ODI version 2.1a has undergone translation according to the Guillemin guidelines, cross-cultural validation and assessment for reliability and validity for Nepalese general populations. The Nepali version has not however been validated for pregnant populations, which must be considered in the total assessment of validity of method in the current study. Interestingly, although this translation and validation was based on a sample consisting of both male and female Nepalese, the response rate to the item concerning sex life in ODI had a missing rate of more than one fourth. The study further suggests that the reluctance to expose personal information about sex life may be particular to women, however it also argues that revealing information about sex life is generally culturally forbidden in Asian societies (138, 150). Despite the low response rate to such items, the study that completed the translation and cultural adaption of the English ODI version 2.a to Nepali, claimed that the elimination of the item concerning sex life merely resulted in a slight and statistically non-significant increase of Cronbach's alpha (from 0.723-0.726). Considering this, the high missing rate of this item in the current study is regarded as less important to the total construct validity and internal consistency. In summary, the perhaps most important limitation of the Nepali ODI in relation to the assessment of LBP in the present study, is that it has not been validated for samples where respondents are currently pregnant.

Unlike for the PGQ and ODI, there was no available Nepali version of the POP-SS. Therefore, for the purpose of this study, forward- and backward-translation of the POP-SS was successfully performed according to the Guillemin guidelines (132). The absence of a translated and cross-culturally validated Nepali version of the POP-SS was rather conspicuous as studies

investigating POP in Nepal appear to be more frequent than studies investigating other maternal morbidities. In order to fully assess the prevalence of POP, one would need to perform additional clinical examinations. Such clinical examinations can assess the anatomical degree of POP according to the POP-Q criteria (86, 139). Although such clinical assessments were not conducted in the present study, the current objective was to generate understandings on the associations between different complaints such as symptoms of POP and symptoms of depression. Therefore, the utilization of the POP-SS to describe such tendencies is regarded as adequate to meet the demands of the current objective.

Finally, the assessment of pain intensity was an important measure to accompany measures of POP symptoms and disability due to LBP and/or PGP. The NRS has been deemed an appropriate scale for pain intensity assessment (125) and has been translated and cross-culturally validated for Nepalese populations presenting with musculoskeletal pain (127). Furthermore, utilizing the NRS for pain intensity gives an opportunity of compare across studies, as the NRS is a recommended and much used pain intensity measure in literature (125-127). The women were asked to rate their pain over the course of the past four weeks. These attempts to reproduce ratings of pain intensity from back in time may have been compromised by recall bias. Moreover, the women may have reported higher NRS-scores than the "true" score, since intense pain experiences may be more strongly engraved in the memory, and thus more easily recalled when being asked. The women's experience of pain intensity may also vary according to what they have been doing prior to being asked to rate their pain. Considering these factors, it might have been better to require an NRS-rating of the women's pain the past 24 hours or the past week. However, the average pain intensity of the past four weeks gives an important retrospective illusion of how the women have been during the time prior to sampling for the present study. Since the purpose of the study was to investigate associations between independent variables and symptoms of depression, it seemed more correct to include a pain intensity variable that reflected how the women have experienced their pain over the past four weeks. The experience of increased pain intensity over a longer period of time, may add to the total life stress experienced by the women, as pain may compromise the ability to perform essential household chores of everyday life. In summary, a four-week time interval for rating the pain intensity provides important information about how the women have been in the time prior to measure, which is relevant considering the current interest of associations to symptoms of depression.

Overall, despite the absence of validation of the EDS-5, ODI and POP-SS for pregnant Nepalese women, the utilization of the measures in the current study was deemed as acceptable for extracting the different concepts and symptoms of maternal morbidities. This is argued by the fact that the objective of this study was to generate understandings of how symptoms of depression during pregnancy may be associated with different sociodemographic factors and pregnancy-related complaints in a setting where such objectives have not yet been explored. This may involve some methodological limitations such as the ones mentioned above, simply because some measures have not been translated nor validated for the appropriate samples. However, it is important to emphasise that the purpose of this study is to investigate the overall associative tendencies in a large study sample, to which purpose the current measures were regarded acceptable.

5.1.5 Statistical strengths and limitations

The number of women in each category of the different variables was mapped through cross-tabulation, ensuring that the number in each category was adequate according to the prerequisites of the analysis. However, it is important to clarify that multivariate logistic regression provides only a "best fit" model that illustrates the impact of the independent variables on the odds ratio of the dependant variable or observation of interest (151). It calculates associations based on actual observations and expected observations but cannot establish causal relationships.

Upon the backward removal procedure, all independent variables were included in a binominal logistic regression analysis with the dependant variable. An inclusion limit of $p < 0.10$ was established to determine which variables would go into the multivariate logistic regression analysis. Based on the high number of women included in the sample, it is possible that this inclusion limit was too strict. Being too careful when establishing such inclusion limits, may increase the risk of type-II errors or false negative findings. For example, if an inclusion limit was set to $p <0.20$, more variables would have gone into the analysis and the final model could have come out with some additional or different significant values. However, the inclusion limit of $p < 0.10$ was set to reduce the risk of type-I errors or false positive findings, as the number of variables would have grown quite high if the inclusion level was extended. Because of the high number of participants and the intention of reducing the risk of false positive findings, the

inclusion limit of $p < 0.10$ was deemed as the most optimal compromise to meet these requirements.

To enhance interpretation, all variables that were included in the multivariate logistic regression were dichotomised if possible. Cut-off values that would essentially serve to make up the dichotomous categories were based on recommendations from literature where such recommended values existed. Sociodemographic items such education was dichotomised into categories of women who had never gone to school and women who had some level of education. The perhaps most troublesome dichotomizations were those of the EDS-5, ODI, POP and NRS. This is because the cut-off value may have had an impact on the classification of women as either false positive of false negative. However, this risk is inevitable when operation with patient-reported scales and the cut-off values were based on recommendations from literature as far as possible. Moreover, since operating with such a large dataset and number of variables, simplifying the output of the models was an important measure to promote the interpretation of results. Overall, the process of dichotomizing variables was deemed as the most optimal way to manage the large amount of data and to convey the results.

For the EDS-5, the scores were dichotomised into < 7 = mild symptom level and ≥ 7 = moderate to high symptom level (122). These levels only indicate symptom load and cannot solely estimate the severity of symptoms. The women were respectively assigned to the so-called "low symptoms of depression" category or the "symptoms of depression" category. For other samples of reproductive women this dichotomization resulted in a specificity of 92% and a sensitivity of 56% (122), which involved the risk that some women were classified as false negative and went undetected. Choosing a cut-off value of ≥ 7 for the current sample was essentially a compromise between gaining a sustainable sample in statistical terms, and a valid sample in diagnostic terms. Considering the importance of a cut-off value with diagnostic relevance, the chosen cut-off value also represents an attempted optimization between true positive and true negative rate. The most optimal balance of sensitivity and specificity would perhaps have been achieved at a cut-off value of ≥ 5, where sensitivity has been found to be 100% and the specificity 70% (122), although this involves an increased risk of wrongly classifying women as falsely positive. This risk was considerably smaller for the current chosen cut-off value of ≥ 7. Furthermore, it was debated whether the cut-off should be set higher at ≥ 8, as this has been designated as a high symptom level. However, the adjustment in cut-off value to 8 would have resulted in only a minor change in cases and would have increased the

risk of classifying women as false negative. Upon considering these different factors, the decision was made to set the cut-off at ≥ 7, to optimize validity.

For the ODI scale representing LBP disability, the dichotomization was based on a cut-off value of a 40% score (129). Women scoring within the ≤ 40% category were considered having mild to moderate disability due to LBP, whereas women scoring > 40% were considered severely disabled. A recent study concluded that a cut-off value of ≤ 22 % is representative for patient acceptable symptom state (136). However, the patients in the study had undergone elective spine surgery and the findings are therefore less relevant for the present sample. Normative values for the general population have been reported between 8.73-10.19 (129, 135). There were few obtainable studies investigating normative values and cut-off values based on severity of disability for pregnant populations. However, one study has suggested a mean ODI score of 10% for LBP, 14% for PGP and 18% for LBP and PGP among women pregnant in week 12-18 (152). Based on these scores, it may seem that the 40% cut-off was indeed too high. However, since the second objective of this study was to investigate what were the impacts of pain and disability on depression among women with LBP and/or PGP, it seemed more correct to set a cut-off based on disability and not what can be regarded as normative. Overall, the consequence of establishing a cut-off of 40% as supposed to the reported ODI-score of 10% for pregnant women with LBP (152), is that the interpretation of the output must reflect that this cut-off represents scores of general populations with severe disability. It should also be noted that there appeared to be some inconsistency in preliminary literature in how the ODI score is reported. The summarized score in points should be multiplied by 2 to achieve the percentage score (129), however the denomination of points or percent does not appear to be specified in all of the studies that were identified. This may serve as a source of misinterpretation and should be carefully treated. Although dichotomizing the scale towards a higher cut-off value involves the risk of categorizing women as falsely negative in terms of disability, the 40% cut-off appeared to be the most recurring cut-off for severe disability in literature (129, 152). Finally, the establishment of a cut-off for pain intensity may be challenging, since pain experience is a very subjective phenomenon. However, Boonstra et al. have recommended a cut-off set to ≤ 5 for mild pain-related interference with functioning and ≥ 6 for moderate to severe interference with functioning (126). This cut-off was considered appropriate for the current sample, as it denotes the degree to which pain intensity interferes with functioning.

Although the POP-SS met the inclusion criteria following the initial bivariate logistic regressions, the median scores of the total sample was no symptoms (Table 2). To date, it does

not appear that a published cut-off value for severity of symptoms or symptom load exists, making the process of dichotomising the score somewhat problematic. Over half of the women scored a total of 0 and only 22% of the women scored above the 75th percentile. As there was no other obvious way of dichotomising the POP-SS scale, the cut-off was established at the 75th percentile, which represents a score of > 3. Moreover, all women scoring above the 75th percentile would have had some degree of POP symptoms. Similarly, as there were no recommended cut-off values in preliminary literature on the POP-SS, no gold standard of the POP-SS for pregnant women could be identified. These knowledge gaps represent a barrier to the discussion of results in the current study, as scoring above the 75th percentile of the POP-SS was statistically significant in both models. Nonetheless, the findings enable the description of a tendency where increasing POP-SS scores appear to be associated with higher odds of depression compared with those who do not score above the 75th percentile.

5.2 Discussion of results

The occurrence of women in this sample who scored above the cut-off level for depression was 22%, and 29% for women with LBP and/or PGP. This is higher than reports of antenatal depression from systematic reviews ranging from 10.8-18.4% (9, 33, 38) and higher than estimated prevalence for depression during pregnancy in low-income countries, reported at 15.6% (16). However, the findings from this study are consistent with two other identified Nepalese studies that investigated the prevalence of common mental disorders and depression. The studies reported prevalence during pregnancy of respectively 22% and 24%, and were carried out in Bhaktapur and Sindupalchowk, districts that belong to the same province as Kathmandu and Karveplanchowk (111, 113). The study that was carried out in Bhaktapur used the EPDS-10 to assess prevalence and symptom level of common mental disorders, concluding that the most important limitation was that the EDPS-10 has not been validated for pregnant Nepalese women (113). Although the study aimed to assess the outcome of perinatal "common mental disorders" and not depression specifically, the term refers to mental illness occurring during pregnancy or the postpartum year, such as depression and anxiety (38, 153, 154). Thus, the study appears relevant to compare present findings with, especially considering the modest number of Nepalese studies investigating antenatal depression.

The second study that investigated antenatal depression published by Aryal et al., was a cross-sectional study that took place in Sindhupalchowk district and included 164 pregnant women (111). A strength of the study was that it used the Nepali validated Hopkins Symptom Checklist to assess symptoms of depression, revealing that 24% of pregnant women had higher levels of

depression compared to normative values (111). This is quite consistent with results from the present study in terms of prevalence, although the difference in measure of depression makes comparison across studies imprecise. The study sample showed a somewhat different sociodemographic profile than the present sample, with lower education level, higher frequency of joint or extended families and more women involved in agriculture. However, as Sindhupalchowk district boarders Karveplanchowk and is therefore relatively close to Dhulikhel hospital, the present study sample may partially consist of women from similar settings, although this remains speculative. Regardless of the methodological differences and eventual discrepancy in terms of setting and sample, the findings from Aryal et al. are important to the comparison of the present study results, since literature on antenatal depression in Nepal is scarce. Overall, the prevalence of antenatal depression in Nepal appears to be higher than reports from other low-income settings (16). This may partly be associated to some unfortunate tendencies that are deeply rooted in societal structures, as will be discussed subsequently.

5.2.1 Impact of sociodemographic factors and pregnancy-related complaints on symptoms of depression in pregnant women in Nepal

In the final model estimate, four variables were significantly associated with symptoms of depression, explaining 16% of the variance in EDS-5 scores. The model's ability to explain 16% of variance in outcomes, ultimately indicates that there were other exposures that were not measured in the current study, that impacts outcomes of depression. Since the study design and analysis does not accommodate the criteria for establishing causal effects, the direction of these relationships remains unclear. However, the OR denotes how strongly the different exposures were associated for women in this sample. The variables whose exposures were associated with symptoms of depression were; being housewife, fetching water, living without a husband and scoring above the 75th percentile of the POP-SS. Interestingly, some of the sociodemographic factors that have been linked to antenatal depression in previous studies, were not found to be associated with having symptoms of depression in the current sample. For instance, being less educated was not found to be associated with higher symptoms of depression, as the literature suggests (16, 44, 111). This may have been because most of the women in our sample (over 90%) reported having some level of education, which is generally higher than national reports (19). Similarly, it has been suggested that belonging to an ethnic minority is associated with depressive symptoms during pregnancy for women in low-income settings (16). In fact, one study carried out in Nepal found that women belonging to the Dalit caste, which is a caste that

is typically associated with lower status and whose members have traditionally been subjected to untouchability, had nearly five times higher odds of depression than women belonging to upper castes (111). The current sample included women from both traditionally higher and lower castes, yet there was detected no such association between caste and symptoms of depression. This may have been because the women were partly recruited from urban settings and thus may have come from more modernized and urban backgrounds where caste distinctions are slowly growing more faded. Finally, there were no associations between the measures of symptoms and disability due to PGP and/or LBP and symptoms of depression for the entire sample. This result appears to be quite consistent to the results found by Acharya et al. on the very same sample as the current study. They found that having depressive symptoms were associated with having PGP and/or LBP in univariate analysis, however this association was not recognized following the multivariate analysis (82). Other studies have suggested a relation between these factors and Virgara et al. did find associations between LBP and/or PGP and increased symptoms of depression for Australian women with a low socioeconomic status (13). This will be further discussed for model 2.

For the entire sample, women who reported being housewife showed 2.6 higher odds of having symptoms of depression. The confidence interval for the variable housewife was relatively broad, thus indicating relative uncertainty of the OR estimate. Although generally the status of employment has not been a reported risk factor in systematic reviews (9, 33), some studies have detected an association between being a housewife and antenatal depression (50-54). These studies were carried out in both Western and low-income settings, hence indicating a consistence persisting beyond the overall economic status of the country. One factor that should be considered in relation to health and employment is the "Healthy Worker Effect", which denotes the phenomenon where healthy workers tend to be favoured by employers, thus skewing the rate of employment towards populations who are generally healthier (155). Although this may account for some variation in the present sample, it seems less likely to be a prominent factor since most of the women were not formally employed and had no personal income. However, it is important to emphasise that the women in the present sample did not classify as unemployed, but as housewives. It appears that most systematic reviews reporting risk factors for antenatal depression has investigated "status of employment", and not specifically women who specify themselves as housewives (9, 33, 44). This may result in assumptions that being unemployment is not associated with risk of depression, when subgroups of unemployed pregnant women, such as housewives, have not been investigated

specifically. In fact, some housewives in Nepal may bear the responsibility of cultivating food for self-sustain, collecting fuel for cooking, taking care of children and livestock on their own, especially in the absence of a husband. This makes them increasingly vulnerable to adverse effects of hard labour in relation to pregnancy.

The women who classified themselves as being housewives in the current study, also reported having some physically demanding chores related to housework. One of these chores, fetching water, was found to increase the odds of having symptoms of depression by 1.9. This differs from the recurring reported risk factors for antenatal depression in previous studies from in Nepalese settings. However, when considering the imperative significance water has to our health and wellbeing, the association between bearing the responsibility of providing water and having symptoms of depression may not be so conspicuous. As water represents an absolute life necessity, the scarcity of water and lack of access to safe drinking water may increase the total amount of life stress, especially for expectant mothers and caregivers. Interestingly, a relatively recent study conducted in Kathmandu found an association between urban household water supply and postnatal depression one month postpartum (156). Although most women had water pipes or water wells on the premises of their home, the piped water supply was unstable and restricted, leaving 60% worried that they would not have enough water (156). Moreover, because of the unpredictability of water supply, many women collected water from public wells and tanks, often resulting in latency and insufficient time for childcare (156). Interestingly however, the 2016 NDSH found very little difference in the access to improved drinking water between urban, rural and remote settings, and further reported that 95% of households have access to drinking water in some way (19). While the burden of providing water in urban settings may be linked to unstable water supplies and the liability of fetching water at public wells, the challenges with regards to water may present somewhat different in rural settings. For instance, the physical burden of fetching water may be greater with possibly longer commutes to community wells, due to lack of indoor water pipes. Furthermore, as it has been increasingly acknowledged that the overall burden of work for antenatal, perinatal and postpartum women in Nepal is too high, the physical liability of fetching water may add to this burden. Overall, it is possible that the association between being housewife and/or fetching water and having symptoms of depression during pregnancy, may be linked to the physical and psychological burden of being responsible for sustaining the family with food, fuel and adequate water supplies. As some of these perspectives appear to represent knowledge gaps in the research on maternal mental health, it should be further investigated in future studies.

Interestingly, as the imposed work burden on Nepalese women has been directly linked to migration tendencies among the male population (18, 19), women who were living without their husband in the current sample had higher odds of having symptoms of depression. The experience of social and emotional support, especially from husbands, has been consistently reported as a protective factor from antenatal depression in both Western countries, low-income countries and in Nepal (16, 44, 45, 111, 114, 115). Although there is no information on the women's subjective experience of social or emotional support from their husbands, it seems plausible that living with one's partner would affect the experience of support, provided that the husband is kind and supportive. Thus, the association between having the husband living away from home and the adverse effects of depression during pregnancy revealed in the current study, may be understood in the perspective of previous literature. It seems plausible that having someone to share the anticipation of expecting a child with, can contribute to reduce the overall stress and anxiety that women may experience when faced with big life changes such as motherhood. Furthermore, as was implied initially in this section, it is important to consider that the overall liability and work burden of women who live without their husbands is likely to increase in the absence of a partner. Women may consequently face more physical and psychological stress, both in terms of having to tackle an increasing share of physically demanding chores and with regards to the mental stress and responsibility of single parenting and motherhood.

Finally, although the median POP-SS score of the sample was low, the model revealed that women presenting with symptoms of POP had more than 4 times higher odds of having symptoms of depression. Having symptoms of POP was in fact the variable that demonstrated the highest odds of depression in model 1. This result was rather intriguing, as the present sample consisted of mostly nulliparous women in their twenties, and therefore not women who were exposed to the most frequently reported risk factors such as multipara, vaginal delivery and increasing age (83-85, 88, 95). Because of these characteristics of the sample one would not necessarily expect to find high POP-SS scores, and most scored < 3 with the overall median of scores at 0. A relatively sizable number of studies on POP have been conducted in Nepal, as the medical and political issue of POP has been disputed over many years and is acknowledged as a serious complication of labour and birthing practises (11, 20, 117). Despite the acknowledged consequences of POP such as domestic violence, social expulsion and social stigma, the number of studies investigating the psychosocial impacts experienced by women with POP in Nepal is scarce. One study however, assessed quality of life outcomes of women

with POP in Nepal, although the study assessed women who had undergone POP surgery (157). This coincides with conclusions of a scoping review based on women from Western populations on the psychosocial factors of POP that criticise the research field of unilateral focus of life quality outcome and sexual function outcomes (96). In conclusion, when considering the overall limited number of studies assessing psychosocial factors in relation to symptoms of POP, the current findings may represent a small contribution towards a more nuanced understanding of the adverse psychosocial impacts POP may have on pregnant women in a Nepali setting.

As presented above, the exposures of being housewife, fetching water, living without husband and having symptoms of POP were ultimately associated with having symptoms of depression. What is interesting to notice is that all these exposures may be related to work burden and isolation or lack of social support. Living without a husband may increase the burden of work responsibilities such as fetching water, and leave the women exposed and lonely in a period of life when they are more vulnerable. Similarly, being a housewife may increase the number of work chores assigned to the women and may besides leave her feeling alone in managing the responsibilities of taking care of children, family and household. Finally, the experience of POP symptoms during pregnancy has been linked to high workloads in the antenatal, peripartum and postpartum period and may grow worse during pregnancy (20, 24, 88, 118, 119). This may consequently lead to disability, worry and difficulties in performing assigned household chores (85, 86, 88, 89). These exposures could be understood beyond the mere associations, as symptoms of unfortunate societal expectations of women's ability to endure during pregnancy and the postpartum.

5.2.2 Impacts of sociodemographic factors and pregnancy-related complaints on symptoms of depression in pregnant women with LBP and/or PGP in Nepal.

The second research question aimed to display associations between symptoms of depression and sociodemographic factors and pregnancy-related complaints among pregnant women with LBP and/or PGP. The prevalence of women with symptoms of depression seemed to be slightly higher for women presenting with LBP and/or PGP, at 29%. The final model displays four variables that were significantly associated with having symptoms of depression. These variables were; living without a husband, scoring above the 75^{th} percentile of the POP-SS, scoring above 40% on the ODI and having moderate to high pain intensity. The variables living without a husband and having symptoms of POP were consistently associated with symptoms

of depression for both model 1 and 2, which may be interpreted as a strength with regards to the models' validity and the reliability of results. The model has further demonstrated goodness of fit and was found to explain 25% of the variance in EDS-5 scores. This essentially means that there are other exposures that impacts symptoms of depression that were not measured in the current study.

Firstly, women with LBP and/or PGP who lived with their husbands faced lower odds of having symptoms of depression than women who lived without their husbands. As emphasised in the discussion above, living without a husband may involve less social and emotional support during the sensitive period of pregnancy. Additionally, the burden of work that the women must endure may increase in the absence of a resident husband, thus adding to the total responsibility and life stress that is inflicted on the women. The fact that the women in this model also had LBP and/or PGP ascribes the perspective of pain and disability that the women reported experiencing. Moreover, the adverse effects of living without a husband was even stronger for women in model 2 compared to model 1, which may coincide with the presence of pain and disability if it affects the women's ability to perform work. In fact, higher self-reported pain intensity and disability was significantly associated with symptoms of depression for women in model 2. This is rather intriguing, since an association between having LBP and/or PGP and having symptoms of depression was not revealed for the entire sample. However, these results may suggest that having depressive symptoms may affect how we perceive disability and tolerate pain, or vice versa, that experiencing higher disability and pain intensity may have an impact on increasing symptoms of depression. These assumptions are similar to the conclusions of Virgara et al., who concluded that women who had increased depressive symptoms in combination with LBP and/or PGP experienced greater functional disability than women with LBP and/or PGP alone (13).

However, for the present study, the associations between pain intensity and symptoms of depression were stronger than the associations between disability and depressive symptoms. The exposure of experiencing moderate to high pain intensity the past four weeks was in fact the strongest association to symptoms of depression in model 2. Acharya et al. (82) observed high levels of pain intensity and low disability scores for women with LBP and/or PGP in this sample, indicating a similar tendency. Moreover, half of the women did not believe that they would recover from LBP and/or PGP after giving birth (82). Regardless of the ratio between pain and disability, it is plausible that the experience of pain and impairment may cause more stress and worry in relation to the performance of household chores, especially when

considering that many of the women in this sample had little faith in recovery. Women who carry the responsibility for household, childcare, animal care and water supply may fail to meet the expectations that are inflicted on them, as capacity to perform work is reduced. The discrepancy between the expectations of work endurance and actual ability to perform work may increase if the women are incapacitated, thus adding to the total life stress and possibly inflicting adverse effects on psychosocial wellbeing. Considering this, women who live without their husbands are especially vulnerable to such impairments. In the absence of external support, women may be exposed to increased life stress, factors that have been acknowledged to play a significant role in the development of antenatal depression (16, 44).

Finally, model 2 showed that having symptoms of POP was significantly associated with having symptoms of depression for women who had LBP and/or PGP. As discussed for model 1, the number of studies investigating psychosocial factors such as depression in relation to POP is limited, although POP that occurs during pregnancy has been linked to serious complications such as cervical ulceration, preterm labour or miscarriage (85). Acharya et al. (2018, submitted) found strong associations between symptoms of POP and LBP and/or PGP for women in this sample, but further argued that one of the items of the POP-SS may have influenced this association as the item may have acted as a confounding factor to LBP. However, in this matter it is important to consider that the association between POP symptoms and having symptoms of depression was consistent for both models. Or put differently, this association was also present in model 1 that assessed the entire sample and not just the subgroup of LBP and/or PGP, where item of the POP-SS may have acted confounding. This means that the associations between POP symptoms and depression among women who had LBP and/or PGP cannot solely be attributed to the possible confounding items of the POP-SS. In summary, the consistency of the indicated association between symptoms of POP and having symptoms of depression in the two samples, strengthens the reliability of the results and further suggests that symptoms of POP may have adverse impacts on maternal mental health outcomes.

6.0 CONCLUSION

The main findings from this study revealed associations between having symptoms of depression and living without husband, having symptoms of POP and housework characteristics for the overall sample. This indicates that the experience of social support may act as a protective factor, while certain work load characteristics and may involve adverse impacts on symptoms of depression. Furthermore, the results indicate associations between having symptoms of depression and higher pain intensity and disability for pregnant women with LBP and/or PGP, suggesting that the presence of depressive symptoms may impact on the experience of pain intensity and disability in pregnant women with LBP and/or PGP.

6.1 Implication for practice and future research

The WHOs Maternal Morbidity Working Group have compared maternal mortality rates to represent the "tip-of-the-iceberg" with regards to maternal morbidities (1). Although maternal mortality rates in Nepal appear to have been significantly reduced over the last two decades (100), there is still limited knowledge as to the prevalence and associative factors of maternal morbidities, such as depression that occurs during pregnancy. Considering the maternal and neonatal risk-factors that have been associated with antenatal depression, such as premature birth, low birth weight and intrauterine growth restriction (31, 47), it is important to understand and target the factors that may affect antenatal depression.

Considering that women who lived with their husbands had lower odds of having symptoms of depression, any preventative strategies depends on how these results are understood. In the perspective of social support, strategies may include educational programs targeting the expecting mothers, husbands, mothers-in-laws and community health-care workers to raise awareness of the importance of social support to healthy maternal and neonatal outcomes. Furthermore, such programs may also serve to educate key-people around the expectant mothers about the benefits of facilitating and relieving some of the workloads of women as they advance in their pregnancy and the post-partum. Raising awareness and challenging the societal expectations of pregnant women to perform heavy work during the peripartum and postpartum periods, stands especially important in the absence of a social policy or maternity leave for women who are informally employed in agricultural activities. Such measures targeting workload may not only have an impact of antenatal depression but may also contribute to reduce the exposure to risk factors for PGP, LBP and POP.

As the current results revealed associations between symptoms of POP and higher symptoms of depression, preventative strategies should further aim to reduce complaints related to POP symptoms. Although political measures have resulted free surgery and mobile surgery clinics for women with POP, these strategies fail to target prevention of POP. Moreover, since surgical interventions are not recommended for pregnant women presenting with POP symptoms (85), conservative interventions such as pelvic floor training programmes and ergonomic information may be safe and cost-effective alternatives. Such interventions should target both community health-care workers and pregnant women and may possibly encourage husbands to be more involved.

Finally, as the current sample cannot be accounted as generalizable for remote populations of pregnant women, future studies should aim to investigate prevalence and risk factors of maternal morbidities such as depression, LBP, PGP and POP in these settings. Since work load characteristics, access to health care facilities and the sociodemographic profiles of women residing in remote settings are most likely somewhat different from those living in urban and rural settings, it is possible that these complaints may present differently in remote settings.

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8.0 APPENDIX

8.1 Appendix 1 – Ethical approval

KATHMANDU UNIVERSITY
SCHOOL OF MEDICAL SCIENCES

Date: 20 March 2016

To,

Ms. Ranjeeta S. Acharya
Assistant Professor
Department of Physiotherapy
Kathmandu University School of Medical Sciences
Dhulikhel, Kavre

Dear Ms. Acharya

The institutional Review Committee of Kathmandu university School of Medical Sciences/Dhulikhel Hospital (IRC-KUSMS) reviewed and discussed your application to conduct study entitled **"Women's health program focusing antenatal-delivery-postnatal care for low back pain/pelvic girdle pain, pelvic organ prolapse and urinary incontinence in Nepal"** on 10th March 2016.

The Committee has approved the protocol.

Your protocol approval number is: **25/16**

The IRC-KUSMS expects to be informed about the progress of the study, any changes in the protocol and patient information/informed consent. A copy of the final report should be submitted to IRC-KUSMS.

With best regards,

Dr. Dipak Shrestha
Member Secretary, IRC-KUSMS

Dhulikhel, Kavre GPO Box 11000 Kathmandu, Nepal Phone: 00977 11 490497 Fax: 00977 11 490707 Email: kusms@ku.edu.np www.dhulikhelhospital.org Collaborative Program of Kathmandu University and Dhulikhel Hospital

8.2 Appendix 2 – Written information

Request for participation in a research project

"Womens' health program focusing antenatal-delivery-postnatal care for low back pain/pelvic girdle pain, pelvic organ prolapse and urinary incontinence in Nepal "

Background and purpose
This is a request for you to participate in a research study that intends to improve women's health in Nepal, with specific focus on low back pain/pelvic girdle pain, pelvic organ prolapse and urinary incontinence. We will consecutively collect information from pregnant women coming for regular visits at Dhulikhel Hospital and Kist Teaching Hospital.

What does the study entail?
We will examine how many that suffer from low back pain/pelvic girdle pain, pelvic organ prolapse and urinary incontinence and will examine the use of proper questionnaires to collect the information about these complaints. Socio-demographical background data and data on type of heavy work/work load, rest, delivery positions, type of delivery, post-natal rest etc. will also be collected. The questionnaire data will be collected on IPAD's and administered by physiotherapists from the hospital that asks the questions.

Potential advantages and disadvantages
There will be no disadvantages to participate in the study, either any advantages other than receiving information about common women's health complaints such as low back pain/pelvic girdle pain, pelvic organ prolapse and urinary incontinence.

What will happen to the information about you?
The samples and data that are registered about you will only be used in accordance with the purpose of the study as described above. All the data and samples will be processed without name, ID number or other directly recognisable type of information. A code number links you to your data and samples through a list of names which means that the information is de-identified.

Only authorised project personnel will have access to the list of names and be able to identify you. All information will be deleted in December 2024.

It will not be possible to identify you in the results of the study when these are published.

Voluntary participation
Participation in the study is voluntary. You can withdraw your consent to participate in the study at any time and without stating any particular reason. This will not have any consequences for your further treatment. If you wish to participate, sign the declaration of consent on the final page. If you agree to participate at this time, you may later on withdraw your consent without your treatment being affected in any way. If you later on wish to withdraw your consent or have questions concerning the study, you may contact the project leader Ranjeeta Shijagurumayum Acharya, Dhulikhel Hospital, phone 00 977 9841652528

Privacy
Information that is registered about you is socio-demographical background data and data on type of heavy work/work load, rest, delivery positions, type of delivery, post-natal rest etc., together with data on health-related quality of life and low back pain/pelvic girdle pain, pelvic organ prolapse and urinary incontinence.

Releasing material and data to other parties
If you agree to participate in the study, you also consent to samples and de-identified data being released to Oslo University Hospital, Oslo, Norway.

Right to access and right to delete your data and samples
If you agree to participate in the study, you are entitled to have access to what information is registered about you. You are further entitled to correct any mistakes in the information we have registered. If you withdraw from the study, you are entitled to demand that the collected samples and data are deleted, unless the data have already been incorporated in analyses or used in scientific publications.

Funding
Quota Scheme funding have been granted (June 17th 2015) for the study.

Insurance
No insurance schemes relevant in Nepal

Information about the outcome of the study
The information about the study will be published in the hospitals Journal and internationally.

Consent for participation in the study

I am willing to participate in the study.

(Signed by the project participant, date)

I confirm that I have given information about the study.

(Signed, role in the study, date)

8.3 Appendix 3 – Consent form

Consent Form

"Prevalence and severity of low back- and pelvic girdle pain in pregnant Nepalese women"

I hereby agree with my own will and volunteer to participate in the study mentioned above. The study has been explained to me by the researchers and I understand the purpose and implications of this research. The information is provided and the questions are asked in a language I understand. I understand that this participation is entirely voluntary. I can withdraw my consent to participate at any time without prejudice to the extent that my record can be removed from the research. All personal reports will be treated confidentially by the researchers

Participants Signature: . . . . . .

8.4 Appendix 4 – Study questionnaire

Questionnaire on socio-demography, pregnancy, workload, pain intensity, low back pain, pelvic girdle pain, pelvic organ prolapse, urinary incontinence and depression in Nepal

Date: . . ../. . . . . /

Address: . . . . . .

. . . . . .

. . . . . .

ID number:

Mobile number: . . . . . .

Telephone number (landline): . . . . . .

Hosp ID:…….

How to complete this questionnaire – Please read carefully.

Women's health problems are very common in Nepal. To help further in improving the health outcome of the Nepalese women it is important to have an accurate insight in current situation of women's health in Nepal. An accurate understanding requires a high response rate. Your participation is therefore very important to us.

Prior inform consent will be obtained from the participant.

Thank you very much for your participation.

……

Section A: Socio-demographic history			
1	How old are you ?	……years	
2	What is your ethnicity?	☐Brahmin ☐Chhetri ☐Newar ☐Tamang ☐Magar ☐Dalit ☐Others	
3	What is your marital status currently?	☐Stay with husband	
		☐Husband is not staying with me	
		☐Widow	
		☐Divorced /single	
		☐Others.....	
4	Age at marriage	..... years	
5	What type of family do you live in?	☐Nuclear family ☐Joint family ☐Extended joint family	
6	How many members are there in your family	..... nos.	
7	Can you read and write?	☐Yes ☐No	
8	Have you ever been to school?	☐Yes ☐No	
9	What is your highest educational status you completed?	..... class	
10	Can your husband read and write?	☐Yes ☐No	
11	Have your husband ever been to school?	☐Yes ☐No	
12	What is the highest educational status your husband completed?	..... class	
13	What is your main occupation? **(Multiple answer)**	☐Agriculture ☐Housewife ☐Business/Self employed ☐Government employee ☐Private employee ☐Student ☐Retired ☐Labor ☐Others: Specify……..	
14	Do you have any independent income of your own? If yes, what is your personal monthly income?	☐Yes ☐No ☐Less than Rs 8,000 ☐Between Rs 8,000 and Rs16,000 ☐More than Rs 16,000	

15	What is the main occupation of your husband?**(Multiple answer)**	☐Agriculture ☐Business/Self employed ☐Government employee ☐Private employee ☐Student ☐Retired ☐Labor ☐Others: Specify……	
16	Do you know your husband's income? If yes, what is your husband's monthly income?	☐Yes ☐No ☐Less than Rs 8,000 ☐Between Rs 8,000 and Rs16,000 ☐More than Rs 16,000	
17	Where is your husband currently?	☐Nepal ☐Abroad	
18	Are you involved in any institution/women group? **(Multiple answer)**	☐Cooperatives ☐Mothers Group ☐Dhulikhel Hospital(Microfinance) ☐Others…….. ☐None	
Pregnancy history			
Section B (A)Current pregnancy			
1	Gravida	Gravida.....	
2	Weeks of gestation?	..... weeks..... days	
3	What is your current height?	..... cm	
4	What is your current weight?	..... kg	
5	Do you take any medications?	☐Yes ☐No If yes which medicine.....	
6	Do you take any of the beverages containing alcohol? If yes, when did you exactly start drinking alcohol? Why doyou take beverages containing alcohol during pregnancy?	☐Yes ☐No ☐Do not Know If No, then skip to next question No.7 ☐Before pregnancy ..... weeks after pregnancy 1. As tradition/ culture 2. As regular habit 3. For good health 4. As family suggestion 5. For the good health of the child	

	How often do you (on average) consume beverages containing alcohol?	6. To relief pain 7. To relax and promote sleep 8. During festival 9. Others…….. ☐Always ☐Most of the time ☐Some of the time ☐Rarely	
7	Do you have pain, discomfort or urinary leakage during sexual intercourse? If yes, How much does this bother you?	☐Always ☐Most of the time ☐Some of the time ☐Rarely ☐Never If never, skip to Section B Not at all Extreme **0** 1 2 3 4 5 6 7 8 9 **10**	

Section B. (B) Previous pregnancy
(If no h/o previous pregnancy skip to Section C)

1	Age at first pregnancy?	..... years	
2	Have you ever had a pregnancy that ended with:	<table><tr><th></th><th></th><th>Yes</th><th>No</th></tr><tr><td>a.</td><td>Spontaneous abortion</td><td></td><td></td></tr><tr><td>b.</td><td>Abortion on request</td><td></td><td></td></tr><tr><td>c.</td><td>Child born dead</td><td></td><td></td></tr><tr><td>d.</td><td>Premature</td><td></td><td></td></tr></table>	
3	Do you have any children	☐Yes ☐No If no, skip to Section "C"	
4	How many children do you have?	..... nos.	
5	What are the ages of the children? (from the eldest-youngest)	<table><tr><td>S.N</td><td>Age</td></tr><tr><td>1</td><td></td></tr><tr><td>2</td><td></td></tr><tr><td>3</td><td></td></tr><tr><td>4</td><td></td></tr><tr><td>5</td><td></td></tr><tr><td></td><td></td></tr></table>	
6	How was the baby delivered?	<table><tr><td>S.N</td><td>Normal</td><td>Operation</td></tr><tr><td>1</td><td></td><td></td></tr><tr><td>2</td><td></td><td></td></tr><tr><td>3</td><td></td><td></td></tr><tr><td>4</td><td></td><td></td></tr><tr><td>5</td><td></td><td></td></tr></table>	

	If normal delivery, please answer how it was delivered ? [If Operation skip to Q no. 9]		1st baby	2	3	4	5	
		Self						
		Traditional Birth attendant						
		Skilled birth Attendant						
		Help from relatives						
		Others Specify.....						
7	What was the delivery position?	Delivery position	1st baby	2	3	4	5	
		Squatting Lithotomy Prone kneeling Kneeling Supine Side lying						
8	Was episiotomy done before delivery?	☐Yes ☐ No						
9	Which place did you go for regular check up during pregnancy? (Multiple answer)							

S.N	Hosp	Health post/PHC	Clinic	Not applicable
1				
2				
3				
4				
5				

10	On average what has been your time interval from delivery to work?						

S.N	<1 wk	2-4 wk	>4 wk	>8 wk	>12 wk
1st baby					
2					
3					
4					
5					

Section C: Workload

1	What time do you get up in the morning?	..... a.m	
2	What time do you go to sleep?	..... p.m	

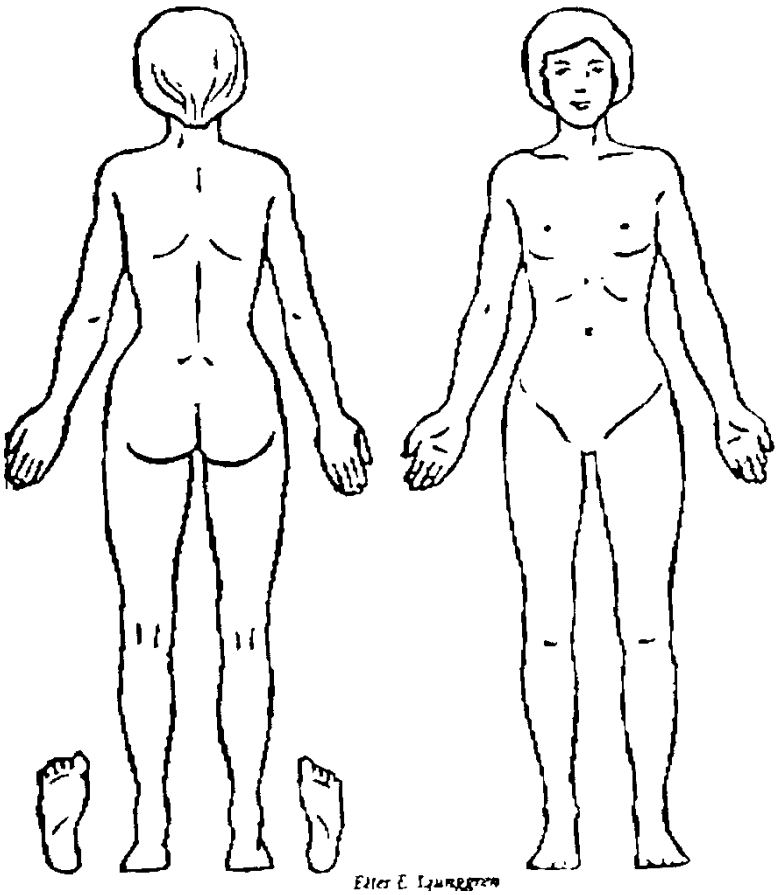
3	Do you go to field work? If yes, what time do you go for field work?	☐Yes ☐No..... If No, skip to Q number 11 …….(time)	
4	How many hours do you walk everyday (on an average)	☐<1/2 hr ☐1/2hr-1hr ☐1hr-1 ½ hr ☐1 ½ hr-2hr ☐2hr-2 ½ hr ☐2 ½ hr-3hr ☐>3hr	
5	How much of load do you carry everyday (on an average)	.....kg	
6	What kind of work do you do in the field (multiple answer)?	☐Grass cutting, ☐Cutting branches of trees ☐Fetching water ☐Farming ☐Others.....	
7	What is your main working position (multiple answer)?	☐Sitting/ squatting ☐Standing/ Bending forward ☐Others.....	
8	How many hours do you stand and/or bend forward during a typical working day?	..... hours	
9	How many hours do you sit during a typical working day?	.....hrs	
10	What are the household work you do? (multiple answer)	☐Cooking food ☐Cleaning house ☐Cleaning utensils ☐Washing clothes ☐Taking care of the children ☐Taking care of animals ☐Fetching water ☐Others.....	
11	Do you take rest during work ? If yes, how frequently?	☐Yes ☐No …….. min in every…….. hour	

Section E:PAIN in the Low back and / or pelvic girdle

1. Do you have had any musculoskeletal pain in the past 4 weeks?

☐Yes
☐ No , If no, skip to Q no.14

If yes, please draw where on the body you have had pain



2	Rate the pain you have had during the past 4 weeks?	0-10 (no/as bad as it could be)
3	***If you had pain in your low back and/or pelvic girdle***, was this pain bad enough to limit your usual activities or change your daily routine for more than one day?	☐Yes ☐No
4	***If you had pain in your low back and/or pelvic girdle***, how often did you have the pain?	☐On some days ☐On most days ☐Every day
5	**Do you believe your pain is from: *(you can answer several locations)*** Low back? Pelvic girdle?	☐ Yes ☐No ☐Do not know ☐Yes ☐No
6	**Is your pain located : *(you can answer several locations)***	☐at the front (symphysis) ☐ on the right side of the back (right pelvic joint/sacroiliac joint) ☐ on the left side of the back (left pelvic joint/sacroiliac joint) ☐ in the middle (over sacrum)
7	**If you had low back and/or pelvic girdle pain <u>in the past 4 weeks</u>, please indicate what was the average intensity of your evening pain on a scale (Please rate your pain)**	0-10 (no/as bad as it could be)
8	**How concerned are you about your low back and/or pelvic girdle pain?**	0-10 (not all concerned/ extremely concerned)
9	**Do you believe that your low back and/or pelvic girdle pain will disappear after the birth?**	Yes ☐ No ☐

10. Numerical Pain Rating Scale:

"I am going to ask you to rate your _____ pain on a scale from 0 to 10, where 0 is no pain, and 10 ils the worst pain imaginable (or worst possible pain). Please rate your level of pain: right now...; .at its worst in the last 24 hours…; at its best in the last 24 hours."
Record all 3 ratings: current; worst; best

NPRS scoring scheme (Say or point to one number):

0 1 2 3 4 5 6 7 8 9 10

No Pain Possible Pain

NPRS pain scale score:	Current			
	Worst in last 24 hours			
	Best in last 24 hours			
	TOTAL			

11. Patient-Specific Functional Scale (PSFS)

Initial Assessment:
It is important to ask the patient standard questions in a standardized way.
"Please tell me three things that you are unable to do or are having difficulty doing because of your _____ problem."
Clinician: explain 1-10 scale to patient, then have the patient rate each item:
For each item, ask the patient to rate their ability to perform the activity on "a scale from zero to ten, where 0 is completely unable, and ten is 100%, fully able."

PSFS rating scale:

0 1 2 3 4 5 6 7 8 9 10

Unable to perform activity at the activity injury or problem

100% **Able to** perform to same level as before the

S.N	**Activities**	**Pain scale score**
1		
2		
3		

12.a Pelvic girdle pain test

TESTS	yes		No	Not tested	
	Right	Left		Right	Left
Posterior pelvic pain provocation tests					
Palpation of long dorsal sacroiliac ligament					
Active Straight leg raise 0 - Able to do easily 1 2 3 4 5- not able to do					
Modified trendelenberg test					

12.b To what extent do you find it problematic to carry out the activities listed below **because of low back and/or pelvic girdle pain**? For each activity tick the box that best describes how you are now. (PELVIC GIRDLE QUESTIONNAIRE)

How problematic is it for you because of your low back and/or pelvic girdle pain to:	Not at all 0	To a little extent 1	To some extent 2	To a great extent 3
1. Dress yourself				
2. Stand for less than 10 minutes				
3. Stand for more than 60 minutes				
4. Bend down				
5. Sit for less than 10 minutes				
6. Sit for more than 60 minutes				
7. Walk for less than 10 minutes				
8. Walk for more than 60 minutes				
9. Climb up and down the stairs				
10. Do housework				
11. Carry light objects				
12. Carry heavy objects				
13. Get up/sit down				
14. Push object with hand				
15. Walk fast				
16.Carry out sporting activities*				
17. Lie down				
18. Roll over in bed				
19. Have a normal sex life*				
20. Push something with one foot				

* if not applicable, mark box to the right

How much pain do you experience;	None 0	Some 1	Moderate 2	Considerable 3
21. in the morning				
22. in the evening				
To what extent because of low back and/or pelvic girdle pain;	Not at all 0	To a little extent 1	To some extent 2	To a great extent 3
23. has your leg/have your legs given way?				
24. do you do things more slowly?				
25. is your sleep interrupted?				

13. The following questions are abouthow your low back pain affects your ability to manage in every day life.(OSWESTRY DISABILITY INDEX)

*Pleas answer every section. Mark **one box only** on each section that most closely describes you **today** (1-10).*

1 – Pain intensity

☐ I have no pain at the moment
☐ The pain is very mild at the moment
☐ The pain is moderate at the moment
☐ The pain is fairly severe at the moment
☐ The pain is very severe at the moment
☐ The pain is the worst imaginable at the moment

2 – Personal care (washing, dressing, etc)

☐ I can look after myself normally without causing extra pain
☐ I can look after myself normally but it is very painful
☐ It is painful to look after myself and I am slow and careful
☐ I need some help but manage most of my personal care
☐ I need help every day in most aspects of self care
☐ I do not get dressed, wash with difficulty and stay in bed

3 – Lifting

☐ I can lift heavy weights without extra pain
☐ I can lift heavy weights but it gives extra pain
☐ Pain prevents me from lifting heavy weights off the floor but I can manage if they are conveniently positioned, e.g. on a table.
☐ Pain prevents me from lifting heavy weights but I can manage light to medium weights if theyare conveniently positioned
☐ I can lift only very light weights
☐I cannot lift or carry anything at all

4 – Walking

☐ Pain does not prevent me from walking any distance
☐ Pain prevents me walking more than 2 km
☐ Pain prevents me walking more than 1 km
☐ Pain prevents me walking more than 500 m
☐ I can only walk using a stick or crutches
☐ I am in bed most of the time and have to crawl to the toilet

5 – Sitting

☐ I can sit in my chair as long as I like
☐ I can sit in myfavorite chair as long as I like
☐ Pain prevents me from sitting for more than 1 hour
☐Pain prevents me from sitting for more than ½ an hour
☐ Pain prevents me from sitting for more than 10 minutes
☐ Pain prevents me from sitting at all

6 – Standing

☐ I can stand as long as I want without extra pain
☐ I can stand as long as I want but it gives me extra pain
☐ Pain prevents me from standing for more than 1 hour

☐ Pain prevents me from standing for more than ½ hour
☐ Pain prevents me from standing for more than 10 minutes
☐ Pain prevents me from standing at all

7 – Sleeping
☐ My sleep is never disturbed by pain
☐ My sleep is occasionally disturbed by pain
☐ Because of pain I have less than 6 hours sleep
☐ Because of pain I have less than 4 hours sleep
☐ Because of pain I have less than 2 hours sleep
☐ Pain prevents me from sleeping at all

8 – Sex life (if applicable)
☐ My sex life is normal and causes no extra pain
☐ My sex life is normal but causes some extra pain
☐ My sex life is nearly normal but is very painful
☐ My sex life is severely restricted by pain
☐ My sex life is nearly absent because of pain
☐ Pain prevents any sex life at all

9 – Social life
☐ My social life is normal and causes no extra pain
☐ My social life is normal but increases the degree of pain
☐ Pain has no significant effect on my social life apart from limiting my more energetic interests, e.g. sport, etc.
☐ Pain has restricted my social life and I do not go out as often
☐ Pain has restricted social life to my home
☐ I have no social life because of pain

10 – Travelling
☐ I can travel anywhere without pain
☐ I can travel anywhere but it gives extra pain
☐ Pain is bad but I manage journeys over two hours
☐ Pain restricts me to journeys of less than one hour
☐ Pain restricts me to short necessary journeys under 30 minutes)
☐ Pain prevents me from travelling except to receive treatment

14. POP SS

How often during the last four weeks have you had the following symptoms:	Never	Occasionally	Some times	Most of the time	All thetime
1. A feeling of something coming down from or in your vagina?	☐	☐	☐	☐	☐
2. An uncomfortable feeling or pain in your vagina which is worse when standing?	☐	☐	☐	☐	☐
3. A heaviness or dragging feeling in your lower abdomen/tummy?	☐	☐	☐	☐	☐
4. A heaviness or dragging feeling in your lower back?	☐	☐	☐	☐	☐
5. A need to strain (push) to empty your bladder?	☐	☐	☐	☐	☐
6. A feeling that your bladder has not emptied completely?	☐	☐	☐	☐	☐
7. A feeling that your bowel has not emptied completely?	☐	☐	☐	☐	☐
8. Which of the symptoms above (1–7) causes you most bother? (please enter a number 1 to 7 in the box, or tick not applicable).		☐☐Not applicable			

15. Many people leak urine some of the time. We are trying to find out how many people leak urine, and how much this bothers them. We would be grateful if you could answer the following questions, thinking about how you have been, on average, over the PAST FOUR WEEKS (ICIQ-UI Short form)

1. How Often do you leak urine? (Tick one box)
If respondent never leak urine then skip to Q no. 16

0	Never ☐
1	about once a week or less often ☐
2	two or three times a week ☐
3	about once a day ☐
4	several times a day ☐
5	all the time ☐

2. We would like to know how much urine you think leaks. How much urine do you usually leak (whether you wear protection or not)? (Tick one box)

0	None ☐
2	A small amount ☐
4	A moderate amount ☐
6	A large amount ☐

3. Overall, how much does leaking urine interfere with your everyday life? Please ring a number between 0 (not at all) and 10 (a great deal)

0 1 2 3 4 5 6 7 8 9 10
not at all a great deal

ICIQ score: sum scores 3+4+5 ☐☐

4. When does urine leak? (Please tick all that apply to you)

	never – urine does not leak ☐
	leaks before you can get to the toilet ☐
	leaks when you cough or sneeze ☐
	leaks when you are asleep ☐
	leaks when you are physically active/exercising ☐
	leaks when you have finished urinating and are dressed ☐
	leaks for no obvious reason ☐
leaks all the time☐	

16. EPDS

In the past 7 days:	Yes, most of the time	Yes, sometimes	Not very often	No, never
I have felt sad or miserable	☐	☐	☐	☐
I have been anxious or worried for no good reason	☐	☐	☐	☐
I have been so unhappy that I have had difficulty sleeping	☐	☐	☐	☐
I have blamed myself unnecessarily when things went wrong	☐	☐	☐	☐
I have looked forward with enjoyment to things	☐	☐	☐	☐

……..

Thank you