Antenatal depression and adversity in urban South Africa

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Abstract

Background—In low and middle-income countries (LMIC), common mental disorders affecting pregnant women receive low priority, despite their disabling effect on maternal functioning and negative impact on child health and development. We investigated the prevalence of risk factors for antenatal depression among women living in adversity in a low-resource, urban setting in Cape Town, South Africa.

Methods—The MINI Neuropsychiatric Interview (MINI Plus) was used to measure the diagnostic prevalence of depression amongst women attending their first antenatal visit at a primary-level, community-based clinic. Demographic data were collected followed by administration of questionnaires to measure psychosocial risk. Analysis examined the association between diagnosis of depression and psychosocial risk variables, and logistic regression was used to investigate predictors for major depressive episode (MDE).

Results—Among 376 women participating, the mean age was 26 years. The MINI-defined prevalence of MDE was 22%, with 50% of depressed women also expressing suicidality. MDE diagnosis was significantly associated with multiple socioeconomic and psychosocial risk factors, including a history of depression or anxiety, food insecurity, experience of threatening life events and perceived support from family.

Limitations—The use of self-report measures may have led to recall bias. Retrospective collection of clinical data limited our ability to examine some known risk factors for mental distress.

Conclusions—These findings confirm the high prevalence of MDE among pregnant women in LMIC settings. Rates of depression may be increased in settings where women are exposed to multiple risks. These risk factors should be considered when planning maternal mental health interventions.

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Conflict of interest

The authors declare no conflict of interest

Background

Depressive disorders account for almost half of the burden of disease presented by mental disorders, followed by anxiety disorders, and drug and alcohol use disorders (WHO Department of Health Statistics and Informatics, 2008). Globally, the lifetime prevalence of major depressive disorder is estimated to be between 10% and 15% (Lépine and Briley, 2011) and in South Africa, it is estimated that 9.8% adults will experience a major depressive episode (MDE) at least once during their lifetime (Stein et al., 2008). It is difficult to estimate the burden for people living with these disorders (Murray et al., 2012; Whiteford et al., 2013), but it is understood that the symptoms are significantly disabling for those affected (Collins et al., 2011). Despite this, fewer than half of those affected globally, have access to adequate treatment and health care. In LMIC, where mental disorders receive little attention and few resources, this "treatment gap" is estimated to be between 75% and 80% (Lund et al, 2012).

Depression during the perinatal period presents a similarly large burden. In high-income countries (HICs), the burden of perinatal depression is approximately 13%–15% (Oates et al., 2004; Oates, 2003; Pearson et al., 2012). In LMIC, the burden is estimated to be much higher (Fisher et al., 2012). However, it is difficult to determine how high the burden is, as prevalence estimates vary greatly across countries and regions and many are based on screening data rather than diagnostic data (Abiodun, 2006; Adewuya et al., 2005; Fisher et al., 2012; Hanlon et al., 2008; Medhin et al., 2010). In South Africa, there are similar disparities between prevalence estimates from studies based on both screening and diagnostic data. Studies using clinical diagnostic methods report rates of 47% (Rochat, Bland, Tomlinson, & Stein, 2013; Rochat, Tomlinson, Newell, & Stein, 2013; Rochat et al., 2011) and 34.7% (Cooper et al, 1999), which is 2–3 times higher than HIC settings. These prevalence data are, however, based on small sample sizes. Studies using the Edinburgh Postnatal Depression Scale (EPDS) as a screening tool have reported similarly high prevalence rates, ranging between 42% – 46 % (Tsai et al., 2014) and 37% – 41% (Hartley et al., 2011; Manikkam & Burns, 2012; Rochat et al., 2006; Tomlinson et al., 2013). A recent study using the Beck Depression Inventory (BDI) with a sample of 726 pregnant women living in an urban, low-resource setting, reported a prevalence rate of 21% (Brittain et al., 2015).

Depression during the perinatal period is of particular concern because of the disabling effect on maternal functioning (Manikkam and Burns, 2012), and the negative consequences for the health and development of infants and children (Grote et al., 2010; Nasreen et al., 2010; Patel and Prince, 2006; Atif Rahman et al., 2003; Tomlinson et al., 2004; Traviss et al., 2012). The impact of maternal depression is greater in contexts of chronic poverty and social adversity, which exacerbate the inter-generational cycle of mental illness and poverty

(Lund et al., 2011). Despite these consequences, approximately 80% of women affected by common perinatal mental disorders (CPMD) are not diagnosed or treated (Condon, 2010).

Multiple risk factors for maternal depression

The relationship between an individual's vulnerability to stress, the experience of a stressful life event, such as pregnancy, and the onset of depression is well established (Ramchandani et al., 2009). This can be exacerbated when a woman has a history of psychiatric diagnosis (Beck, 2001; Robertson et al., 2004; Woods et al., 2010). However, in the majority of cases, the major underlying risk factors for maternal depression are social rather than biological (Austin et al., 2011; Cooper & Murray, 1998; Hartley et al., 2011). The stress of pregnancy and birth (Dunkel Schetter and Tanner, 2012) can be amplified by circumstances where women experience poverty (Faisal-Cury et al., 2009; Milgrom et al., 2008; Patel et al., 2002), lack of social support (Faisal-Cury et al., 2009; Milgrom et al., 2008; Rahman & Creed, 2007; Ramchandani et al., 2009; Robertson et al., 2004; Rochat et al., 2006), intimate partner violence (Dunkle et al., 2004; Dunkle et al., 2003; Woods et al., 2010), and when a pregnancy is unintended and unwanted (Bunevicius et al., 2009). In LMIC, additional psychosocial and socioeconomic risk factors associated with maternal depression include poor education; substance use and low levels of emotional and financial support from a partner (Hartley et al., 2011).

There is growing evidence that food insecurity, which is a proxy measure for poverty, is a risk factor for poor mental health (Huddleston-Casas et al., 2009; Lund et al., 2010; Maes et al., 2010). In low income settings, food insecurity has been strongly associated with mental health problems such as anxiety and depression (Garcia et al., 2013; Hadley and Patil, 2006; Huddleston-Casas et al., 2009). In South Africa, the rate of food insecurity is estimated to be around 25 to 33%, and 38% of households report food insuffiency[1] (Sorsdahl et al., 2011). Both food insecurity and insufficiency are associated with an increased risk of having a diagnosis of anxiety and substance use disorder (Dewing et al, 2013; Sorsdahl et al., 2011). Food insecurity for women during the perinatal period potentially has several negative consequences. Pregnant and breast-feeding women have increased nutritional needs and lack of sufficient and healthy food not only places a woman at risk of malnutrition, but may also impact foetal and infant nutrition and development (Scorgie et al., 2015). In Dewing's study, increased levels of food insecurity (associated with poverty) were associated with hazardous drinking, probability of depression and high-risk suicidality (Dewing et al., 2013).

This study aims to address the variance in reported prevalence rates of antenatal depression in South Africa by providing accurate diagnostic data using a structured clinical interview with a sample of 376 pregnant women. Furthermore, examination of multiple psychosocial and socioeconomic variables simultaneously, seeks to elucidate the core risk factors associated with depression amongst pregnant women living in contexts of poverty and long-standing psychosocial adversity.

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[1]Food insecurity is defined as "limited or uncertain access to food with adequate nutritional value, or the inability to procure food in socially acceptable ways" (Dewing et al, 2013). Food insufficiency is defined as "an extreme form of household food insecurity that refers to a condition in which household members sometimes or often do not have enough to eat" (Sorsdahl et al., 2011).

Methods

Setting

This cross-sectional study was undertaken at the Hanover Park Midwife Obstetric Unit (MOU), which provides primary level maternity services in an urban area of Cape Town, South Africa. Hanover Park has a population of about 35 000 people (Statistics South Africa, 2013), and is a community characterized by high levels of poverty and community-based gang violence. Hanover Park is regarded as one of the most violent parts of Cape Town with high rates of alcohol and substance abuse, physical and sexual violence, and child abuse and neglect (Moultrie, 2004). Rates of violence are amongst the highest in the world. In 2012, per 10 000 people, there were 6 homicides, 87 sexual crimes and 115 cases of assault with grievous bodily harm (Institute for Security Studies, 2015). Ninety eight percent of children are reported to have witnessed violence in the community, with 40% being threatened or assaulted in the community and 58% being threatened or assaulted at home (Benjamin, 2014). Housing is comprised of run-down public residential units, smaller freestanding formal houses and informal shacks. Unemployment rates are between 40 and 69%, almost two-thirds of adults do not have a regular income and less than 20% of adults have completed high school (Benjamin, 2014; Moultrie, 2004).

At the time of data collection, there was no specific mental health service or support for pregnant women. Mental health services were provided for outpatients at the Hanover Park Community Health Centre (CHC), which was staffed by two psychiatric nurses, with weekly consultations by a psychiatrist and an intern clinical psychologist. Psychiatric emergencies were managed by the CHC's casualty unit and referrals made to secondary or tertiary level hospitals.

Sample

Every third woman arriving at the Hanover Park MOU for her first antenatal visit was invited to participate in the study[2]. No prior clinical assessment of the women was performed. Women included in the study were 18 years or older, pregnant, willing to provide informed consent to participate in the study and able to understand the nature of the study, questions, and instructions given by the research assistant.

Ethical approval for the study was granted by the University of Cape Town Department of Health's Human Research and Ethics Committee (HREC REF: 131/2009) and the Provincial Government of the Western Cape's Department of Health Research Committee.

Measures

A demographics questionnaire was administered that included questions on age, education, marital status, socioeconomic status (SES), HIV status as known by the participants

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[2]This sampling frame (k = 3) was used after taking into account the average number of women who presented daily for antenatal care, and the amount of time that screening would take per woman. This was then used to calculate how many women would need to be screened daily in order to obtain the sample number. This method also allowed for sampling of those women who arrived earlier as well as those women who arrived later in the day for antenatal care.

themselves[3], obstetric information, whether the pregnancy was intended and wanted, and whether participants had experienced anxiety or depression in the past.

The Expanded Mini-International Neuropsychiatric Interview (MINI Plus) Version 5.0.0 was used as the diagnostic interview (Sheehan et al. 1998). The MINI Plus, which contains modules for the major axis I psychiatric disorders in DSM-IV TR, covers a broad range of disorders, yet is relatively quick and easy to administer. The MINI Plus has been validated for use in South Africa (Kaminer, 2001) and is available for administration in English, Afrikaans and isiXhosa, the languages spoken by the women attending the MOU (Myer et al. 2008; Spies et al. 2009).

The Multidimensional Scale of Perceived Social Support (MSPSS) (Zimet et al., 1988) was used to identify perceptions of social support from three possible sources: family, friends and a significant other. The MSPSS has proven to be psychometrically sound in diverse samples and to have good internal reliability and test-retest reliability, and robust factorial validity The MSPSS has been used in South Africa in diverse populations (Bruwer et al., 2008; Myer et al., 2008). Scores range between 12 and 84 for the whole instrument and between 4 and 28 for the three sub-scales. There are no cut-off points, but higher scores are indicative of higher levels of perceived support.

Intimate partner violence was assessed using the Revised Conflict Tactic Scales (CTS2) (Straus et al., 1996). The CTS2 is a shortened form of the original Conflict Tactics Scale (CTS) which may be used in low-resource settings to screen for IPV amongst vulnerable women. The CTS2 has demonstrated good cross-cultural reliability and has been used in South Africa (Devries et al., 2013; Gass et al., 2010).

Food insecurity was measured using the U.S. Household Food Security Survey Module (HFSSM): Six-Item Short Form. This scale was developed to assess financially based food insecurity and hunger in surveys of households (Blumberg et al., 1999). The scale measures, for the prior six months, inadequacy of food each month, frequency of going hungry, and not having money to buy enough food for the individual or their household.

The List of Threatening Experiences (LTE) was used to measure the number of threatening life experiences faced by women in the preceding 6 months (Brugha and Cragg, 1990). The LTE is an evaluation of a stress-score based on 12 categories of life events highly likely to be perceived as threatening. We categorised women into those who had experienced two or more stressful life events and those who had experienced less than two in the past 6 months.

An asset index was used as a measure of socio-economic status of households (Deaton, 1997). Asset index measurements are preferred over the use of total household income, since the latter suffers several methodological weaknesses (Filmer and Pritchett, 2001; Klasen, 2000; McIntyre et al., 2002; Montgomery et al., 2000; Vyas and Kumaranayake, 2006). Information on ownership of electronic equipment (e.g. microwave, washing machine, television and fridge), transport (cars), sources of energy (electricity) and bank accounts

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[3]Women participated in this research prior to having their antenatal HIV test conducted as part of routine obstetric care. Some women were already aware of their status, (from prior testing), however these women were not asked to reveal what this status was.

(including credit card) was pooled together to construct the index. All assets that were owned (or not) by all respondents were dropped from the principal component analysis to ensure that the result was not skewed. In conducting the principal component analysis, the first component factor[4] was used to represent the asset index. On this basis, the study population was classified into 4 quartiles (i.e., least poor, poor, very poor and poorest).

Procedures

Training

A research assistant and a mental health officer were appointed to conduct the study[5]. A clinical psychologist, with research experience, trained and supervised both these staff. The research assistant was trained to recruit women, administer the demographics questionnaire and manage the study database. The mental health officer was trained to administer the MINI Plus diagnostic interview as well as to counsel women who received a diagnosis with a common mental disorder and refer those with severe mental disorder. Health care staff at Hanover Park MOU received maternal mental health training, to sensitise them to the mental health needs of their patients. Referral protocols were established with the MOU and CHC for women who required higher-level psychological, psychiatric or social interventions.

Data collection

Data were collected by systematically sampling every third woman presenting for antenatal care at the Hanover Park MOU between 22 November 2011 and 28 August 2012. After the study was verbally explained to potential participants and informed consent was obtained, the research assistant administered the demographics questionnaire and the psychosocial risk screening instruments. The MINI Plus was then administered by the mental health officer. Data collection was supervised by a clinical psychologist. Clinical data on HIV status was collected from women's clinic files retrospectively, following routine antenatal HIV testing.

Referral for psychopathology

Women who presented a high risk for suicide on the MINI Plus were referred to specialist care after screening. Women who were diagnosed with a common mental disorder such as MDE on the MINI Plus were offered counselling with the mental health officer.

Data analysis

Data were analysed using Stata v13.1. Internal consistency and scale reliability within assessment tools were assessed using the Cronbach's α Statistics (Cronbach, 1951). Descriptive measures were used to analyse the socio- demographic data and obtain the sample statistics. Non-parametric tests, the Wilcoxon sum of rank test, the Fisher exact test and the two sample t-test were used to determine whether there were significant associations between MDE diagnosis on the MINI Plus and psychosocial risk variables. A descriptive analysis was conducted for the assets owned and other factors that were included in the asset

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[4]The first component factor is defined statistically as a weighted sum of the various assets used to assess household wealth, in order for that component to explain as much as possible of the variance observed in asset ownership between households.
[5]The mental health officer, who administered the MINI Plus, had a 4-year undergraduate psychology degree and was registered as a counsellor with the Health Professions Council of South Africa.

index. Adjusted logistic regression was conducted to identify associations between the outcome of interest and key confounding predictor variables, with results presented in the form of an odds ratio (OR). Multi-collinearity was assessed among independent variables using the variance inflation factor (Chen et al., 2003). A probability value of p 0.05 was selected as the level of significance.

Results

Description of the sample

A total of 376 women were recruited and completed the screening process (Table 1). Most women were in their mid-twenties, and in the second trimester of their second pregnancy. Although 90% of women were in an intimate relationship, only 56% were cohabiting with their partner. The average highest level of education achieved was Grade 10. Only 27% of women were employed on a full time basis, 18% had informal, contract or part time employment and 55% were unemployed. Only 5% were earning over R5000 (US$360) a month. Approximately 42% of women met the criteria for living in food insecure households, with 13% categorised as living with "very low" food security or food insufficiency.

Although 63% of the pregnancies were unintended, the majority (78%) of those women reported feeling pleased to be pregnant. Sixteen percent of women had experienced abuse from their intimate partner during the past 6 months, including verbal or emotional abuse (11% of all women) physical abuse (11%) and sexual abuse (2%). The prevalence of HIV, collected retrospectively from patient records, was 11%, with 51% of the sample reported being unaware of their HIV status at the time of screening. Thirty nine percent of women had experienced two or more threatening life events during the past 6 months. These experiences included becoming unemployed (27%), the death of a close family friend or relative (26%), something of value being lost or stolen (17%), interpersonal conflict (17%), serious illness, injury or assault of a close relative or significant other (15%) and major financial difficulties (15%).

Prevalence of MINI diagnosed MDE

Using the MINI Plus, 22% of the women were diagnosed with a current MDE. There were 68 women (18% of the total sample) who expressed suicidal ideation, with 45 (12%) classified as high risk, 9 (2%) as medium risk and 14 (4%) as low risk for suicide. Based on this assessment of suicide risk, 14% of women required intervention and/or referral to specialist care. Of those with a current diagnosis of MDE, just over 50% (41 women) expressed suicidal ideation on the MINI Plus. There were 57 women (15%) who reported that they had previously had serious depression, panic attacks or problems with anxiety. The MSPSS (Cronbach's α 0.89), the CTS2 (Cronbach's α 0.85), and the HFSSM (Cronbach's α 0.83) all exhibited good internal consistency and reliability.

Results of the bivariate analysis

The bivariate analysis revealed significant associations between MDE and home language, employment status, living separately from a partner, perceived lack of support from a

significant other or family and friends, experience of interpersonal violence or abuse, experience of threatening life events, no longer being in a relationship with their partner, food insecurity and insufficiency, unintended and unwanted pregnancy and past psychiatric history (Table 1).

Results of the multivariable regression model

The multicollinearity test result for the multivariable analysis shows no multicollinearity within the regression model (max VIF = 1.41, Condition Number = 8.43). The results of this analysis revealed a number of risk factors that increased the odds of an MDE diagnosis (Table 2). Lower socioeconomic status increased the odds for MDE diagnosis. Women who were currently working were more likely to have an MDE episode than those that were unemployed. Being in a casual relationship also increased the odds for MDE. Higher scores for perceived social support from family appear to be a significant protective factor, reducing the risk of antenatal depression in this study. Conversely, a lower score for perceived support from family is associated with increased risk for MDE diagnosis. Women who reported intimate partner violence were nearly twice more likely to experience MDE than those that had not reported any abuse. Recent experience of two or more threatening life events doubled the risk for MDE. Those who knew their HIV status at the time of mental health screening were slightly more likely to have MDE than those that didn't know their status, irrespective of what their status was. Food insecurity increased likelihood of MDE by two and a half times. Women who were not feeling pleased about their pregnancy were more likely to be diagnosed with MDE, regardless of whether pregnancy was intended or not. Lastly, women who reported having a past psychiatric history, including experiencing depression, panic attacks or anxiety, were five times more likely to have MDE than those that did not report past mental health problems.

Discussion

This study used a clinical diagnostic tool to determine the prevalence of antenatal MDE in a low resource urban area. The prevalence of MDE in this sample is 22%, approximately double that of HIC settings but lower than some of the highest rates found in LMIC (Fisher et al., 2012). The wide range of prevalence rates reported in LMIC settings has been attributed to the limited local evidence available compared to HIC settings. According to Fisher and colleagues (2012), only 8% of LMIC have reliable prevalence data on antenatal depression, and there is a large disparity in the quality of studies. The use of different methods to assess depression may also contribute to these differences, as there are relatively few studies that have used a structured diagnostic tool to diagnose depression. Previous studies in South Africa, using screening and diagnostic methods, have similarly reported a wide range of prevalence data, ranging between 21% and 47% (Brittain et al., 2015; Rochat et al., 2011). A study using clinical diagnostic methods in an impoverished setting showed a prevalence rage of 47%. However, this result may be skewed by the small sample size and the 45% HIV positive prevalence rate in the study setting (Rochat et al., 2011). Studies using the EPDS also report high rates of antenatal depression ranging from 37% (Tomlinson et al., 2013) to 46% (Tsai et al., 2014). Interestingly, a recent study (Brittain et al., 2015) using the BDI to screen for antenatal depression in a peri-urban area in the Western Cape reported a

21% prevalence rate, very similar to the rate of our study. Through use of the MINI Plus, a clinical diagnostic interview, and an adequate sample size, the prevalence data in this study may reflect, with greater accuracy, the true rate of antenatal depression in low resource settings.

The high rate of depression in this setting supports the finding that women who live in contexts of social and economic adversity may be at increased risk for depression during the perinatal period (Hartley et al., 2011; Patel et al., 2002; Tomlinson et al., 2013). This presents a major public health concern, as the high rate of maternal depression greatly increases the risk for adverse maternal health and child health and development outcomes (Dunkel Schetter and Tanner, 2012; Meintjes et al., 2010). The results from the bivariate and multivariable analyses further confirm that pregnant women living in such settings are exposed to multiple risk factors for antenatal MDE. Furthermore, these risk factors perpetuate the cycle of psychological distress and lead to the loss of developmental potential, both for mothers and their infants (Tomlinson et al., 2013).

Of these risk factors, a history of depression or anxiety, food insecurity experience of threatening life events and perceived lack of support from family had the highest predictive value for depression in this sample. Past diagnosis with depression, perceived lack of social support and the stress of experiencing difficult life events are well-documented risk factors for depressive symptoms during pregnancy (Biaggi et al., 2016; Lancaster et al., 2010; Robertson et al., 2004). It is well recognised that stressful life events can trigger depressive symptoms or disorders (Biaggi et al., 2016; Dudas et al., 2012; Lancaster et al., 2010) and women living in this context may be highly likely to experience one or more threatening life events. It is not known whether the previous mental health problems referred to in this sample pertain to an episode within the perinatal period or depressive symptoms at any time. However, consistent evidence from other studies shows that both categories have significant predictive ability (Robertson et al., 2004).

Although it is well known that support from a partner is instrumental in the mental health of pregnant women (Biaggi et al., 2016; Dudas et al., 2012), the availability of emotional and practical support provided by the family and social environment also play a crucial protective role (Biaggi et al., 2016; Rahman et al., 2003). Previous studies found that depressed women reported feeling less supported than they objectively were (Robertson et al., 2004) and that higher scores on depression screening instruments were associated with a higher need for social support (Biaggi et al., 2016). There may be a number of factors whereby depressed women in this study perceived lower levels of support from their families. These possibly include living in isolation from family and extended family, domestic conflict and socioeconomic factors contributing to lack of practical support.

Aside from these well known risk factors, this study also highlights food insecurity as an additional and emerging risk factor for depression in pregnant women living in poverty (Dewing et al., 2013; Garcia et al., 2013). Pregnancy may exacerbate the stress created by poverty, and vice versa. Women in this study were of low socioeconomic status and almost half (42%) were living with food insecurity, which was a significant predictor of MDE. Pregnancy may create an unforeseen expense for individuals and their families, placing

additional stress on scarce financial resources. Personal finances are required for transport to antenatal clinic visits and for preparation for the birth of the child. The increased expenditure associated with pregnancy and child rearing may push households, who are on the margin, into food insecurity, as expenses rise and there is less money for food. The association between food insecurity and maternal depression may exacerbate unfavourable child health and development outcomes. Inadequate nutrition, together with stress and antenatal depression may increase the risk for poor foetal growth in-utero, premature labour and birth, infant malnutrition and stunting, neuro-developmental disorders in infants and psychiatric disorders in offspring (Garg et al., 2014).

Women living in the context of this study experience high levels of psychosocial and socio-economic adversity (Benjamin, 2014; Moultrie, 2004), which may operate to increase the risk for MDE prior to pregnancy. However, becoming pregnant – especially when the pregnancy is unintended or unwanted–may place a further strain on scarce resources and this may be the precipitating event that triggers the onset of MDE.

These findings have important implications for the design of mental health interventions targeting pregnant women. Firstly, integrating mental health services into routine, primary level antenatal services may increase detection of antenatal depression and increase access to mental health care for low-resource women (Patel et al., 2007; Petersen et al., 2012). Secondly, screening women for risk factors in addition to depressive symptoms may help to identify those who are vulnerable before the onset of MDE (Buist et al., 2002; Milgrom et al., 2008). It may then be feasible to address some of the risks directly to mitigate their effect. For example, providing social or financial assistance in the form of food vouchers for pregnant and post-partum women who are food insecure. For those women in low-income settings who have antenatal MDE, an intervention that can be delivered by primary care workers, such as that described in the Thinking Healthy Programme, may be a useful approach to consider (Patel et al., 2009; Rahman, 2004; Simon, 2009).

Strengths & limitations of the study

A major strength of this study is that it presents diagnostic data and in so doing, reports more accurately on diagnostic prevalence, thus contributing to knowledge on antenatal depression in LMIC settings. The strength of the data is further enhanced through the supervision of a clinical psychologist during data collection. This paper also presents extensive data on multiple psychosocial and socio-demographic factors associated with antenatal MDE, which contributes to emerging literature on risk factors for pregnant women in LMICs. There are few studies on maternal stress, depression and anxiety during the perinatal period that have identified food insecurity as a major risk factor (Garcia et al., 2013).

There are a number of limitations to this study. The study was designed as a clinic-based study as the level of antenatal uptake in the Western Cape province is 83% (Day and Gray, 2013); however women with more severe psychopathology may have been missed if they were unwilling or unable to attend the clinic. As a cross-sectional study, we were not able to measure change in mental state over trimesters. The use of self-report measures to collect

data such as ownership of assets and income may have yielded data that could not be verified or that was subject to recall bias. Screening women prior to HIV counselling and testing may also be regarded as a limitation, as recent HIV diagnosis may have a significant impact on mental health and could therefore be an important risk factor to consider for future research. Further research is also recommended to understand whether there is an exponential increase in risk for women who experience multiple risk factors simultaneously.

Conclusions

The high prevalence of depression amongst pregnant women in this study was significantly associated with multiple risk factors. Many of these have been cited in previous studies, but some were novel for the setting. The experience of multiple risk factors may elicit a significant stress response in the form of MDE, which has consequences for maternal and child health and well-being (Morgan et al., 2012). An integrated approach is recommended to provide mental health care as part of antenatal care. Early detection may be enhanced by screening for risk factors, such as food insecurity, as an adjunct to screening for clinical symptoms of depression.

Acknowledgments

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Table 1

a. Bivariate analysis of demographic and social factors associated with antenatal MDE.

Variable & description		Total sample N or mean (%)	MDE diagnosis n or mean (%)	No Diagnosis n or mean (%)	p-value
		376	81 (22)	295 (78)	
Age **	18–24years	146 (39)	35 (43)	111 (38)	
	25–29 years	114 (30)	22 (27)	92 (31)	
	>29years	116 (31)	24 (30)	92 (31)	0.650
Population group **	Black	133 (35)	21 (26)	112 (38)	
	"Coloured" 1	224 (60)	56 (69)	168 (57)	
	White and "other"	19 (5)	4 (5)	15 (5)	0.099
Home language **	English	139 (37)	31 (38)	108 (37)	
	Afrikaans	121 (32)	34 (42)	87 (29)	
	isiXhosa	116 (31)	16 (20)	100 (34)	0.025
Obstetric info: Gravidity **	Primigravida	96 (26)	19 (23)	77 (26)	
	Multigravida	280 (74)	62 (77)	218 (74)	0.669
Parity **	Nulliparous	122 (32)	26 (32)	96 (33)	
	Multiparous	254 (68)	55 (68)	199 (67)	1.000
Gestation *	Mean no. of weeks (standard deviation)	17.4 (6.57)	17.8 (6.69)	17.3 (6.55)	0.632
Trimester **	Trimester 1	90 (24)	21 (26)	69 (23)	
	Trimester 2	181 (48)	33 (41)	148 (50)	
	Trimester 3	105 (28)	27 (33)	78 (26)	0.295
Educational attainment *	Mean highest level of education (standard deviation)	10.5 (1.59)	10.3 (1.41)	10.5 (1.63)	0.264
Socioeconomic status **	Least poor	94 (25)	25 (31)	69 (23)	
	Poor	94 (25)	17 (21)	77 (26)	
	Very poor	96 (26)	16 (20)	80 (27)	
	Poorest	91 (24)	23 (28)	68 (23)	0.244

Variable & description		Total sample N or mean (%)	MDE diagnosis n or mean (%)	No Diagnosis n or mean (%)	p-value
Employment status **	Not working	208 (55)	52 (64)	156 (53)	
	Informal job/hawker	17 (5)	1 (1)	16 (5)	
	Contract	23 (6)	7 (9)	16 (5)	
	Part-time	28 (7)	10 (12)	18 (6)	
	Full-time	100 (27)	11 (14)	89 (30)	0.003
Individual income (monthly) **	R0 ($0)	97 (26)	23 (28)	74 (25)	
	R1 – R1000 (6c – $64)	99 (26)	23 (28)	76 (26)	
	R1001 – R2000 ($64 – $129)	64 (17)	17 (21)	47 (16)	
	R2001 – R5000 ($129 – $322)	97 (26)	17 (21)	80 (27)	
	>R5000 ($322)	19 (5)	1 (2)	18 (6)	0.096
Relationship type **	Married	146 (39)	23 (29)	123 (42)	
	Stable partner	192 (51)	46 (58)	146 (50)	
	Casual partner	16 (4)	4 (5)	12 (4)	
	No relationship/partner	20 (5)	7 (9)	13 (4)	0.101
Living with partner **	Lives with partner	209 (56)	36 (44)	173 (59)	
	Lives separately from partner	167 (44)	45 (56)	122 (42)	0.024
Perceived social support *	MSPSS total score (standard deviation)	66.6 (12.50)	59.9	68.4	0.001
	MSPSS score family (standard deviation)	22.54 (5.08)	19.7	23.3	<0.001
	MSPSS score friends (standard deviation)	20.01 (6.81)	17.5	20.7	<0.001
	MSPSS score significant other (standard deviation)	24.0 (3.93)	22.7	24.4	0.001
Intimate partner violence (IPV) **	Experience of IPV in the past 6 months (CTS2 score)	62 (16)	23 (28)	39 (13)	0.002
Threatening life events **	Experience of two or more threatening life events in past 6 months (LTE score)	146 (39)	49 (60)	97 (33)	<0.001
Break up of relationship with partner **	Participant and their partner are no longer together	26 (7)	10 (12)	16 (5)	0.045
Knowledge of HIV status **	Knows their HIV status prior to routine antenatal HIV testing	182 (49)	46 (57)	136 (46)	0.104
Food insecurity **	Household food insecurity over the last 6 months (HFSSM score)	158 (42)	54 (67)	104 (35)	<0.001
Food insufficiency **	Very low food insecurity	50 (130)	23 (28)	27 (9)	<0.001

Variable & description		Total sample N or mean (%)	MDE diagnosis n or mean (%)	No Diagnosis n or mean (%)	*p*-value
Pregnancy [**]	Unintended pregnancy	237 (63)	63 (78)	174 (59)	0.003
	Unwanted pregnancy	81 (22)	25 (31)	56 (19)	0.032
Past psychiatric history [**]	Prior diagnosis or treatment for depression, anxiety or panic attacks	57 (15)	30 (37)	27 (9)	<0.001

[1] The term "Coloured" refers to a heterogeneous group of people of mixed race ancestry that self-identify as a particular ethnic and cultural grouping in South Africa. This term, and others such as "White"; "Black/African" and "Indian/Asian", remain useful in public health research in South Africa, as a way to identify ethnic disparities, and for monitoring improvements in health and socio- economic disparities.

Statistical tests used to measure association between MDE and non-MDE groups and risk variables:

[*] Two-sample t-test

[**] Fisher exact test

Table 2

Multivariable analysis of predictors for MDE

Variables	Odds Ratio	95% Confidence Interval	
Age category: 18 – 24 years	Ref		
25 – 29 years	0.51	0.23	1.09
>29 years	0.73	0.33	1.59
Education level (above grade 10)	0.68	0.37	1.25
Asset Index: Least poor	Ref		
Poor	0.58	0.24	1.37
Very poor	0.74	0.32	1.75
Poorest	1.35	0.59	3.04
Working currently	1.35	0.67	2.69
Partner status (has a partner)	0.80	0.23	2.37
Relationship type with partner: Stable relationship	1.32	0.66	2.69
Casual relationship	2.04	0.44	9.45
Perceived support from partner	1.03	0.94	1.11
Perceived support from family	0.88[*]	0.82	0.94
Perceived support from friends	0.97	0.93	1.01
Experience of intimate partner violence	1.75	0.85	3.62
Threatening life events	2.07[*]	1.09	3.94
Knowledge of HIV status	1.06	0.59	1.95
Food insecurity	2.45[*]	1.32	4.57
Not pleased to be pregnant	1.57	0.79	3.14
Past psychiatric history	5.20[*]	2.57	10.55

[*] shows significance at 0.05