BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2018-021807
Article Type:	Research
Date Submitted by the Author:	19-Jan-2018
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Keywords:	MENTAL HEALTH, PUBLIC HEALTH, INTIMATE PARTNER VIOLENCE, NON-PSYCHOTIC MENTAL HEALTH DISORDERS

Intimate Partner Violence during Pregnancy in Relation to Non-Psychotic Mental Health Disorders in Rwanda: A cross-sectional population-based study

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Keywords: Intimate partner violence; Pregnancy; Non-psychotic mental health disorders

Word count: 3689

ABSTRACT

Objectives: To investigate the prevalence of non-psychotic mental health disorders (MHDs) and the association between exposure to all forms of intimate partner violence (IPV) during pregnancy and MHDs.

Design: Cross-sectional population-based study conducted in the Northern Province of Rwanda and Kigali city.

Participants and Settings: Totally, 921 women who gave birth ≤13 months before being interviewed were included. Simple random sampling was done to select villages, households and participants. Community health workers helped to identify eligible participants and clinical psychologists, nurses or midwives conducted face-to-face interviews. The collected data were analysed using descriptive statistics and bivariable and multivariable logistic regression modelling

Results. The prevalence rates of generalised anxiety disorder, suicide ideation and posttraumatic stress disorder (PTSD) were 19.7%, 10.8% and 8.0%, respectively. Exposure to the four forms of IPV during pregnancy was highly associated with the likelihood of meeting diagnostic criteria for each of the non-psychotic MHDs investigated. Physical, psychological and sexual violence, showed the strongest association with PTSD, with adjusted odds ratios (aORs) of 4.5, 6.2 and 6.3, respectively. Controlling behaviour had the strongest association with major depressive episode in earlier periods with an aOR of 9.2

Conclusion: IPV and MHDs should be integrated into guidelines for perinatal care. Moreover, community-based services aimed at increasing awareness and early identification of violence and MHDs should be instituted in all villages and health centers in Rwanda. Finally, health care providers need to be educated and trained in a consistent manner to manage the most challenging cases quickly, discreetly and efficiently.

Strengths and limitations of this study

- We had a large number of participants, a very low non-response rate and used scientifically proven instruments for assessment of non-psychotic mental health disorders and intimate partner violence
- We investigated several forms of intimate partner violence and non-psychotic mental health disorders.
- Our findings suggest that among women exposed to any form of intimate partner violence during pregnancy, those exposed to controlling behavior may be at an increased risk of non-psychotic mental health disorders
- The study is cross-sectional, consequently we are unable to draw any causal inferences
- Due to the sensitive nature of the intimate partner violence and mental health disorders as well as the time interval between childbirth and data collection, underreporting of some events cannot be ruled out

INTRODUCTION

Mental health disorders (MHDs) continue to increase with serious consequences for people's health and well-being worldwide.[1 2] More women are affected with MHDs than men and the impact is especially severe during pregnancy and the postpartum period as they directly increase maternal and neonatal morbidity and mortality.[1 3] Maternal physiological changes lead to elevated susceptibility to MHDs during and post-pregnancy.[4] Furthermore, women suffering from mental health conditions during the perinatal period are at an increased risk of the inadequate use of maternal health services.[5] Globally, depression is the most common MHD affecting pregnant women and has been the main research focus on perinatal mental health [1 6] However, evidence shows that other disorders such as anxiety and posttraumatic stress disorder (PTSD), are also common and lead to substantial co-morbidity with depression.[6 7] The adverse effects of women's poor mental health during pregnancy and after childbirth on their developing infants are severe: conditions such as low birth weight, malnutrition, infectious diseases and death in extreme cases may arise, especially in resource-constrained settings.[8 9]

Higher prevalence rates of MHDs in women during and after pregnancy have generally been reported from low-and middle-income countries (LMICs) than from high-income countries (HICs).[10] The prevalence of depression or anxiety is about 16% in pregnant women and even higher after childbirth (about 20% in LMICs). [1] The effects are exacerbated in resource-limited settings because of women's vulnerable life circumstances (e.g., low socioeconomic status, insufficient social support and exposure to gender inequality).[11-13] Additionally, violent traumatic events (e.g., conflicts and intimate partner violence, IPV), which are more prevalent in LMICs than in HICs, have been widely associated with MHDs.[14 15] The situation may be worsen in that the disorders may go undiagnosed or mismanaged because of gaps in knowledge and attitude

among health care providers and the public in general.[2 16] The suffering and economic costs this causes women and their families may be so unbearable that they may commit suicide.[17]

The devastating genocide against the Tutsi in Rwanda in 1994 during which an estimated 800,000 people were killed has inevitably contributed to the increase in MHDs that have been reported several years after the genocide.[18-20] The genocide may have also contributed to barriers and challenges that have been observed in seeking mental health care.[21] Apart from the genocide and its effects, many other factors, not least IPV, may underlie this increase in MHDs. IPV refers to behaviour by an intimate partner (or ex-partner) that causes physical, sexual or psychological harm, including physical aggression, sexual coercion, psychological abuse and controlling behaviour.[22] In this research programme we have shown that different forms of IPV are common during pregnancy among Rwandan women.[23] However, little is known about the relationship between violence against pregnant women in low-income countries (LICs) and MHDs during the perinatal period. The few available studies investigated the prevalence and association in general population samples and did not include the different forms of IPV.[10 24 25] It is also not known whether prevalence rates of MHDs attributed to IPV vary between pregnant women and the rest of the population. Therefore, this study aimed to assess the prevalence of non-psychotic MHDs in women who gave 1-13 months before the interview. A further aim was to study the association between different forms of IPV exposure during pregnancy and the MHDs.

This study is part of the Maternal Health Research Programme (MaTHeR) undertaken by the University of Rwanda (UR) in collaboration with the University of Gothenburg and Umeå University in Sweden.

METHODS

Study design, study population and sample size

This cross-sectional population-based study was conducted in the Northern Province and in Kigali city, the largest city in Rwanda. Kigali has urban, semi-urban and rural areas, whereas the Northern Province is predominantly rural. The target population was women who gave birth 1-13 months before the interview. The sample size was calculated according to the estimated prevalence of hypertensive disorders during pregnancy, as hypertension is one of the major factors to be investigated within this research programme and was the least prevalent disorder among study outcomes.[26 27] The desired level of precision was set at 0.025 and a design effect of 1.5 was applied to account for the multi-stage nature of the study. Thus, after adding 10% to the sample size for possible non-responses, the final sample comprised 921 women. The selection process was based on the total population of about 2,865,000 inhabitants from 4791 villages in the study area. [28] The selection process involved three steps. First, the villages were randomly selected proportionate to the total number of villages in each district by using Epi-Info random function. Second, the number of households from each village was selected based on the total number of households in each selected village (proportionate to size). If an excess number of households with an eligible woman were available in a village, lottery decided which ones to include. Finally, the woman to be interviewed was randomly selected among eligible women in each household, if more than one were present. In case of fewer eligible women in the village than envisaged in the study the closest village was approached and the same data collection procedures were used to obtain the remaining number of eligible women. Eligible women were identified with the help of community health workers who keep maternal records. The overall response rate was 99.9% (One woman refused to be interviewed).

Data collection procedures

Data collection took place between July and August 2014. All the data collection instruments were translated into Kinyarwanda, the Rwandan national language, and pre-tested; no major changes were made apart from a few minor adjustments in Kinyarwanda wording. Twelve well-trained interviewers, who were clinical psychologists, nurses or midwives belonging to a pool of interviewers at the School of Public Health (SPH), UR, carried out face-to-face interviews with the participating women. All the interviews, ranging from 40-65 minutes, took place in the participants' homes. Four supervisors (first author and three colleagues) guided the interviews. If an eligible woman were not present at the time of interview, the team waited for her to come home or returned later to do the interview. The SPH at UR was the lead implementer of the study. Data entry was performed by four skilled personnel from a permanent cohort of data entry clerks from the SPH under the supervision of a data entry manager. Very few errors were detected and these were corrected after checking the accuracy of the first data entry. The procedure has been described elsewhere.[23]

Measures and instruments

Mental health disorders assessment

The Mini International Neuropsychiatric Interview (MINI) version 5.0.0 developed to explore disorders according to Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) was used to identify non-psychotic MHDs. The MINI requires little time to administer and was developed to meet the need for a short but precise structured interview. It does not necessarily require clinical staff to use and has been shown to be a reliable and valid instrument.[29] Four non-psychotic MHDs were assessed and used as the outcome variables: major depressive episodes during the past two weeks before the interview and earlier in life (≥2 weeks before the

interview), generalised anxiety disorder (in the past six months), suicide ideation (anytime in life) and PTSD current (in the past month). The major depressive episodes, generalised anxiety disorder and PTSD sections of the MINI start with two screening questions corresponding to the main criteria of the disorder and end with a *yes/no* diagnostic conclusion indicating whether the disorder was present. Suicide ideation was investigated using six questions (all with *yes/no* options); diagnosis was reached when at least one question had a yes answer. A summary measure was constructed from the four MHDs and later dichotomised into having at least one of the MHDs (experienced a MHD) or having none (did not experience a MHD). This measure was then used to assess the relationship between participants' socio-demographic characteristics with a MHD experience.

Intimate partner violence assessment

IPV during pregnancy was measured as exposure to four forms of violence: physical violence (six items), sexual violence (three items), psychological abuse (four items) and controlling behaviour (7 items). The items for investigating violence were selected from the Women's Health and Life Experiences Questionnaire, a validated questionnaire developed by the WHO for research on IPV experience. [30 31] This instrument has been shown to be cross-culturally valid and has previously been successfully used for similar studies in Rwanda. [25 32] Women were asked to indicate whether they had been exposed to any of the four forms of violent acts during pregnancy. Subsequently, summary measures for each of the forms of violence were constructed. For each of the forms of violence, women who reported *yes* on any of the items were considered as having experienced violence during pregnancy and were designated as the exposed group in the analyses.

Assessment of socio-demographic and psychosocial characteristics

Information about participants' socio-demographic and psychosocial characteristics was obtained by a paper-based interviewer-administered questionnaire. *Participants' age* was categorised into two age groups: 15-30 and 31-46. *Marital status* was dichotomised into married or cohabitating (reference category) and then single, divorced or widowed were combined in the exposure category. *Women's highest attained level of education* was assessed as three items: incomplete primary school (including very few who did not go to school at all), complete primary school or vocational training and complete secondary school, university or any other higher institution of learning. The last category was then used as the reference group in the analyses. *Total household monthly income* was recorded into a three-category variable as ≤17,500 FRW (≤30$), from 17,501-35,999 FRW (30-60$) and ≥36,000 FRW (≥60$) and which was later dichotomised into ≤17,500 FRW and ≥17,501 FRW. *Social support* was assessed as having a family member, a relative or a friend who could lend support to the woman if any need or problem would arise (6 items). Each of the items was responded to with four response options (always, often, sometimes and never). These were later combined into *yes* (always, often and sometimes) and *no* (never) response alternatives. Subsequently, a summary measure for *social support* was created and dichotomised into *good social* support (having responded always, often or sometimes on at least one of the items) and poor social support (having responded never to all the items). *Partner's age* was categorised into ≤40 years and 41-70 years age groups. A similar technique as described above for participants was used to categorise *partner's highest attained level of education*. A composite variable of *assets in the household* was used as a proxy for socioeconomic status of the household. Assets in the household included a radio, a television set, a refrigerator, a bicycle, a motorcycle, a car, a mobile phone and a computer. The variable was dichotomised into having at least one of the assets (improved) or having none of the assets (poor) with the latter constituting the exposed group.

Statistical analysis

Descriptive statistics was calculated to estimate the prevalence of MHDs, violence exposure and participants' socio-demographic and psychosocial characteristics. The chi-square test was used to assess the relationship between the psychosocial characteristics and MHD experience. For the association between different forms of IPV (predictor variables) and the MHDs (outcome variables), bivariable and multivariable logistic regression analyses were performed. Possible confounders were considered based on statistical significance in bivariable analyses and theoretical reasons grounded in previous research. The final regression models were therefore adjusted for women and husband's education, social support, household assets, marital status and alcohol consumption. All estimates from the multivariable logistic regression models are presented as adjusted odds ratios (aORs) with their 95% confidence intervals (95% CIs). Finally, population attributable risk fractions (PAFs) for the effect of exposure to each of the forms of IPV during pregnancy on different MHDs were calculated using the following formula: PAF = P_1 (aOR-1) / (aOR) where P_1 = proportion of women with any of the MHDs who reported exposure to physical, psychological or sexual violence, or controlling behaviour during pregnancy; aOR = adjusted odds ratio for the association between the four forms of IPV and the MHD of interest. The formula takes potential confounding into account and allows for adjusted estimates.[33] The PAFs represent the excess of prevalent cases of MHDs in the study population that can be attributed to IPV exposure and could thus be avoided if no physical violence, psychological violence, sexual violence or controlling behaviour were present. All the analyses were performed using the Statistical Package of Social Sciences version 25.0 for Windows (SPSS, Armonk, NY, USA).

Ethical considerations

Participation was voluntary and no remuneration was paid for participating in the study. Before the interview, the interviewer explained in detail the content of the questionnaire, informed the participants on confidentiality of their responses and of their free choice to withdraw at any time during the study without any consequence. For the protection of the interviewed women in the households and to maintain confidentiality, only one woman in each household was interviewed. The interview was conducted in privacy where no one else was able to overhear the conversation. In case the partner/husband could not leave the household at the time of the interview, the woman to be interviewed would be revisited later. A written and signed consent was obtained from all participants. Because MHDs and IPV are sensitive issues, the participants were informed that those in need of any kind of assistance could receive it at a nearby health centre or hospital that was informed in advance about the study. The study was approved by the Institutional Review Board of the College of Medicine and Health Sciences, UR and the National Institute of Statistics of Rwanda (No: 0425/2014/10/NISR).

RESULTS

Socio-demographic and psychosocial characteristics, IPV and MHDs

Most participants were of low socio-economic status, had not completed primary school and were engaged in non-skilled work (Table 1). The mean time since childbirth and the time of the interview was 7.1 month (range: 1.4-14.3). The majority were married or cohabiting (84.2%, n=774). Just over 20% of the participants (n=186) had poor social support. Of all participating women, 10.2% (n=94) had been subjected to physical violence, 17% (n=157) to psychological violence, 9.7% (n=89) to sexual violence and 17.6% (n=163) to controlling behaviour during pregnancy. Suicide ideation was reported in 10.8% (n=98) of the participants and 27.1% (n=247) had experienced at least one of the MHDs. Living in Kigali city, being single or divorced, having poor social support and lower socioeconomic status were associated with experiencing a MHD ($p<0.05$, Table 2).

Table 1. Socio-demographic and psychosocial characteristics of the study population. N=921.

Variable	Frequency	Per cent
Age groups (years)		
15-30	633	68.8
31-46	287	31.2
Marital status		
Single, divorced, widowed, separated	146	15.8
Married or cohabitating	774	84.2
Highest attained level of education		
Incomplete primary school	417	50.1
Complete primary school or vocational training	219	26.4
Secondary school or university	195	23.5
Occupation		
Skilled work, civil servant, student	119	13.1
Non-skilled work	528	58.3
Not employed, other occupation	260	28.6
Social support		
Good	734	79.8
Poor	186	20.2
Partner/husband's age (years)		
≤40	666	86.1
41-70	108	13.9
Partner/husband's highest level of education		
Incomplete primary school	283	42.9
Complete primary school or vocational training	248	37.6
Secondary school or university	128	19.5
Total household monthly income		
<17500FRW* (30$)	258	29.9
17501-35999FRW (30-60$)	240	27.8
≥36000 FRW (≥60$)	364	42.2
Intimate partner violence during pregnancy		
Physical	94	10.2
Psychological	157	17.0
Sexual	89	9.7
Controlling behaviour	163	17.6
Mental health disorders		
Major depressive episode in the past two weeks	110	11.9
Major depressive episode in earlier periods	88	9.5
Generalised anxiety disorder	182	19.7
Suicide risk	98	10.8
Post-traumatic stress disorder	74	8.0
Suffering from any mental condition	247	27.1

*Francs Rwandais

Table 2. Participants' characteristics by mental health disorder. N=921.[a]

Variable	Total n (%)	Mental health disorder n (%)	No mental health disorder n (%)	P-value
Province				
Northern Province	613 (67.3)	146 (59.1)	467 (70.3)	0.001
Kigali city	298 (32.7)	101 (40.9)	197 (29.7)	
Age groups (years)				
15-30	624 (68.6)	178 (72.1)	446 (67.3)	0.147
31-46	286 (31.4)	69 (27.9)	217 (32.7)	
Marital status				
Single, divorced, widowed, separated	142 (15.6)	63 (25.5)	79 (11.9)	0.001
Married or cohabitating	768 (84.4)	184 (74.5)	584 (88.1)	
Highest attained level of education				
Incomplete primary school	411 (50.1)	116 (52.7)	295 (49.0)	
Complete primary school or vocational training	215 (26.2)	53 (24.1)	162 (27.0)	0.615
Secondary school or university	195(23.7)	51 (23.2)	144 (24.0)	
Social support				
Good	726 (79.8)	177 (71.7)	549 (82.8)	0.001
Poor	184 (20.2)	70 (28.3)	114 (17.2)	
Household assets summary measure				
Improved (≥1 asset)	710 (78.9)	181 (74.5)	529 (80.5)	0.040
Poor (none of the assets)	190 (21.1)	62 (25.5)	128(19.5)	
Partner/husband's level of education				
Incomplete primary school	281 (43.0)	56 (39.4)	225 (43.9)	
Complete primary school or vocational training	246 (37.6)	60 (42.3)	186 (36.3)	0.390
Secondary school or university	127 (19.4)	26 (18.3)	101 (19.7)	
Partner/husband's age (years)				
≤40	662 (86.1)	158 (86.3)	504 (86.0)	0.937
41-70	107 (13.9)	25 (13.7)	82 (14.0)	

[a] p-values are from Pearson's Chi-squared test and show the relationship between participants' characteristics and having a mental health disorder (MHD). Having a MHD was defined as having at least one of the MHDs i.e. the major depressive episode in the past two weeks or in earlier periods, generalised anxiety disorder, suicide ideation or posttraumatic stress disorder.

Associations between IPV during pregnancy and MHDs

After adjusting for potential confounders, multivariable logistic regression showed that exposure to physical, sexual or psychological violence and controlling behaviour during pregnancy were associated with the four MHDs investigated in this study (Table 3). For physical, psychological and sexual violence, the associations were strongest with PTSD, with aORs of 4.52 (95% CI: 2.14, 9.58), 6.29 (95% CI: 3.18, 12.46) and 6.22 (95% CI: 2.98, 12.92), respectively. The four forms of IPV exposure were strongly associated with suicide ideation with aORs of 3.16 (95% CI: 1.53, 6.52), 2.89 (95% CI: 1.51, 5.55) and 3.04 (95% CI: 1.40, 6.60) for exposure to physical, sexual or psychological violence, respectively. The likelihood of meeting diagnostic criteria for suicide ideation was higher among women who reported controlling behaviour as compared with those who did not, with an aOR of 6.28 (95% CI: 3.20, 12.33). Controlling behaviour had the largest estimates with each of the MHDs, the strongest association being with major depressive episode in earlier periods: aOR = 9.17 (95% CI: 4.22, 19.93). In the final adjusted models most associations with socio-demographic and psychosocial characteristics were nearly fully attenuated, except for social support, which remained statistically significant in all models (estimates not shown).

Table 3 Association between women's exposure to intimate partner violence (IPV) during pregnancy and mental health disorders (MHDs). N=921*

Form of intimate partner violence	Major depressive episode in the past two weeks			Major depressive episode in earlier periods			Generalised anxiety disorder			Suicide ideation			Post-traumatic stress disorder		
	n	%	aOR (95% CI)	n	%	aOR (95% CI)	n	%	aOR (95% CI)	n	%	aOR (95% CI)	n	%	aOR (95% CI)
Physical violence															
No	81	9.8	1	62	7.5	1	151	18.2	1	76	9.3	1	55	6.6	1
Yes	29	30.9	3.73 (2.00, 7.14)	26	27.7	4.43 (2.17, 9.05)	31	33.0	2.02 (1.12, 3.17)	22	23.7	3.16 (1.53, 6.52)	19	20.2	4.52 (2.14, 9.58)
Psychological violence															
No	70	9.2	1	52	6.8	1	126	16.5	1	66	8.7	1	43	5.6	1
Yes	40	25.2	3.52 (1.98, 6.26)	36	40.9	3.99 (2.08, 7.67)	56	35.7	3.26 (1.99, 5.34)	32	20.5	2.89 (1.51, 5.55)	31	19.7	6.29 (3.18, 12.46)
Sexual violence															
No	86	10.3	1	64	7.7	1	142	17.1	1	74	9.0	1	49	5.9	1
Yes	24	27.0	2.57 (1.28, 5.18)	24	27.0	2.65 (1.23,5.73)	40	44.9	3.45 (1.91, 6.25)	24	27.3	3.04 (1.40, 6.60)	25	28.1	6.22 (2.98, 12.92)
Controlling behaviour															
No	47	7.2	1	30	4.6	1	87	13.4	1	44	6.9	1	29	4.5	1
Yes	44	27.0	7.06 (3.78, 13.20)	36	23.3	9.17(4.22,19.93)	68	41.7	5.90 (3.54, 9.82)	38	23.6	6.28 (3.20, 12.33)	31	19.0	6.90 (3.15, 15.12)

*Values are adjusted odds ratios (aORs) with their 95% confidence interval (CIs) from multivariable logistic regression models. They indicate the differences in likelihood of meeting the diagnostic criteria for major depressive episode in the past two weeks, major depressive episode in earlier periods, generalised anxiety disorder, suicide ideation and posttraumatic stress disorder in different categories of women who reported exposure to IPV as compared with the reference groups of women who did not report any exposure to IPV. All values are adjusted for woman and husband's age and education, social support, household assets, marital status and alcohol consumption.

Population attributable fraction

aORs and proportions of participants with MHDs who suffered from IPV during pregnancy were used to calculate PAFs that could be attributed to physical, psychological or sexual violence and controlling behaviour in the study population. For all the MHDs, the PAFs attributed to controlling behaviour were the highest: 42% for major depressive episode in the past two weeks, 48% for major depressive episode in earlier periods, 36% for generalised anxiety disorder, 38% for suicide ideation and 44% for PTSD. For major depressive episode in the past two weeks, the PAF attributed to physical violence was 19% and to psychological violence 25%. The PAF attributed to sexual violence was highest among those participants with PTSD (28%) and lowest (13%) among those with major depressive episode in the past two weeks. For suicide ideation, the PAFs attributed to physical, psychological or sexual violence were 15%, 21% and 16% respectively (Table 4)

Table 4 Population attributable fractions of mental health disorder due to exposure to intimate partner violence during pregnancy. N=921[‡]

Form of intimate partner violence	Major depressive episode in the past two weeks	Major depressive episode in earlier periods	Generalised anxiety disorder	Suicide ideation	Post-traumatic stress disorder
Physical violence	0.19	0.22	0.08	0.15	0.19
Psychological violence	0.25	0.29	0.21	0.21	0.35
Sexual violence	0.13	0.16	0.15	0.16	0.28
Controlling behaviour	0.42	0.48	0.36	0.38	0.44

[‡]Calculated from adjusted odds ratios derived from the final multivariable logistic regression models

DISCUSSION

In this study we found that non-psychotic MHDs are common after childbirth among Rwandan women. Furthermore, the four forms of IPV perpetrated against pregnant women during pregnancy are consistently associated with the occurrence of these disorders. Studies investigating the prevalence of MHDs during pregnancy and after childbirth are extremely rare in LICs. The few related publications showed discrepant results [34-36] A study that included 200 Rwandan women and men demonstrated that the prevalence rate for depression was 19%, 23% for anxiety and 11% for PTSD.[34] These estimates are higher than ours, but this is not surprising considering that the study used a sample from a general population. Another study comprising 376 pregnant women from South Africa showed higher prevalence rates of MHDs than in our study [36]. The differences in results might be attributable to the South Africa study only including women from urban areas; we similarly observed in the present study that women living in Kigali city were more likely to meet diagnostic criteria for a MHD than women from rural areas. However, the relatively lower prevalence rates of MHDs in our study may indicate that many of the efforts to improve mental health care following the 1994 genocide in Rwanda are starting to bear fruit.[37]

Our results indicate that women exposed to IPV during pregnancy were more likely to have any of the non-psychotic MHDs (i.e. depressive episodes during the past two weeks before the interview and earlier in life, generalised anxiety disorder, suicide ideation and PTSD) than those not exposed to IPV. Our findings add to a growing body of evidence showing a negative impact of IPV during pregnancy on antenatal and postnatal mental health.[10 38-40] A systematic review assessing determinants of non-psychotic common perinatal mental disorders in LMICs shows that women experiencing IPV were at a higher risk, with ORs ranging from 2.11-6.75.[10] The

magnitude of the impact is similar to the estimates for sexual, physical and psychological violence found in our study. The effect of partner's controlling behaviour on women's mental health during and after pregnancy has not been studied in LICs. Nevertheless, the strong association of controlling behaviour during pregnancy with MHDs in the perinatal period observed in this study is not surprising given that studies in similar settings have consistently shown that controlling behaviour was far more common than other forms of violence.[23 41] Our results emphasise the need to recognise the severity of controlling behaviour and rectify any misleading perception that it is less harmful than physical or sexual violence. Although the underlying mechanisms through which IPV may lead to MHDs are not fully understood, violent experiences have been shown to cause neuroendocrine dysregulation which can trigger a range of conditions, including MHDs. [42] The strong independent association of social support with all the MHDs reported in this study confirms previous findings showing that poor social support is an important risk factor for MHDs during the perinatal period [36 43]

Finally, we have shown the excess of prevalent cases of different MHDs that can be attributed to exposure to the four forms of IPV. Although these are theoretical calculations, they demonstrate the detrimental role that IPV exposure plays during pregnancy in the occurrence of non-psychotic MHDs in women. The PAFs are plausible estimations of the magnitude of such disorders that could potentially be avoided if there were no IPV in the population.

Methodological considerations

The strengths of this study are the large sample size, the low non-response rate and the use of internationally recognised instruments to investigate MHDs and IPV, including controlling behaviour. Furthermore, Rwanda is a homogenous society, and therefore we believe that the findings are generalisable to the entire country in women who have just given birth. However,

this study has limitations. First because of cultural beliefs and the sensitive nature of both MHDs and IPV, possibility of underreporting of some events cannot be dismissed. Nevertheless, data collection was conducted with utmost care by a team of experienced medical personnel that included clinical psychologists who were able to establish a favourable environment for discussion with the participants. The interviewers were of the same sex and of similar age as the participants, which have been shown to improve the accuracy of reporting in interviews. [44] Second, because the design was cross-sectional, we are unable to draw any causal inferences. Finally, data were collected retrospectively from respondents who gave birth between 1-13 months before the interview. This time interval may have resulted in recall bias and underestimation of prevalence rates as incidences of MHDs have generally been shown to peak immediately after childbirth and start to decline 6 months postpartum.[45] However, 52% of the participants had given birth ≤6 months before the interview suggesting that this time frame may not be a serious concern.

Conclusion

Non-psychotic MHDS are common among Rwandan women during and after pregnancy and IPV plays a key role in their occurrence. We suggest that MHDs and IPV should be integrated into the perinatal health assessment package and that antenatal care providers are regularly trained and have sufficient abilities so that they can identify and manage cases of IPV and MHDs correctly. Community-based health care services aiming at increasing awareness and early identification of IPV and MHDs during the perinatal period need to educate and train community health workers, nurses and midwives. Community discussions on these issues should be instituted and scaled up in all villages and antenatal care clinics. Finally, strategies that have been put in place to reduce poverty and promote gender equality and social support should be intensified.

Competing interests

None

Sources of funding

This study forms part of the Maternal Health Research Programme (MaTHeR) undertaken by the University of Rwanda in collaboration with the University of Gothenburg and Umeå University in Sweden. The Study was made possible by financial support from The Swedish International Development Cooperation Agency (SIDA).

Authors' contributions

GK, IM and AAR designed the study. GK, IM, AAR and JN developed part of the study questionnaire. AAR coordinated and participated in piloting and data collection activities and performed the statistical analyses with the assistance of GK and JN. The manuscript was drafted and written by AAR with contributions from GK, IM, JN and KG.

Acknowledgments

We gratefully acknowledge the contribution of all participating women who welcomed us into their homes and gave their valuable time to answer our questions. We are also grateful to the Section for Epidemiology and Social Medicine (EPSO), University of Gothenburg and the School of Public Health, College of Medicine and Health Sciences, University of Rwanda for all their support.

Data sharing statement

No additional data are available

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Title page
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract page
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1, 2
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3, 4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4,5,6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4, 5, 6
Bias	9	Describe any efforts to address potential sources of bias	*4,7*
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5,6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	3
		(b) Give reasons for non-participation at each stage	3
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	9, 10, 11
Outcome data	15*	Report numbers of outcome events or summary measures	11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7, 13
		(*b*) Report category boundaries when continuous variables were categorized	11
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	15
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17,18
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Intimate Partner Violence during Pregnancy in Relation to Non-Psychotic Mental Health Disorders in Rwanda: A Cross-Sectional Population-Based Study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2018-021807.R1
Article Type:	Research
Date Submitted by the Author:	05-Apr-2018
Complete List of Authors:	Rurangirwa, Andrew; University of Rwanda College of Medicine and Health Sciences Huye, Epidemiology and Biostatistics; Goteborgs Universitet, Department of Public Health and Community Medicine Mogren, Ingrid; Umeå University, Department of Clinical Sciences, Obstetrics and Gynecology Ntaganira, Joseph; University of Rwanda, Epidemiology and Biostatistics Govender, Kaymarlin; University of KwaZulu-Natal, KwaZulu-Natal 4000, South Africa Krantz, Gunilla; The Sahlgrenska Academy at University of Gothenburg, Community Medicine and Public Health/Social Medicine
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Mental health, Epidemiology, Public health
Keywords:	MENTAL HEALTH, INTIMATE PARTNER VIOLENCE, Intimate partner violence; Pregnancy; Non-psychotic mental health disorders

Intimate Partner Violence during Pregnancy in Relation to Non-Psychotic Mental Health Disorders in Rwanda: A Cross-Sectional Population-Based Study

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Keywords: Intimate partner violence; Pregnancy; Non-psychotic mental health disorders

ABSTRACT

Objectives: To investigate the prevalence of non-psychotic mental health disorders (MHDs) and the association between exposure to all forms of intimate partner violence (IPV) during pregnancy and MHDs.

Design: Cross-sectional population-based study conducted in the Northern Province of Rwanda and Kigali city.

Participants and Settings: Totally, 921 women who gave birth ≤13 months before being interviewed were included. Simple random sampling was done to select villages, households and participants. Community health workers helped to identify eligible participants and clinical psychologists, nurses or midwives conducted face-to-face interviews. The collected data were analysed using descriptive statistics and bivariable and multivariable logistic regression modelling

Results. The prevalence rates of generalised anxiety disorder, suicide ideation and posttraumatic stress disorder (PTSD) were 19.7%, 10.8% and 8.0%, respectively. Exposure to the four forms of IPV during pregnancy was highly associated with the likelihood of meeting diagnostic criteria for each of the non-psychotic MHDs investigated. Physical, psychological and sexual violence, showed the strongest association with PTSD, with adjusted odds ratios (aORs) of 4.5, 6.2 and 6.3, respectively. Controlling behaviour had the strongest association with major depressive episode in earlier periods with an aOR of 9.2

Conclusion: IPV and MHDs should be integrated into guidelines for perinatal care. Moreover, community-based services aimed at increasing awareness and early identification of violence and MHDs should be instituted in all villages and health centers in Rwanda. Finally, health care providers need to be educated and trained in a consistent manner to manage the most challenging cases quickly, discreetly and efficiently.

Strengths and limitations of this study

- Validated data collection instruments were used for investigating non-psychotic mental health disorders and intimate partner violence
- A large sample size and few non-response rate
- Detailed socio-demographic and psychosocial characteristics were available
- The study is cross-sectional, consequently we are unable to draw any causal inferences
- Due to the sensitive nature of the intimate partner violence and mental health disorders, underreporting of some events cannot be ruled out

INTRODUCTION

Mental health disorders (MHDs) continue to increase with serious consequences for people's health and well-being worldwide.[1 2] More women are affected with MHDs than men and the impact is especially severe during pregnancy and the postpartum period as they directly increase maternal and neonatal morbidity and mortality.[1 3] Maternal physiological changes lead to elevated susceptibility to MHDs during and post-pregnancy.[4] Furthermore, women suffering from mental health conditions during the perinatal period are at an increased risk of the inadequate use of maternal health services.[5] Globally, depression is the most common MHD affecting pregnant women and has been the main research focus on perinatal mental health [1 6] However, evidence shows that other disorders such as anxiety and posttraumatic stress disorder (PTSD), are also common and lead to substantial co-morbidity with depression.[6 7] The adverse effects of women's poor mental health during pregnancy and after childbirth on their developing infants are severe: conditions such as low birth weight, malnutrition, infectious diseases and death in extreme cases may arise, especially in resource-constrained settings.[8 9]

Higher prevalence rates of MHDs in women during and after pregnancy have generally been reported from low-and middle-income countries (LMICs) than from high-income countries (HICs).[10] The prevalence of depression or anxiety is about 16% in pregnant women and even higher after childbirth (about 20% in LMICs). [1] The effects are exacerbated in resource-limited settings because of women's vulnerable life circumstances (e.g., low socioeconomic status, insufficient social support and exposure to gender inequality).[11-13] Additionally, violent traumatic events (e.g., conflicts and intimate partner violence, IPV), which are more prevalent in LMICs than in HICs, have been widely associated with MHDs.[14 15] The situation may be worsen in that the disorders may go undiagnosed or mismanaged because of gaps in knowledge and attitude

among health care providers and the public in general.[2 16] The suffering and economic costs this causes women and their families may be so unbearable that they may commit suicide.[17]

The devastating genocide against the Tutsi in Rwanda in 1994 during which an estimated 800,000 people were killed has inevitably contributed to the increase in MHDs that have been reported several years after the genocide.[18-20] The genocide may have also contributed to barriers and challenges that have been observed in seeking mental health care.[21] Apart from the genocide and its effects, many other factors, not least IPV, may underlie this increase in MHDs. IPV refers to behaviour by an intimate partner (or ex-partner) that causes physical, sexual or psychological harm, including physical aggression, sexual coercion, psychological abuse and controlling behaviour.[22] In this research programme we have shown in an earlier study that different forms of IPV are common during pregnancy among Rwandan women.[23] Most previous studies about the relationship between violence against pregnant women and MHDs in low-income countries (LICs) have investigated the prevalence rates and associations in general population samples and included a few forms of IPV and non-psychotic MHDs.[10 24-27] It is also not known whether prevalence rates of MHDs attributed to IPV vary between pregnant women and the rest of the population. Therefore, this study aimed to assess the prevalence of non-psychotic MHDs in women who gave birth 1-13 months before the interview. A further aim was to study the association between different forms of IPV exposure during pregnancy and non-psychotic MHDs.

This study is part of the Maternal Health Research Programme (MaTHeR) undertaken by the University of Rwanda (UR) in collaboration with the University of Gothenburg and Umeå University in Sweden.

METHODS

Study design, study population and sample size

This cross-sectional population-based study was conducted in the Northern Province and in Kigali city, the largest city in Rwanda. Kigali has urban, semi-urban and rural areas, whereas the Northern Province is predominantly rural. The target population was women who gave birth 1-13 months before the interview. The sample size was calculated according to the estimated prevalence of hypertensive disorders during pregnancy, as hypertension is one of the major factors to be investigated within this research programme and was the least prevalent disorder among study outcomes.[28 29] The desired level of precision was set at 0.025 and a design effect of 1.5 was applied to account for the multi-stage nature of the study. Thus, after adding 10% to the sample size for possible non-responses, the final sample comprised 921 women. The selection process was based on the total population of about 2,865,000 inhabitants from 4791 villages in the study area. [30] The selection process involved three steps. First, the villages were randomly selected proportionate to the total number of villages in each district by using Epi-Info random function. Second, the number of households from each village was selected based on the total number of households in each selected village (proportionate to size). Finally, with the help of community health workers (CHWs) who keep maternal records, the list of all eligible women from each village was compiled. From the list, the women to be interviewed were randomly selected and thereafter visited in their households for the interview. Random selection was used if more than one eligible woman was present in the household. If an eligible woman was not present at the time of interview, the team waited for her to come or went back later to do the interview at the earliest possible time. In case of fewer eligible women in the village than envisaged in the study, the closest village was approached and the same data collection procedures were used to obtain the remaining number of eligible women. The supervisors

ensured that all selected women were contacted and reviewed the filled-in questionnaires before the team left the village. The overall response rate was 99.9% (One woman refused to be interviewed).

Data collection procedures

Data collection took place between July and August 2014. A structured, paper-based interviewer administered questionnaire including socio-demographic and psychosocial characteristics, items related to intimate partner violence and non-psychotic mental health disorders was developed. All the data collection instruments were translated into Kinyarwanda, the Rwandan national language, and pre-tested; no major changes were made apart from a few minor adjustments in Kinyarwanda wording. Twelve well-trained interviewers, who were all female, clinical psychologists, nurses or midwives belonging to a pool of interviewers at the School of Public Health (SPH), UR, carried out face-to-face interviews with the participating women. All the interviews, ranging from 40-65 minutes, took place in the participants' homes. Four supervisors (first author and three colleagues) guided the interviews. If an eligible woman were not present at the time of interview, the team waited for her to come home or returned later to do the interview. The SPH at UR was the lead implementer of the study. Data entry was performed by four skilled personnel from a permanent cohort of data entry clerks from the SPH under the supervision of a data entry manager. Very few errors were detected and these were corrected after checking the accuracy of the first data entry. The procedure has been described elsewhere.[23]

Measures and instruments

Mental health disorders assessment

The Mini International Neuropsychiatric Interview (MINI) version 5.0.0 developed to explore disorders according to Diagnostic and Statistical Manual of Mental Disorders fourth edition

(DSM-IV) was used to identify non-psychotic MHDs. The MINI requires little time to administer and was developed to meet the need for a short but precise structured interview. It does not necessarily require clinical staff to use, has been shown to be a reliable and valid instrument and has previously been successfully used for similar studies in Rwanda.[31] Four non-psychotic MHDs were assessed and used as the outcome variables: major depressive episodes during the past two weeks before the interview and earlier in life (≥2 weeks before the interview), generalised anxiety disorder (in the past six months), suicide ideation (anytime in life) and PTSD current (in the past month). The major depressive episodes, generalised anxiety disorder and PTSD sections of the MINI start with two screening questions corresponding to the main criteria of the disorder and end with a *yes/no* diagnostic conclusion indicating whether the disorder was present. Suicide ideation section of the MINI had six questions, all with *yes/no* options i.e. did you think that you would be better off dead or wish you were dead, want to harm yourself, think about suicide, have a suicide plan, attempt suicide, ever make a suicide attempt? Diagnosis was reached when at least one question had a yes answer. A summary measure was constructed from the four MHDs and later dichotomised into having at least one of the MHDs (experienced a MHD) or having none (did not experience a MHD). This measure was then used to assess the relationship between participants' socio-demographic characteristics with a MHD experience.

Intimate partner violence assessment

IPV during pregnancy was measured as exposure to four forms of violence: physical violence (six items), sexual violence (three items), psychological abuse (four items) and controlling behaviour (7 items). The items for investigating violence were selected from the Women's Health and Life Experiences Questionnaire, a validated questionnaire developed by the WHO for research on IPV experience. [32 33] This instrument has been shown to be cross-culturally valid and has previously

been successfully used for similar studies in Rwanda. [25 34] Women were asked to indicate whether they had been exposed to any of the four forms of violent acts during pregnancy. Subsequently, summary measures for each of the forms of violence were constructed. For each of the forms of violence, women who reported *yes* on any of the items were considered as having experienced violence during pregnancy and were designated as the exposed group in the analyses.

Assessment of socio-demographic and psychosocial characteristics

Information about participants' socio-demographic and psychosocial characteristics was obtained by a paper-based interviewer-administered questionnaire. *Participants' age* was categorised into two age groups: 15-30 and 31-46. *Marital status* was dichotomised into married or cohabitating (reference category) and then single, divorced or widowed were combined in the exposure category. *Women's highest attained level of education* was assessed as three items: incomplete primary school (including very few who did not go to school at all), complete primary school or vocational training and complete secondary school, university or any other higher institution of learning. The last category was then used as the reference group in the analyses. *Total household monthly income* was recorded into a three-category variable as ≤17,500 FRW (≤30$), from 17,501-35,999 FRW (30-60$) and ≥36,000 FRW (≥60$) and which was later dichotomised into ≤17,500 FRW and ≥17,501 FRW. *Social support* was assessed as having a family member, a relative or a friend who could lend support to the woman if any need or problem would arise (6 items). Each of the items was responded to with four response options (always, often, sometimes and never). These were later combined into *yes* (always, often and sometimes) and *no* (never) response alternatives. Subsequently, a summary measure for *social support* was created and dichotomised into *good social* support (having responded always, often or sometimes on at least one of the items) and poor social support (having responded never to all the items). *Partner's age*

was categorised into ≤40 years and 41-70 years age groups. A similar technique as described above for participants was used to categorise *partner's highest attained level of education*. A composite variable of *assets in the household* was used as a proxy for socioeconomic status of the household. Assets in the household included a radio, a television set, a refrigerator, a bicycle, a motorcycle, a car, a mobile phone and a computer. The variable was dichotomised into having at least one of the assets (improved) or having none of the assets (poor) with the latter constituting the exposed group.

Statistical analysis

Descriptive statistics was calculated to estimate the prevalence of MHDs, violence exposure and participants' socio-demographic and psychosocial characteristics. The chi-square test was used to assess the relationship between the psychosocial characteristics and MHD experience. For the association between different forms of IPV (predictor variables) and the MHDs (outcome variables), bivariable and multivariable logistic regression analyses were performed. Possible confounders were considered based on statistical significance in bivariable analyses and theoretical reasons grounded in previous research. The final regression models were therefore adjusted for women and husband's education, social support, household assets, marital status and alcohol consumption. Potential interactions between variables in the final models were tested but no statistically significant interactions were present. All estimates from the multivariable logistic regression models are presented as adjusted odds ratios (aORs) with their 95% confidence intervals (95% CIs). Finally, population attributable risk fractions (PAFs) for the effect of exposure to each of the forms of IPV during pregnancy on different MHDs were calculated using the following formula: PAF = P_1 (aOR-1) / (aOR) where P_1 = proportion of women with any of the MHDs who reported exposure to physical, psychological or sexual violence, or controlling

behaviour during pregnancy; aOR = adjusted odds ratio for the association between the four forms of IPV and the MHD of interest. The formula takes potential confounding into account and allows for adjusted estimates.[35] The PAFs represent the excess of prevalent cases of MHDs in the study population that can be attributed to IPV exposure and could thus be avoided if no physical violence, psychological violence, sexual violence or controlling behaviour were present. All the analyses were performed using the Statistical Package of Social Sciences version 25.0 for Windows (SPSS, Armonk, NY, USA).

Ethical considerations

Participation was voluntary and no remuneration was paid for participating in the study. Before the interview, the interviewer explained in detail the content of the questionnaire, informed the participants on confidentiality of their responses and of their free choice to withdraw at any time during the study without any consequence. For the protection of the interviewed women in the households and to maintain confidentiality, only one woman in each household was interviewed. The interview was conducted in privacy where no one else was able to overhear the conversation. In case the partner/husband could not leave the household at the time of the interview, the woman to be interviewed would be revisited later. A written and signed consent was obtained from all participants. Because MHDs and IPV are sensitive issues, the participants were informed that those in need of any kind of assistance could receive it at a nearby health centre or hospital that was informed in advance about the study. The study was approved by the Institutional Review Board of the College of Medicine and Health Sciences, UR and the National Institute of Statistics of Rwanda (No: 0425/2014/10/NISR).

Patient and Public Involvement

No Patients were involved. Study findings will be presented to stakeholders, including local community groups at national conferences and community meetings.

RESULTS

Socio-demographic and psychosocial characteristics, IPV and MHDs

Most participants were of low socio-economic status, had not completed primary school and were engaged in non-skilled work (Table 1). The mean time since childbirth and the time of the interview was 7.1 month (range: 1.4-14.3). The majority were married or cohabiting (84.2%, n=774). Just over 20% of the participants (n=186) had poor social support. Of all participating women, 10.2% (n=94) had been subjected to physical violence, 17% (n=157) to psychological violence, 9.7% (n=89) to sexual violence and 17.6% (n=163) to controlling behaviour during pregnancy. Suicide ideation was reported in 10.8% (n=98) of the participants and 27.1% (n=247) had experienced at least one of the MHDs. Living in Kigali city, being single or divorced, having poor social support and lower socioeconomic status were associated with experiencing a MHD ($p<0.05$, Table 2).

Table 1. Socio-demographic and psychosocial characteristics of the study population. N=921.

Variable	Frequency	Per cent
Age groups (years)		
15-25	362	39.4
26-36	472	51.3
37-47	86	9.3
Marital status		
Single, divorced, widowed, separated	146	15.8
Married or cohabitating	774	84.2
Highest attained level of education		
Incomplete primary school	417	50.1
Complete primary school or vocational training	219	26.4
Secondary school or university	195	23.5
Occupation		
Skilled work, civil servant, student	119	13.1
Non-skilled work	528	58.3
Not employed, other occupation	260	28.6
Social support		
Good	734	79.8
Poor	186	20.2
Partner/husband's age (years)!		
15-25	129	20.9
26-36	446	72.4
≥37	41	6.7
Partner/husband's highest level of education!		
Incomplete primary school	283	42.9
Complete primary school or vocational training	248	37.6
Secondary school or university	128	19.5
Total household monthly income		
<17500FRW* (30$)	258	29.9
17501-35999FRW (30-60$)	240	27.8
≥36000 FRW (≥60$)	364	42.2
Intimate partner violence during pregnancy		
Physical	94	10.2
Psychological	157	17.0
Sexual	89	9.7
Controlling behaviour	163	17.6
Mental health disorders		
Major depressive episode in the past two weeks	110	11.9
Major depressive episode in earlier periods	88	9.5
Generalised anxiety disorder	182	19.7
Suicide risk	98	10.8
Post-traumatic stress disorder	74	8.0
Suffering from any mental condition	247	27.1

*Francs Rwandais, !Data was missing as some women could not report their husband/partner's age and level of education

Table 2. Participants' characteristics by mental health disorder. N=921.[a]

Variable	Total n (%)	Mental health disorder n (%)	No mental health disorder n (%)	P-value
Province				
Northern Province	613 (67.3)	146 (59.1)	467 (70.3)	0.001
Kigali city	298 (32.7)	101 (40.9)	197 (29.7)	
Age groups (years)				
15-25	358 (39.3)	109 (44.1)	249 (37.6)	0.09
26-36	466 (51.2)	121 (49.0)	345 (52.0)	
37-47	86(9.5)	17 (6.9)	69 (10.4)	
Marital status				
Single, divorced, widowed, separated	142 (15.6)	63 (25.5)	79 (11.9)	0.001
Married or cohabitating	768 (84.4)	184 (74.5)	584 (88.1)	
Highest attained level of education				
Incomplete primary school	411 (50.1)	116 (52.7)	295 (49.0)	
Complete primary school or vocational training	215 (26.2)	53 (24.1)	162 (27.0)	0.615
Secondary school or university	195 (23.7)	51 (23.2)	144 (24.0)	
Social support				
Good	726 (79.8)	177 (71.7)	549 (82.8)	0.001
Poor	184 (20.2)	70 (28.3)	114 (17.2)	
Household assets summary measure				
Improved (≥1 asset)	710 (78.9)	181 (74.5)	529 (80.5)	0.040
Poor (none of the assets)	190 (21.1)	62 (25.5)	128(19.5)	
Partner/husband's level of education!				
Incomplete primary school	281 (43.0)	56 (39.4)	225 (43.9)	
Complete primary school or vocational training	246 (37.6)	60 (42.3)	186 (36.3)	0.390
Secondary school or university	127 (19.4)	26 (18.3)	101 (19.7)	
Partner/husband's age (years)!				
15-25	128 (21.0)	27 (19.3)	101 (21.5))	0.73
26-36	442 (72.5)	105 (75.0)	337 (71.7)	
≥37	40 (6.5)	8 (5.7)	32 (6.8)	

[a] p-values are from Pearson's Chi-squared test and show the relationship between participants' characteristics and having a mental health disorder (MHD). Having a MHD was defined as having at least one of the MHDs i.e. the major depressive episode in the past two weeks or in earlier periods, generalised anxiety disorder, suicide ideation or posttraumatic stress disorder.

! Data was missing as some women could not report their husband/partner's age and level of education

Associations between IPV during pregnancy and MHDs

After adjusting for potential confounders, multivariable logistic regression showed that exposure to physical, sexual or psychological violence and controlling behaviour during pregnancy were associated with the four MHDs investigated in this study (Table 3). For physical, psychological and sexual violence, the associations were strongest with PTSD, with aORs of 4.52 (95% CI: 2.14, 9.58), 6.29 (95% CI: 3.18, 12.46) and 6.22 (95% CI: 2.98, 12.92), respectively. The four forms of IPV exposure were strongly associated with suicide ideation with aORs of 3.16 (95% CI: 1.53, 6.52), 2.89 (95% CI: 1.51, 5.55) and 3.04 (95% CI: 1.40, 6.60) for exposure to physical, sexual or psychological violence, respectively. The likelihood of meeting diagnostic criteria for suicide ideation was higher among women who reported controlling behaviour as compared with those who did not, with an aOR of 6.28 (95% CI: 3.20, 12.33). Controlling behaviour had the largest estimates with each of the MHDs, the strongest association being with major depressive episode in earlier periods: aOR = 9.17 (95% CI: 4.22, 19.93). In the final adjusted models most associations with socio-demographic and psychosocial characteristics were nearly fully attenuated, except for social support, which remained statistically significant in all models (estimates not shown).

Table 3 Association between women's exposure to intimate partner violence (IPV) during pregnancy and mental health disorders (MHDs). N=921*

Form of intimate partner violence	Major depressive episode in the past two weeks			Major depressive episode in earlier periods			Generalised anxiety disorder			Suicide ideation			Post-traumatic stress disorder		
	n	%	aOR (95% CI)	n	%	aOR (95% CI)	n	%	aOR (95% CI)	n	%	aOR (95% CI)	n	%	aOR (95% CI)
Physical violence															
No	81	9.8	1	62	7.5	1	151	18.2	1	76	9.3	1	55	6.6	1
Yes	29	30.9	3.73 (2.00, 7.14)	26	27.7	4.43 (2.17, 9.05)	31	33.0	2.02 (1.12, 3.17)	22	23.7	3.16 (1.53, 6.52)	19	20.2	4.52 (2.14, 9.58)
Psychological violence															
No	70	9.2	1	52	6.8	1	126	16.5	1	66	8.7	1	43	5.6	1
Yes	40	25.2	3.52 (1.98, 6.26)	36	40.9	3.99 (2.08, 7.67)	56	35.7	3.26 (1.99, 5.34)	32	20.5	2.89 (1.51, 5.55)	31	19.7	6.29 (3.18, 12.46)
Sexual violence															
No	86	10.3	1	64	7.7	1	142	17.1	1	74	9.0	1	49	5.9	1
Yes	24	27.0	2.57 (1.28, 5.18)	24	27.0	2.65 (1.23,5.73)	40	44.9	3.45 (1.91, 6.25)	24	27.3	3.04 (1.40, 6.60)	25	28.1	6.22 (2.98, 12.92)
Controlling behaviour															
No	47	7.2	1	30	4.6	1	87	13.4	1	44	6.9	1	29	4.5	1
Yes	44	27.0	7.06 (3.78, 13.20)	36	23.3	9.17(4.22,19.93)	68	41.7	5.90 (3.54, 9.82)	38	23.6	6.28 (3.20, 12.33)	31	19.0	6.90 (3.15, 15.12)

*Values are adjusted odds ratios (aORs) with their 95% confidence interval (CIs) from multivariable logistic regression models. They indicate the differences in likelihood of meeting the diagnostic criteria for major depressive episode in the past two weeks, major depressive episode in earlier periods, generalised anxiety disorder, suicide ideation and posttraumatic stress disorder in different categories of women who reported exposure to IPV as compared with the reference groups of women who did not report any exposure to IPV. All values are adjusted for woman and husband's age and education, social support, household assets, marital status and alcohol consumption.

Population attributable fraction

aORs and proportions of participants with MHDs who suffered from IPV during pregnancy were used to calculate PAFs that could be attributed to physical, psychological or sexual violence and controlling behaviour in the study population. For all the MHDs, the PAFs attributed to controlling behaviour were the highest: 42% for major depressive episode in the past two weeks, 48% for major depressive episode in earlier periods, 36% for generalised anxiety disorder, 38% for suicide ideation and 44% for PTSD. For major depressive episode in the past two weeks, the PAF attributed to physical violence was 19% and to psychological violence 25%. The PAF attributed to sexual violence was highest among those participants with PTSD (28%) and lowest (13%) among those with major depressive episode in the past two weeks. For suicide ideation, the PAFs attributed to physical, psychological or sexual violence were 15%, 21% and 16% respectively (Table 4)

Table 4 Population attributable fractions of mental health disorder due to exposure to intimate partner violence during pregnancy. N=921[‡]

Form of intimate partner violence	Major depressive episode in the past two weeks	Major depressive episode in earlier periods	Generalised anxiety disorder	Suicide ideation	Post-traumatic stress disorder
Physical violence	0.19	0.22	0.08	0.15	0.19
Psychological violence	0.25	0.29	0.21	0.21	0.35
Sexual violence	0.13	0.16	0.15	0.16	0.28
Controlling behaviour	0.42	0.48	0.36	0.38	0.44

[‡]Calculated from adjusted odds ratios derived from the final multivariable logistic regression models

DISCUSSION

In this study we found that non-psychotic MHDs are common after childbirth among Rwandan women. Furthermore, the four forms of IPV perpetrated against pregnant women during pregnancy are associated with the occurrence of these disorders. Studies simultaneously investigating the prevalence of all types of MHDs during pregnancy and after childbirth are rare in LICs. Nevertheless, the available publications have shown the presence of depressive disorders, PTSD and anxiety symptoms with varying prevalence rates.[26 36-38] A study that included 1180 pregnant antenatal care patients in Tanzania demonstrated that the prevalence rate for depression was 55%, 23% for anxiety and 13% for PTSD.[26] These estimates are higher than ours, but this is expected considering that the study used a different sample and did not make any distinction between depressive disorders during different time periods. Another study comprising 376 pregnant women from South Africa showed higher prevalence rates of MHDs than in our study [38]. The differences in results might be attributable to the South Africa study only including women from urban areas; we similarly observed in the present study that women living in Kigali city were more likely to meet diagnostic criteria for a MHD than women from rural areas. However, the relatively lower prevalence rates of MHDs in our study may indicate that many of the efforts to improve mental health care following the 1994 genocide in Rwanda are starting to bear fruit.[39]

Our results indicate that women exposed to IPV during pregnancy were more likely to have any of the non-psychotic MHDs (i.e. depressive episodes during the past two weeks before the interview and earlier in life, generalised anxiety disorder, suicide ideation and PTSD) than those not exposed to IPV. Our findings add to a growing body of evidence showing a negative impact of IPV during pregnancy on antenatal and postnatal mental health.[10 40-42] A systematic review

assessing determinants of non-psychotic common perinatal mental disorders in LMICs shows that women experiencing IPV were at a higher risk, with ORs ranging from 2.11-6.75.[10] The magnitude of the impact is similar to the estimates for sexual, physical and psychological violence found in our study. The effect of partner's controlling behaviour on women's mental health during and after pregnancy has not been studied in LICs. Nevertheless, the strong association of controlling behaviour during pregnancy with MHDs in the perinatal period observed in this study is not surprising given that studies in similar settings have consistently shown that controlling behaviour was far more common than other forms of violence.[23 43] Our results emphasise the need to recognise the severity of controlling behaviour and rectify any misleading perception that it is less harmful than physical or sexual violence. Although the underlying mechanisms through which IPV may lead to MHDs are not fully understood, violent experiences have been shown to cause neuroendocrine dysregulation which can trigger a range of conditions, including MHDs. [44] The strong independent association of social support with all the MHDs reported in this study confirms previous findings showing that poor social support is an important risk factor for MHDs during the perinatal period [38 45]

Finally, we have shown the excess of prevalent cases of different MHDs that can be attributed to exposure to the four forms of IPV. Although these are theoretical calculations, they demonstrate the detrimental role that IPV exposure plays during pregnancy in the occurrence of non-psychotic MHDs in women. The PAFs are plausible estimations of the magnitude of such disorders that could potentially be avoided if there were no IPV in the population.

Methodological considerations

The strengths of this study are the large sample size, the low non-response rate and the use of

internationally recognised instruments to investigate MHDs and IPV, including controlling behaviour. Furthermore, Rwanda is a homogenous society, and therefore we believe that the findings are generalisable to the entire country in women who have just given birth. Howeverthis study has limitations. First because of cultural beliefs and the sensitive nature of both MHDs and IPV, possibility of underreporting of some events cannot be dismissed. Nevertheless, data collection was conducted with utmost care by a team of experienced medical personnel who were of the same sex and of similar age as the participants. This has been shown to improve the accuracy of reporting in interviews. [46] Second, because the design was cross-sectional, we are unable to draw any causal inferences. Moreover, pregnant women´s health and life circumstances vary considerably between nations. Our findings may therefore not be generalizable to women from other countries. Finally, data were collected retrospectively from respondents who gave birth between 1-13 months before the interview. This time interval may have resulted in recall bias and underestimation of prevalence rates as incidences of MHDs have generally been shown to peak immediately after childbirth and start to decline 6 months postpartum.[47] However, 52% of the participants had given birth ≤6 months before the interview suggesting that this time frame may not be a serious concern.

Conclusion

Non-psychotic MHDS are common among Rwandan women during and after pregnancy and IPV plays a key role in their occurrence. We suggest that MHDs and IPV should be integrated into the perinatal health assessment package and that antenatal care providers are regularly trained and have sufficient abilities so that they can identify and manage cases of IPV and MHDs correctly.

Community-based health care services aiming at increasing awareness and early identification of IPV and MHDs during the perinatal period need to educate and train community health workers, nurses and midwives. Community discussions on non-psychotic MHDs should be instituted and scaled up in all villages to reduce the stigma. Further research is needed to fully understand what screening tools and measures that could be used to identify MHDs early through ANC services and CHWs. Finally, strategies that have been put in place to reduce poverty and promote gender equality and social support should be intensified.

Competing interests

None

Sources of funding

This study forms part of the Maternal Health Research Programme (MaTHeR) undertaken by the University of Rwanda in collaboration with the University of Gothenburg and Umeå University in Sweden. The Study was made possible by financial support from The Swedish International Development Cooperation Agency (SIDA).

Authors' contributions

GK, IM and AAR designed the study. GK, IM, AAR and JN developed part of the study questionnaire. AAR coordinated and participated in piloting and data collection activities and performed the statistical analyses with the assistance of GK and JN. The manuscript was drafted and written by AAR with contributions from GK, IM, JN and KG.

Acknowledgments

We gratefully acknowledge the contribution of all participating women who welcomed us into their homes and gave their valuable time to answer our questions. We are also grateful to the Erasmushogeschool .

Section for Epidemiology and Social Medicine (EPSO), University of Gothenburg and the School of Public Health, College of Medicine and Health Sciences, University of Rwanda for all their support.

Data sharing statement

No additional data are available

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Title page
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract page
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1, 2
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3, 4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4,5,6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4, 5, 6
Bias	9	Describe any efforts to address potential sources of bias	*4,7*
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5,6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	3
		(b) Give reasons for non-participation at each stage	3
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	9, 10, 11
Outcome data	15*	Report numbers of outcome events or summary measures	11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7, 13
		(*b*) Report category boundaries when continuous variables were categorized	11
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	15
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17,18
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.