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Previous pregnancy loss has an adverse impact on distress and behaviour in subsequent pregnancy

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Objective To investigate whether women with previous miscarriages or terminations have higher levels of anxiety, depression, stress, and altered behaviours in a subsequent pregnancy.

Design A retrospective analysis of 5575 women recruited into the Screening for Pregnancy Endpoints (SCOPE) study, a prospective cohort study.

Setting Auckland, New Zealand, Adelaide, Australia, Cork, Ireland, and Manchester, Leeds, and London, UK.

Population Healthy nulliparous women with singleton pregnancies.

Methods Outcomes were recorded at 15 and 20 weeks of gestation.

Main outcome measures Short-form State–Trait Anxiety Inventory (STAI) score, Perceived Stress Scale score, Edinburgh Postnatal Depression Scale score, and pregnancy-related behaviour measured using behavioural responses to pregnancy score.

Results Of the 5465 women included in the final analysis, 559 (10%) had one and 94 (2%) had two previous miscarriages, and 415 (8%) had one and 66 (1%) had two previous terminations of pregnancy. Women with one previous miscarriage had increased anxiety (adjusted mean difference 1.85; 95% confidence interval, 95% CI 0.61–3.09), perceived stress (adjusted mean difference 0.76; 95% CI 0.48–1.03), depression (adjusted odds ratio, aOR 1.26; 95% CI 1.08–1.45), and limiting/resting behaviour in pregnancy (adjusted mean difference 0.80; 95% CI 0.62–0.97). In women with two miscarriages, depression was more common (aOR 1.65; 95% CI 1.01–2.70) and they had higher scores for limiting/resting behaviour in pregnancy (adjusted mean difference 1.70; 95% CI 0.90–2.53) at 15 weeks of gestation.Women with one previous termination displayed elevated perceived stress (adjusted mean difference 0.65; 95% CI 0.08–1.23) and depression (aOR 1.25; 95% 1.08–1.45) at 15 weeks of gestation. Women with two previous terminations displayed increased perceived stress (adjusted mean difference 1.43; 95% CI 0.00–2.87) and depression (aOR 1.67; 95% 1.28–2.18).

Conclusions This study highlights the psychological implications of miscarriage and termination of pregnancy.

Keywords Anxiety, behaviour, depression, miscarriage, stress, termination of pregnancy.

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Introduction

Miscarriage affects approximately 20% of pregnancies,[1] and in some regions, including England and Wales, as many as a further 20% of pregnancies undergo termination.[2,3] Pregnancy loss can have significant psychological implications for a couple and can impact adversely on relationships.[4–7] Depression, anxiety, and grief are important consequences of miscarriage.[8,9] Women who have experienced a miscarriage have been shown to experience subse-

quent mental distress, whereas women who have undergone termination of pregnancy have been shown to have feelings of guilt, shame, and anxiety up to 5 years after the termination.[10,11] The relative risk of psychiatric contact has been shown not to differ significantly after termination of pregnancy, as compared with before termination.[12] Factors influencing the development of subsequent anxiety and depression include recent life events and a history of previous psychiatric illness.[13] Some studies suggest that women with a history of miscarriage suffer more from pregnancy-specific anxieties in the first trimester of a new pregnancy than pregnant women with no history of miscarriages,[14] whereas other studies suggest that these anxiety effects last only up to 4 months following miscarriage.[15]

Stress, anxiety, and depression are known to adversely affect pregnancy outcomes, and are associated with small-for-gestational-age infants and long-term neurodevelopmental adverse outcomes.[16–18] As a result, research measuring the degree of psychological ill health caused by potential stressors is important in identifying stressors, the magnitude of effect, and also may help guide research into interventions aimed at reducing maternal distress. Recently published research investigated the association between previous pregnancy losses and adverse pregnancy outcomes in subsequent pregnancy.[19] This study demonstrated that a single previous pregnancy loss (termination of pregnancy or miscarriage) managed by cervical dilatation and curettage was associated with a greater risk of spontaneous preterm birth, compared with women with no previous pregnancy loss and women with a previous pregnancy loss managed by non-surgical methods. In this follow-on study of a large prospective cohort of nulliparous women with a singleton pregnancy, we investigated the association between spontaneous miscarriage or termination of pregnancy and distress and behaviour in subsequent pregnancy. We hypothesised that women with previous miscarriage or termination would have higher levels of stress and anxiety, and would display altered behavioural responses to pregnancy.

Methods

Screening for Pregnancy Endpoints (SCOPE) is a prospective, multicentre, cohort study with the main aim of developing screening tests to predict pre-eclampsia, small-for-gestational-age infants, and spontaneous preterm birth.[20] Methods are described in detail elsewhere.[19,20] In brief, participants were healthy nulliparous women with singleton pregnancies recruited between November 2004 and February 2011 in: Auckland, New Zealand; Adelaide, Australia; Cork, Ireland; and Manchester, Leeds, and London, UK.

Women were recruited at 15 ± 1 weeks of gestation, as previously described.[20,21] Interviews were performed in a private room in the respective research centres. At 14–16 weeks of gestation an in-depth history was taken by the research midwives. Psychological scales were completed. Blood pressure, urinalysis, random whole-blood glucose and serum lipid concentrations were also measured. Ultrasound examination was performed at 19–21 weeks of gestation. Participants were followed prospectively, and research midwives collected data on pregnancy outcome and measurements of the baby. Women were excluded if they were considered to be at high risk of pre-eclampsia, small-for-gestational-age babies, or spontaneous preterm birth because of underlying medical conditions, gynaecological history, three or more previous miscarriages, three or more terminations of pregnancy, or had received interventions, such as aspirin, that might modify pregnancy outcome.

The SCOPE participants were interviewed and examined by SCOPE research midwives at 15 ± 1 and 20 ± 1 weeks of gestation. At the time of interview, data were entered on an internet-accessed central database with a complete audit trail (MedSciNet). Participants were followed-up prospectively, with pregnancy outcome data collected by research midwives. Primary outcomes, reported at the 15 ± 1 week and 20 ± 1 week interview, were: anxious mood, measured using the short form of the State–Trait Anxiety Index (STAI);[22] how much stress the individual feels that they are currently experiencing, measured using the Perceived Stress Scale (PSS);[23] depressed mood, measured using the Edinburgh Postnatal Depression Scale (EPDS);[24] and pregnancy-related behaviour, measured using the Behavioural Responses to Pregnancy Questionnaire, a modified version of the Behavioural Response to Illness Questionnaire (Table 1).[25] The Behavioural Reponses to Pregnancy Questionnaire has two subscales, all-or-nothing behaviour and limiting/resting behaviour. All-or-nothing behaviour represents a pattern of alternating extremes of behaviour, characterised by a cyclical response of pushing oneself to keep going until this no longer feels physically possible. Limiting/resting behaviour refers to a tendency to curtail activities of daily living in response to symptoms, or to respond to symptoms by resting: e.g. 'I have avoided my usual activities'. Each of the primary outcomes was analysed as a continuous variable with the exception of the EPDS, which was analysed as a categorical variable using ordered logistic regression. The EPDS is the only primary outcome to have recognised clinical cut-off values that relate to risk of depression (Table 1), and has been extensively studied during pregnancy as well as postnatally.[26–28]

Miscarriage was defined as spontaneous pregnancy loss at <20 weeks of gestation.

Table 1. Cognitive, behavioural, and emotional health scores, and their interpretations; adapted from McCarthy et al.[33]

Psychological and behavioural scales	Score range and interpretation
Short-form State–Trait Anxiety Inventory (STAI)[22]	Short-form STAI scores of 6–24 converted to a score range of 20–80 to mimic the full version of the STAI, with high scores indicating high state anxiety (i.e. current anxiety)
Perceived Stress Scale[23]	0–40, with high scores representing higher perceived stress (feelings of lack of control)
Edinburgh Postnatal Depression Scale (EPDS)[24]	As a continuous measure (0–30), where a higher score indicates a higher probability of depression OR As a categorical variable, with the following three categories **1** EPDS < 5: unlikely to experience postpartum depression **2** EPDS 5–9: increased risk of depression in the next year **3** EPDS > 9: very likely depressed
Behavioural Responses to Pregnancy (adapted from the Behavioural Response to Illness Questionnaire[25])	Two subscales: **1** Limiting/resting behaviour (0–20) **2** All-or-nothing behaviour (0–28)

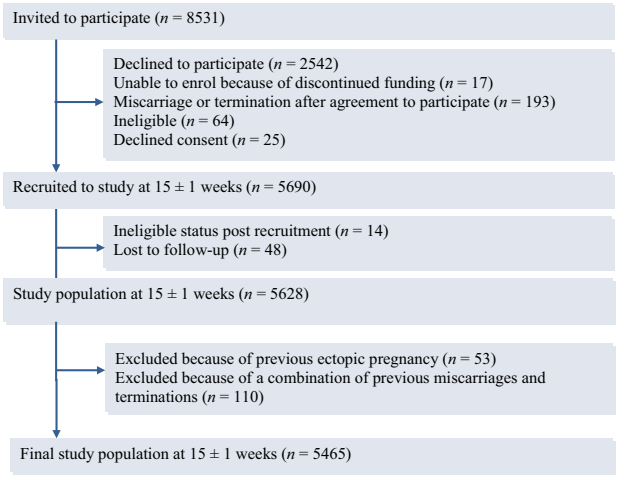

Figure 1. Participants recruited.

Analysis of variance (ANOVA) was used to compare continuous variables and chi-square or Kruskall–Wallis tests were used to compare categorical variables in relation to previous miscarriage(s) only and previous termination(s) only. As the primary aim was to examine the effects of miscarriage or termination as separate entities, women who had a combination of miscarriages and terminations were excluded from the final analyses (Figure 1). In all of the statistical tests women with no previous pregnancies represented the reference group. Analyses were performed to assess the effect of previous miscarriages or terminations of pregnancy on primary outcomes. This was performed by generating a three-category variable: (i) no previous miscarriage or termination; (ii) one previous miscarriage or termination; and (iii) two previous miscarriages or terminations.

Linear regression with robust variance estimation and ordered logistic regression (for EPDS categorical variable) were used to analyse the continuous and categorical variables, respectively. Following peer review, a further *post-hoc* analysis was performed to compare the effects of stress, anxiety, and depression in women with previous miscarriage only (one or two miscarriages) and in women with previous termination only (one or two terminations). All regression models were adjusted for maternal age, smoking, alcohol consumption, ethnicity, body mass index (BMI), marital status, and income. Infant sex and women who conceived using assisted fertility were ruled out as potential confounding factors, and were not included in the final regression models. The models were further adjusted for any clustering effect of SCOPE centres using the 'cluster' option in STATA, which specifies that the standard errors allow for intragroup correlation, relaxing the usual requirement that the observations be independent. That is, the observations are independent across centres but not necessarily within groups.

Women who had previous terminations of pregnancy were excluded from the miscarriage analyses. Similar women with previous miscarriages were excluded from the termination of pregnancy analysis. All statistical analyses were performed in STATA 10.0.[29]

Results

Of the 5690 women who were recruited to the SCOPE study, 5628 (99%) were included in this study (Figure 1). Fifty-three (1%) women were excluded from the final analysis for a history of previous ectopic pregnancy. As the main aim of this study was to examine women with either a previous miscarriage or a previous termination of pregnancy, a further 110 (1%) women were excluded for having a history of a combination of previous miscarriages and terminations of pregnancy, resulting in a final cohort of 5465 women for analysis. A total of 4331 women (78%) had no history of miscarriage or termination, and 559 women (10%) had one and 94 women (2%) had two previous miscarriages only. A total of 415 women (8%) had one and 66 women (1%) had two previous terminations of

pregnancy only. Compared with women undergoing their first pregnancy, women with previous miscarriages or terminations tended to be older and more likely to be overweight, compared with those with no miscarriages or terminations (Table 2).

Women with one previous miscarriage had increased anxiety (adjusted mean difference 1.85; 95% confidence interval, 95% CI 0.61–3.09), stress (adjusted mean difference 0.76; 0.48, 1.03), depression (adjusted OR, aOR 1.26; 95% CI 1.08–1.45) and limiting/resting behaviour in pregnancy (adjusted mean difference 0.80; 95% CI 0.62–0.97) scores at 15 weeks of gestation (Table 3).

Significant changes in the scores were also seen at 20 weeks of gestation in anxiety (adjusted mean difference 1.15; 95% CI 0.73–1.56), perceived stress (adjusted mean difference 0.62; 95% CI 0.23–1.01), depression aOR 1.13; 95% CI 1.00–1.28), and limiting/resting behaviour in pregnancy (adjusted mean difference 0.58; 95% CI 0.42–0.75).

In women with two previous miscarriages significant changes were observed in depression scores at 15 weeks of gestation (aOR 1.65; 95% CI 1.01–2.70) and in the limiting/resting behavioural response to pregnancy score (adjusted mean difference 1.70; 95% CI 0.90–2.53). These changes in limiting/resting behavioural response to pregnancy score persisted at 20 weeks of gestation (adjusted mean difference 1.46; 95% CI 0.41–2.51).

Women with previous terminations did not display differences in anxiety scores compared with women undergoing their first pregnancy with no previous terminations. Perceived stress and depression scores were different in women with previous terminations. Stress scores were significantly elevated at 15 weeks of gestation in women with

Table 2. Characteristics and primary outcomes of participants by number of, and mode of, pregnancy losses

Variable	1st pregnancy (n = 4331)	1 miscarriage (n = 559)	2 miscarriages (n = 94)*	P**	1 TOP (n = 415)*	2 TOP (n = 66)*	P**
Mean (SD)	28.4 (5.4)	29.6 (5.5)	30.5 (5.5)	<0.001	28.6 (5.5)	28.9 (5.2)	0.14
Maternal age (years)							
Ethnicity							
White European	3910 (90)	517 (92)	82 (87)	0.38	355 (85)	59 (89)	0.02
South Asian	106 (3)	9 (2)	3 (3)		11 (3)	1 (2)	
Other	315 (7)	33 (6)	9 (10)		49 (12)	6 (9)	
Married/cohabitating	3901 (90)	525 (94)	90 (96)	0.003	372 (89)	55 (83)	0.19
Body mass index							
≤18.5 kg/m^2	69 (2)	8 (1)	2 (2)	0.008	3 (1)	0	0.04
18.6–24.9 kg/m^2	2452 (57)	283 (51)	41 (44)		224 (53)	28 (42)	
25.0–29.9 kg/m^2	1185 (27)	182 (33)	28 (30)		119 (29)	21 (32)	
>35 kg/m^2	625 (14)	86 (15)	23 (24)		69 (17)	17 (26)	
Socio-economic index							
≥24	3520 (81)	427 (76)	78 (83)	0.07	318 (77)	49 (74)	0.008
Alcohol* **							
No alcohol in pregnancy	1647 (38)	237 (42)	45 (47)	0.06	163 (39)	25 (38)	0.94
Quit in first trimester	2333 (52)	277 (50)	41 (44)		206 (50)	33 (50)	
Continued to drink	451 (10)	45 (8)	8 (9)		46 (11)	8 (12)	
Smoking* **							
Never smoked	3329 (77)	415 (74)	77 (82)	0.03	295 (71)	30 (46)	<0.001
Quit in pregnancy	583 (13)	70 (13)	6 (6)		68 (16)	16 (24)	
Continued to smoke	419 (10)	74 (13)	11 (12)		52 (13)	20 (30)	
Psychological scales* **							
Anxiety	30 (23,40)	33 (27,43)	32 (27,40)	<0.002	33 (23,40)	30 (23,40)	0.54
Stress	14 (10,19)	14 (10,19)	14 (11,19)	0.11	15 (10,20)	14 (10,19)	0.002
Depression	6 (3,10)	6 (3,10)	8 (4,10)	0.0018	7 (3,11)	8 (4,12)	0.008
Limiting response	8 (5,10)	9 (6,11)	10 (7,12)	<0.001	8 (5,10)	8 (6,12)	0.37
All or nothing response	9 (6,11)	8 (5,12)	8 (5,12)	0.73	9 (5,12)	10 (7,12)	0.19

Data are mean (SD) or number (%). P values are for comparisons between the groups using analysis of variance (ANOVA) or the chi-square test, $P < 0.05$.

*Women with both miscarriages and termination of pregnancy (TOP) were excluded. Additional demographics are available.[19]

**Women in first pregnancies were used as a reference group.

***At 15 ± 1 weeks of gestation.

Table 3. Association between previous miscarriage and primary outcomes

Scale	Gestation measured (weeks)	One previous miscarriage only (n = 559)		Two previous miscarriages only (n = 94)	
		Unadjusted mean difference (95% CI)	Adjusted mean difference (95% CI)	Unadjusted mean difference (95% CI)	Adjusted mean difference (95% CI)
State–Trait Anxiety Inventory*	15	1.78 (0.53, 3.02)	1.85 (0.61, 3.09)	1.39 (−2.40, 5.18)	1.58 (−1.98, 5.14)
	20	1.12 (0.65, 1.59)	1.15 (0.73, 1.56)	0.46 (−1.72, 2.63)	0.45 (−1.62, 2.52)
Perceived Stress Scale*	15	0.68 (0.40, 0.97)	0.76 (0.48, 1.03)	0.73 (−2.04, 3.51)	0.88 (−2.08, 3.84)
	20	0.57 (0.14, 0.99)	0.62 (0.23, 1.01)	1.31 (−1.00, 3.62)	1.30 (−1.24, 3.84)
EPDS** (categorical, OR)	15	1.21 (1.05, 1.39)	1.26 (1.08, 1.45)	1.55 (0.99, 2.42)	1.65 (1.01, 2.70)
	20	1.12 (1.01, 1.23)	1.13 (1.00, 1.28)	1.51 (0.80, 2.87)	1.53 (0.75, 3.12)
Limiting response*	15	0.81 (0.60, 1.02)	0.80 (0.62, 0.97)	1.74 (0.80, 2.69)	1.70 (0.90, 2.53)
	20	0.61 (0.43, 0.79)	0.58 (0.42, 0.75)	1.53 (0.52. 2.53)	1.46 (0.41, 2.51)
All or nothing response*	15	−0.04 (−0.52, 0.43)	−0.03 (−0.49, 0.42)	−0.34 (−2.28, 1.59)	−0.29 (−0.49, 0.42)
	20	0.25 (−0.08, 0.58)	0.23 (−0.09, 0.56)	−0.59 (−2.27, 1.09)	−0.60 (−2.49, 1.29)

The reference group was primigravid women (with no previous pregnancy losses). All regression models were adjusted for maternal age, smoking, alcohol consumption, ethnicity, BMI, marital status, and income. All analyses were adjusted for the potential clustering effect of SCOPE centres.
*Score variables are analysed using linear regression (95% CI).
**Edinburgh Postnatal Depression Score, categorical variable presented as odds ratio and calculated using ordered logistic regression.

Table 4. Association between previous termination of pregnancy and primary outcomes

Scale	Gestation measured (weeks)	One previous termination (n = 415)		Two previous terminations (n = 66)	
		Unadjusted mean difference (95% CI)	Adjusted mean difference (95% CI)	Unadjusted mean difference (95% CI)	Adjusted mean difference (95% CI)
State–Trait Anxiety Inventory*	15	0.77 (−0.16, 1.70)	0.72 (−0.34, 1.79)	−0.13 (−2.98, 2.71)	−0.67 (−3.64, 2.30)
	20	0.71 (−0.33, 1.75)	0.51 (−1.03, 2.06)	2.22 (0.05, 4.40)	1.54 (−0.89, 3.98)
Perceived Stress Scale*	15	0.82 (0.19, 1.45)	0.65 (0.08, 1.23)	2.11 (0.86, 3.37)	1.43 (0.00, 2.87)
	20	1.04 (0.19, 1.88)	0.82 (−0.06, 1.71)	2.08 (−0.37, 4.53)	1.43 (−0.95, 3.82)
EPDS** (categorical, OR)	15	1.17 (1.00, 1.37)	1.25 (1.08, 1.45)	1.89 (1.44, 2.48)	1.67 (1.28, 2.18)
	20	1.39 (1.13, 1.71)	1.64 (1.01, 2.68)	2.20 (1.57, 3.08)	1.81 (1.25, 2.62)
Limiting response*	15	−0.11 (−0.49, 0.28)	−0.07 (−0.36, 0.22)	0.78 (−0.22, 1.77)	0.98 (−0.09, 2.04)
	20	0.33 (−0.17, 0.83)	0.31 (−0.18, 0.80)	0.83 (0.06, 1.60)	0.72 (0.01, 1.42)
All-or-nothing response*	15	0.20 (−0.16, 0.56)	0.21 (−0.15, 0.56)	0.78 (−0.34, 1.90)	0.75 (−0.49, 1.99)
	20	0.65 (0.11, 1.18)	0.58 (−0.03, 1.19)	0.37 (−1.13, 1.89)	0.14 (−1.47, 1.75)

The reference group was primigravid women (no previous pregnancy losses). All regression models were adjusted for maternal age, smoking, alcohol consumption, ethnicity, BMI, marital status, and income. All analyses were adjusted for the potential clustering effect of SCOPE centres.
*Score variables are analysed using linear regression (95% CI).
**Edinburgh Postnatal Depression Score, categorical variable presented as odds ratio and calculated using ordered logistic regression.

both one (adjusted mean difference 0.65; 95% CI 0.08–1.23) and two (adjusted mean difference 1.43; 95% CI 0.00–2.87) previous terminations (Table 4). No differences were observed at 20 weeks of gestation. Elevated depression scores were also observed in women with one (aOR 1.25; 95% CI 1.08–1.45) and two (aOR 1.67; 95% CI 1.28–2.18) previous terminations. These scores remained elevated at 20 weeks of gestation (aOR 1.64, 95% CI 1.01–2.68, for one previous termination; aOR 1.81, 95% CI 1.25–2.62, for two previous terminations). Women with two previous terminations displayed altered behavioural responses to pregnancy, having increased limiting/resting responses to pregnancy scores at 15 weeks of gestation (adjusted mean difference 0.98; 95% CI –0.09 to 2.04) and at 20 weeks of gestation (adjusted mean difference 0.72; 95% CI 0.01–1.42).

Table 5. Psychological scores of women with previous miscarriage only (one or two) compared with women with previous termination (one or two)

Psychological scales*	Unadjusted mean difference	Adjusted mean difference
Anxiety (STAI)	−1.07 (−2.30, 0.15)	−1.43 (−2.82, −0.05)
Stress (PSS)	0.31 (−0.46, 1.07)	−0.07 (−0.76, 0.62)
Depression (EPDS; categorical, OR)	0.03 (−0.18, 0.25)	−0/06 (−0.27, 0.13)

*Measured at 15 weeks of gestation. Women with previous miscarriage (one or two): n = 653. Women with previous termination (one or two): n = 481. All regression models were adjusted for maternal age, smoking, alcohol consumption, ethnicity, BMI, marital status, and income.

Women with previous miscarriage only (one or two) were then compared with women with previous termination (one or two). This analysis demonstrated that women with previous termination had significantly lower anxiety levels compared with women with previous miscarriage (adjusted mean difference –1.43; 95% CI –2.82 to –0.05; Table 5). No significant differences were observed in stress or depression.

Discussion

Main findings

This study has demonstrated that previous pregnancy loss is associated with higher levels of perceived stress, depression, and altered limiting/resting behavioural responses to pregnancy in a subsequent pregnancy. These findings apply to nulliparous women with a maximum of two miscarriages or two terminations of pregnancy. These changes are seen regardless of whether or not the pregnancy loss was a previous miscarriage or termination. The magnitude of these effects tended to be greater in those with two pregnancy losses. The observed differences in score variables were generally higher at 15 weeks of gestation compared with 20 weeks of gestation, suggesting that women may perceive the early pregnancy period as a higher risk time. Women with previous miscarriages but not with previous terminations also reported significantly elevated anxiety scores, a possible reflection of the unpredictability of miscarriage and increased risk of recurrence in subsequent pregnancies.

There was also evidence that those with either previous termination or miscarriage displayed elevated limiting/resting behaviour in subsequent pregnancy at both 15 and 20 weeks of gestation. It is possible that these behavioural responses relate to obstetric advice given to women with previous miscarriage to rest, although there is no evidence that these behaviours improve pregnancy outcomes.[30,31] It is unlikely to explain the results for women with previous terminations of pregnancy, however. It is also possible that these behavioural changes reflect an attempt by women with previous pregnancy losses to rest more.

Strengths and limitations

The strengths of our study are that detailed information about cognitive, behavioural, and emotional factors in pregnancy was collected prospectively, and pregnancy outcome data were available in more than 99% of participants. A limitation is the use of self-reported scales and questionnaires as indicators of depression, etc., rather than a clinical diagnosis. Although we have reported significantly different scores in women with previous pregnancy losses, the actual clinical effect of these differences remains unclear and requires further research. The majority of pregnancy losses in this study were early first-trimester losses. Therefore, these findings may not be applicable to later (second-trimester) pregnancy losses. Similarly, scores were recorded at 15 and 20 weeks of gestation, beyond the typical gestational age for miscarriage and termination of pregnancy. It is possible that scores would be higher in the earlier stages of pregnancy but further research is needed to confirm or refute this. Women with three or more miscarriages or three or more terminations of pregnancy were excluded from the SCOPE study because of an accepted assumption of increased risk, and therefore increased surveillance. As a result, this study was unable to assess the potential 'dose' effect beyond two losses. A small proportion of women (n = 193; Table 1) had a miscarriage or termination after initially agreeing to take part in the SCOPE study. These terminations or miscarriages may have been linked to congenital anomalies. As a result, these findings are not generalisable to this cohort of women.

Interpretation

This study supports previous research that has found associations between previous miscarriage and depressive behaviour and anxiety.[8,9] Similarly, this study also supports the association between previous termination of pregnancy and subsequent mental distress.[10,11] What this study adds is a clear demonstration of the association and magnitude of change between previous miscarriage and termination of pregnancy and higher levels of perceived stress, depression, and altered limiting/resting

behavioural responses to pregnancy in a subsequent pregnancy. This study also demonstrates the persistence of these observed changes past 15 weeks of gestation up to 20 weeks of gestation.

Conclusion

There is evidence to suggest that women with previous pregnancy losses display increased stress, anxiety (miscarriage only), depression scores, and altered behavioural responses to pregnancy. The magnitude of these effects was generally higher in early pregnancy (15 weeks of gestation) compared with later in pregnancy (20 weeks of gestation), and was higher in women with two miscarriages or terminations compared with women with one miscarriage or termination. Although we have demonstrated significant associations between previous miscarriage or termination of pregnancy loss and subsequent cognitive, behavioural, and emotional ill health, an interpretation of any causal effect of miscarriage or termination of pregnancy is not possible, and further studies are necessary to explore this. Further research is also needed to explore whether interventions may be justified in order to provide additional supportive care to women with previous pregnancy losses. This may help them manage their distress and provide guidance and support for appropriate activity levels during pregnancy to avoid excessive inactivity and distress in the early periods of gestation, which may be associated with adverse pregnancy outcomes.[32]

Disclosure of interests

The authors did not report any potential conflicts of interest. The funders had no role in the study design, data collection and analysis, decision to publish, or preparation of the article.

Contribution to authorship

FMC is guarantor. FMC, RMM, AK, KOD, LK, RN, LMC, PB, GD, LP, and JW had a role in the conception and design of the study. FMC, AK, RMM, KOD, and LK interpreted the data. FMC, RMM, AK, KOD, LK, RN, LMC, PB, GD, LP, and JW took part in drafting the article or revising it for critically important intellectual content, and all gave final approval of the version to be published.

Details of ethics approval

Ethical approval was obtained from local ethics committees [New Zealand AKX/02/00/364; Australia REC 1712/5/2008; London, Leeds, and Manchester 06/MRE01/98' and Cork ECM5(10)05/02/08], and all women provided written informed consent.

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