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Depression after pregnancy loss: the role of the presence of living children, the type of loss, multiple losses, the relationship quality, and coping strategies*

Stefanie Rita Balle [†], Christine Nothelfer [†], Roland Mergl , Sarah Miriam Quatz , Svenja Hoffmann, Helena Hoffmann, Antje-Kathrin Allgaier [†] and Kathryn Eichhorn[†]

Institute of Psychology, University of the Bundeswehr Munich, Neubiberg, Germany

ABSTRACT

Background: Pregnancy loss (PL) is a common, yet rarely examined public health issue associated with an increased risk of impaired mental health, particularly depression.

Objective: Previous research shows childlessness to be a correlate of depression after PL. First studies also indicate associations of the type of loss, multiple losses, relationship quality, and coping strategies with depression after the loss of a pregnancy. However, results are inconsistent and the few existing studies show methodological deficits. Therefore, we expect higher depression scores for women without living children, and we exploratively examine the associations between the type of loss, the number of losses, relationship quality, and coping strategies with depression scores for women who suffered a PL.

Method: In an online setting, $N = 172$ women with miscarriage ($n = 137$) or stillbirth ($n = 35$) throughout the last 12 months completed the Patient Health Questionnaire (PHQ-D), Brief-COPE, and Partnerschaftsfragebogen (PFB), a German questionnaire measuring relationship quality.

Results: In a multiple hierarchical regression analysis, stillbirth, $\beta = 0.15$, $p = .035$, presence of living children, $\beta = -0.17$, $p = .022$, and self-blame/emotional avoidance, $\beta = 0.34$, $p < .001$, are predictors of depression scores. However, there was no association between depression symptoms and other coping strategies, relationship quality, and multiple losses.

Conclusions: Especially with regard to women who have no living children, have suffered a stillbirth, or are affected by self-blame/emotional avoidance, health care providers should monitor the presence of depressive symptoms. Our results indicate the need for specific instruments measuring coping style and relationship quality after PL, since the standard items of the PFB and the Brief-COPE seem inappropriate for this setting.

Depresión tras la pérdida del embarazo: el papel de la presencia de hijos vivos, el tipo de pérdida, las pérdidas múltiples, la calidad de la relación y las estrategias de afrontamiento

Antecedentes: La pérdida del embarazo (PL) es un problema de salud pública común, aunque raramente examinado, asociado con un mayor riesgo de deterioro de la salud mental, en particular la depresión.

Objetivo: Investigaciones anteriores muestran que la falta de hijos es un correlato de la depresión tras la PL. Los primeros estudios también indican asociaciones del tipo de pérdida, las pérdidas múltiples, la calidad de la relación y las estrategias de afrontamiento con la depresión tras la pérdida de un embarazo. Sin embargo, los resultados son inconsistentes y los pocos estudios existentes muestran déficits metodológicos. Por lo tanto, esperamos puntuaciones de depresión más altas para las mujeres sin hijos vivos, y examinamos de forma exploratoria las asociaciones entre el tipo de pérdida, el número de pérdidas, la calidad de la relación y las estrategias de afrontamiento con las puntuaciones de depresión para las mujeres que sufrieron una PL.

Método: En un contexto online, $N = 172$ mujeres con aborto espontáneo ($n = 137$) o mortinato ($n = 35$) a lo largo de los últimos 12 meses completaron el Cuestionario de Salud del Paciente (PHQ-D), Brief-COPE, y Partnerschaftsfragebogen (PFB), un cuestionario alemán que mide la calidad de la relación.

Resultados: En un análisis de regresión jerárquica múltiple, el mortinato, $\beta = 0,15$, $p = 0,035$, la presencia de hijos vivos, $\beta = -0,17$, $p = 0,022$, y la autculpabilidad/evitación emocional, $\beta = 0,34$, $p < 0,001$, $p = 0,039$, son predictores de las puntuaciones de depresión. Sin embargo, no hubo asociación entre los síntomas de depresión y otras estrategias de afrontamiento, la calidad de la relación y las pérdidas múltiples.

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Aborto espontáneo; mortinato; pérdidas múltiples; depresión; falta de hijos; calidad de la relación; estrategias de afrontamiento


HIGHLIGHTS

- Stillbirth is associated with higher maternal depression scores than miscarriage.
- Women with living children show lower depression scores after pregnancy loss than childless women.
- Self-blame and emotional avoidance are associated with higher maternal depression scores after pregnancy loss.

CONTACT Stefanie Rita Balle  stefanie.balle@unibw.de  Institute of Psychology, University of the Bundeswehr Munich, Werner-Heisenberg-Weg 39, D-85577 Neubiberg, Germany  <https://www.linkedin.com/in/stefanie-balle-927a18b5>

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[†]These authors contributed equally to this work.

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Conclusiones: En particular, en el caso de las mujeres que no tienen hijos vivos, han dado a luz un mortinato, o padecen de sentimientos de culpa/ evitación emocional, los profesionales de la salud deberían monitorear la presencia de síntomas depresivos. Nuestros resultados indican la necesidad de contar con instrumentos específicos que midan el estilo de afrontamiento y la calidad de las relaciones después de una PL, ya que los elementos estándar de la PFB y la Brief-COPE parecen inadecuados para este contexto.

1. Introduction

The number of miscarriages worldwide is estimated at 23 million per year with a very high number of unreported cases due to only partial detection (Quenby et al., 2021). With regard to stillbirths, which are usually officially recorded, there are two million cases per year worldwide (unicef, 2020) and 4.3 stillbirths/1000 births in Germany (Statistisches Bundesamt, 2022). According to the Civil Status Act, a baby is considered stillborn if, upon separation from the maternal womb, it exhibited neither a heartbeat nor pulsation of the umbilical cord, nor demonstrated natural lung function. Additionally, the baby must either weigh at least 500 grams or have reached at least the 24th week of gestation. All other instances where a baby is not born alive are classified as miscarriages (§31 PStV¹). Although research in this field is still quite new, there are already indications of far-reaching psychological consequences for affected women (Burden et al., 2016). In addition to post-traumatic stress disorder, anxiety disorders, and adjustment disorders, depressive reactions in particular seem to be a common consequence of pregnancy loss (PL; e.g. Campbell-Jackson & Horsch, 2014; Farren et al., 2018; Hogue et al., 2015; Jacob et al., 2017; Klier et al., 2002). In one of the few existing reviews of depression prevalence after PL, Lok and Neugebauer (2007) showed that 10-50% of women suffered from a major depressive episode after miscarriage.

Some initial studies exist that examine specific correlates of depression after PL. PL-specific factors were examined as well as factors known to be correlates of depression in populations without PL. In particular, Farren et al. (2018) identified a lower number of living children as a correlate of depression after PL. Further, Klier et al. (2002) found an elevated relative risk for depression symptoms and depressive disorders in the case of childlessness. While the absence of living children seems to be a well-documented correlate of depressive symptoms after PL, evidence related to other relevant factors is less clear.

Several studies investigated whether multiple losses are associated with increased depression scores (Craig et al., 2002; Farren et al., 2018; Rai & Regan, 2006; Robinson, 2014). Effects of multiple losses on depression seem obvious, since it has generally been shown that the risk of depression increases exponentially with an increasing number of aversive life events

(Kendler et al., 1999). However, the findings were again heterogeneous: While Farren et al. (2018) identified multiple miscarriages as risk factors for depression after PL, Craig et al. (2002) found that the number of miscarriages in a sample of women after at least two losses did not show an association with the subjects' depressiveness.

In addition, Obi et al. (2009) examined the specific type of PL, and stillbirths tended to be associated with higher depression scores than miscarriages. However, this study investigated a Nigerian sample and applied a depression questionnaire that is not widely used in Western culture and is thus generalisable only to a limited extent in other cultural contexts.

Today, it is clear that social support and, in particular, high relationship quality are protective factors against the development of depressive symptoms (e.g. Leach et al., 2013). However, regarding PL, few studies exist to date that examine relationship quality as a correlate of depression. For example, Voss et al. (2020) found increased depression scores after recurrent miscarriage for participants with lower relationship satisfaction. However, in general, changes in individual subfacets of relationship quality have so far tended to be studied independently of psychopathology. To our knowledge, most studies to date have been conducted on changes in sexual relationships (e.g. Serrano & Lima, 2006), conflict (e.g. Heazell et al., 2016), support (e.g. Lasker & Toedter, 2000), and closeness (Swanson et al., 2003) after PL. Additionally, the results obtained so far are not very conclusive due to methodological shortcomings, such as small sample sizes (e.g. Serrano & Lima, 2006), and considerable differences in methodology. Consequently, it appears necessary to examine relationship quality as an overall construct with more broadly defined facets and its association with depression symptoms after PL.

There is also a large body of scientific work regarding the relationship between coping strategies and depression. In general, the coping strategies cognitive restructuring, problem solving (Thompson et al., 2010), and social support (George et al., 1989) tend to be related to lower depression symptoms on average, whereas self-blame (Peterson et al., 1981) and rumination (Thompson et al., 2010) are associated with increased depression symptoms. These factors have also been sporadically examined in previous studies in terms of their association with depression

in populations after PL. Similarly, self-blame has been shown to be positively (Cacciato et al., 2013; Gold et al., 2018; Nazaré et al., 2013) and social support negatively (Bennett et al., 2008; Cacciato et al., 2009; Campbell-Jackson & Horsch, 2014) associated with depression symptoms quite consistently in this type of sample. In contrast, effects on depression for coping strategies that can be used specifically after bereavement, such as counselling (Murphy et al., 2012; Nikčević et al., 2007), self-help groups (Cacciato et al., 2007; Rich, 2000), memorial rituals (especially seeing and holding the dead baby; Cacciato et al., 2008), and religious activities (Cowchock et al., 2010; Mann et al., 2008), have been inconsistent so far. The interpretability of these studies is further limited by their methodological limitations such as small sample sizes, a lack of clearly established definitions of PL (Bennett et al., 2008; Cacciato et al., 2013), and large time intervals between loss and study execution (Bennett et al., 2008).

In summary, apart from childlessness, little firm evidence exists on the correlates of maternal depression after PL. Accordingly, no measurement instruments have been available that specifically capture relationship quality and coping strategies after PL. Thus, tools for useful research on the consequences of PL for mental health have been lacking. The few studies that have been conducted to date usually asked the participants only a single or a few self-constructed questions that have not been validated and whose reliability is uncertain (e.g. Korenromp et al., 2007). It can be assumed that the reported inconsistent findings also stem to some extent from this deficit. Therefore, in this study, potential factors related to depression are recorded as comprehensively as possible in a large sample, thus contributing to the development of adequate questionnaires.

1.1. Research questions

As previously found by Klier et al. (2002), we expect lower depression scores for women with living children compared to childless women after PL. Due to the insufficient number of studies and the inconsistent findings, it is not possible to formulate directed hypotheses regarding further potential correlates of depression after PL at the present time. Therefore, we explore whether there is an association of the type of loss, the number of losses, relationship quality, and coping strategies with depression scores.

2. Methods

2.1. Participants

In total, we recruited $N = 207$ women via print media, social media, social contacts of participants, social contacts

of employees, gynaecologists, counselling centers, postnatal courses, and registry offices. Inclusion criteria were female gender, a miscarriage (< 24th week of pregnancy and < 500 g weight of the baby lost [≤ 31 PStV]) or stillbirth (≥ 24 th week of pregnancy or ≥ 500 g weight of the baby lost [≤ 31 PStV]) within the last 12 months, an age between 18 and 50 years, and sufficient knowledge of German. Current or subsequent pregnancy as well as abortions² were exclusion criteria. The final sample comprised $n = 172$ female participants ($M_{age} = 34.5$ years, $SD = 4.4$; see Figure 1).

2.2. Procedure

Ethical approval was obtained from the ethics committee of the University of the Bundeswehr Munich. At first, a telephone screening of potential participants was conducted by members of the research team in order to check inclusion/exclusion criteria and to generate an individual pseudonym. Depending on the psychological distress indicated in the telephone screening, the respective participant was scheduled for an interview with either a student or a member of the research team. All interviewers had been trained. After written informed consent had been obtained, the online interview was conducted via RED medical (RED Medical Systems GmbH, 2022). The following data were collected via SoSci Survey (Leiner, 2019) between October 2020 and March 2022 (see [Supplementary material, Appendix I](#)): pseudonyms, personal data, questions about PL, psychological distress, the Partnerschaftsfragebogen (PFB; Hahlweg, 2016; relationship questionnaire), the Brief-COPE (Knoll et al., 2005), and questions about relationship (modified according to Kahmann, 2002). The latter two questionnaires are provided in [Supplementary material, Appendix II](#). All SoSci Survey questionnaires had to be processed promptly after the interview. From the interview data (see [Supplementary material, Appendix I](#)), the number of PL as well as the sub-questionnaire of the German version of the Patient Health Questionnaire (PHQ-D; Loewe et al., 2002), which measures depressive symptoms, were used. If participants mentioned suicidal thoughts, a specific study protocol was applied (see [Supplementary material, Appendix III](#)). For full study participation, the participants received 30 euros.

2.3. Measures

A more detailed description of the measurement instruments can be found in the [Supplementary material, Appendix IV](#).

2.4. Data analyses

The analyses were conducted with SPSS version 26. The significance level was set at $\alpha = .05$. For two groups of potential predictors for depression in

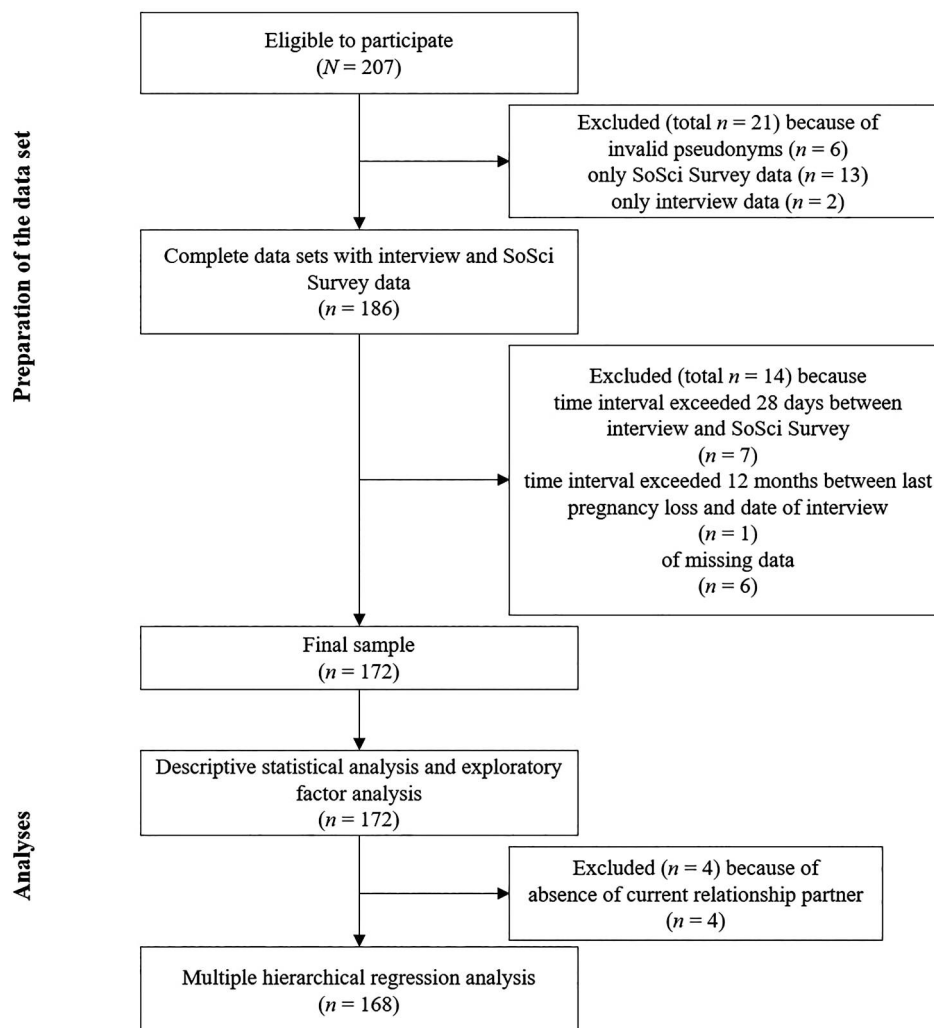


Figure 1. Sampling and flow of subjects.

Note. 'SoSci Survey' is a tool for creating online questionnaires. Invalid pseudonyms arose from inconsistent pseudonyms provided in the different sections of the study, which consequently could not be matched. The number of participants in the descriptive statistical analyses differs for the PFB ($n = 168$) as not all participants currently were in a relationship.

women with miscarriages or stillbirths (3 PFB variables reflecting partnership quality (see below) and 9 coping factors (see Table 2)) the above-mentioned p value was adjusted according to the Bonferroni correction leading to alpha-adjusted p values of .017 and .0055, respectively.

As an exploratory factor analysis, we conducted a principal component analysis with a varimax rotation. Via the Kaiser-Meyer-Olkin (KMO) and Bartlett coefficient, we ensured that the necessary conditions were fulfilled. Factors were extracted by Screeplot and Kaiser-Guttman Criterion, which can be used according to Auerwald and Moshagen (2019) for orthogonal factor analytic models. Factor loadings falling below .3 were suppressed (Bühner, 2021).

To test the hypothesis and answer the research questions, a multiple hierarchical linear regression analysis was calculated. The following independent variables were included categorically in the analyses: type of PL (0 = miscarriage vs. 1 = stillbirth), existence of living children (0 = no, 1 = yes), and existence of a history of

multiple PL (0 = one PL, 1 = more than one PL). PFB sum score, scores of PFB subscales, and scores of Brief-COPE subscales were implemented as dimensional independent variables. Age and time interval between PL and study participation served as dimensional covariates. The PHQ-D sum score represented the dimensional dependent variable. All independent variables were examined only in their additive associations with the dependent variable as there is a lack of theoretical basis for investigating specific interaction effects between the individual predictors. A post-hoc power analysis revealed that an assumed middle effect size ($R^2 = 0.13$), 18 predictors (including the constant) and a significance level of $\alpha = .05$ resulted in a statistical power of $1 - \beta = 0.87$ being sufficiently high (Hemmerich, 2019).

3. Results

3.1. Descriptive statistics

Personal, pregnancy-related, amnestic, and questionnaire-specific descriptive data can be found in Table 1.

Table 1. Descriptive statistics.

Variables	Frequencies <i>n</i> (%)	<i>M</i> (<i>SD</i>)
Type of pregnancy loss (PL)		
Miscarriage	137 (79.7%)	
Stillbirth	35 (20.3%)	
Week of pregnancy at time of loss ^a		14.71 (8.87)
Miscarriage		10.77 (3.79)
Stillbirth		30.11 (5.63)
Weight of the lost baby (in grams) ^b		1336.48 (1098.50)
Number of losses		1.60 (0.98)
Single loss	111 (64.5%)	
Multiple losses ^c	61 (35.5%)	
Living children		
Yes ^d	75 (43.6%)	1.28 (0.45)
No	97 (56.4%)	
Relationship status		
Single	3 (1.7%)	
In a relationship	49 (28.5%)	
Married	119 (69.2%)	
Separated	1 (0.6%)	
Job		
Without current employment	14 (8.1%)	
Currently employed	158 (91.9%)	
Education level		
Without school-leaving certificate	0 (0%)	
Certificate of secondary education	2 (1.2%)	
Qualifying certificate of secondary education	1 (0.6%)	
Intermediate school-leaving certificate	22 (12.8%)	
Subject-related entrance qualification	13 (7.6%)	
General qualification for university entrance	16 (9.3%)	
University degree	118 (68.6%)	
Psychotherapy within the last 12 months		
No	130 (75.6%)	
Yes	42 (24.4%)	
Psychotherapy before the last 12 months		
No	112 (65.1%)	
Yes	60 (34.9%)	
Psychiatric treatment within the last 12 months		
No	162 (94.2%)	
Yes	9 (5.2%)	
Without specification	1 (0.6%)	
Psychiatric drugs		
No	152 (88.4%)	
Yes	18 (10.5%)	
Without specification	2 (1.2%)	
Infertility treatment		
No	136 (79.1%)	
Yes	36 (20.9%)	
Previous abortion		
No	170 (98.8%)	
Yes	2 (1.2%)	
Time interval between loss and study participation in months		4.66 (3.09)
Subjective psychological distress at time of questionnaire completion (0–100)		55.05 (24.92)
Subjective psychological distress at time immediately after PL (0–100)		81.66 (21.49)
Subjective psychological impairment immediately after PL (0–100)		64.69 (29.39)
PFB dispute behaviour		4.91 (4.88)
PFB tenderness		20.48 (5.65)
PFB commonality		22.20 (4.82)
PFB sum score		67.77 (12.29)
PFB additional item		4.95 (0.95)
PHQ-D depression sum score		7.08 (4.84)

Notes. ^aWeek of pregnancy at time of loss ranged from three to 40 weeks. ^bThe weight of the lost baby was only assessed in case of PL \geq 21st week of pregnancy ($n = 31$ valid cases). It ranged from 165 to 3800 grams. ^cMultiple PLPL ranged from two to five losses. ^dIf present, the number of living children ranged from one to four children. Age of living children ranged from <1 to 19 years ($M = 3.91$, $SD = 2.27$).

3.2. Factor analysis and reliability (Brief-COPE)

For the principal component analysis with Varimax rotation, the requirements according to the KMO criterion (.67) and Bartlett's test ($\chi^2 [378, 172] = 1990.52$, $p < .001$) were fulfilled. The Kaiser-Guttman criterion suggested nine factors, while the Scree plot was less clear, indicating a solution between five and nine factors. Due to the ambiguous

interpretation of the Scree Plot, the solution with nine factors according to the Kaiser-Guttman criterion – which can be regarded as a standard criterion (Yeomans & Golder, 1982) – was chosen. This decision is supported by the adequate interpretability as well as overall satisfactory reliabilities of the factors thus obtained. The results of the factor analysis (loadings and suggested titles of factors) as well as descriptive statistics are shown in Table 1

Table 2. Titles of factors, descriptive statistics, and reliability of Brief-COPE.

Title of factors	<i>M</i>	<i>SD</i>	Cronbach's- α
1 Social support	11.90	2.83	.84
2 Self-blame and emotional avoidance	9.92	3.38	.77
3 Acceptance and positive reframing	10.22	2.96	.80
4 Active problem solving	8.62	2.12	.76
5 Substance consumption	2.66	1.18	.92
6 Humour	2.73	1.32	.81
7 Distraction	7.23	1.80	.54
8 Religion	3.30	1.66	.74
9 Negative emotionality	7.01	1.83	.58

(see Supplementary material, Appendix V) and Table 2.

3.3. Regression analysis

Table 3 shows the results of the linear regression model. It showed a significant difference between miscarriages and stillbirths in terms of depression scores ($\beta = .15$, $p = .035$), with women suffering a stillbirth reaching higher depression scores than women suffering a miscarriage. Furthermore, the presence of living children ($\beta = -0.17$, $p = .022$) represents a negative predictor for depressive symptoms. In addition, the results indicate a positive correlation with levels of depression of the coping pattern *self-blame and emotional avoidance*, ($\beta = 0.34$, $p < .001$). The same applies for the association of a short time interval between last PL and date of interview ($\beta = -0.15$, $p = .036$) with depression scores.

4. Discussion

To the best of our knowledge, this study is the first to simultaneously analyse potential risk factors for depression following PL within a large sample.

For the first time, the psychological constructs of relationship quality and coping were examined in their complexity, capturing various subfacets, as well as in combination with PL-specific factors.

Analysing the factor structure of the Brief-COPE, nine factors were extracted with mainly satisfactory reliabilities. In our data, we find support for the validity of our hypothesis: Women with living children showed lower depression scores than childless women. Our explorative analyses revealed higher depression scores for stillbirth (compared to miscarriage) as well as *self-blame and emotional avoidance*. Moreover, a short time interval between the last PL and the date of interview was found to be associated with a higher intensity of depression. In contrast, no association was found between the presence of multiple PL, relationship quality, and other coping strategies with the expression of depression symptoms. No age effects were found.

Our results showing higher depression rates for participants without living children correspond to those of Klier et al. (2002) and Farren et al. (2018) who reported a positive association between maternal depression and childlessness and a negative association between depressiveness and the number of living children after miscarriages. The results of the present study suggest that the associations found for women after miscarriage also apply to stillbirth, although this needs to be replicated in studies with paralleled groups (miscarriage versus stillbirth). If affected women already have at least one living child, one might assume that PL should interfere less fundamentally with general family and life planning and the desire to identify oneself as a mother. Further, interactions with children represent sources of positive reinforcement and provide a functional daily structure. From an attachment theory perspective,

Table 3. Multiple linear hierarchical regression analysis.

Variable	Standardized Beta coefficient β	<i>t</i>	<i>p</i>	95% CI	
				<i>LL</i>	<i>UL</i>
Intercept		1.94	.055	-0.19	18.40
Multiple losses	0.11	1.44	.152	-0.41	2.59
Type of pregnancy loss	0.15	2.13	.035*	0.13	3.52
PFB tenderness	-0.13	-1.32	.189	-0.27	0.05
PFB dispute behaviour	-0.06	-0.73	.468	-0.20	0.09
PFB commonality	-0.08	-0.85	.396	-0.28	0.11
Social support	-0.11	-1.35	.180	-0.46	0.09
Self-blame and emotional avoidance	0.34	4.76	< .001**	0.29	0.71
Acceptance and positive reframing	-0.11	-1.58	.117	-0.42	0.05
Active problem solving	-0.04	-0.50	.621	-0.41	0.24
Substance consumption	0.10	1.42	.158	-0.16	0.99
Religion	-0.14	-1.97	.051	-0.83	0.002
Humour	-0.10	-1.36	.176	-0.86	0.16
Distraction	0.09	1.27	.207	-0.14	0.62
Negative emotionality	0.16	2.08	.039	0.02	0.82
Age	-0.01	-0.11	.915	-0.17	0.15
Time interval between last pregnancy loss and date of interview	-0.15	-2.12	.036*	-0.45	-0.02
Presence of living children	-0.17	-2.31	.022*	-3.04	-0.24

Notes. * $p < .05$, ** $p < .001$, except for the PFB variables tenderness, dispute behaviour, and commonality as well as the coping factors social support, self-blame and emotional avoidance, acceptance and positive reframing, active problem solving, substance consumption, religion, humour, distraction, and negative emotionality, for which the *p*-value was Bonferroni-adjusted; CI = confidence interval; *LL* = lower limit, *UL* = upper limit. The following variable was excluded from the model: PFB sum score.

one can additionally expect that mothers already experience an intense bond with the living child or children (Field, 1996), which creates a sense of meaning.

Further, we found higher depression scores for stillbirths, compared to miscarriages. This is in line with descriptively elevated depression rates in previous studies with participants suffering from stillbirth (e.g. Gravensteen et al., 2012) in contrast to inconsistent findings regarding mothers suffering from miscarriage (e.g. Farren et al., 2016; Klier et al., 2002). However, there is a lack of studies allowing the direct comparison of women with previous miscarriages versus stillbirths regarding depression scores or the prevalence of depressive disorders. The higher depression scores could be due to a closer bond with the unborn in the case of stillbirths, as well as more concrete, already prepared family plans for the future compared to an earlier stage of PL. According to Howard (2008), the focus of the mother in the first trimester is primarily on being pregnant per se, with all its physical symptoms and risks. Conversely, a deeper attachment between mother and fetus develops particularly from the second trimester onwards, as described by Cannella (2005). Accordingly, it can be assumed that as the duration of the pregnancy progresses, the grief in the event of a loss increases, as gradually a mentally represented baby is mourned rather than an abstract concept.

Further, knowledge of increased risk of PL in the first trimester is widespread (Lidegaard et al., 2020), whereas later PL might be more unexpected for affected parents.

Emotional avoidance represents a typical clinical characteristic of depression (Kahn & Garrison, 2009) and self-blame is even an explicit depression symptom according to DSM-5 (American Psychiatric Association, 2013). Similarly to Burden et al. (2016) and Gold et al. (2018), whose participants occasionally attributed blame to themselves for the death of their baby after stillbirths/infant deaths, participants scoring high on the self-blame factor reported blaming themselves and feeling guilty. Emotional avoidance was notably pronounced when participants reported being unable to believe what had happened and convincing themselves that it was not true. Accordingly, these dysfunctional coping strategies, which have already been found to be linked to elevated levels of depression symptoms by Cacciatore et al. (2013) and Bennett et al. (2008), map onto a depressive attribution style of PL, which is in turn a well-known risk factor for manifest depressive disorders (Abramson & Seligman, 1978). The presumed underlying cognitive maladaptive attempt of control might require particularly prompt depression screenings and, if necessary, cognitive-psychotherapeutic interventions because of its direct reflection of a depressive processing pattern.

The association between a shorter time interval since the most recent PL and higher depression symptoms serves as evidence that the depression symptoms indeed represent a reaction to the event of loss, which needs to be confirmed in longitudinal studies. Furthermore, this finding is consistent with previous studies that also demonstrated a decrease in depressive symptoms over time following early losses (Farren et al., 2018) and stillbirths (Campbell-Jackson & Horsch, 2014).

It should be noted that a relatively high proportion of participants were engaged in psychotherapeutic treatment in the year prior to study enrollment. This may be attributed to individuals who perceived study participation as meaningful, particularly those experiencing significant psychological distress and hoping for improved psychosocial support as a result of the research. Consequently, it is imperative to replicate the findings obtained herein and assess their robustness.

In contrast to the significant results just mentioned, no association was found between multiple PL, relationship quality, and other coping strategies with depression symptoms after PL. In our study, an unequal distribution of single versus multiple PL was present, eventually underestimating the effect of multiple PL on depression scores. On the other hand, the type of PL could have a greater impact than the number of PL on the expression of depression symptoms.

As most subjects participated relatively soon after the PL, relevant associations of relationship quality and coping strategies during later processing after PL were probably not captured. Above all, the questionnaires measuring these psychological constructs were not specific to the situation after PL. Numerous items (e.g. 'When he/she tells something from his/her working world, he/she wants to hear my opinion about it.', PFB) were inappropriate and possibly incomplete for the specific sample in terms of content, which could also contribute to the lack of effects on depression. The PFB and Brief-COPE items are worded in such general terms that specific sub-aspects relevant only to relationship and coping strategies after PL may not be covered. For example, the PFB does not examine congruence in the grief management of both partners (Cassaday, 2018) and the Brief-COPE lacks a query concerning seeing or holding the deceased baby as a potential coping strategy (Cacciatore et al., 2008). In addition, most scales showed a very low scatter in the answers, so that only a limited spectrum of their expression was covered.

4.1. Strengths and Limitations

Compared to previous thematically related studies (e.g. Serrano & Lima, 2006), the present sample is significantly larger. To our knowledge, this is the first

study to consider official definitions of miscarriage and stillbirth according to §31(2) PStV, which approximates the WHO guidelines (World Health Organisation, 1975), and to relate these subgroups to depression symptoms. We are the first to include the whole range of gestation age at time of PL. Further, we assessed a large number of parameters of high practical relevance, which is a necessary prerequisite for the comprehensive identification of specific correlates of depressive disorders following PL. As far as we know, this is the first study to map relationship quality and coping strategies with subfacets as differentiated as possible and to examine both factors in parallel in their association with depression.

The negative association between the period between PL and study participation with depression symptoms indicates the validity of our study findings, as they are consistent with the overarching normative trajectory of depression symptoms (Bundesärztekammer et al., 2022) and the course of depressive symptoms found so far specifically after PL (Farren et al., 2018).

In contrast, the cross-sectional design and the lack of a control group represent methodological limitations of our study. Furthermore, future studies should also investigate depression at a diagnostic level using clinical diagnostic interviews. In a longitudinal study, it is also important to capture antenatal depression symptoms to assess their influence on the course or onset of depressive symptoms following a PL.

Since we did not consider the special case of medically indicated abortion as a separate subgroup, no statements can be made for specific psychological processing of affected women. Moreover, given a statistical power problem due to the large number of variables included, interaction effects could not be tested, which should be possible in future studies in even larger samples. An additional limitation is that relationship duration, baseline relationship satisfaction, baseline depressiveness or a history of depression, and aversive life events jointly managed as a couple prior to PL were not included as covariates in the analyses.

Contrary to its usual application as a questionnaire, the PHQ-D was used in an interview format in this study. In this context, it must also be mentioned that the PHQ-D was assessed after participants had answered several detailed questions about their PL in a personal virtual interaction, which might have caused biases in reported depression symptom scores. Statistical indices of the Brief-COPE show an ambiguous factor structure (see, e.g. Solberg et al., 2022) with partly low reliabilities, which again indicates the need for new questionnaires adapted for PL.

4.2. Future studies

Generally, future studies with a larger and more heterogeneous sample are necessary. In this context,

questionnaires to assess relationship quality and coping strategies specifically adapted for women after PL should be developed. Beyond that, other mental disorders such as anxiety disorders (Cumming et al., 2007), prolonged grief disorder (Kersting et al., 2007), and post-traumatic stress disorder (Farren et al., 2018) should also be explored in association with relationship quality and coping strategies following PL, since various dysfunctional responses to PL are conceivable, which would imply different intervention strategies. In future studies examining relationship quality, it is crucial to investigate the extent to which the psychological burdens experienced by partners following PL influence their association with the affected women's depressive symptoms.

4.3. Practical implications

In general, due to the high significance of PL for mental health this stressful life event must receive more attention in clinical practice. In particular, women after stillbirth and without living children should be screened for depressive symptoms early after their PL. Regarding concrete depression symptoms, self-blame and emotional emptiness should receive particular attention. At the current state of research, no recommendations can yet be made about protective factors or groups at low risk for depression.

Early identification of at-risk groups with regard to the development of depressive symptoms could establish a timely and individualised link to the clinical care system. This preventive approach would be accompanied by a reduction of the burden and impairment of affected women as well as relief of the health care system.

4.4. Conclusion

To the best of our knowledge, this is the first study to examine multiple potential correlates of depressive symptoms in parallel after PL. The sample studied was comparatively large and covered a wide range of gestation ages at the time of PL. Stillbirths, the absence of living children, *self-blame and emotional avoidance* as well as a short time interval between the last PL and the date of interview were associated with elevated depression scores in our sample. These results are highly relevant for daily gynaecological practice and should be replicated in more heterogeneous samples in longitudinal studies. Above all, questionnaires specifically adapted for women after PL are necessary, which could be used to identify at-risk patients in terms of depression symptoms.

Notes

1. PStV represents the German 'Personenstandsgesetz'.

2. Please note that terminations for medical reasons were not excluded.

Author contributions

Author contributions were as follows: CN: Conceptualization, Recruitment of participants, Data curation, Formal Analysis, Investigation, Methodology, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. SB: Conceptualization, Recruitment of participants, Data curation, Formal Analysis, Investigation, Methodology, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. RM: Methodology, Supervision, Writing – review & editing. SQ: Conceptualization. SH: Data curation, Recruitment of participants. Investigation. HH: Recruitment of participants. AKA: Conceptualization, Recruitment of participants, Supervision, Project administration, Writing – review & editing. KE: Supervision, Writing – review & editing.

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All data on which this article is based are freely available.

ORCID

Stefanie Rita Balle  <http://orcid.org/0000-0002-5320-9022>

Christine Nothelfer  <http://orcid.org/0000-0003-0485-9413>

Roland Mergl  <http://orcid.org/0000-0002-2829-6283>

Sarah Miriam Quaatz  <http://orcid.org/0000-0002-8299-2722>

Antje-Kathrin Allgaier  <http://orcid.org/0000-0003-3657-9133>

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