

The course of mental health after miscarriage and induced abortion: A longitudinal, five-year follow-up study.

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Abstract

Background: Miscarriage and induced abortion are life events with the potential to cause mental distress. The objective of this study was to explore whether there were different patterns in the normalization of mental health scores after these pregnancy termination events.

Methods: At the main hospital of Buskerud county in Norway, forty women who experienced miscarriage and eighty women who underwent an abortion were interviewed and completed the following questionnaires 10 days (T1), 6 months (T2), 2 years (T3), and 5 years (T4) after the pregnancy termination: Impact of Event Scale (IES), Quality of Life, Hospital Anxiety and Depression Scale (HADS), and feelings connected to the pregnancy termination. Statistical tests: Differential change in mean scores were explored by analyses of covariance (ANCOVA) and intergroup differences were assessed by ordinary least squares methods (OLS).

Results: Overall, women who experienced miscarriage had more mental distress ten days and six months after the pregnancy termination than women who underwent an abortion did. However, women who had a miscarriage showed significantly quicker improvement on the scores of IES avoidance, grief, loss, guilt, and anger throughout the observation period. Two and five years after the pregnancy termination, women with induced abortion had significantly greater scores of IES avoidance, guilt, shame, and also relief, than the miscarriage group (IES avoidance, mean at T3: 9.3 vs. 3.2, $p < 0.001$, at T4: 8.3 vs. 1.5, $p < 0.001$). Compared to the general population, women with induced abortion had significantly higher HADS anxiety scores at all four time points ($p < 0.01$ to $p < 0.001$), while women with miscarriage had significantly higher anxiety scores only at T1 ($p < 0.01$).

Conclusion: The course of psychological responses to pregnancy termination differed between miscarriage and abortion in the five years following the event. Women who underwent an abortion showed higher scores on some of the outcomes for the duration of the follow-up period. The difference in the course of the responses may partly result from the different characteristics of the two pregnancy termination events.

Introduction

Miscarriage has for a long time been viewed as a difficult and distressing life event for a woman [1-3]. Miscarriage may cause anxiety [4;5] and depression [6], and miscarriage may also be experienced as a traumatic life event [7;8].

Results from research on the psychological implications of abortion have been more equivocal and have resulted in debate, possibly because the theme is controversial on political, ethical, and social grounds [9-12]. A recent review of post-1990 research articles [13] concludes that anxiety symptoms are clearly identified as the most common adverse response, and that there has been an increasing understanding of abortion as a potential trauma. Recent studies have explored the traumatic aspects of abortion, with one study reporting that 1% of participants suffered from PTSD two years after the event [12], and another reporting that 10% of the women were traumatized (according to high levels on IES) six months after the induced abortion [14]. In our study [15] (same material as the present article), we found that two years after induced abortion, 18.1% of women were “cases” (scoring >19 points on one or both of the IES subscales).

Very few studies have compared the course of psychological responses after miscarriage and abortion. In some ways, induced abortion and miscarriage are similar life events; the women abort after a short term of pregnancy. However, the two life events differ in some important aspects. Miscarriage happens involuntarily and suddenly to women who were expecting to give birth a few months later. Abortion, on the other hand, is the result of a decision made after days or weeks of thinking, and the woman is mentally prepared when she arrives at the hospital. Nevertheless, the discovery of the pregnancy may have been a shock, and the time before the abortion can be distressing. The process of deciding to have an

abortion may be difficult, and the reason for electing to have an abortion can affect psychological responses after the event [16].

Thus, the social, moral, and psychological context of an induced abortion may be more complicated than that of a miscarriage, and may lead to different psychological responses. We hypothesized that women who undergo an induced abortion would have a more protracted course of mental disturbance compared to women who experience a miscarriage.

Therefore, in this study, we aimed to compare the mental health outcomes, measured by IES, Quality of Life, HADS, and feelings connected to the pregnancy termination, of women who either experienced a miscarriage or underwent an induced abortion, during the five years after the event.

Methods

In Norway, induced abortion within the first 12 weeks of pregnancy became an unconditional, legal right in 1978. Norway has approximately 4.6 million inhabitants, and each year, about 15 000 induced abortions and 8–10 000 miscarriages are treated in general hospitals (and only there).

Our study included 120 women between the ages of 18 and 45 years (80 who had an induced abortion and 40 who experienced miscarriage), treated in the gynecology department at Buskerud hospital (the main hospital in Buskerud county, situated in Drammen, a city of 55 000 citizens, 40 km west of Oslo, Norway) between April 1998 and February 1999. All women who had an induced abortion were < 13 weeks pregnant, and no terminations were due to fetal anomaly. Of the women who experienced miscarriage, one had a pregnancy of 21 weeks, while the rest were < 17 weeks pregnant. In our study, all surgery performed on the

women was completed under anesthesia, with the women leaving the hospital a few hours after the procedure. The staff contacted the women shortly after the abortion, while they were still in hospital. Those who agreed to participate in the study were then contacted by a female psychiatrist (ANB) who was working in the psychiatry department of the same hospital.

Two hundred and sixty-eight women were approached. Of these, 13 women were excluded based on the defined exclusion criteria as follows: 1) not Norwegian-speaking (n = 9); 2) mentally disabled or suffering from serious psychiatric illness (n = 3); 3) pregnancy following rape (n = 1).

Of the 255 women who were asked to participate, 120 (47%) agreed and were included (46% of the women who had an induced abortion and 50% of those who experienced miscarriage). For women who had an induced abortion, the response rate varied between 52% and 30%, according to the level of staff motivation, and which person asked the women. If nurse G. asked the women, 52% agreed to participate in the study. For several years, this nurse has had a special task of caring for women during the first hours after an induced abortion. She was genuinely interested in the project, and had a positive attitude towards taking part in it. When other staff members asked the women, only 30% wanted to participate. The project leader (who was also the interviewer) was not well known by the staff, and some of the staff were skeptical about the study being carried out in their department. At the beginning of December 1998, when all the women who had an induced abortion were included (except three), only half of the women with miscarriage were included. The project leader then had the opportunity to inform the staff herself, in a meeting lasting two hours. Several of the staff members said after this meeting that they had become much more positive about the project, and that they would now feel more comfortable when

asking women to participate in the study. Before this meeting, the inclusion rate of women who experienced miscarriage was 36.5%, while after the meeting it increased to 75%.

The mean age of the women who had an induced abortion and did or did not participate was 27.7 and 27.5 years, respectively (n.s.). The corresponding values for women with miscarriage were 30.1 and 30.5 years (n.s.). We had no demographic information other than the ages of the women who did not participate in the study.

The women were interviewed 10 days (T1), six months (T2), two years (T3) and five years (T4) after the abortion. The interviews were semi-structured and included self-administered questionnaires.

Of the 80 women who had an induced abortion, 74 completed the interviews at T2, 72 at T3, and 70 at T4. Of the 40 women who experienced miscarriage, all 40 completed at T2, 39 at T3, and 39 at T4. Thus, of the 120 women, 91% of those taking part in the project, and 43% of all eligible women, completed the study.

At T1, all the women were asked if they felt that the time after the pregnancy termination had been difficult. Twelve women did not feel that it had been difficult (one with miscarriage, eleven with induced abortion). All these women completed the study, including the interview at T4. Eleven women did not complete the study, represented by one woman who experienced miscarriage, and ten who had an induced abortion. Of these, the woman who miscarried and seven of the women who had an induced abortion said, when they were contacted for follow-up interviews, that they wanted to discontinue their participation in the study, because they felt it was too difficult for them to answer questions about the pregnancy termination.

All interviews were conducted face-to-face by the female psychiatrist, except two at T3 (one by telephone, one by mail) and nine at T4 (eight by telephone, one by mail).

The women's mental health before the pregnancy termination was measured in two ways, namely, by self-report, and a diagnostic evaluation by the interviewer.

A. Self-reported scale examining the previous need for psychiatric help, measured on a six-point scale

1. No help ever required from the health services;
2. No contact with, or help from, the health services, but the woman felt that, either once or several times earlier in her life, she needed professional help;
3. The woman had either once or several times consulted a general practitioner about psychological problems;
4. Previous contact with a private practitioner (psychiatrist or psychologist);
5. Previous treatment at a psychiatric outpatient clinic;
6. Previous inpatient treatment at a psychiatric clinic or at a clinic for substance abuse.

B. Diagnostic evaluation

After the first interview, the women were assigned one or more ICD-10 (International Statistical Classification of Diseases, 10th Revision) lifetime psychiatric diagnoses, if applicable. Based on a combination of the self-reporting and the diagnostic evaluation, we formed a new three-point scale, called *Former psychiatric health*:

1. Good. The woman rated herself as “1” or “2”, and she received no diagnosis from the psychiatrist.
2. Medium. The woman rated herself as “1” or “2”, but was given a diagnosis by the psychiatrist.
3. Previous psychiatric problems. The woman rated herself as “3”–“6”, and was given a diagnosis by the psychiatrist.

Questionnaires

The following questionnaires were completed at all time-points:

Impact of Event Scale (IES)

The Impact of Event Scale [17] has been widely used as a measure of stress reactions after a traumatic event. It has a two-factor structure, one measuring intrusion (flashbacks, bad dreams and strong feelings related to the traumatic event), and another measuring avoidance (of thoughts and feelings related to the event). Evaluation of the scale after 20 years of use [18] reported that IES is valuable in measuring stress reactions in a number of different populations. The type of event was shown to be a strong predictor of intrusive and avoidant symptoms in the time after the traumatic event.

The IES version that we used contained 15 questions. Seven questions dealt with intrusion and eight with avoidance. The women were asked to rate, on a scale from 0 to 5, their perceived level of the mentioned symptoms during the last week. The scale thus ranged from 0 to 35 on intrusion, and from 0 to 40 on avoidance. Examples of questions on the intrusion scale are: “I have had bad dreams about the pregnancy termination”. “Things I have seen or heard suddenly reminded me of the pregnancy termination”.

Examples of questions on the avoidance scale are: “I know that I have many pent-up feelings about the pregnancy termination, but I have pushed them away.” “I have tried not to talk about the pregnancy termination.” “I have not allowed myself to have thoughts about the pregnancy termination”.

A recent review [19] shows that the IES is a reliable index of the degree of subjective distress associated with a particular trauma. A high score on the IES, especially on the intrusion part, seems to be closely related to the presence of Acute Stress Disorder (ASD) or PTSD, as defined by DSM-IV. In our study, we did not use the specific criteria for assigning these diagnoses. We used the term “case”, defined as a score of >19 points on either of the two subscales, IES intrusion or IES avoidance, in line with common practice [20;21].

Quality of Life

The Quality of Life questionnaire we used consisted of twelve items. The women were asked to indicate how much each statement applied to their own lives during the last two weeks, indicating one of the five following answers: “Never, seldom, sometimes, often, all the time”. Examples of statements are as follows: “I have felt fit and strong”. “I have felt that life is worth living”. “I have felt close contact with another person”. The twelfth and last item was: “When you think about how you are doing nowadays, are you mostly content with your life, or mostly discontent?” To this last item, the women had six different alternatives when answering. The total score therefore ranged from 12 to 61 points; the higher the score, the better the quality of life. Cronbach’s alpha at the four time-points of interviews varied between 0.92 and 0.94. The questionnaire is a more comprehensive version of “Subjective Well-Being”, which has been used in other studies

in Norway [22-24]. The correlation between items in the version used in our study and “Subjective Well-Being” is 0.93. Normative values for this test are not available.

However, an indication of normative values may be found in a study that used the same material when investigating hypertension screening [22]: the mean score of 60 women aged 25–45 years was: 47.90 (SD = 7.60).

Hospital Anxiety and Depression Scale (HADS)

Zigmond and Snaith [25] introduced the HADS questionnaire in 1983. The questionnaire has proven to be valuable in detecting symptoms of anxiety and depression in a wide variety of patients [26]. It contains 14 questions; each rated from 0 to 3. Seven questions deal with anxiety during the last week, and seven with depression over the previous week. The score of anxiety thus ranges from 0 to 21 points, as does the depression score. As to normative values, we used data from a large population study that was completed in Norway in 1995–1997, the “HUNT” (Helse Undersøkelse Nord Trøndelag) study. This study was performed in the county of northern Trøndelag (situated in the central part of Norway, and containing about 3% of all people in Norway) [27]. Of all people between 20 and 89 years, 62 344 persons (67.7% of the total population) filled in valid ratings of HADS. The data were provided to us by courtesy of the Norwegian researcher, Dr. Eystein Stordal. Women aged 30–35 years ($n = 2879$) had the following mean scores: HADS anxiety = 4.6 ± 3.4 (SD), HADS depression = 2.6 ± 2.7 (SD). We used this age category for comparison, as the women in our study had mean ages of 30.1 years (miscarriage) and 27.7 years (induced abortion) at T1, and at T4 they were five years older.

Feelings connected to the abortion

Rating of the feelings after an induced abortion has been done in other studies [9;12;28] which used Likert-type scales ranging from 1 (not at all) to 5 (extremely). In our study, we used a similar scale. Specifically, we measured the intensity of various feelings that the women experienced at the time of the interview when asked to think about the abortion. The participants were asked to rate their feelings of relief, grief, loss, guilt, shame, and anger. For each feeling, they rated the intensity as: 1 = not at all; 2 = a little; 3 = a great deal; 4 = much; and 5 = very much.

Statistics

Statistical associations between pregnancy termination group and other categorical independent variables were tested using chi-square. Mean differences between pregnancy termination groups for continuous variables were tested by point-biserial r / ANOVA (t-tests). Significance of changes in mean scores over time within pregnancy termination groups was tested with paired-samples t-tests. Significance of differential change between groups was assessed by analyses of covariance (ANCOVA), using follow-up scores as the dependent variable, the pregnancy termination group and categorical confounders as factors and baseline scores for the outcomes as a linear covariate (using procedure GLM in SPSS). Effect sizes for change are expressed as Cohen's d . Partial product-moment correlations were computed between continuous outcome variables with linear controls for previous psychiatric health.

Results

The characteristics of the women are shown in table 1.

(Insert table 1 about here).

There were statistically significant differences between the two pregnancy termination groups regarding their marital status, number of children and vocational activity. These variables were thus possible confounders. As the outcomes of the study were related to mental outcomes, we also judged former psychiatric health (which was close to being significantly different between the two groups) to be a possible confounder.

Table 2 shows the mean scores from all mental health questionnaires in both pregnancy termination groups.

(Insert table 2 about here).

Concerning IES, women with miscarriage had significantly higher intrusion scores than women with induced abortion at T1 (17.6 vs. 11.9, $p < 0.01$), but not at any subsequent time-point. Women who had an induced abortion had significantly higher IES avoidance scores at all time points: At T1 (11.1 vs. 7.0, $p < 0.01$), T2 (9.7 vs. 5.9, $p < 0.05$), T3 (9.3 vs. 3.2, $p < 0.001$), and T4 (8.3 vs. 1.5, $p < 0.001$).

The cases on Impact of Event Scale (>19 points on each subscale) are shown in figures 1 and 2. Figure 1 shows the percentage of IES intrusion cases in both pregnancy termination groups in the five years after the event.

(Insert figure 1 about here).

Women who experienced miscarriage had a high percentage of intrusion cases initially, but no cases at later time-points: T1 = 47.5%, T2 = 20.0%, T3 = 0%, T4 = 0%. The corresponding figures for women with induced abortion were: T1 = 23.8%, T2 = 13.5%, T3 = 1.4%, T4 = 4.3%.

Figure 2 shows the percentage of IES avoidance cases in both pregnancy termination groups in the five years after the event.

(Insert figure 2 about here).

Women who experienced miscarriage had a rather low percentage of avoidance cases initially, with this percentage decreasing at subsequent time-points: T1 = 7.5%, T2 = 7.5%, T3 = 2.6%, T4 = 2.6%. Women who had an induced abortion had a sustained elevation of the percentage of avoidance cases across all four time-points (T1 = 12.5%, T2 = 18.9%, T3 = 16.7%, T4 = 18.6%).

The total percentage of women in both pregnancy termination groups who were cases on one or both IES subscales were as follows: women who experienced miscarriage at T1 = 47.5% T2 = 22.5% T3 = 2.6% T4 = 2.6%; women who had an induced abortion at T1 = 30.0% T2 = 25.7% T3 = 18.1% T4 = 20.0%.

Table 2 shows that the Quality of life scores were not significantly different between the two groups at any time-point and improved in both groups across the study period. The HADS scores were also not significantly different between the two groups. However, compared to the mean HADS scores of the general population, women who experienced miscarriage had significantly higher anxiety ($p < 0.01$) and depression ($p < 0.001$) scores at T1, but not at the later time-points. Compared to the general population, women who had an induced abortion had significantly higher anxiety scores at all four

time-points ($p < 0.001$ to $p < 0.01$), and significantly higher depression scores at T1 ($p < 0.001$) and T2 ($p < 0.05$).

Regarding feelings related to the pregnancy termination, women who experienced miscarriage had significantly more grief at T1, T2 and T3, and significantly more feelings of loss at T1 and T2. Women who had an induced abortion had significantly more relief than women with miscarriage at all time-points, but no increase across the five-year period. They also had significantly more guilt at T2, T3 and T4, and more shame at all time-points.

Comparing scores on the mental health outcomes in the two groups (Table 2) with controls for possible confounders (marital status, number of children, vocational activity, and former psychiatric health), resulted in IES avoidance at T1 and T2 no longer being statistically significant. Further, the difference between groups were reduced for IES avoidance at T3 ($p < 0.01$), IES avoidance at T4 ($p < 0.01$), guilt at T2 ($p < 0.05$), shame at T1 ($p < 0.01$), shame at T2 ($p < 0.01$), shame at T3 ($p < 0.05$). On the other hand, the differences between the groups became more statistically significant on IES intrusion at T1 ($p < 0.001$).

Table 3 shows the changes in mental health scores for all the women throughout the study period, controlled for all four possible confounders.

(Insert table 3 about here).

In both groups, the outcomes changed significantly from T1 to T4 on IES intrusion, IES avoidance, Quality of Life, HADS depression, grief, and anger, but not on HADS

anxiety, relief and shame. Women who experienced miscarriage also improved significantly on the feelings of loss and guilt, but this did not occur for women who had an induced abortion.

The mental health scores of the two pregnancy termination groups changed somewhat differently over the study period. From T1 to T4, levels of IES avoidance, grief, loss, guilt, and anger changed significantly more in women who experienced miscarriage compared to the other group. By contrast, levels of none of the outcomes changed significantly more in women who had an induced abortion compared to women who experienced miscarriage.

As the results from the study showed continued, elevated scores on IES avoidance, remaining two and five years after the event in women who had an induced abortion, partial correlations were completed between IES avoidance at T3 and T4, and the other mental health outcomes (HADS, Quality of Life, Feelings) at the corresponding time-points. The analyses showed statistically significant correlations (from $p < 0.05$ to $p < 0.001$) with all the negative health outcomes (except HADS depression at T3, and except HADS depression and less relief at T4). The analyses were controlled for former psychiatric health.

Discussion

Our hypothesis of a protracted course of psychological responses in women who had an induced abortion was supported by a few of the responses measured in this study.

Apparently, women who had a miscarriage experienced the sudden termination of pregnancy as a traumatic and sad life event. Almost half of the women were cases on IES

at T1, and they scored high on feelings of grief and loss at T1 and T2. In the five-year follow-up period they improved faster than women who had an induced abortion on IES avoidance, grief, loss, guilt, and anger.

The HADS anxiety scores were rather high, compared to the general population sample, especially in the induced abortion group. Anxiety was not reduced significantly from T1 to T4 in either group, and the rate of change from T1 to T4 was not significantly differently between women who experienced miscarriage or an induced abortion. Recent review articles indicate that anxiety seems to be more important after both miscarriage and induced abortion than has been acknowledged to date [4;13].

Women who had an induced abortion experienced a more protracted course of IES avoidance. Their IES avoidance scores stayed high and almost unchanged through the five years, while their IES intrusion scores fell as time passed. In the miscarriage group, both the IES subscales were reduced in parallel, as is more common in trauma responses. An explanation of the unusual and split course of IES in the induced abortion group is not obvious, but may result from the characteristics of the abortion event.

Thirty percent of the women who had an induced abortion were IES cases on one or both IES subscales at T1. Five years after the abortion, 20% were still cases. Most of these cases resulted from high IES avoidance scores. Being a case on IES indicates that the person suffers from some degree of mental distress, though it does not mean she is suffering from PTSD. However, IES is a psychological trauma test and is recommended for screening of possible PTSD cases [19]. For women who had an induced abortion, the partial correlation tests showed that high IES avoidance scores at T3 and T4 correlated with most of the concurrent negative mental health scores.

The elevated scores on guilt, shame and IES avoidance in women with induced abortion may need more attention. Several recent studies have focused on the relationship between guilt, shame, and PTSD [29-31]. One article states, “the affects of shame and guilt in particular can be very disabling, in so far as they ... effect help-seeking, and impede emotional processing of the event.” [32]. In our previous article [15], we found that feelings of guilt and shame 10 days after a pregnancy termination predicted high IES avoidance scores two years later (a statistical interaction effect made this tendency even more important for women who had an induced abortion). It is possible that feelings of guilt and shame connected to the induced abortion contribute to a slower improvement in mental health.

Women who had an induced abortion had high scores of relief throughout the study period. This indicates that their situation shortly before the abortion was experienced as very difficult and stressful. Other studies confirm this observation of relief after an induced abortion [9;12;33].

Limitations and strengths of the study:

The new scale “Former psychiatric health” may be a limitation of the study, as the validity and reliability of this scale has not been tested. However, the assessment was based on observations by an experienced psychiatrist, and on reports by the women on rather robust aspects of mental health, such as whether they had previously been treated for psychiatric problems or not. In most of the analyses we controlled for former psychiatric health, but even so, we cannot exclude possible bias due to (unmeasured)

differences in mental health between the two pregnancy termination groups prior to the event.

The low participation rate (47%) is a limitation of the study. Regarding the nature and direction of a possible selection bias, a former study has shown that those not participating in studies like these have more problems than those participating [34]. Another report [35] showed that there had been a selection bias in a study on how women experienced induced abortion a year after the event. One third of the women did not want to participate, and these women were overrepresented on certain socio-demographic factors (young, unmarried, low educational status), which in studies about other medical problems have been shown to be associated with increased vulnerability and morbidity. Even so, the fact remains, that we do not know what women not participating in the study would have scored on the psychological tests.

Another limitation is the selection of the participants throughout the study. As described in the methods section, there was an overrepresentation of women who were managing better with the termination among those who completed the whole study. This was particularly true for women who had an induced abortion. Thus, the results at T2, T3 and T4 may have been biased in the direction of showing too favorable results on the mental health outcomes.

The high follow-up rate (109 of 120 women, 91%, completed all four interviews) and the long time of the follow-up strengthen the study.

Conclusion

The responses of women in the miscarriage group were approximately those that are expected after a traumatic and sad life event. Women in the induced abortion group however had more atypical responses. The more complex nature of the induced abortion event may account for differences in the course of psychological responses between the two groups. Women in both groups should be given information about common psychological responses to pregnancy termination, and follow-up talks with health personnel should be offered those women most affected by the event.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

ANB contributed to the design of the study, made all the interviews, participated in the analyses of the data, drafted and completed the manuscript. TM made the analyses of the data, participated in drafting the manuscript, and revised it critically for intellectual content. ASB contributed to the design of the study, to the acquisition of data, and revised the manuscript critically for intellectual content. ØE contributed to the design of the study, to the interpretation of data, and revised the manuscript critically for intellectual content. All the authors have read and approved the final manuscript.

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Approval

The study was approved by the Norwegian Regional Ethical Committee.

Reference List

1. Frost M, Condon JT: **The psychological sequelae of miscarriage: a critical review of the literature.** *Aust N Z J Psychiatry* 1996, **30**:54-62.
2. Klier CM, Geller PA, Ritsher JB: **Affective disorders in the aftermath of miscarriage: a comprehensive review.** *Arch Women Ment Health* 2002, **5**:129-149.
3. Thapar AK, Thapar A: **Psychological sequelae of miscarriage: a controlled study using the general health questionnaire and the hospital anxiety and depression scale.** *Br J Gen Pract* 1992, **42**:94-96.
4. Brier N: **Anxiety after miscarriage: a review of the empirical literature and implications for clinical practice.** *Birth* 2004; **31**:138-142.
5. Geller PA, Klier CM, Neugebauer R: **Anxiety disorders following miscarriage.** *J Clin Psychiatry* 2001, **62**:432-438.
6. Klier CM, Geller PA, Neugebauer R: **Minor depressive disorder in the context of miscarriage.** *J Affect Disord* 2000, **59**:13-21.
7. Bowles SV, James LC, Solursh DS, Yancey MK, Epperly TD, Folen RA et al: **Acute and post-traumatic stress disorder after spontaneous abortion.** *Am Fam Physician* 2000, **61**:1689-1696.
8. Engelhard IM, van den Hout MA, Arntz A: **Posttraumatic stress disorder after pregnancy loss.** *Gen Hosp Psychiatry* 2001, **23**:62-66.
9. Adler NE, David HP, Major BN, Roth SH, Russo NF, Wyatt GE: **Psychological factors in abortion. A review.** *American Psychologist* 1992, **47**:1194-1204.
10. Gissler M, Hemminki E, Lonnqvist J: **Suicides after pregnancy in Finland, 1987-94: register linkage study.** *BMJ* 1996, **313**:1431-1434.

11. Kero A, Hogberg U, Lalos A: **Wellbeing and mental growth-long-term effects of legal abortion.** *Soc Sci Med* 2004, **58**:2559-2569.
12. Major B, Cozzarelli C, Cooper ML, Zubek J, Richards C, Wilhite M et al: **Psychological responses of women after first-trimester abortion.** *Arch Gen Psychiatry* 2000, **57**:777-784.
13. Bradshaw Z, Slade P: **The effects of induced abortion on emotional experiences and relationships: a critical review of the literature.** *Clin Psychol Rev* 2003, **23**:929-958.
14. Perrin E, Bianchi-Demicheli F: **Sexual life, future of the couple, and contraception after voluntary pregnancy termination. Prospective study in Geneva (Switzerland) with 103 women.** *Rev Med Suisse Romande* 2002, **122**:257-260.
15. Broen AN, Moum T, Bodtker AS, Ekeberg O: **Psychological Impact on Women of Miscarriage Versus Induced Abortion: A 2-Year Follow-up Study.** *Psychosom Med* 2004, **66**:265-271.
16. Broen AN, Moum T, Bodtker AS, Ekeberg O: **Reasons for induced abortion and their relation to women's emotional distress: a prospective, two-year follow-up study.** *Gen Hosp Psychiatry* 2005, **27**:36-43.
17. Horowitz M, Wilner N, Alvarez W: **Impact of Event Scale: a measure of subjective stress.** *Psychosomatic Medicine* 1979, **41**:209-218.
18. Sundin EC, Horowitz MJ: **Horowitz's Impact of Event Scale evaluation of 20 years of use.** *Psychosom Med* 2003, **65**:870-876.
19. Joseph S: **Psychometric evaluation of Horowitz's Impact of Event Scale: a review.** *J Trauma Stress* 2000, **13**:101-113.
20. Salvesen KA, Oyen L, Schmidt N, Malt UF, Eik-Nes SH: **Comparison of long-term psychological responses of women after pregnancy termination due to fetal anomalies and after perinatal loss.** *Ultrasound Obstet Gynecol* 1997, **9**:80-85.

21. Winje D: **Long-term outcome of trauma in adults: the psychological impact of a fatal bus accident.** *J Consult Clin Psychol* 1996, **64**:1037-1043.
22. Moum T, Naess S, Sorensen T, Tambs K, Holmen J: **Hypertension labelling, life events and psychological well-being.** *Psychol Med* 1990, **20**:635-646.
23. Roysamb E, Harris JR, Magnus P, Vitterso J, Tambs K: **Subjective well-being. Sex-specific effects of genetic and environmental factors.** *Pers Individ Dif* 2002, **32**:211-213.
24. Roysamb E, Tambs K, Reichborn-Kjennerud T, Neale MC, Harris JR: **Happiness and health: environmental and genetic contributions to the relationship between subjective well-being, perceived health, and somatic illness.** *J Pers Soc Psychol* 2003, **85**:1136-1146.
25. Zigmond AS, Snaith RP: **The hospital anxiety and depression scale.** *Acta Psychiatr Scand* 1983, **67**:361-370.
26. Herrmann C: **International experiences with the Hospital Anxiety and Depression Scale--a review of validation data and clinical results.** *J Psychosom Res* 1997, **42**:17-41.
27. Stordal E, Bjelland I, Dahl AA, Mykletun A: **Anxiety and depression in individuals with somatic health problems. The Nord-Trondelag Health Study (HUNT).** *Scand J Prim Health Care* 2003, **21**:136-141.
28. Adler NE: **Emotional responses of women following therapeutic abortion.** *Am J Orthopsychiatry* 1975, **45**:446-454.
29. Leskela J, Dieperink M, Thuras P: **Shame and posttraumatic stress disorder.** *J Trauma Stress* 2002, **15**:223-226.
30. Stone AM: **The role of shame in post-traumatic stress disorder.** *Am J Orthopsychiatry* 1992, **62**:131-136.

31. Street AE, Arias I: **Psychological abuse and posttraumatic stress disorder in battered women: examining the roles of shame and guilt.** *Violence Vict* 2001, **16**:65-78.
32. Lee DA, Scragg P, Turner S: **The role of shame and guilt in traumatic events: a clinical model of shame-based and guilt-based PTSD.** *Br J Med Psychol* 2001, **74**:451-466.
33. Adler NE, David HP, Major BN, Roth SH, Russo NF, Wyatt GE: **Psychological responses after abortion.** *Science* 1990, **248**:41-44.
34. Weisaeth L: **Importance of high response rates in traumatic stress research.** *Acta Psychiatr Scand Suppl* 1989, **355**:131-137.
35. Soderberg H, Andersson C, Janzon L, Sjoberg NO: **Selection bias in a study on how women experienced induced abortion.** *Eur J Obstet Gynecol Reprod Biol* 1998, **77**:67-70.

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