

This Provisional PDF corresponds to the article as it appeared upon acceptance. The fully-formatted PDF version will become available shortly after the date of publication, from the URL listed below.

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

BMC Medicine 2005, 3:18 doi:10.1186/1741-7015-3-18

Anne Nordal Broen (a.n.broen@medisin.uio.no)
Torbjorn Moum (torbjorn.moum@medisin.uio.no)
Anne Sejersted Bodtker (abodtker@online.no)
Oivind Ekeberg (oivind.ekeberg@medisin.uio.no)

ISSN 1741-7015

Article type Research article

Submission date 8 Jul 2005

Acceptance date 12 Dec 2005

Publication date 12 Dec 2005

Article URL <http://www.biomedcentral.com/content/3/1/18>

Like all articles in BMC journals, this peer-reviewed article was published immediately upon acceptance. It can be downloaded, printed and distributed freely for any purposes (see copyright notice below).

Articles in BMC journals are listed in PubMed and archived at PubMed Central.

For information about publishing your research in BMC journals or any BioMed Central journal, go to

<http://www.biomedcentral.com/info/authors/>

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

Anne Nordal Broen ^{1§}, Torbjørn Moum ¹, Anne S. Ejersted Bødtker ², Øivind Ekeberg ¹

¹Department of Behavioral Sciences, Institute of Basic Sciences in Medicine, University of Oslo, P.O. Box 1111 Blindern, 0317 Oslo, Norway

²Department of Obstetrics and Gynecology, Buskerud Hospital, 3000 Drammen, Norway

[§] Corresponding author

Email addresses:

ANB: a.n.broen@medisin.uio.no

TM: torbjorn.moum@medisin.uio.no

ASB: abodtker@online.no

ØE: ovind.ekeberg@medisin.uio.no

Abstract

Background

Miscarriage and induced abortion are related events that can potentially cause mental distress. The objective of this study was to determine whether there are differences in the patterns of normalization of mental health consequences between pregnancy termination events.

Methods

Forty women who experienced miscarriage and 80 women who underwent abortions at the same hospital in Buskerud County in Norway were interviewed. All subjects completed the following questionnaires 10 days (T1), six months (T2), two years (T3) and five years (T4) after the pregnancy termination: Impact of Events Scale (IES), Quality of Life, Hospital Anxiety and Depression Scale (HADS), and a number addressing their feelings about the pregnancy termination. Differential changes in means were tested by analysis of covariance (ANCOVA) and inter-group differences were assessed by ordinary least squares methods.

Results

Women who had experienced a miscarriage had more mental distress at 10 days and six months after pregnancy termination than women who had undergone an abortion. However, women who had a miscarriage exhibited significantly greater improvement on IES scores for avoidance, grief, loss, guilt and anger throughout the observation period. Women who had experienced an abortion had significantly greater IES scores for avoidance and reported feelings of guilt, shame and relief than the miscarriage group at two and five years after pregnancy termination (IES avoidance means: 3.2 vs 9.3 at T3, respectively, p

<0.001; 1.5 vs 8.3 at T4, respectively, $p < 0.001$). Compared with the general population, women who had undergone a spontaneous abortion had significantly higher HADS anxiety scores at all our interviews ($p < 0.01$ to $p < 0.001$), while women who had a miscarriage had significantly higher anxiety scores only at T1 ($p < 0.01$).

Conclusion

The course of psychological responses to miscarriage and abortion differed in the five-year period after the event. Women who had undergone an abortion exhibited higher scores during the follow-up period for some outcomes. The differences in the course of responses may partly result from the different characteristics of the two pregnancy termination events.

Background

Miscarriage is regarded as a difficult and stressful life event for women [1–3]. It can cause anxiety [4,5] and depression [6], and can also be experienced as a traumatic life event [7,8]. Results from research note the psychological implications of an abortion are equivocal, and this has resulted in much debate, possibly because of the historical, political, ethical and social grounds [9–12]. A recent review of post-1990 research articles [13] concluded that anxiety symptoms are not common adverse responses, and that our understanding of an abortion's potential to cause trauma has increased. Recent studies have explored the traumatic aspects of an abortion. One study reported that 1% of participants suffered from post-traumatic stress disorder (PTSD) two years after the event [12], and another reported that 10% of women were traumatized (according to a high Impact of Events Scale [IES] score) six months after the induced abortion [14]. In a previous study [15] in which the subjects were the same as those evaluated in this study, we found that 18.1% of women were classified as “cases” (>19 points on one or both of the IES subscales) two years after an induced abortion.

Very few studies have compared the course of psychological responses after miscarriage with that after an abortion. Induced abortion and miscarriage are similar life events in that women abort either as a result of pregnancy. However, the two life events differ in important respects. Miscarriage happens involuntarily and is usually to women who were expecting to give birth a few months later, whereas an abortion is a planned and known event. Women with unintended pregnancies include those who are not content but have not finished their education or already have a number of children they desire. This category also includes women who have a desire for an abortion because of financial

difficulties, unstable relationships or chronic mental illness. A study conducted by the Norwegian Institute of Health Research (HI) in 1998 found that the decision to abort is often made under pressure, and that women who abort often experience regret and psychological distress. Nevertheless, the discovery of fetal abnormalities can be a shock, and the period prior to the abortion can be very stressful. The process of deciding whether to abort can be difficult, and the reasons for electing to abort are often complex and multifaceted. The psychological responses after the event [16]. Thus, the social, moral and psychological context of a decision to abort may be more complicated than that of a miscarriage, and may result in different psychological responses.

We hypothesized that women who have undergone an induced abortion will have a more protracted course of mental disturbance than women who have experienced a miscarriage. Therefore, we compared them with those who either experienced a miscarriage or underwent an induced abortion over a period of five years after the event using IES, Quality of Life, the Hospital Anxiety and Depression Scale (HADS), and feelings connected to the pregnancy termination.

Methods

In Norway, induced abortion within the first 12 weeks of pregnancy became a non-conditional legal right in 1978. Norway has approximately 4.6 million inhabitants; about 15,000 induced abortions and 8,000–10,000 miscarriages are treated in general hospitals per annum.

This study was approved by the Norwegian Regional Ethics Committee. Our study comprised 120 women between the ages of 18 and 45 years (80 of whom had had an induced abortion and 40 of whom had experienced a miscarriage), who were treated in the gynecology department of Buskerud Hospital between April 1998 and February 1999.

Buskerud Hospital is situated in Buskerud County and is located 40 km west of Oslo, Norway. All women who had an induced abortion were included in the study. The study was conducted in the department of obstetrics and gynaecology at Buskerud Hospital. The study was approved by the local ethics committee. All women gave their informed consent before participating in the study. The study was conducted between 1998 and 2000. The study was conducted in the department of obstetrics and gynaecology at Buskerud Hospital. The study was approved by the local ethics committee. All women gave their informed consent before participating in the study. The study was conducted between 1998 and 2000.

Two hundred and sixty-eight women were approached. Of these, 13 were excluded for the following reasons: (1) not Norwegian-speaking (n = 9); (2) mentally ill (n = 3); and (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 had experienced a miscarriage). For women who had an induced abortion, the response rate varied between 52% and 30%, depending on staff motivation and the person who asked the women to participate. Within 2 weeks, 52% agreed to participate in the study. For several years, this was the case during the first hour after an induced abortion. She was genuinely interested in the project and had a positive attitude towards taking part in it. When the staff members asked the women, only 30% agreed to participate. The project leader (who was also the interviewer) was not well known to the staff, and some of the staff were kept in the dark about the study being carried out in their department. At the beginning of December 1998,

whena llbut t hreeo ft he womenw hoha dha d ani nducedabortionw erei ncluded, onl y halft hew omenw hoh ad hada m iscarriagew erei ncluded. T hepr ojectl eadert henha dt he opportunityt oa ddresst hes taffa t am eeting hatl astedf ort wohour s. Aftert hism eeting, severals taffm emberss aidt hatt heyw erem uchm orepos itivea boutt hepr ojectt han previously, andt hatt hey feltm orecomforablea bouta skingw oment opa rticipatei nt he study. B eforet hism eeting, t hei nclusionr ateof w omenw hoha de xperienceda miscarriage was36.5% ; aftert hem eetingi ti ncreasedt o75% .

Them eana gesof t hew omenw hoha dha d ani nducedabortiona nndi do r didnot participat ew ere27.7 and27.5 years, r espectively (nots taticallys ignificant[n.s.]). T he correspondingv aluesf or womenw hoha dha d am iscarriagew ere30.1a nd 30.5 years (n.s.). W eha dnodemographici nformationot hert hana gef ort hew omen whodi dnnot participatei nt hes tudy.

Thew omenw erei nterviewed10da ys (T1),s ixm onths(T2),t wo years(T3),a nd five years(T4) aftert hee ndof pr egnancy. T hei nterviewsw eres emi-structureda nd includedself-administeredque stionnaires. O ft he 80w omenw hoha dha d ani nduced abortion,74c ompletedt hei nterviewsa tT 2,72 atT 3,a nd70a tT 4. O ft he 40w omen whoha de xperienceda m iscarriage,40c ompleted thei nterviewsa tT 2,39a tT 3,a nd39 atT 4. T hus,of t he120w oment akingp arti nt hep roject,91% (43%of e ligiblew omen) completedt hes tudy.

AtT 1,a llthew omenw erea skedi ft heyf eltt hatt het imea ftert hep regnancy terminationha dbe endi ffcult. T welvew omendi dnnot f eelt hati tha dbe en difficult(one ofw homha dha d am iscarriage,11a ni nducedabortion). A llthesew omenc ompletedt he study. E leven womendi dnnot c ompletet hes tudy, oneof w homexperienceda m iscarriage

and 10 of whom had induced abortion. Of these, the woman whom I carried and seven of the women who had induced abortions said that they would not continue their participation in the study because it was too difficult for them to answer questions about her pregnancy termination.

All interviews were conducted face-to-face by a female psychiatrist, except for two (T3 (one by telephone, one by mail) and T4 (eight by telephone, one by mail)). The women's mental health before her pregnancy termination was measured by self-report and by diagnostic evaluation by the interviewer.

A. Self-reported six-point scale assessment of her previous need for psychiatric help

1. No help ever required from health services.
2. No contact with health services, but the woman felt that she had needed professional help on previous occasions.
3. The woman had 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 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. We devised a three-point scale, the Former Psychiatric Health Scale, based on a combination of the self-reporting assessment and the diagnostic evaluation:

1. Good. The woman rated herself as 1 or 2 and 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 interviews.

Impact of Events Scale (IES)

The Impact of Events Scale [17] has been widely used as a measure of stress reactions after traumatic events. It has a two-factor structure: one measures intrusion (flashbacks, bad dreams, and strong feelings related to the traumatic event) and the other measures avoidance of thoughts and feelings related to the event. An evaluation of the scale after 20 years of use [18] reported that IES has been a valuable form of 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 after the traumatic event.

The IES version that we used contained 15 questions. Seven questions dealt with intrusion and eight dealt with avoidance. The women were asked to rate, on a scale from 0 to 5, the frequency of specified symptoms during the previous week. The scale thus ranged from 0 to 35 for intrusion and from 0 to 40 for avoidance. Examples of

questions on their intrusions came to: "I have had dreams about pregnancy termination" and "Things I have seen or heard suddenly reminded me of pregnancy termination." Examples of questions on their avoidances came to: "I know that I have many pent-up feelings about pregnancy termination, but I have pushed them away", "I have not thought about pregnancy termination", and "I have not allowed myself to have any thoughts about pregnancy termination".

As recently reviewed [19] showed that the IES is a reliable index of the degree of subjective distress associated with a particular trauma. Although scores on the IES, especially on their intrusions scale, seem to be closely related to the presence of a current Stress Disorder (ASD) or PTSD, as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). In our study, we did not use specific criteria for assigning these diagnoses but used the term "case", defined as a score of > 19 points on either of the two subscales, IES intrusions or IES avoidance, as is common practice [20,21].

Quality of Life

The Quality of Life questionnaire that we used consisted of 12 items. The women were asked to choose between "never", "seldom", "sometimes", "often" or "all the time" to indicate the extent to which each of 12 statements applied to their lives during the previous two weeks. Examples of statements are: "I felt that life is worth living", and "I feel lost or no other person". The well-being scale was "When you think about how you are doing now days, are you mostly content with your life, or mostly discontent?" To this scale, the women were allowed to select from six different alternative answers. Thus, the total score ranged from 12 to 61 points; the

highest scores, the difference between the two groups was significant. Cronbach's alpha for our 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 the two instruments is 0.93. Normative values for this instrument are not available. However, a indication of normative values may be found in other studies that have examined the same material to investigate hypertension screening [22]; the mean score for 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 was shown to be a valuable indicator of 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 previous week, and seven questions deal with depression during the previous week. The scores for anxiety and depression range from 0 to 21 points. For normative values, we used data from the "HUNT" (Helseundersøkelse Nord-Trøndelag) study, a large population study conducted in Norway from 1995 to 1997. This study was performed in the county of Northern Trøndelag (situated in the central part of Norway and containing about 3% of the population of Norway) [27]. Of the people aged between 20 and 89 years, 62,344 (67.7% of the total population) completed a rating of HADS. The data were kindly provided by Dr. Eystein Sordal. Women aged 30–35 years (n = 2,879) had the following mean scores: HADS anxiety = 4.6 ± 3.4 , HADS depression = 2.6 ± 2.7 . We used this category for comparison because the women in

ours study had a mean age of 30.1 years (miscarriage) and 27.7 years (induced abortion) at T1, and 35.1 and 32.7 at T4, respectively.

Feelings associated with the abortion

Feelings after an induced abortion have been reported in other studies [9, 12, 28], which used Likert-type scales ranging from 1 (not at all) to 5 (extremely). We used a similar scale to measure the intensity of various feelings that women experienced at the time of the interview when they had their 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 either 1 (not at all), 2 (a little), 3 (a great deal), 4 (much) or 5 (very much).

Statistics

This study was designed to detect “medium” effects when comparing the two abortion groups (defined as 0.5 by Cohen [29]) and requiring ample sizes of approximately 70 individuals for each group when the alpha [type I] error level is set at 5% and the beta [type II] error level is set at 10%. As a result, our study groups contained 70 (induced abortion) and 39 (miscarriage) participants at T4, yielding statistical powers slightly above 70% for medium-sized effects and above 98% for “large (>0.80) effects. This was considered satisfactory for our purposes.

Statistical associations between both pre-pregnancy termination groups and their categorical independent variables were tested using the χ^2 test. Mean differences between pregnancy termination groups for continuous variables were tested by independent serial t/ANOVA (t-tests). The significance of changes in means scores over time within each pregnancy termination group was tested with paired-sample t-tests. The significance of

differential changes between groups was assessed by analysis of covariance (ANCOVA), using follow-ups as a continuous variable, pregnancy termination group as a categorical confounder as factors, and baseline scores of the outcome variables as covariates (using the General Linear Model procedure of SPSS). Effects sizes or changes are expressed as Cohen's d [29]. Partial product-moment correlations were computed between continuous outcome variables with linear controls for previous psychiatric illness.

Results

The characteristics of the two groups are shown in Table 1. There were statistically significant differences between the two pregnancy termination groups regarding their marital status, number of children and vocational activity. Therefore, these variables are possible confounders. As the outcomes of this study were related to mental outcomes, we also considered former psychiatric illness (which was lost to being significantly different between the two groups) to be a possible confounder.

Table 2 shows the mean scores from the mental health questionnaires for each pregnancy termination group. The results of Table 2 are illustrated in the figures below.

At T1, women who had experienced a miscarriage had significantly higher IES intrusions scores than those of women who had experienced an induced abortion (17.6 vs 11.9, respectively; $p < 0.01$), but this was not the case at any subsequent time-point.

Women who had had an induced abortion had IES avoidance scores significantly higher than those of women who had had a miscarriage at T1 (11.1 vs 7.0, respectively; $p < 0.01$), T2 (9.7 vs 5.9, respectively; $p < 0.05$), T3 (9.3 vs 3.2, respectively; $p < 0.001$), and T4 (8.3 vs 1.5, respectively; $p < 0.001$).

The cases of the IES (> 19 points on the subscale) are shown in Figures 3 and 4. Figure 3 shows the percentage of IES intrusion cases in the pregnancy termination group during the five years after the event.

The group of women who had experienced an miscarriage initially had a high percentage of intrusion cases, but there were no cases at later interviews: T 1 = 47.5%, T 2 = 20.0%, T 3 = 0%, T 4 = 0%. The corresponding values for women who had induced abortions were: T 1 = 23.8%, T 2 = 13.5%, T 3 = 1.4%, T 4 = 4.3%.

Figure 4 shows the percentages of IES avoidance cases in the pregnancy termination group during the five years after the event.

Women who had experienced an miscarriage had a relatively low initial percentage of avoidance cases, which increased at subsequent interviews: T 1 = 7.5%, T 2 = 7.5%, T 3 = 2.6%, T 4 = 2.6%. Among women who had had an induced abortion, the number of avoidance cases was consistently elevated at all our interviews (T 1 = 12.5%, T 2 = 18.9%, T 3 = 16.7%, T 4 = 18.6%). The total proportion of women who had experienced an miscarriage, and T 1 = 30.0%, T 2 = 25.7%, T 3 = 18.1%, T 4 = 20.0% of women who had had an induced abortion.

Figure 5 shows that the quality of Life scores were not significantly different between the two groups at any time and that they improved in both groups during the study period.

The HADS scores (Figures 6 and 7) were not significantly different between the two groups. However, compared with the mean HADS scores of the general population, women who had experienced an miscarriage had significantly higher anxiety ($p < 0.01$) and depression ($p < 0.001$) scores at T 1, but not at later interviews. Compared with

these general population, women who had an induced abortion had significantly higher anxiety scores at all four interviews ($p < 0.001$ 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 had experienced a miscarriage had significantly more grief at T1, T2 and T3 and significantly more feelings of loss at T1 and T2 than their group. Women who had an induced abortion had significantly more relief at all interviews than women who had a miscarriage, but this variability did not increase during the five-year period. They also had significantly more guilt at T2, T3 and T4, and more shame at all interviews.

When scores for mental health outcomes of the two groups (Table 2) were compared with those of controls for possible confounders (marital status, number of children, vocational activity and former psychiatric illness), differences in IES avoidance at T1 and T2 were not statistically significant. Furthermore, the difference between groups was 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 ($p < 0.01$) and shame at T3 ($p < 0.05$). Overall, however, the difference between groups was not statistically significant for IES intrusion at T1 ($p < 0.001$).

Table 3 shows how these changes in mental health scores for all women throughout the study period after all possible confounders are controlled for.

In both groups, the outcomes changed significantly from T1 to T4 for IES intrusion, IES avoidance, Quality of Life, and HADS depression, grief and anger, but not for HADS anxiety, relief or shame. Women who had experienced a miscarriage also had

significantly ameliorated feelings of loss and guilt over the period of observation, but this was not true of women who had a miscarriage.

The pattern of changes in mental health scores over the study period differed between the women who had a miscarriage and those who had an induced abortion. The changes in levels of IESa avoidance, grief, loss, guilt and anger from T1 to T4 were significantly greater for women who had experienced a miscarriage than for those who had an induced abortion. In contrast, none of the outcomes changed significantly more for women who had a miscarriage than for those who had an induced abortion.

Because the results of the study revealed that elevated scores for IESa avoidance persisted for two and a half years after the event for women who had an induced abortion, partial correlations were estimated between IESa avoidance at T3 and T4 and mental health outcomes, HADS, Quality of Life, and feelings at the corresponding interviews. There were statistically significant correlations (from $p < 0.05$ to $p < 0.001$) with all these outcomes (except HADS depression at T3 and HADS depression and illness at T4). These analyses controlled for other psychiatric health.

Discussion

Our hypothesis that there would be a protracted course of psychological responses in women who had an induced abortion was supported by some of the responses measured in this study. Women who had a miscarriage experienced the sudden termination of pregnancy as traumatic and devastating. Almost half the women were “cases” according to their score on the IESa at T1, and they continued to have feelings of grief and loss at T1 and T2. During the five-year follow-up period, they improved more

rapidly according to their consistent use of IES avoidance, grief, loss, guilt and anger than women who had an induced abortion.

In both groups, the HADS anxiety scores were higher relative to those of the general population. This was especially true for the induced abortion group, for which mean anxiety scores were statistically significantly higher than those of the general population in all our interviews. Anxiety after induced abortion has been the topic of other studies. Higher rates of subsequent generalized anxiety were recently reported among abortifacient women than among women who had conceived and intended pregnancy or term [30]. The authors stated that no causal relationship between pregnancy outcome and anxiety could be determined. Despite this, their remark that their findings of more generalized anxiety among abortifacient women were consistent with their results of other studies, which also noted that anxiety was a possible negative effect of induced abortion [13,31]. In our study, abortifacient women had somewhat higher (although non-significant) levels of anxiety than miscarriage women. This finding may imply that induced abortion resulted in more anxiety than miscarriage. However, the mean level of anxiety for abortifacient women was poorer (almost statistically significantly) than that of miscarriage women prior to their pregnancy termination event. Therefore, we cannot infer that induced abortion caused the elevated anxiety of the induced abortion group relative to that of the miscarriage group.

The induced abortion group had significantly higher anxiety scores than the general population in all interviews, whereas the miscarriage group only had significantly higher anxiety scores at T1. This indicates that the mental health of the abortifacient women was different from that of the general population before and after the abortion event.

that the induced abortion led to anxiety that persisted for several years after the abortion. An appropriate experimental design is required to answer this question.

Other mental health outcomes, such as depression, trauma responses, quality of life and feelings, may likewise be poor for women in the induced abortion group because of their mental health status before the abortion.

In our study, anxiety was not significantly reduced from T1 to T4 in either group, and there was no change from T1 to T4 was not significantly different between women who had experienced a miscarriage and those who had not had an induced abortion. Recent review articles indicate that anxiety is an important aftermath of miscarriage and induced abortion than has been recognized (4,13).

Women who had an induced abortion experienced a more pronounced course of IES avoidance. Their IES avoidance scores remained high and were almost unchanged throughout the five years, whereas their IES intrusions scores fell within time. In the miscarriage group, both scores on IES subscales decreased simultaneously, a significant common with trauma responses. An explanation for the unusual parallel course of the IES scores in the induced abortion group is not obvious, but may result from the characteristics of the abortion event.

Our findings of high IES avoidance scores in the induced abortion group are in agreement with results from a study in which trauma responses after abortion were examined in American and Russian women [32]. Many women had avoidance symptoms related to the induced abortion several years after the event (for American women, the mean was about 10 years after the event; for Russian women, the mean was about six years after the event). Among the American women, 50% avoided thinking or talking

about the abortion, compared with 19% of the Russian women. About 25% of the American women had difficulties being embarrassed, compared with 4% of the Russian women. Of the American women, 36% had three or more avoidance symptoms, compared with 3% of the Russian women. This study indicates that cultural differences influence psychological responses to induced abortion. The results of our study imply that post-abortion avoidance responses among Norwegian women are more similar to those of American women than to those of Russian women.

In our study, 30% of the women who had a decision-induced abortion were IES cases according to one or both IES subscales. Five years after the abortion, 20% were still cases. Most of these cases resulted from high IES avoidance scores. Classification as a "case" according to the IES indicates that people suffer from moderate mental distress, although it does not mean they are suffering from PTSD. However, the IES is a psychological trauma indicator recommended for screening possible PTSDs [19]. For those women who had a decision-induced abortion, the post-abortion correlation tests showed that high IES avoidance scores at T3 and T4 correlated with most of their concurrent negative mental health scores.

The elevated scores for guilt, shame and IES avoidance for women who had a decision-induced abortion may require more attention. Several recent studies have focused on the relationship between guilt, shame and PTSD [33–35]. One article states that "the effects of shame and guilt in particular are everywhere in our lives... the effect of the experience of these feelings on social behaviour, contribution to psychopathology, effect help-seeking, and impediment to emotional processing of the event." [36]. In our previous article [15], we found that feelings of guilt and shame 10 days after a pregnancy termination

predicted high IESa voidances corest wo years later(as statistical interaction effect showed that history wase venm ore important for women who had induced abortion). It is possible that feelings of guilt associated with the induced abortion contributed to a lower improvement in mental health.

Women who had an induced abortion had higher scores on relief throughout the study period. This indicates that their situations shortly before the abortion were as experienced as every difficulty stressful. Others studies confirm his observation of relief after an induced abortion [9,12,37] .

Limitations and strengths of this study

The introduction of the new parameter "former psychiatric health" may be a limitation of this study because validity and reliability of this scale has not been established. However, the assessment was based on observations by experienced psychiatrists and reports by the women rather than a spectrum of mental health, such as whether they had been treated for psychiatric problems previously. In most of the analyses we controlled for former psychiatric health, but we cannot exclude possible bias due to (unmeasured) differences in mental health between the two pregnancy termination groups before the event.

Another limitation of this study is the lack of control for prior and subsequent pregnancy outcomes. We did not adjust for a few of the possible confounding factors, but did not detect any statistically significant effect of prior miscarriages or induced abortions on scores on IES or feelings at T 1, T 2 or T 3. No differences were found statistically significant effect of childbirth events between T 1 and T 4 on the HADS

anxiety and depression scores at T4. This finding should be tested in a study with a larger sample and extended to include the effects of subsequent miscarriages and abortions.

The low participation rate (47%) is another limitation of this study. Regarding the nature and direction of possible election bias, as former studies have shown that those who do not participate in studies such as this have more problems than those who do participate [38]. Another report [39] demonstrated election bias in a study of how women experienced induced abortion one year after the event. One third of the women did not want to participate; these women were overrepresented on certain sociodemographic factors (young, unmarried, low educational status) that have been shown to be associated with increased vulnerability and morbidity. However, we cannot know that those women who did not participate in this study would have scored differently on the psychological tests and this constitutes a limitation.

Another limitation arises from the election of the participants. As described in the Methods section, there was a novel representation of women who completed the study. This was particularly evident for women who had had an induced abortion. Therefore, their results at T2, T3 and T4 may have been biased towards a more favorable mental health outcome.

The high follow-up rate (109 of 120 women [91%] completed all our interviews) and the longitudinal nature of the follow-up periods strengthen this study.

Conclusions

The responses of women in the miscarriage group were similar to those expected after a traumatic event. However, the women in the induced abortion group had

more a typical response. This may be because the mental health of the women was somewhat poorer than that of the men carrying women before pregnancy termination. The more complex nature of the induced abortion may also account for differences in the course of psychological responses between the groups.

Women not only should be given information about common psychological responses to pregnancy termination, and follow-up talks with the health personnel should be offered to women most affected by the event.

Competing interests

The authors declare that they have no competing interests in this research.

Authors' contributions

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

Acknowledgements

We extend our warm thanks to the members of the research group. We also especially thank Buskerud Hospital, which gave us financial support for the study, thereby making this study possible. We also thank Dr. Eystein Sordal for data from the HUNT study.

The project was supported financially by Buskerud Hospital, the Norwegian Council for Mental Health, the Norwegian Foundation for Health and Rehabilitation, and the University of Oslo, Norway. It was also supported by legacies from Majken Nilsen, Josefa and Haraldsen, and Solveig and Johan Sommer. All these financial sources (except the legacies from Majken Nilsen, and Solveig and Johan Sommer) constituted the first author. The second and fourth authors were funded by the University of Oslo, and the third author was funded by Buskerud Hospital, Norway.

References

1. Frost M, Condon JT: **The psychological sequelae of miscarriage: a critical review of the literature.** *Aust NZ 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, Masone M: **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.** *Am Psychol* 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, Gramzow RH: **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].**[French]. *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.** *Psychosom Med* 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-Trøndelag 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. Cohen J: *Statistical power analysis for the behavioral sciences*, 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.
30. Cogle JR, Reardon DC, Coleman PK: **Generalized anxiety following unintended pregnancies resolved through childbirth and abortion: a cohort study of the 1995 National Survey of Family Growth.** *J Anxiety Disord* 2005, **19**:137–142.

31. Moseley DT, Follingstad DR, Harley H, Heckel RV: **Psychological factors that predict reaction to abortion.** *J Clin Psychol* 1981, **37**:276–279.
32. Rue VM, Coleman PK, Rue JJ, Reardon DC: **Induced abortion and traumatic stress: a preliminary comparison of American and Russian women.** *Med Sci Monit* 2004, **10**:SR5–SR16.
33. Leskela J, Dieperink M, Thuras P: **Shame and posttraumatic stress disorder.** *J Trauma Stress* 2002, **15**:223–226.
34. Stone AM: **The role of shame in post-traumatic stress disorder.** *Am J Orthopsychiatry* 1992, **62**:131–136.
35. 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.
36. 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.
37. Adler NE, David HP, Major BN, Roth SH, Russo NF, Wyatt GE: **Psychological responses after abortion.** *Science* 1990, **248**:41–44.
38. Weisaeth L: **Importance of high response rates in traumatic stress research.** *Acta Psychiatr Scand Suppl* 1989, **355**:131–137.
39. 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.

Figures

Figure 1. Mean IES intrusions scores in each pregnancy termination group at all four interviews. IES intrusion is a psychological trait that measures the extent of intrusive thoughts, feelings and flashbacks about pregnancy termination. Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 2. Mean IES avoidance scores in each pregnancy termination group at all four interviews. IES avoidance is a psychological trait that measures how much women avoid thinking, talking or feeling anything about pregnancy termination. Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 3. Percentage of cases according to IES intrusion in each pregnancy termination group at all four interviews. IES intrusion is a psychological trait that measures the women's extent of intrusive thoughts, feelings and flashbacks about pregnancy termination. A high score (>19 points) on this scale indicates a "case". Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 4. Percentage of cases according to IES avoidance in each pregnancy termination group at all four interviews. IES avoidance is a psychological trait that measures how much women avoid thinking, talking or feeling anything about pregnancy termination.

pregnancy termination. A high score (>19 points) on this scale indicates a “case”. Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 5. Mean Quality of Life scores in the pregnancy termination group at four interviews. The Quality of Life estimates show satisfied subjects are in the lower lives. The high score, the better the quality of life. Statistically significant differences between groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 6. Mean Anxiety scores in the pregnancy termination group at four interviews. The mean anxiety scores for the two pregnancy termination groups and the mean anxiety scores for women in the general population sample in Norway (HUNT) are shown. There were no statistically significant differences between the two pregnancy termination groups. Statistically significant differences between the scores of the pregnancy termination group and those of the general population sample (of women aged 30–35 years, $n = 2,879$): $p < 0.05$, $p < 0.01$, $p < 0.001$.

Figure 7. Mean Depression scores in the pregnancy termination group at four interviews. The mean depression scores for the two pregnancy termination groups and the mean depression scores for women in the general population sample in Norway (HUNT) are shown. There were no statistically significant differences between the two pregnancy termination groups. Statistically significant differences between the scores of the pregnancy termination group and those of the general population sample (of women aged 30–35 years, $n = 2,879$): $p < 0.05$, $p < 0.01$, $p < 0.001$.

Figure 8. Means scores for feeling relief in the postpartum group at 1 four interviews. At each interview, the women were asked to indicate how much relief they felt when thinking about her pregnancy termination. The scores were: 1 (not at all), 2 (a little), 3 (a great deal), 4 (much) and 5 (very much). Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 9. Means scores for feeling grief in the postpartum group at 1 four interviews. At each interview, the women were asked to indicate how much grief they felt when thinking about her pregnancy termination. The scores were: 1 (not at all), 2 (a little), 3 (a great deal), 4 (much) and 5 (very much). Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 10. Means scores for feeling loss in the postpartum group at 1 four interviews. At each interview, the women were asked to indicate how much loss they felt when thinking about her pregnancy termination. The scores were: 1 (not at all), 2 (a little), 3 (a great deal), 4 (much) and 5 (very much). Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 11. Means scores for feeling guilt in the postpartum group at 1 four interviews. At each interview, the women were asked to indicate how much guilt they felt when thinking about her pregnancy termination. The scores were: 1 (not at all), 2 (a little), 3 (a great deal), 4 (much) and 5 (very much). Statistically significant differences between the groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 12. Means scores for feelings hame ine achp regnancy terminationgr oupat a ll four interviews. Ate achi nterview, t hew omen werea skedt oi ndicateho w muchs hame theyf eltw hent hinking aboutt hepr egnancyt ermination. T hes cores were: 1(nota ta ll), 2 (al ittle), 3(a greatde al), 4(much)a nd5 (verym uch). S tatisticalys ignificantdi fferences between he groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 13. Means cores for feelingan geri n eachp regnancy terminationgr oupat a ll four interviews. Ate achi nterview, t hew omen werea skedt oi ndicateho w mucha nger theyf eltw hent hinking aboutt hepr egnancyt ermination. T hes cores were: 1(nota ta ll), 2 (al ittle), 3(a greatde al), 4(much)a nd5 (verym uch). S tatisticalys ignificantdi fferences between he groups: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Tables

Table 1.C characteristics at T1 of women participating in the study.

Statistically significant differences between the two groups are shown.

	Women with miscarriage, n = 40. (Scored '1')	Women with induced abortion, n = 80. (Scored '2')	Point biserial r / χ^2
At T1 (10 days after the event)	Mean (95% CI)	Mean (95% CI)	
Age (years)	30.1 (28.2–31.9)	27.7 (26.2–29.3)	$r = -0.17$, n.s.
Length of pregnancy (weeks)	10.5 (9.4–11.5)	9.6 (9.3–9.9)	$r = -0.18$, n.s.
Number of previous induced abortions	0.3 (0.1–0.5)	0.3 (0.2–0.4)	$r = -0.02$, n.s.
Number of previous miscarriages	0.4 (0.2–0.6)	0.4 (0.2–0.6)	$r = 0.02$, n.s.
Number of children	0.8 (0.5–1.0)	1.2 (0.9–1.4)	$r = 0.19^*$
Marital status			$\chi^2 = 15.38^{***}$
Married	42.5%	21.3%	
Cohabitant	50.0%	37.5%	
Not married/cohabitant	7.5%	41.3%	
Education			$\chi^2 = 5.42$, n.s..
Comprehensive school up to 16 years of age	10.0%	15.0%	
Comprehensive school up to 19	15.0%	31.3%	

years of age			
Vocational education	47.5%	31.3%	
University education	27.5%	22.5%	
Vocational activity			$\chi^2 = 10.34^*$
Still in education	2.5%	21.3%	
Regular employment	75.0%	50.0%	
Temporary employment	5.0%	11.3%	
Working at home	10.0%	8.8%	
Other	7.5%	8.8%	
Religious faith			$\chi^2 = 5.05$, n.s.
Christian, the faith is of minor importance	80.0%	71.3%	
Christian, the faith is of great importance	12.5%	6.3%	
Agnostic or humanistic ethicist	5.0%	17.5%	
Muslim or other	2.5%	5.0%	
Former psychiatric health			$\chi^2 = 3.63$, n.s.
Good	65.0%	47.5%	
Medium	15.0%	17.5%	
Previous psychiatric problems	20.0%	35.0%	

χ^2 (Pearson's χ^2) = for pregnancy termination group by nominal variable

r (Pearson's r, t-test) = for pregnancy termination type by continuous variables

*p < 0.05, **p < 0.01, ***p < 0.001.

Table2. Mean outcome scores and standard deviations (SD) for both pregnancy**terminations groups.**

	T 1		T2		T3		T4	
	Ten days after pregnancy termination Mean ± (SD)		Six months after pregnancy termination Mean ± (SD)		Two years after pregnancy termination Mean ± (SD)		Five years after pregnancy termination Mean ± (SD)	
Outcome	Mis-carriage n = 40	Induced abortion n = 80	Mis-carriage n = 40	Induced abortion n = 74	Mis-carriage n = 39	Induced abortion n = 72	Mis-carriage n = 39	Induced abortion n = 70
IES intrusion	17.6** ± (9.5)	11.9 ± (9.3)	10.6 ± (8.7)	8.0 ± (8.6)	4.9 ± (5.3)	5.1 ± (5.6)	3.7 ± (4.5)	3.6 ± (5.9)
IES avoidance	7.0 ± (6.1)	11.1** ± (7.9)	5.9 ± (6.4)	9.7* ± (8.6)	3.2 ± (4.6)	9.3*** ± (9.4)	1.5 ± (3.6)	8.3*** ± (10.1)
Quality of Life	42.2 ± (9.0)	41.4 ± (9.1)	45.6 ± (7.9)	43.6 ± (8.7)	47.7 ± (7.8)	45.3 ± (7.9)	47.4 ± (6.5)	45.9 ± (8.2)
HADS anxiety	6.1 ± (4.1)	6.6 ± (4.6)	5.5 ± (4.1)	6.8 ± (5.0)	5.6 ± (4.1)	6.0 ± (4.7)	5.2 ± (4.2)	5.9 ± (4.6)
HADS depression	4.5 ± (4.2)	3.9 ± (4.0)	3.0 ± (3.3)	3.3 ± (3.7)	2.3 ± (3.2)	2.6 ± (3.7)	2.0 ± (2.6)	2.7 ± (3.2)
Feelings, rated 1–5:								
Relief	1.3 ± (0.7)	2.8*** ± (1.4)	1.3 ± (0.6)	2.6*** ± (1.4)	1.3 ± (0.8)	2.7*** ± (1.3)	1.4 ± (0.9)	2.7*** ± (1.4)
Grief	3.7*** ± (1.5)	2.4 ± (1.4)	3.2*** ± (1.3)	2.2 ± (1.2)	2.4* ± (1.2)	1.9 ± (1.0)	1.8 ± (0.9)	1.8 ± (1.0)
Loss	3.6*** ± (1.5)	2.2 ± (1.4)	3.4*** ± (1.4)	2.2 ± (1.3)	2.5 ± (1.2)	2.2 ± (1.3)	2.0 ± (1.1)	1.9 ± (1.1)
Guilt	1.9 ± (1.2)	2.1 ± (1.4)	1.5 ± (0.9)	2.1** ± (1.2)	1.2 ± (0.7)	1.9** ± (1.0)	1.1 ± (0.2)	2.0*** ± (1.1)
Shame	1.1 ± (1.2)	1.8*** ± (1.4)	1.1 ± (0.9)	1.9*** ± (1.2)	1.1 ± (0.7)	1.6** ± (1.0)	1.0 ± (0.2)	1.6** ± (1.1)

	± (0.3)	± (1.3)	± (0.4)	± (1.3)	± (0.4)	± (1.0)	± (0.0)	± (1.0)
Anger	2.2	1.8	2.0	1.9	1.5	1.8	1.3	1.5
	± (1.3)	± (1.3)	± (1.1)	± (1.3)	± (1.0)	± (1.1)	± (0.7)	± (1.0)

Statistically significant differences between pregnancy termination groups at all time points:

*p < 0.05, **p < 0.01, ***p < 0.001

Table 3.C Changes in mental health outcomes between T1 and T4 in each pregnancy termination group.

Cohen's d estimates the changes in outcomes between the two pregnancy termination groups. Within-group analyses were performed using paired t-tests and between-group analysis was performed using ANCOVA (estimated with controls for all four possible confounders, i.e. marital status, number of children, vocational activity and former psychiatric illness).

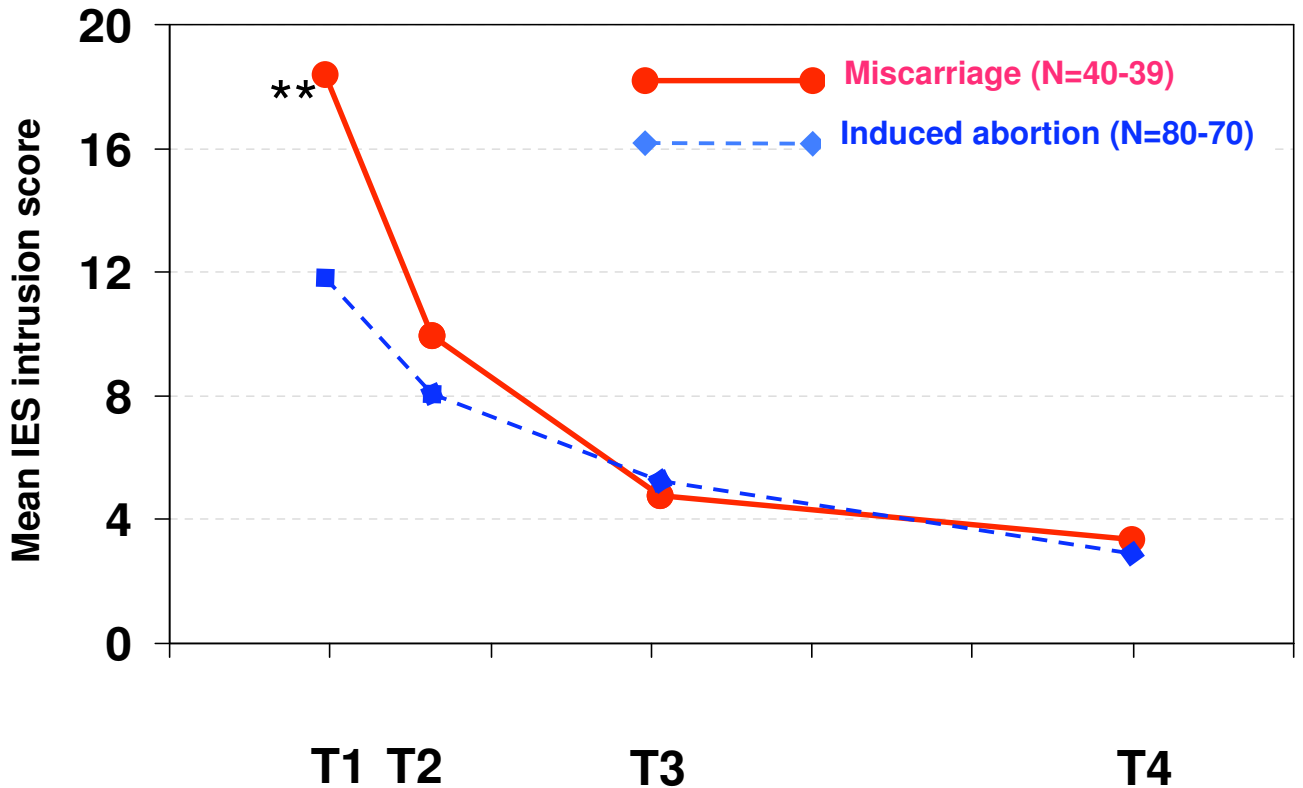
Outcome at corresponding interviews:	Change in the miscarriage group from T1 to T4: Cohen's d	Change in the induced abortion group from T1 to T4: Cohen's d	Differential change between groups from T1-T4: Exact p-value
IES intrusion	1.92***	0.85***	p = 0.096
IES avoidance	1.20***	0.21**	p = 0.003
Quality of life	-0.69***	-0.40**	p = 0.628
HADS anxiety	0.10	0.02	p = 0.999
HADS depression	0.80**	0.30*	p = 0.314
Feelings, rated 1-5:			
Relief	-0.50	0.07	p = 0.081
Grief	1.54***	0.41***	p = 0.015
Loss	1.22***	0.08	p = 0.007
Guilt	0.93***	0.00	p < 0.001
Shame	0.47	0.17	p = 0.088
Anger	0.86***	0.34**	p = 0.027

T1 = 10 days after pregnancy termination

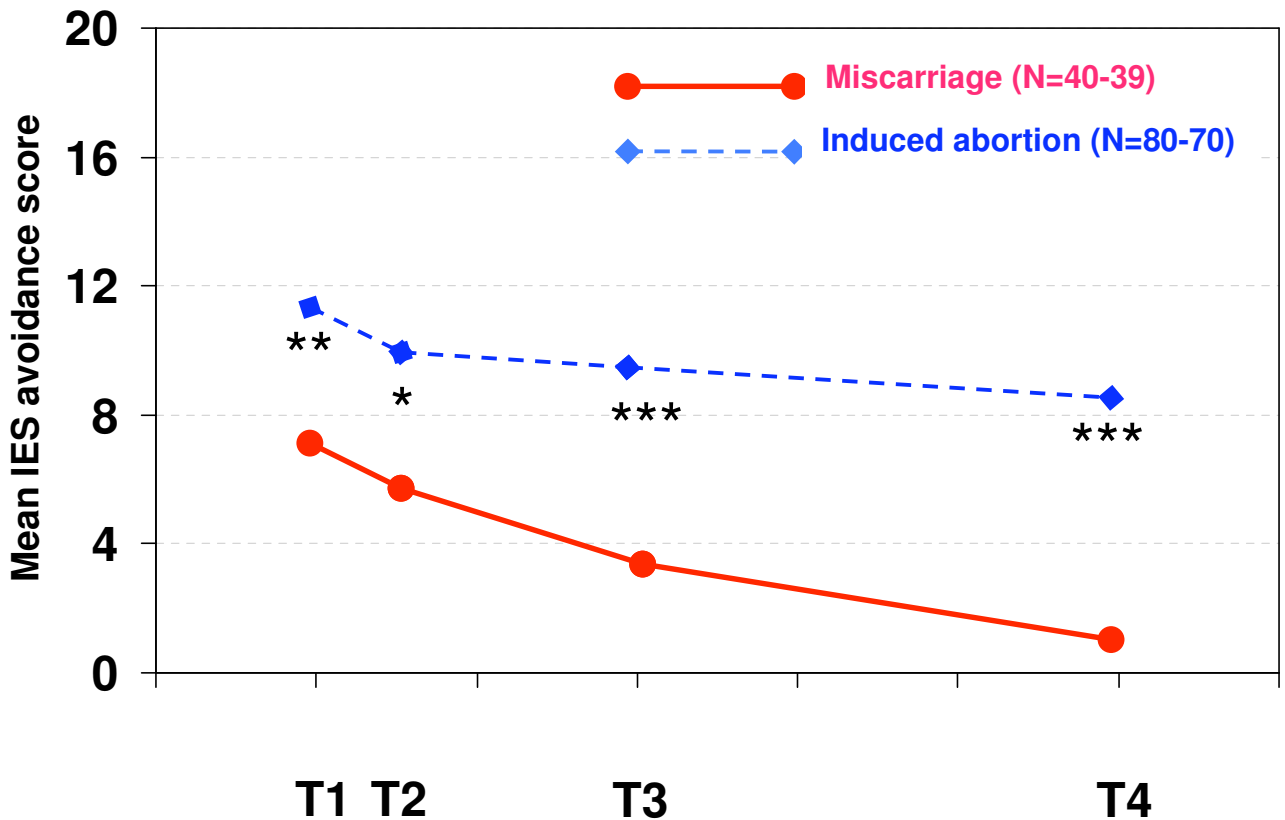
T4 = five years after pregnancy termination

Significant change from T1 to T4 (in each pregnancy termination group) by paired t-test: * $p < 0.05$,

** $p < 0.01$, *** $p < 0.001$.

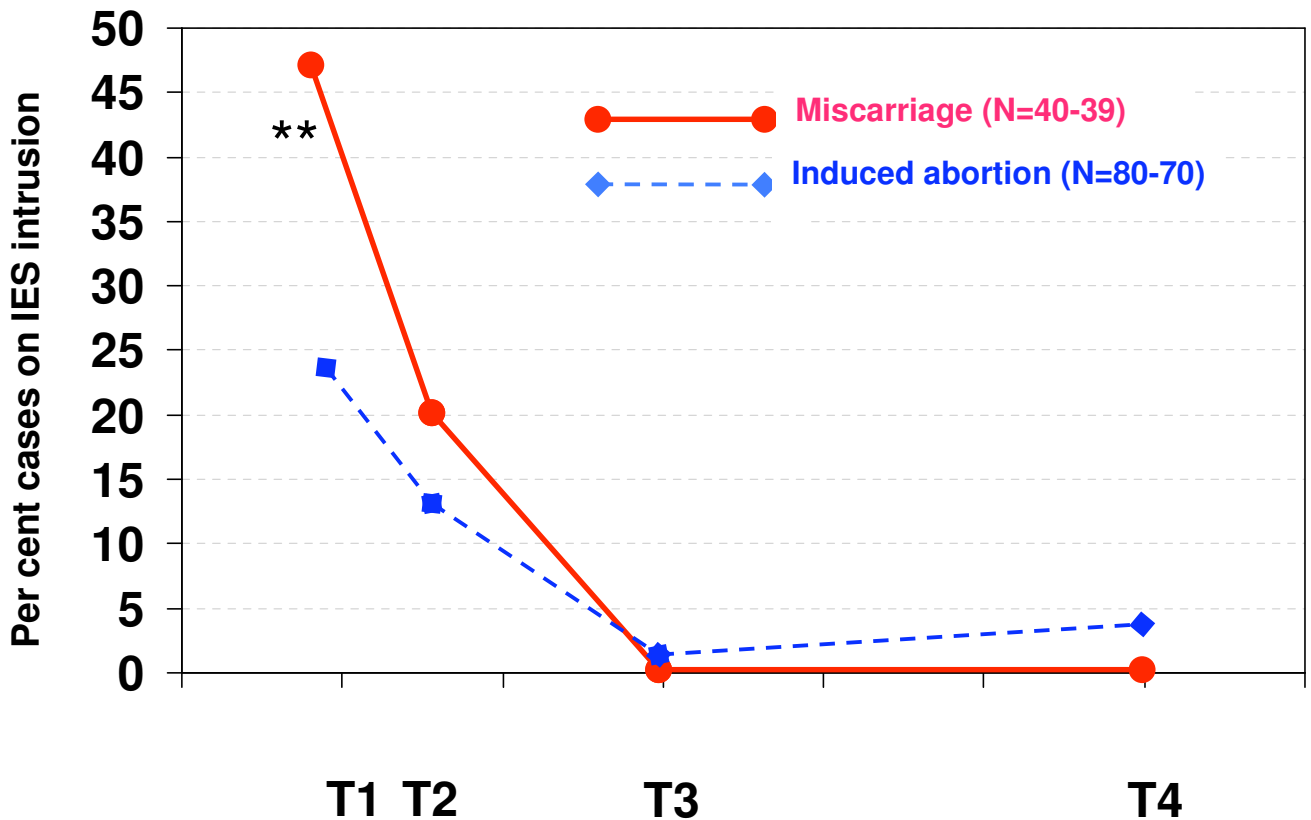


T1 – 10 days after pregnancy termination
T2 – 6 months after pregnancy termination
T3 – 2 years after pregnancy termination
T4 – 5 years after pregnancy termination



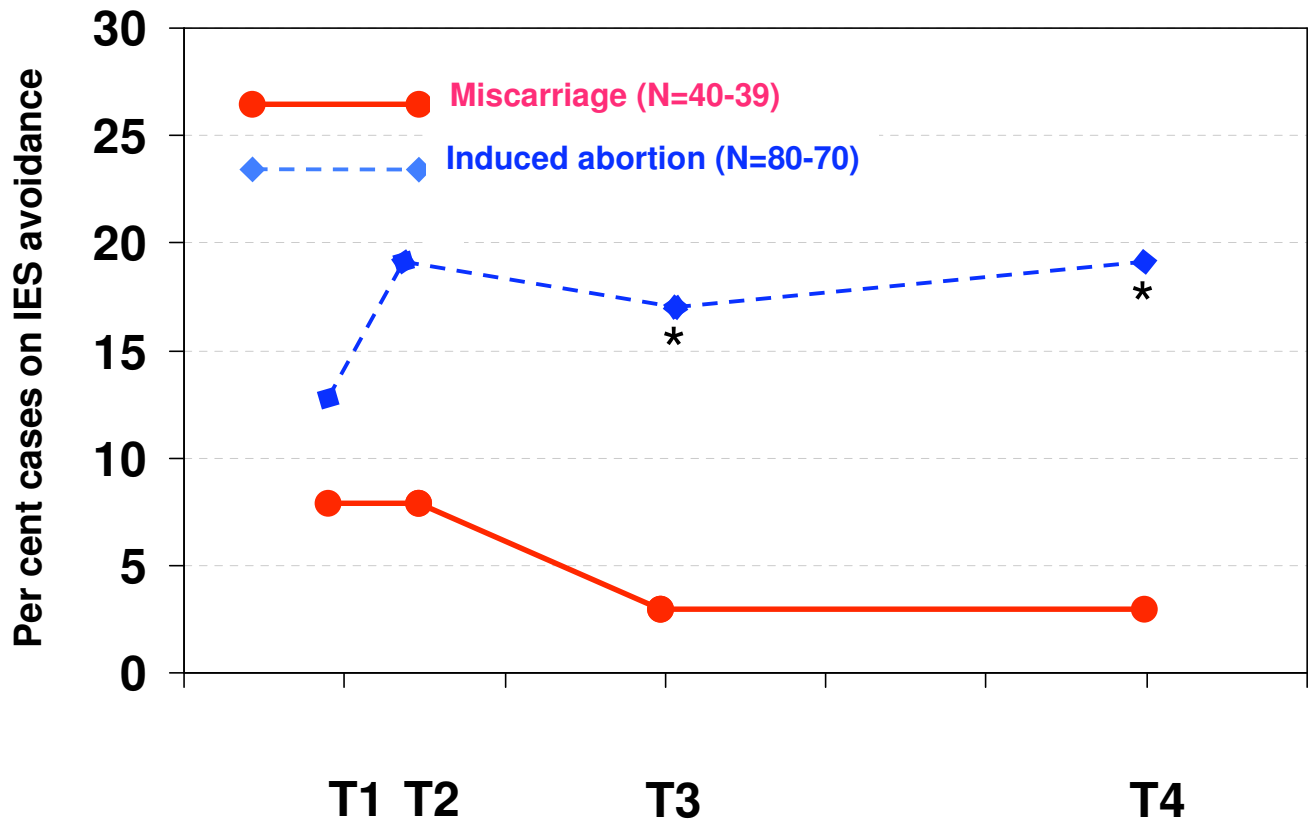
T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 2



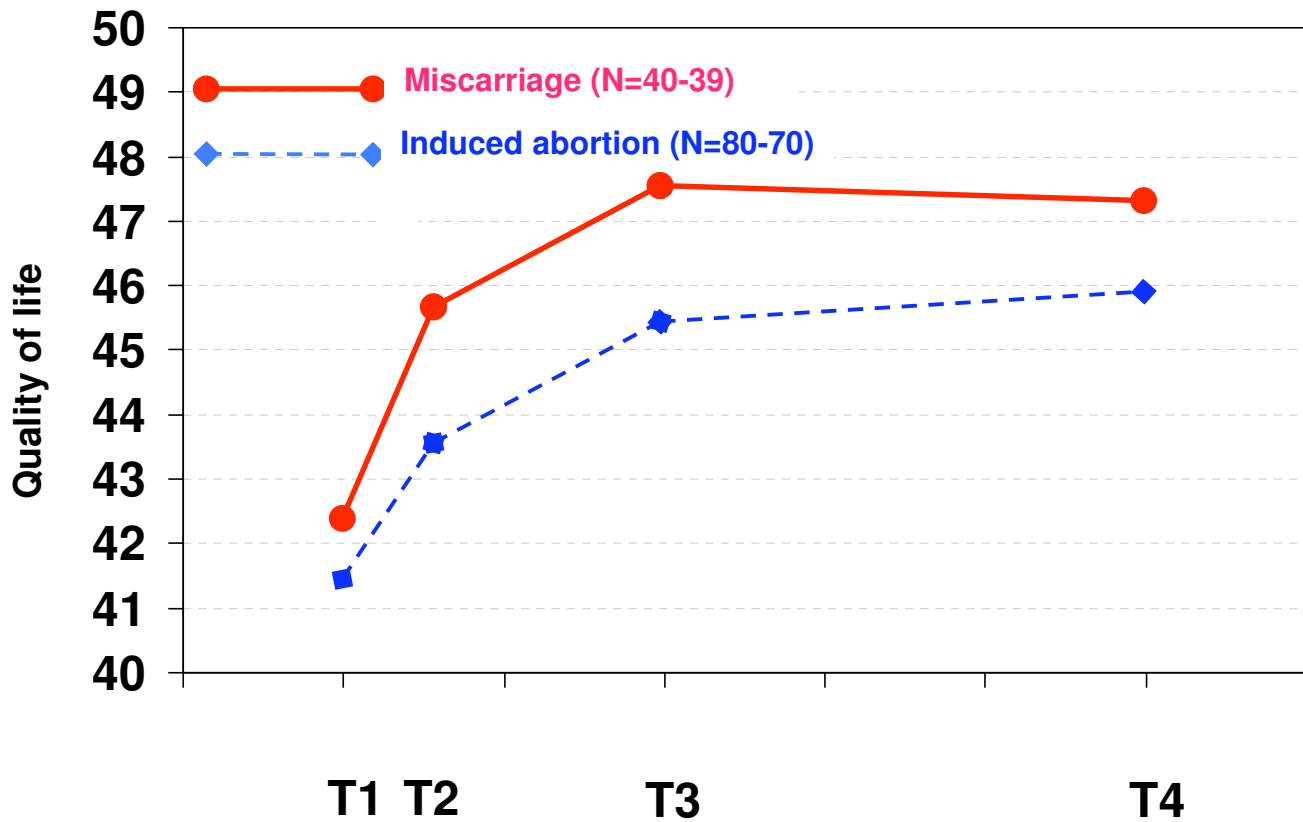
T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 3



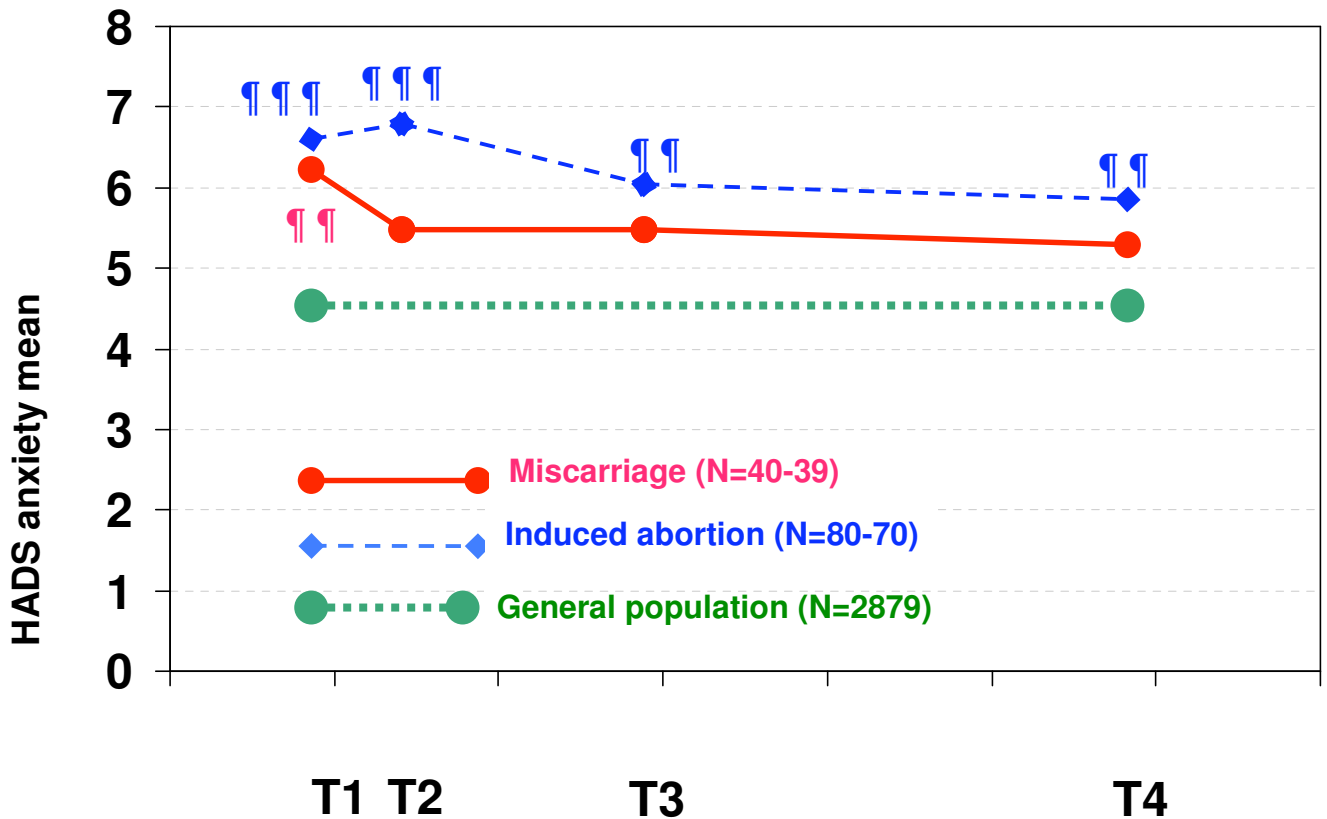
T1 – 10 days after pregnancy termination
T2 – 6 months after pregnancy termination
T3 – 2 years after pregnancy termination
T4 – 5 years after pregnancy termination

Figure 4



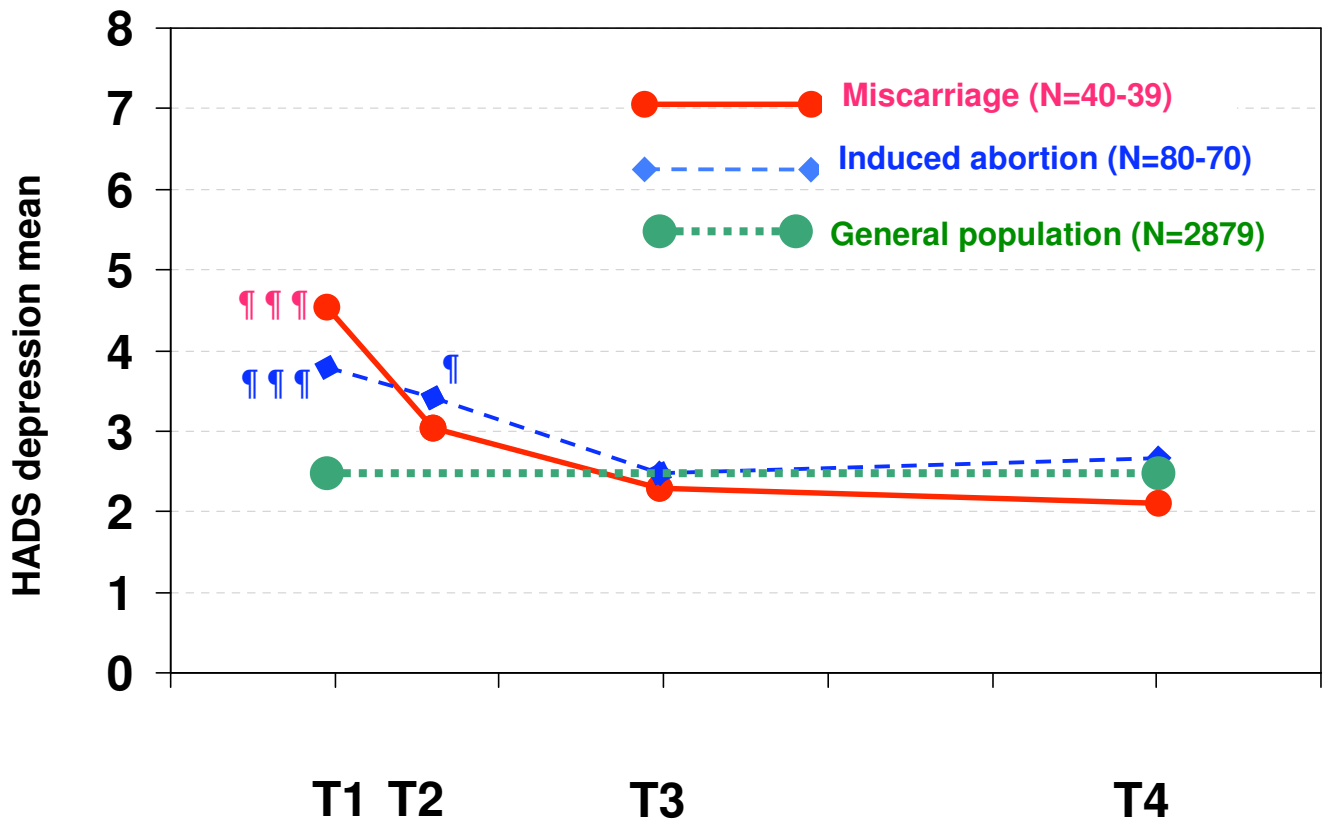
T1 – 10 days after pregnancy termination
T2 – 6 months after pregnancy termination
T3 – 2 years after pregnancy termination
T4 – 5 years after pregnancy termination

Figure 5



T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 6



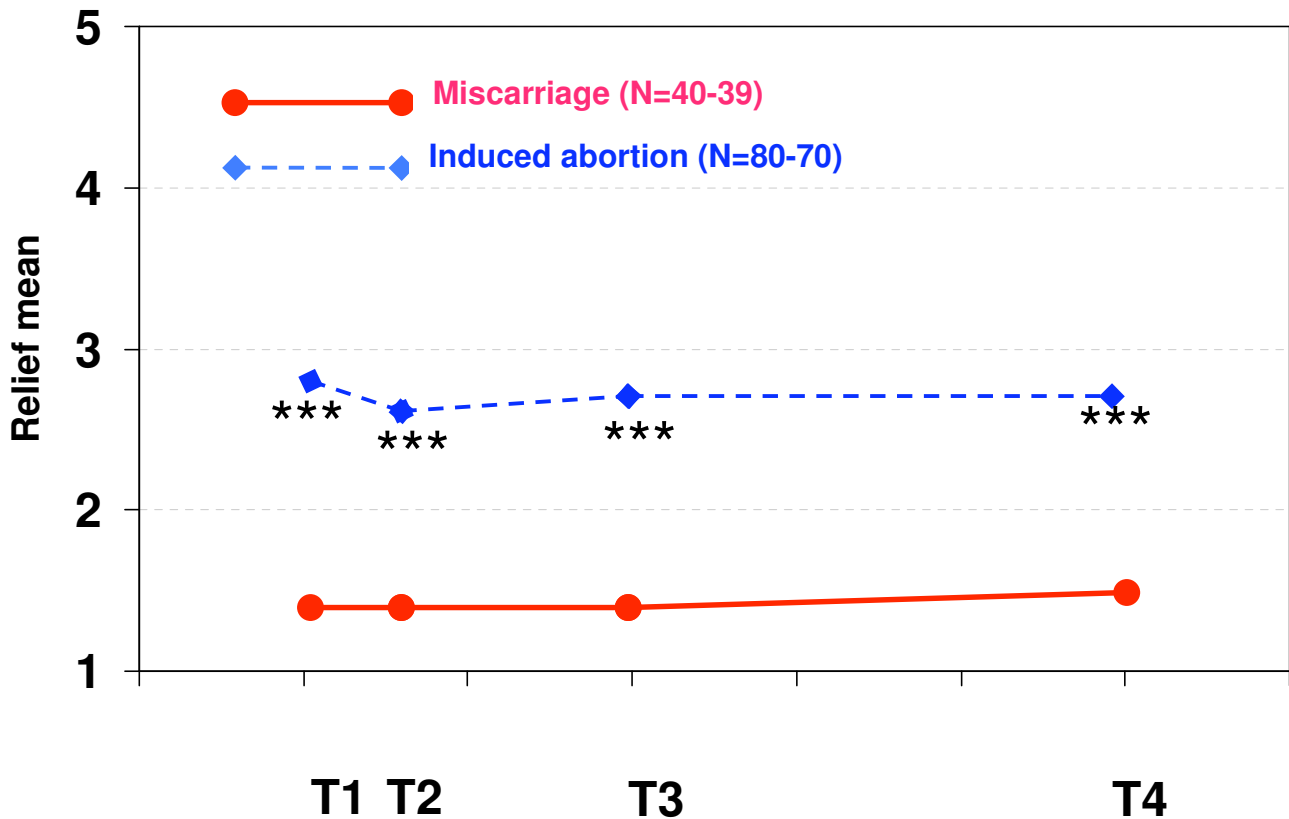
T1 T2

T3

T4

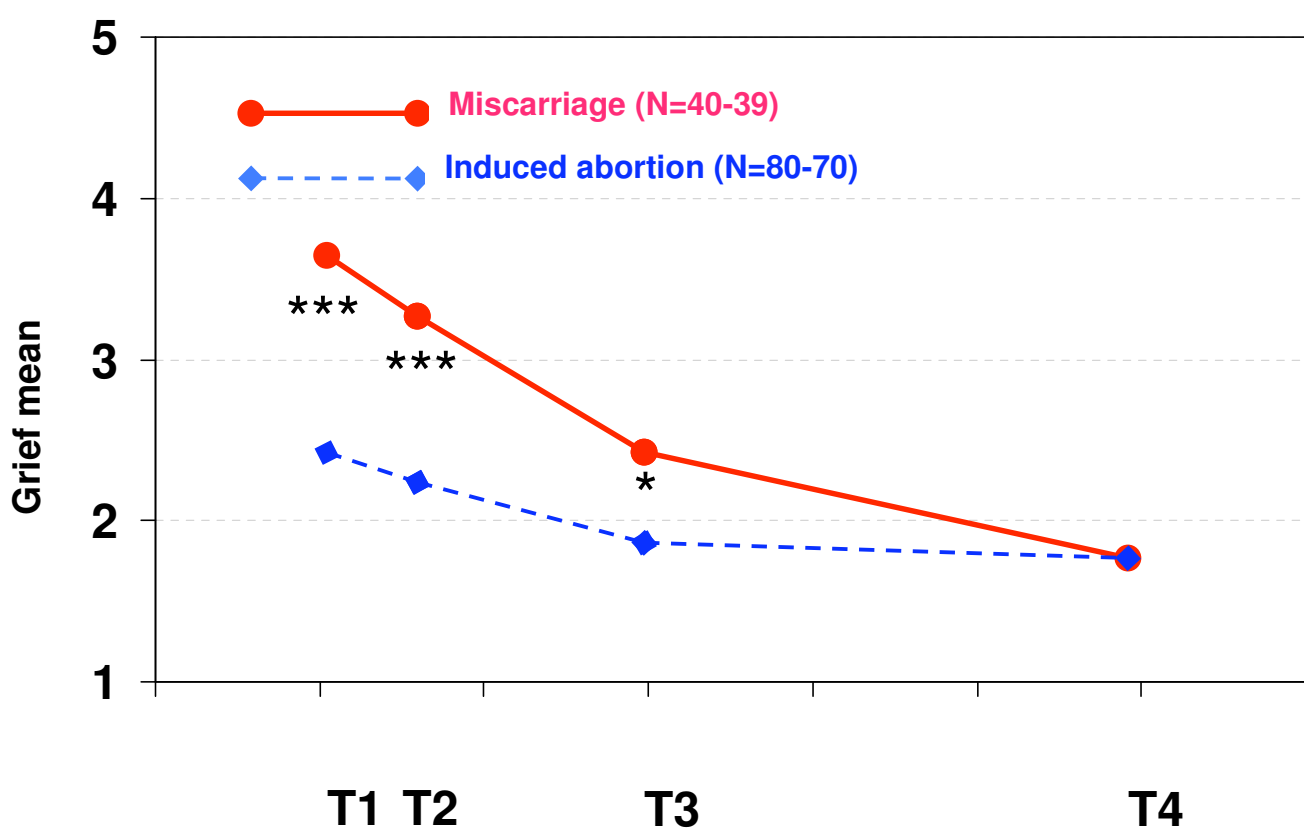
T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 7



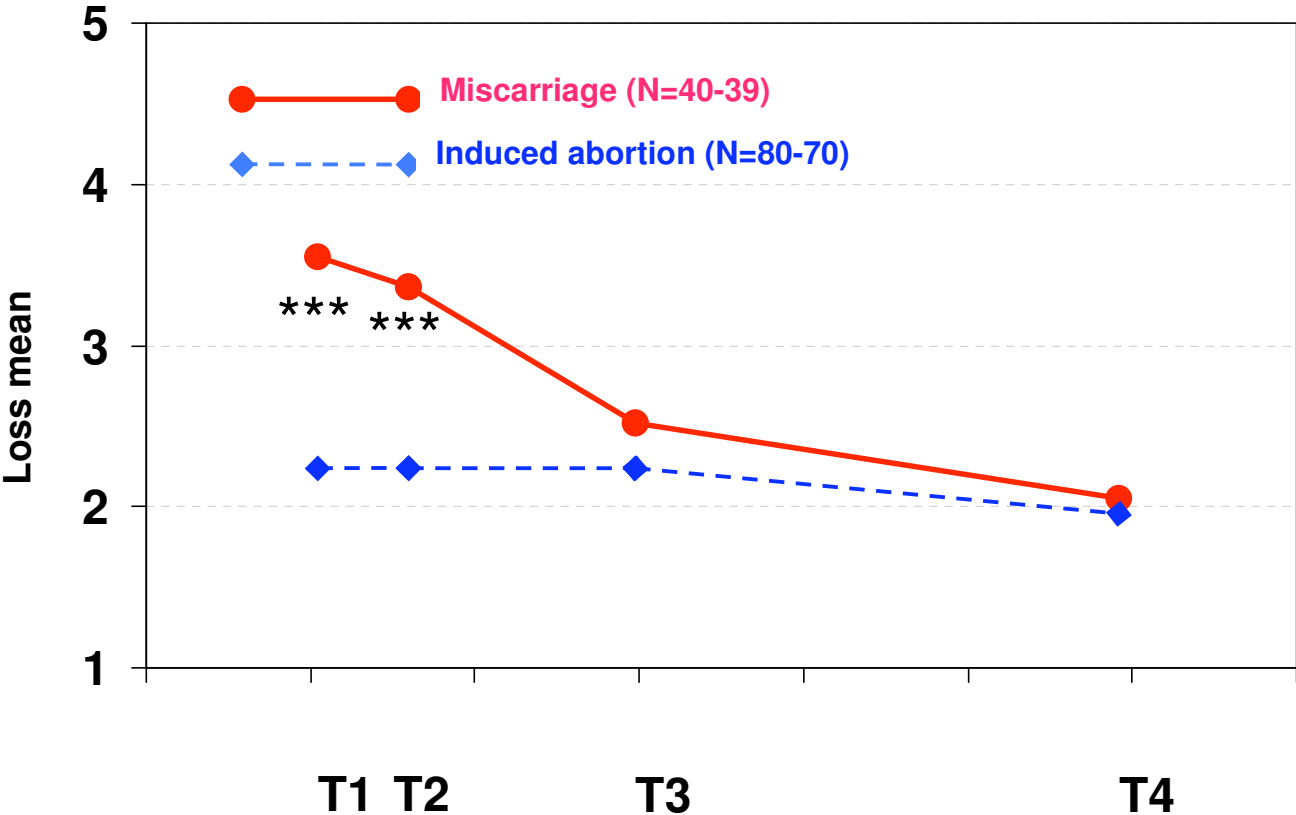
T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 8



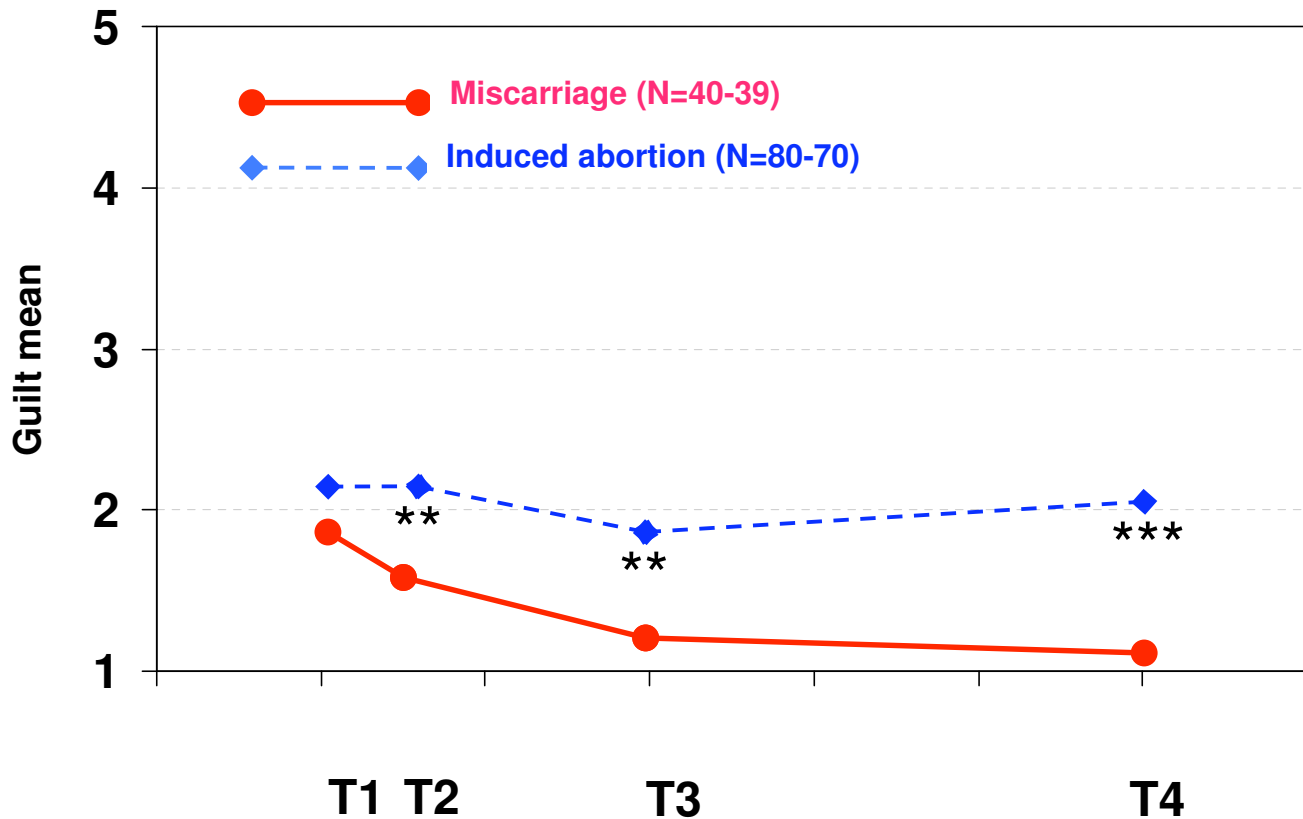
T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 9



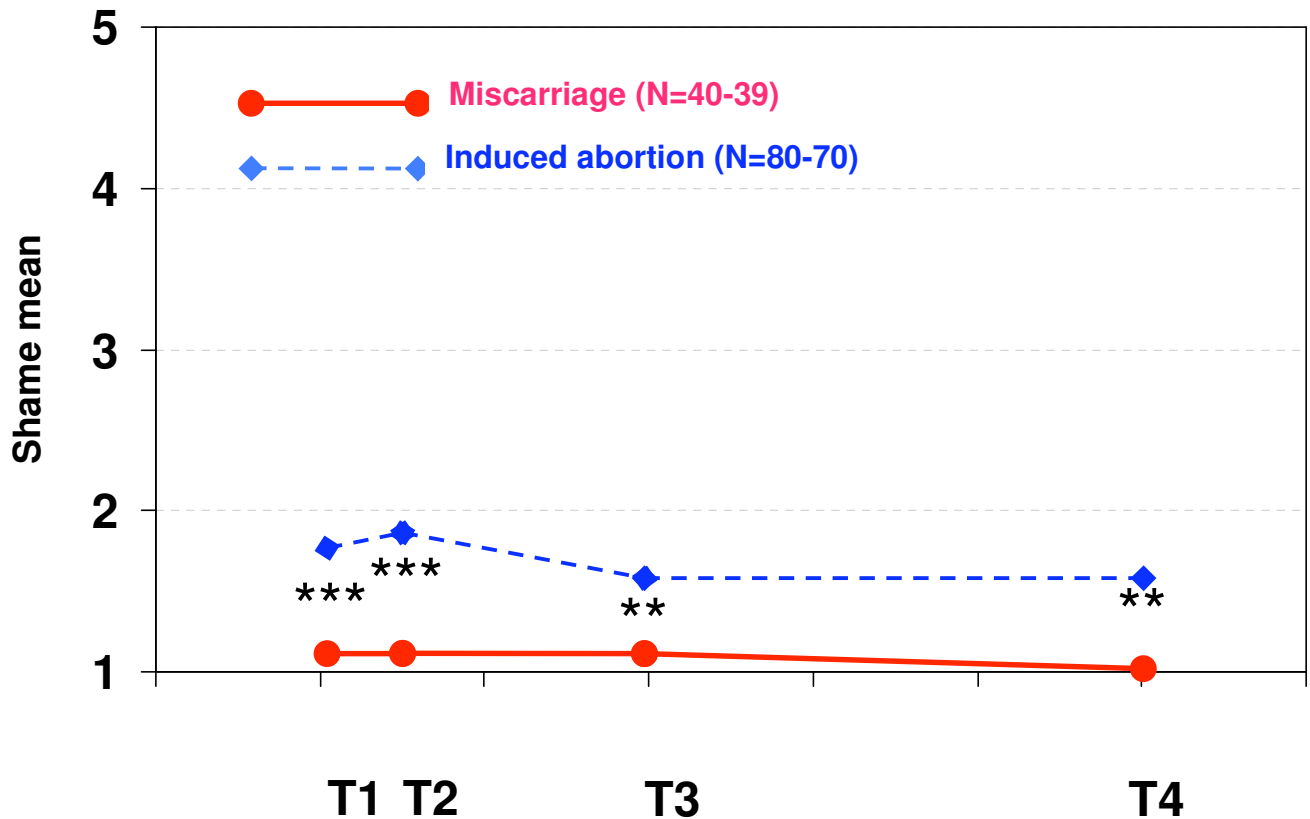
T1 – 10 days after pregnancy termination
T2 – 6 months after pregnancy termination
T3 – 2 years after pregnancy termination
T4 – 5 years after pregnancy termination

Figure 10



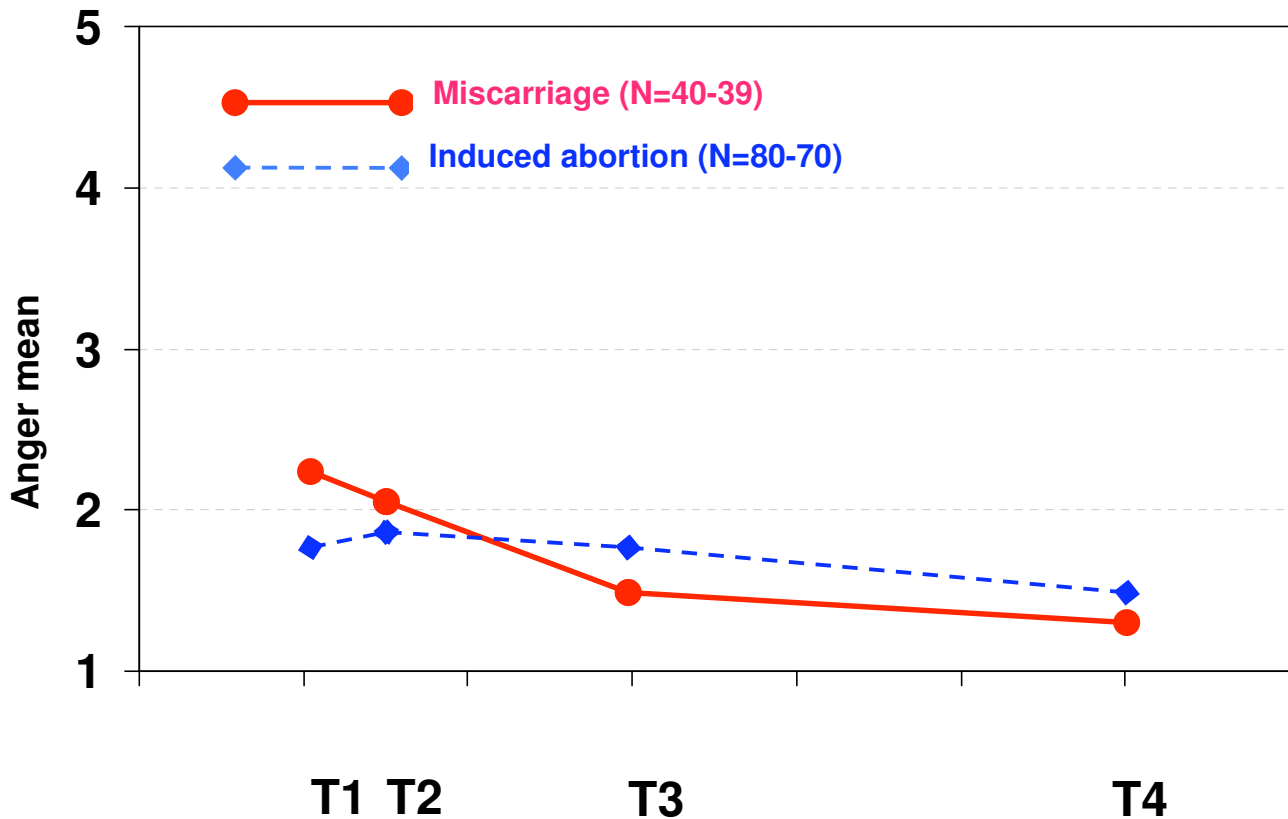
T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 11



T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 12



T1 – 10 days after pregnancy termination
 T2 – 6 months after pregnancy termination
 T3 – 2 years after pregnancy termination
 T4 – 5 years after pregnancy termination

Figure 13