

Neuroticism and low educational level predict the risk of posttraumatic stress disorder in women after miscarriage or stillbirth[☆]

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Abstract

Objective: This study aimed to determine whether neuroticism and educational level predict posttraumatic stress disorder (PTSD) in women following an unsuccessful pregnancy.

Method: Via advertisements, pregnant women with a gestational period shorter than 12 weeks were asked to participate in a study regarding their perception of pregnancy. After they had agreed, they were sent questionnaires, including a scale for neuroticism and their highest attained educational level. Every other month during the pregnancy and 1 month after the expected date of birth, they were sent brief questionnaires about the pregnancy. Participants for whom the pregnancy had ended unsuccessfully were contacted by phone and asked to participate in a follow-up study with a PTSD scale.

Results: Of the 1339 women studied, 126 (9%) experienced an unsuccessful pregnancy; 8 of these dropped out of the study (response rate, 94%); 1 had not indicated her educational level. The remaining 117 women filled out the PTSD scale after about 1 month. Thirty-one women (26%) met the *DSM-IV* criteria for PTSD and 86 women did not. Logistic regression analysis revealed that PTSD was significantly associated with higher neuroticism, lower educational level and longer duration of gestation.

Conclusion: For patients with a high educational level and low neuroticism score, the risk of developing PTSD was negligible, while for those with a low educational level and a high score for neuroticism, the estimated risk was about 70%. Care and guidance should focus primarily on the latter group.

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1. Introduction

Almost one in five pregnancies end in pregnancy loss. This is the most common complication in pregnancy [1]. There are 47,500 such incidences in the Netherlands every year (<http://statline.cbs.nl>), and 80% occurs within the first 20 weeks. Even during the early stages of pregnancy, many women find this a stressful experience, resulting in sadness, anger, tension, a sense of guilt and search for

meaning [2–4]. These reactions generally decrease with time. However, a minority of women suffer from depression and anxiety disorders or problems recorded in the *DSM-IV* [5] as posttraumatic stress disorder (PTSD). PTSD is typified by three symptom clusters: “reexperiencing the traumatic event” (e.g., upsetting intrusive recollections, nightmares, flashbacks, being upset by reminders), “avoidance of its reminders and emotional numbing” (e.g., avoidance of thoughts, places and activities, restricted affect, diminished interest, detachment from others) and “increased arousal” (e.g., sleeping problems, irritability, hypervigilance, difficulty concentrating). The *DSM-IV* requires the occurrence of at least one reexperiencing symptom, three avoidance symptoms and two symptoms of increased arousal for at least 1 month that cause significant distress or impairment in functioning to diagnose PTSD. Although PTSD was initially

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associated with war, violence and disasters, it has been shown that a similar disorder can follow threatening medical experiences [6]. This may involve a miscarriage, particularly if it is experienced as the death of a baby, if parental bonding has taken place and if the patient is exposed to potentially unpleasant images of blood and tissue [2,3,7,8].

Although the prevalence of PTSD is only 1.7% after a normal pregnancy [9], it seems to be around 25% about 1 month after pregnancy loss, with a symptom severity comparable to that of clinical PTSD patients [10]. This percentage decreases to 10% after around 4 months, 5% after 6 months and 4% after 12 months. Depressive symptoms are more severe for women with PTSD after 1 month and appear to extend beyond 4 months [10,11]. The onset of such disorders can lead to problems in a subsequent pregnancy, including the reactivation of PTSD. This occurs in 20% of cases [12] and can have unfavorable obstetric and postnatal consequences [13]. PTSD can also lead to fear of subsequent pregnancy, avoidance of sexual intercourse, avoidance of medical care, and so forth [4,7]. Such avoidance symptoms increase in time. The symptoms described above and the avoidance behavior suggest that early intervention is important.

Psychological intervention in all patients who have experienced a potentially traumatic event is not effective and can have more disastrous effects than no intervention [14]. Interventions must be aimed at individuals at higher risk [14]. Who are they? First of all, it has been found that PTSD is predicted by indicators of the severity of the stressor, such as the gestational age [10]. In the case of longer gestation, parental bonding increases. However, this is not always a good predictor [6]. Much research has been conducted into premorbid risk and protective factors but almost always retrospectively. This is a problem because variables can be distorted by PTSD symptoms. Some extensive prospective trauma studies found that lower cognitive ability (intelligence and education) and higher neuroticism (the stable tendency to interpret experiences in a negative way) are among the best pretrauma predictors of PTSD (e.g., Ref. [15]). Note also that in countries with a very accessible and differentiated secondary education system, there is a high correlation between educational level and intelligence. The predictive value of education and neuroticism corresponds with an influential theory [16], which suggests that PTSD does not originate directly from the traumatic event but from negative interpretations of the (effects of a) traumatic experience and from the lack of integration of traumatic memories in autobiographical memory.

The goals of this study were to document the predictive value of these factors in the onset of PTSD after pregnancy loss and to develop a risk table for practical usage. Gestational age was taken into account. Participants enrolled in the study in early pregnancy. This way, PTSD predictors could be assessed before pregnancy loss (see Refs. [10,17,18]).

2. Method

2.1. Participants

In advertisements in Dutch national newspapers (from June to November 1999), women in the early stages of pregnancy (less than 12 weeks) were requested to take part in a study regarding the experience of pregnancy. Immediately after enrolment, they received the Eysenck Personality Questionnaire and other questionnaires, including one involving educational level (see Section 2.2). Every other month during the pregnancy and 1 month after the expected birth date, they received short questionnaires about the pregnancy, in which they were asked about any pregnancy loss. Participants who had experienced a loss were then contacted by telephone and asked to participate in a further study. Of the 1339 women in the study, 126 (9%) had suffered pregnancy loss. Eight of them did not respond (making the response 94%), and two women were excluded from the analyses: one appeared to be pregnant with twins after a miscarriage (and later gave birth to a healthy baby), and one had not reported her educational level. The remaining women completed the Posttraumatic Symptom Scale after around a month (see Section 2.2; five of them were not included in our previous reporting [10], as they entered the study late and had suffered a loss late in the pregnancy). Nearly all (98%) of the participants had a partner, and around 40% had completed a higher professional or university education. The mean gestational age at the time of the loss was 12 weeks (S.D.=6; range, 5–40). In around 95% of the cases, the loss occurred before the 20th week. We complied with ethical guidelines of the American Psychological Association [19] in the treatment of our sample.

2.2. Measures

The highest educational level was determined using a seven-point interval scale (see Appendix). Neuroticism was measured using the 22-item neuroticism scale of the Eysenck Personality Questionnaire [20]. This measure employs a dichotomous scale and requires participants to give the answer that best reflects their own character (e.g., “Do you consider yourself a worrier?” “Do you worry about dreadful things which could happen?”). The range of this scale is 0–22. PTSD was measured with the self-report version of the Posttraumatic Symptom Scale (PSS-SR; [21]). This questionnaire consists of the 17 *DSM-IV* [5] PTSD symptoms, whereby the presence and severity of each symptom is indicated on a four-point scale (0–3). Scores under 10 are considered mild, those from 11 to 20 are considered average, those between 21 and 35 are considered average to severe and scores above 35 are considered severe. The validity and reliability of this scale are satisfactory [21]. The PTSD diagnosis was calculated according to the *DSM-IV* [5] symptom criteria. The diagnosis based on the PSS-SR corresponds well with the “gold standard” of diagnostic instruments, the Structured

Table 1

Age, gestational age, education and neuroticism of participants who did and did not meet the PTSD criteria (standard deviations are in parentheses)

	No PTSD	PTSD	Statistical test
Age (years)	30.8 (4.1)	29.9 (4.3)	$t(114)=1.03$
Gestational age (weeks)	10.9 (4.3)	15.7 (9.4)	$t(114)=3.79^{a,*}$
Education	4.7 (1.4)	4.3 (1.7)	$t(114)=2.10^*$
Neuroticism			
Low	46	7	$\chi^2(1, 116)=9.11^*$
High	39	24	

^a This test is based on the transformed scores.

* $P<.05$.

Clinical Interview for the DSM-IV [22]. This scale is therefore used to screen for the disorder in large studies or settings where diagnostic interviews are not feasible (e.g., Refs. [23,24]). A PTSD symptom was considered to be present if at least 2 (*half of the time*) was scored.

2.3. Statistical analysis

With a logistic regression, the predictive value of education and neuroticism on PTSD was calculated. The gestational age at the time of the loss was also included in this model. It was skewed to the right and logarithmically transformed twice. Neuroticism was dichotomized on the basis of a score of 6 on the Eysenck Personality Questionnaire (low neuroticism, score ≤ 5 ; high neuroticism, score ≥ 6) This yielded the highest OR and was considered the optimal discriminating cutoff. The risk of PTSD as a function of education and neuroticism was then calculated with a logistic function ([25]: comparison 20.3, p. 421).

3. Results

The average neuroticism score was 7.3 (S.D.=4.6), and the average PTSD Symptom Scale score was 18.1 (S.D.=9.1). Based on the PSS-SR, 31 women (26%) met the PTSD symptom criteria and 86 women did not. The average PSS-SR score was 28.2 (S.D.=7.0) for the group with PTSD and 14.7 (S.D.=6.7) for the group without PTSD. Table 1 shows age, gestational age, education and neuroticism for women who met the PTSD criteria and those who did not. The groups differed only on the latter three variables.

Table 2 displays the logistic regression, which showed that risk of PTSD was significantly predicted by longer gestational age, lower education and higher neuroticism. The interactions between these variables were not significant and were not considered further. Each odds ratio was

Table 2

Summary of logistic regression analysis for variables predicting PTSD

Variable	OR	P value	95% CI	RR	95% CI
Gestational age	2.48	.001	1.45–4.25	1.78	1.29–2.28
Education	0.53	.009	0.33–0.85	0.60	0.40–0.89
Neuroticism	4.49	.004	1.60–12.60	2.32	1.38–3.07

Note. $\chi^2=28.44$, $P<.001$.

Table 3

Risk of PTSD after pregnancy loss based on education and low and high neuroticism

Education	Low neuroticism (%)	High neuroticism (%)
1	37	73
2	28	64
3	20	53
4	14	43
5	10	33
6	7	24
7	4	17

adjusted to convert it to a relative risk (see Ref. [26]), and these are also presented in Table 2.

Table 3 shows estimated risks of PTSD based on the average gestational age. The lowest risk of PTSD (4%) is found among women with the highest education and low neuroticism. The risk is almost 20 times as great (73%) among women with the lowest education and higher neuroticism. The risks were higher as the level of education decreased both in the group with low neuroticism and the group with high neuroticism. Given a certain education, the risk of PTSD is more than two times higher for people with relatively high neuroticism.

4. Discussion

Based on the PTSD Symptom Scale, 31 of the 117 women fulfilled the DSM-IV criteria for PTSD. It was possible to predict whether they would or would not develop symptoms on the basis of a combination of two elementary factors: neuroticism and education. For patients with a high education and low neuroticism, the risk of PTSD is negligible; for patients with a low education and high neuroticism, the estimated risk is around 70%. Elsewhere and previously, the predictive ability of education/intelligence and neuroticism was documented for PTSD after other traumatic events such as accidents, crimes and military war experiences (see Ref. [15]). Yet, no combined risk table was calculated; hence, it is not known how much the figures from Table 2 can be generalized to other traumas. However, there are no empirical or theoretical reasons to suppose that, for other traumatic events of medical or nonmedical nature, the pattern of the predictors would significantly differ from the data reported here.

The presence of a connection between lower intelligence/education and PTSD is characteristic of this disorder; other anxiety disorders such as panic disorder and obsessive-compulsive disorder are not negatively correlated with intelligence (e.g., Ref. [27]). The connection between intelligence and the onset of PTSD may be related to the specific nature of the disorder. The so-called “processing” of the traumatic event tends to be a cognitive task whereby a generally unexpected and dramatic experience has to be integrated in a qualified and realistic way in autobiographical memory. Intelligence can support this process. The connection between PTSD and neuroticism is not unique for

this anxiety disorder. Neuroticism is related to all anxiety disorders (except specific phobia) and depression. It could be said that the connection between neuroticism and PTSD is partially tautological: PTSD symptoms and the characteristics of neuroticism overlap [18]. Although the increase in symptoms after the traumatic event seems to be similar for people with high and low neuroticism [18], on account of that higher baseline, people with high neuroticism are more at risk of developing symptoms of a caliber that justifies the PTSD diagnosis.

It is not desirable to provide every woman with psychological or psychosocial care after a pregnancy loss, without due consideration of the person (see Ref. [14]). Quite apart from that, it is not always possible due to scarcity of time and resources. The present findings provide a rational basis for deploying scarce time in supporting traumatized individuals. Generally, patients with low education/intelligence and high neuroticism are vulnerable to developing PTSD. Care and support should preferably focus on the latter group.

Appendix A. Measuring education level

What is the highest level of education you have completed?

- Primary education
 - 1. Primary education
- Secondary school
 - 2. Low-level vocational training
 - 3. Intermediate general vocational training
 - 4. Intermediate professional vocational training
 - 5. College-bound high school
- Higher education
 - 6. College
 - 7. University

References

- [1] Smith NC. Epidemiology of spontaneous abortion. *Contemp Rev Obstet Gynaecol* 1988;1:43–8.
- [2] Frost M, Condon JT. The psychological sequelae of miscarriage: a critical review of the literature. *Aust N Z J Psychiatry* 1996;30:54–62.
- [3] Lee C, Slade P. Miscarriage as a traumatic event: a review of the literature and new implications for intervention. *J Psychosom Res* 1996;3:235–44.
- [4] Maker C, Ogden J. The miscarriage experience: more than just a trigger to psychological morbidity? *Psychol Health* 2003;18:403–15.
- [5] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington, DC: Author; 1994. p. 424–9.
- [6] Tedstone JE, Tarrier N. Posttraumatic stress disorder following medical illness and treatment. *Clin Psychol Rev* 2003;23:409–48.
- [7] Bowles SV, James LC, Solursh DS, et al. Acute and post-traumatic stress disorder after spontaneous abortion. *Am Fam Phys* 2000; 61:1689–96.
- [8] Speckhard A. Traumatic death in pregnancy: the significance of meaning and attachment. In: Figley CR, Bride BE, Mazza N, editors. *Death and trauma: the traumatology of grieving*. Washington, DC: Taylor and Francis; 1997. p. 67–101.
- [9] Wijma K, Söderquist J, Wijma B. Posttraumatic stress disorder after childbirth: a cross-sectional study. *J Anxiety Dis* 1997;11:587–97.
- [10] Engelhard IM, van den Hout MA, Arntz A. Posttraumatic stress disorder after pregnancy loss. *Gen Hosp Psychiatry* 2001;23:62–6.
- [11] Janssen HJEM. A longitudinal prospective study of the psychological impact of pregnancy loss on women (dissertation). Nijmegen, The Netherlands: Katholieke Universiteit Nijmegen; 1995. p. 65–92.
- [12] Turtton P, Hughes P, Evans CDH, et al. Incidence, correlates and predictors of post-traumatic stress disorder in the pregnancy after stillbirth. *Br J Psychiatry* 2001;178:556–60.
- [13] Levine RE, Oandasan AP, Primeau LA, Berenson AB. Anxiety disorders during pregnancy and postpartum. *Am J Perinatol* 2003; 20:239–48.
- [14] Ruzek J, Watson P. Early prevention to prevent PTSD and other trauma-related problems. *PTSD Res Q* 2001;12:1–3.
- [15] Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol* 2001;68:748–66.
- [16] Ehlers A, Clark DM. A cognitive model of posttraumatic stress disorder. *Behav Res Ther* 2000;38:319–45.
- [17] Engelhard IM, van den Hout MA, Kindt M, Arntz A, Schouten E. Peritraumatic dissociation and posttraumatic stress after pregnancy loss: a prospective study. *Behav Res Ther* 2003;41:67–78.
- [18] Engelhard IM, van den Hout MA, Kindt M. The relationship between neuroticism, pre-traumatic stress, and post-traumatic stress: a prospective study. *Pers Individ Differ* 2003;35:381–8.
- [19] American Psychological Association. Ethical principles of psychologists and code of conduct. *Am Psychol* 2002;57:1060–73.
- [20] Eysenck HJ, Eysenck SBG. *Manual of the Eysenck Personality Questionnaire*. San Diego, CA: Educational and Industrial Testing Service; 1975.
- [21] Foa EB, Riggs DS, Dancu CV, Rothbaum BO. Reliability and validity of a brief instrument for assessing post-traumatic stress disorder. *J Trauma Stress* 1993;6:459–73.
- [22] First MB, Spitzer RL, Williams JBW. *Structured Clinical Interview for DSM-IV Axis I disorders: SCID-I: clinician version*. New York: American Psychiatric Press; 1997.
- [23] Ehlers A, Mayou RA, Bryant B. Psychological predictors of chronic posttraumatic stress disorder after motor vehicle accidents. *J Abnorm Psychol* 1998;107:508–19.
- [24] Brewin CR, Andrews B, Rose S. Fear, helplessness, and horror in posttraumatic stress disorder: investigating DSM-IV criterion A2 in victims of violent crime. *J Trauma Stress* 2000;13:499–509.
- [25] Kleinbaum DG, Kupper LL, Morgenstern H. *Epidemiologic research: principles and quantitative methods*. Chapter 20. New York: Van Nostrand Reinhold Company; 1982.
- [26] Zhang J, Yu K. What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. *JAMA* 1998; 280:1690–1.
- [27] Purcell R, Maruff P, Kyrios M, Pantelis C. Neuropsychological deficits in obsessive-compulsive disorder. *Arch Gen Psychiatry* 1998; 55:415–23.