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Perioperative anxiety and length of hospital stay after caesarean section – A cohort study

N.K. Schaal^{a,*,1}, P. Hepp^{b,c,d,1}, M. Heil^a, O.T. Wolf^e, C. Hagenbeck^c, M. Fleisch^b, T. Fehm^c^a Department of Experimental Psychology, Heinrich-Heine-University, Düsseldorf, Germany^b Clinic for Gynecology and Obstetrics, HELIOS University Clinic, Wuppertal, University Witten/Herdecke, Germany^c Clinic for Gynecology and Obstetrics, Heinrich-Heine-University, Düsseldorf, Germany^d Clinic for Gynecology and Obstetrics, University Clinic, Augsburg, Germany^e Department of Cognitive Psychology, Institute of Cognitive Neuroscience, Faculty of Psychology, Ruhr-University Bochum, Germany

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ABSTRACT

Objective: The caesarean section is one of the most frequently performed surgeries. Due to growing economic challenges, hospitals are encouraged to improve their cost-efficiency. One factor that influences hospital costs of caesarean sections is a prolonged hospital stay.

Study design: The aim of the current prospective study was to investigate psychosocial factors, with an emphasis on anxiety, and sociodemographic factors that are associated with longer hospital stay after caesarean sections with no medical complications. Data of 195 women who gave birth by caesarean section was analyzed. As possible predictors anxiety levels measured pre-, peri- and postoperative as well as age, parity (primiparous/multiparous), repeated caesarean (yes/no), BMI (<30/ ≥30), STAI-Trait scores, duration of surgery, PH arterial and Apgar 5 min. were entered into a backward linear regression with duration of hospital stay as the dependent factor.

Results: The analysis revealed that higher age, primiparity as well as higher anxiety scores during the postoperative phase are significant factors associated with prolonged hospital stay. The significant model explains 22.1 % of the variance.

Conclusion: The results should sensitize the medical team to these risk factors in order to improve patients' recovery and shorten hospital stays.

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1 Introduction

In the last two decades the proportion of caesarean sections has increased to around 30 percent in many developed countries [1–3]. The caesarean section has therefore become one of the most frequently performed surgeries, and due to growing economic challenges, hospitals are encouraged to keep caesarean section costs low. One factor that influences hospital costs of caesarean sections is a prolonged hospital stay [4–6]. Furthermore, the length of hospital stay is an indicator for quality of inpatient care [7,8]. However, there is a variance in duration of hospital stay after caesarean sections within one setting and so far sparse research has investigated which factors (that are not related to medical complications) influence recovery and duration of hospital stay which might account for this variance.

There are a small number of retrospective cohort studies investigating factors, which predict early discharge from hospitals after birth [5,9,10]. A study including vaginal births and caesareans revealed that multiparity and vaginal births are the strongest predictors for early discharge from hospitals [5]. Additionally, a study by Weiss et al. [9] examined sociodemographic factors, which may influence hospital stay after vaginal births and revealed that prolonged hospital stay was associated with higher age, primiparity and high education status, highlighting the impact of sociodemographic factors in healthcare settings.

Another two studies have examined possible factors influencing recovery and hospital stay after caesarean sections. A retrospective cohort study by Blumenfeld et al. [10] involving a large sample of 57,067 women focused on medical factors and revealed that perioperative complications, endometriosis and wound complications were strong predictors for a prolonged hospital stay after caesarean. A study by Hobson et al. [11] involving 85 women who gave birth by elective caesarean revealed that preoperative anxiety levels were negatively associated with postoperative maternal birth satisfaction and recovery, but no influence of preoperative anxiety on hospital stay was shown.

* Corresponding author at: Heinrich-Heine-University Düsseldorf, Department of Experimental Psychology, Universitätsstraße 1, 40225 Düsseldorf, Germany.

E-mail address: nora.schaal@uni-duesseldorf.de (N.K. Schaal).

¹ Contributed equally, shared first authorship.

However, research in other areas of medicine has shown that anxiety levels are related to pain perception, recovery and hospital stay [12–15].

The aim of the current prospective study was to investigate factors that are associated with longer hospital stay after caesareans with no medical complications. Emphasis is given to the question of whether anxiety, measured as a trait (i.e. a personal characteristic) and experienced anxiety states at different time points on the day of the caesarean (i.e. anxiety measured at admission (T1), at skin closure (T2) and 2 h post surgery (T3)) influences hospital stay after the caesarean. Based on the presented literature, we hypothesized that anxiety levels may influence hospital stay.

2 Material and methods

2.1 Participants

A total of 304 patients took part in the present study. Inclusion criteria were that women had a singleton pregnancy and an indication for an elective caesarean section at term under spinal anesthesia. Furthermore, exclusion criteria were known severe comorbidities (medical or psychological) of the patient or illnesses of the fetus.

Initially 412 women were recruited at the Clinic for Gynecology and Obstetrics at the University Hospital in Düsseldorf between March 2015 and August 2017. However 107 women could not complete the study because they no longer fulfilled the inclusion criteria at birth: three had delivered spontaneously, 18 had an indication for caesarean at preterm, 41 had an emergency caesarean (for example because of premature rupture of membranes) and furthermore, technical difficulties occurred during the study period (reconstruction of the operation theatre) which disrupted the study process. Additionally, another 19 cases were excluded from the analysis as these were multiple pregnancies and therefore these women did not meet the inclusion criteria.

Furthermore, the data of additional 90 patients was not complete (one of three anxiety scores was missing) and were not included in the analysis. Therefore, the final sample consisted of 195 women (see Fig. 1). The reasons why women gave birth by elective caesarean were breech position (38 cases), maternal

reasons (i.e. placenta previa, diabetes, a scar from a preceding caesarean; 81 cases), fetal reasons (i.e. macrosomia; 11 cases) and caesarean on patients' request (65 cases). A post-hoc power analysis conducted with the software GPower [17] revealed a power of 97 % considering a sample size of 195, an alpha of .05 and 10 predictors for the regression analysis with a small to medium effect size (.1).

The study was approved by the ethics committee of the Heinrich-Heine-University Düsseldorf in Germany (ID: 3625). The study is registered in the "Deutsches Register Klinischer Studien" (DRKS00007840). All participants gave informed written consent prior to participation. Participants were part of a larger prospective study and another research question was addressed in a previous publication [16].

2.2 Material and procedure

To evaluate the patients anxiety levels, the State-Trait-Anxiety Inventory (STAI; 17) and a visual analogue scale for anxiety (VAS-A) were used. The STAI is an introspective questionnaire, which consists of two parts with 20 questions each evaluating general tendencies towards anxiety (STAI-Trait) on the one hand and anxiety levels induced temporarily by a specific situation (STAI-State) on the other hand. With the VAS-A participants can indicate their subjective situational anxiety level at the time point of evaluation by making a cross on a continuous 10 cm line between two end-points (i.e. 0 = *not at all anxious* to 10 = *extremely anxious*).

Patients were offered participation by the physician on duty at the preoperative assessment around fourteen days before the scheduled caesarean. Patients who fulfilled the inclusion criteria were recruited sequentially.

After signing the informed written consent form, they filled in the STAI-Trait questionnaire. On the day of the caesarean, the women were asked to indicate their anxiety level on the VAS-A and to fill in the STAI-State at the following three time points: on admission when patients arrived in the hospital in the morning of the caesarean (T1), during skin closure (T2) and two hours after the end of the surgery (T3). After the last measurement the mother was transferred from the labour ward to the postnatal ward.

The duration of hospital stay after the caesarean as well as basic information about the mother (age, BMI at the time of the caesarean, parity) and information about the caesarean (i.e. number of preceding caesareans, duration of the operation) and the newborn (APGAR 5 min. and pH arterial) were taken from the electronic files.

2.3 Statistical analysis

Independent factors (Table 1), which might influence hospital stay after caesarean, were identified prospectively based on the literature and then entered into a backward linear regression.

As for the measure of situational anxiety, the VAS-A scores and the STAI-State scores were included as possible predictors in the analysis. Parity was categorised in primiparous vs multiparous. The number of preceding caesareans was also categorised into a binary factor "repeated caesarean section" with the categories no (i.e. patient underwent first caesarean section) and yes (i.e. patient had one to three preceding caesarean section). BMI scores were also categorised into a binary variable (<30 and ≥30, as >30 is classified as obesity in pregnancy [18]).

3 Results

3.1 Demographics

The mean age of the sample was 33.4 years (SD = 5.4). Sixty-Eight women were primiparous and 127 were multiparous. Ninety

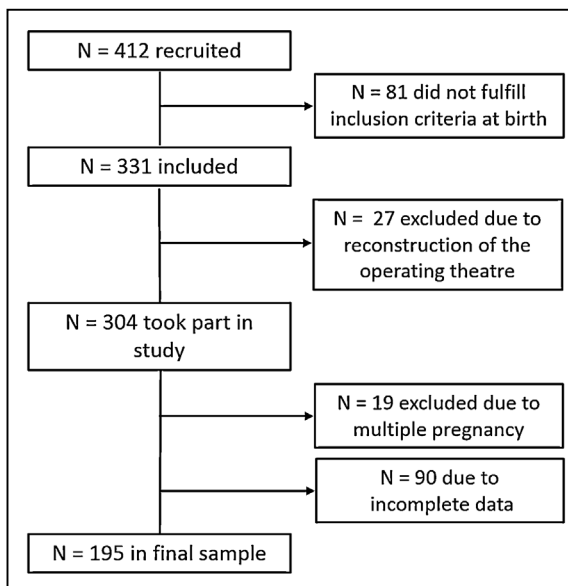


Fig. 1. Participant flow chart.

Table 1
Overview of independent factors.

| Variable | Mean ± SD or Quantity |
|----------------------------------|-----------------------|
| Age (in years) | 33.4 ± 5.4 |
| Parity (primiparous/multiparous) | 68/127 |
| Repeated cesarean (no/yes) | 90/105 |
| BMI (<30/>30 kg/m ²) | 145/50 |
| STAI-Trait | 37.1 ± 7.9 |
| STAI-State T1 | 47.76 ± 11.25 |
| STAI-State T2 | 32.75 ± 7.88 |
| STAI-State T3 | 29.70 ± 6.02 |
| VAS-A T1 (in cm) | 4.95 ± 2.76 |
| VAS-A T2 (in cm) | 1.43 ± 1.42 |
| VAS-A T3 (in cm) | 0.93 ± 1.21 |
| Duration of surgery (in minutes) | 43.1 ± 10.2 |
| pH arterial | 7.32 ± 0.04 |
| 5min APGAR | 9.93 ± 0.42 |

Note: BMI: Body Mass Index; STAI: State-Trait-Anxiety Inventory; T1: at admission; T2: at skin closure; T3: 2 h post surgery; VAS-A: visual analogue scale for anxiety.

women received their first caesarean (i.e. 22 women had a baby vaginally before) whereas 105 received a repeated caesarean section. The mean BMI value was 28.0 ± 5.5 with 145 women having a BMI below 30 (<30) and 50 women above 30 (>30).

The range of the duration of hospital stay after the caesarean section was 1–8 days with a mean stay of 3.91 ± 1.02 days.

3.2 Regression analysis

A backward linear regression was calculated with the duration of hospitalization as the dependent variable and age, parity (primiparous/multiparous), repeated caesarean (yes/no), BMI (<30/ ≥30), STAI-Trait, STAI-State T1-T3, VAS T1-T3, duration of surgery, pH arterial and Apgar 5 min. as possible factors. Table 1 gives an overview of the included independent variables. The analysis revealed that age, parity and VAS T3 (anxiety measured 2 h post surgery) are significantly associated with length of hospital stay. A significant model to predict duration of hospitalization emerged, $F(3,193) = 17.95$, $p < .001$ with $R^2 = .221$. The model

Table 2
Stepwise backward linear regression model of significant factors associated with the duration of hospital stay.

| | b | SE B | β | p |
|----------|-------|------|------|--------|
| Constant | 2.451 | .436 | | < .001 |
| Age | .070 | .013 | .370 | < .001 |
| Parity | -.614 | .144 | -.29 | < .001 |
| VAS-A T3 | .171 | .061 | .183 | .006 |

Note: $R^2 = .221$, dependent variable: duration of hospital stay; VAS-A: visual analogue scale for anxiety; T3: 2 h post surgery.

explains 22.1 % of the variance. A summary of the significant factors of the model is presented in Table 2.

Bivariate correlations showed a significant relationship between age and hospitalization, $r = .289$, $p < .001$ (Fig. 2A) as well as between the VAS-A T3 scores and hospitalization, $r = .227$, $p = .001$ (Fig. 2C). An independent-sample t-tests revealed a significant effect of parity on hospitalization, $t(193) = 2.48$, $p = .014$ (Fig. 2B) with primipara women staying longer ($M = 4.1 \pm 1.06$ days) than multipara women ($M = 3.7 \pm 0.95$ days).

4 Discussion

The aim of the present study was to evaluate risk factors, which are associated with prolonged hospital stay after caesareans beyond perioperative complications. The analysis concentrated on anxiety levels evaluated on the day of the caesarean section and revealed that age, parity and the subjective anxiety scores measured by VAS two hours after the surgery are significant predictors for the duration of hospital stay.

The result that self-reported anxiety levels measured by a VAS are significantly related to length of hospital stay after caesarean is particularly interesting. This has already been shown in other medical contexts such as elective arthroplasty [13], cardiac surgery [14], breast cancer [19]. However, in these studies preoperative anxiety was correlated with recovery and length of hospital stay whereas in the current study postoperative anxiety and not preoperative anxiety was a significant predictor. We would argue that the present study is the first evaluating the relationship of anxiety levels and the length of hospital stay which assessed anxiety of the patient at multiple time points. Additionally, the current study included two different measures to evaluate anxiety levels, the VAS and the STAI-State, and the results show that only postoperative anxiety levels measured by VAS significantly predict hospital stay. We would argue that the VAS is a more instinctive and direct measure of depicting anxiety levels as only one quick answer needs to be given. This very easy and quick method could be of use in identifying patients who could profit from additional support, which reduces their anxiety and therefore prevent prolonged hospital stay. Women with higher anxiety scores could for example profit from an enhanced recovery programme, which has been shown to improve recovery after the caesarean section [20].

Anxiety measured as a personality trait did not significantly predict hospital stay after caesarean section in the present study, whereas other studies in other areas of surgery have shown an association between anxiety traits and pain perception, recovery and hospital stay [21,22]. An important difference between these studies and our study is that the caesarean section is a surgery

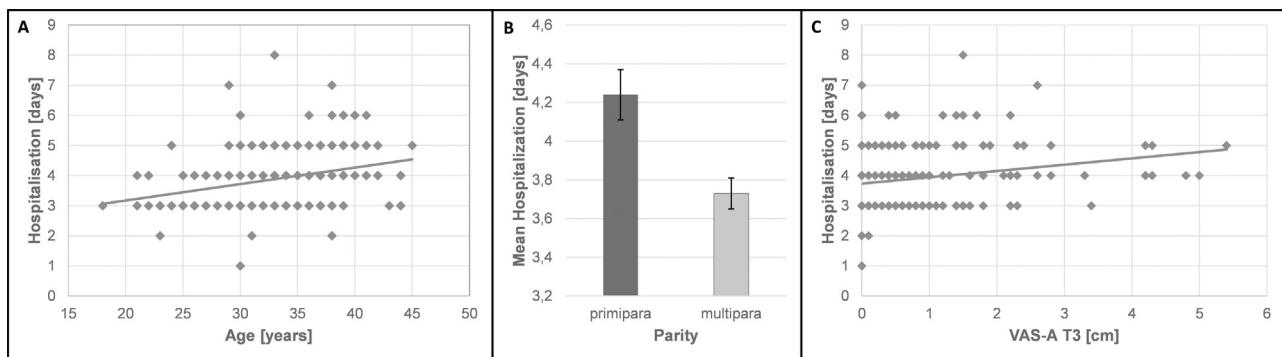


Fig. 2. Significant factors that influence the duration of hospital stay. **A** Age is positively correlated with hospitalization after a caesarean section ($r = .289$, $p < .001$); **B** Primipara women stay significantly longer in hospital than multipara women ($p = .014$); **C** Anxiety levels 2 h post surgery (VAS-A T3) are positively correlated with hospitalization ($r = .227$, $p = .001$).

which is combined with a happy event, the birth of a child, which is a central factor to keep in mind. This could maybe explain why postoperative anxiety and not preoperative anxiety, as shown in other studies [13,14,19] is highlighted here. A hypothesis, which needs further elaboration in future studies could be that before the surgery the uncertainty about whether the unborn child will be healthy is added to the anxiety regarding the surgery, which is a key difference to other surgeries.

The significant influence of parity is in line with previous research. Nilsson and colleagues showed that parity has a large impact on the duration of hospital stay by showing that multiparity was one of the strongest predictors for early discharge after giving birth [5]. This result has also been shown in other studies [4,9,23]. To the best of our knowledge the present study is the first to include parity as well as the factor repeated caesarean (yes/no). The study highlights that primiparity is a significant predictor whereas receiving a first or repeated caesarean section is not. A possible reason may be that first time mothers are more insecure with the new situation and more anxious about whether feeding and caring for the baby will be mastered well and therefore are tempted to stay in hospital longer. In this respect it has been shown that maternal sense of competence is related to maternal anxiety in first-time mothers [24].

The influence of age on hospital stay has also been shown in previous studies [9,25]. Here we show that a higher age is associated with longer hospital stay after caesarean section in line with the study by Weiss et al., [9]. It may be hypothesized that older mothers need more time to recover from the surgery and are maybe more concerned about the care and wellbeing of their newborn and feel safer if they stay in hospital longer. On a related note, it has been shown that older primiparas display worse physical symptoms such as back and wrist pain one month postpartum [26], highlighting that age is an important factor when recovering from giving birth and that older obstetric patients may require special attention regarding physical recovery.

Based on the results presented, some indications for clinical practice arise. Women who display one or more factors which are highlighted here to predict prolonged hospital stay should receive additional care and information shortly after the caesarean in order to improve their recovery and therefore positively influence the length of hospital stay. More information for example about breastfeeding and care of the newborn has a positive influence and also emotional and social support are important factors to consider [27,28]. Based on our result that anxiety levels evaluated two hours after the caesarean section influence the duration of hospital stay, it would be a conceivable option to include the easy to implement VAS for anxiety in the postoperative phase in clinical practice so that women can express their anxiety levels in order to enable the medical team to react as early as possible. Thereafter, patients with high anxiety levels should be offered more patient-centred postpartum care from health providers [29].

We acknowledge that retrospective studies can include bigger sample sizes and therefore display more power in order to identify possible predictors. On the other hand, we believe that our prospective approach allowing us to evaluate anxiety levels at several time points on the day of the caesarean is a strength. By only including elective caesareans without medical complications, this study could explicitly concentrate on risk factors, which go beyond medical circumstances and complications. The present data confirms that factors beyond medical complication influence hospitalization, as the model applied could explain 22% of the variance in the duration of hospital stays after a caesarean section. This is an important point to consider, as studies have shown that the longer the length of stay is, the more expensive the delivery costs are [6,30]. Furthermore, another limitation warrants a comment here. The present study has a fairly high drop-out rate and furthermore also a

substantial subset of patients had to be excluded because of incomplete data. This leads to a selection bias and limits the external validity of the results. However, the post-hoc power analysis revealed high statistical power and the results of the study should encourage further research in the field investigating factors that influence anxiety levels at birth and subsequently the duration of hospital stay. In this respect, it would also be very interesting to compare perioperative anxiety levels between women who receive a caesarean due to medical indications and those who give birth by caesarean due to patients' request.

5 Conclusions

The study highlights that higher age, primiparity as well as higher anxiety scores during the postoperative phase are significant predictors for prolonged hospital stay. The influence of postoperative anxiety levels should be highlighted as we would like to encourage the medical team and hospital staff to be sensitized in this respect and give special support to women with high anxiety levels.

Ethics approval and consent to participate

The study was approved by the ethics committee of the Medical Department of the Heinrich-Heine-University in Düsseldorf (No.: 3625). The research was conducted in accordance with the 1964 Helsinki Declaration. All patients gave their written consent.

Availability of data and material

The dataset analysed during the current study is available from the corresponding author on reasonable request

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Authors' contributions

N.K.S, P.H., O.T.W., M.F. and T.F. conceived the study concept. All authors contributed to the study design. N.K.S, P. H. and M.H. were responsible for data analysis and interpretation. N.K.S and P.H. drafted the manuscript and all other authors provided critical revisions. All authors approved the final version of the manuscript for submission.

Declaration of Competing Interest

All authors declare that they have no competing interests.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ejogrb.2020.03.045>.

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