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Sense of coherence predicts uncomplicated delivery: a prospective observational study

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Abstract
The present study aimed to investigate factors predicting uncomplicated deliveries and specifically whether a sense of coherence (SOC) and perceived stress can predict such deliveries. A prospective observational study was conducted employing self-administered SOC and perceived stress scale (PSS) questionnaires with pregnant women attending the outpatient clinic for routine surveillance. Following delivery, data regarding maternal and fetal delivery complications were collected from the participants’ medical records. Of one hundred forty-five women completing the study, 43.4% completed the delivery process without complications. Women experiencing delivery complications, on average, had lower SOC scores (67.7 ± 1.19 vs. 72.2 ± 1.32, p = 0.014). Maternal complications (as opposed to fetal complications) accounted for this divergence and were related to lower SOC scores (67.74 ± 1.19 vs. 72.18 ± 1.32, p = 0.01). PSS was not associated with uncomplicated delivery (18.82 ± 0.59 vs. 17.98 ± 0.62, p = 0.341). Nulliparity, however, was associated with higher occurrence of complicated delivery (31.9% of complicated vs. 13.2% of uncomplicated deliveries, p = 0.007). Multivariable analysis demonstrated that high SOC (OR = 1.042; 95% CI = 1.004–1.08; p = 0.03) and nulliparity (OR = 0.293; 95% CI = 0.113–0.758; p = 0.011) both were independent predictors of uncomplicated delivery, directly and inversely, respectively. In conclusion, higher SOC scores are an independent protective factor for the prediction of uncomplicated delivery.

Keywords: Salutogenesis, sense of coherence, uncomplicated delivery, perceived stress scale, nulliparity

Introduction
Pregnancy and labor are basically joyous processes, yet hold significant hazard to both mother and fetus. Medicine has made major progress in treatment and prevention of birth complications, employing advanced prenatal care, vaccinations and food supplements. Nevertheless, detection of factors which may predict uncomplicated labor has not yet received adequate scholarly attention.

Complicated delivery is defined as one that deviates from spontaneous onset, without the need for induction or augmentation, resulting with no maternal or fetal complications, i.e., vertex vaginal delivery, normal fetal Apgar scores, fetus not requiring intensive care hospitalisation and surviving at 28 days post delivery [1]. Complicated labors inherently result in medical, psychological and financial consequences. Currently, in the southern part of Israel, approximately 20% of labors involve induction and another 20% conclude with caesarian delivery (CD) [2–4].

The Salutogenesis theory developed by Antonovsky [5] relates to the individual’s ability to promote health in spite of daily stress [6]. Sense of coherence (SOC) poses a fundamental concept within this theory. SOC portrays the degree to which a person perceives the world and the inevitable stressful events he/she encounters, as comprehensible, manageable and meaningful challenges worth overcoming. Such orientation enables efficient recruitment of available resources to cope with a variety of demanding situations. High SOC facilitates flexibility and an increased ability to effectively choose the appropriate resources for coping with a specific situation. Persons characterised by a strong SOC, will be less anxious, less depressed and have more positive emotions [7–9]. Higher SOC scores were found to be associated with an increased health-related quality of life [10] and with physical health, in general, in women [11].
Conversely, lower SOC was found to be associated with morbidity risk factors such as dyslipidemia (e.g., Svartvik et al. [12]). Sjostrom et al. [13] demonstrated a positive correlation between SOC and subjective well-being of pregnant women, which in turn is known to be correlated with low morbidity.

Previous studies showed several epidemiologic and sociologic factors to be related to the possibility of having an uncomplicated delivery. For example, social support is an important factor which enhances the physical and mental health of pregnant women [14]. On the other hand, psychological stress such as depression and anxiety has been found to increase birth complications [15]; stress may be measured by the perceived stress scale (PSS) [16]. Motivated by the association of SOC with a variety of parameters and by the wish to establish a predictive tool for uncomplicated delivery, we explore in this current prospective study the relationship between SOC and PSS measures and uncomplicated labor.

Methods

Study population

A prospective observational study was conducted at the Soroka University Medical Center. Inclusion criteria were (1) maternal age of 18 years and above, (2) fluent Hebrew speaker, (3) singleton pregnancy, (4) expected term delivery (weeks 37 to 41) and (5) vertex presentation. Complicated labor was defined as having at least one of the following criteria: (1) induction of labor, (2) augmentation of labor, (3) non-vertex presentation, (4) instrument delivery, (5) CD, (6) post-partum hemorrhage, (7) an Apgar score at 5 min of less than 7, (8) neonatal umbilical artery pH of less than 7.1 and (9) base excess of more than 12 [1,17].

The study was approved by the local institutional review board, and all participants gave their written informed consent. Sample size was estimated employing a power analysis with the following parameters: expected rate of complicated deliveries 35% [3], a two-fold difference in subjects’ SOC-13 scores between women with uncomplicated and complicated deliveries, 80% power, alpha of 0.05. This analysis resulted in a sample size of approximately 150.

The study was conducted in two phases: first, in the initial visit to the out-patient clinic for routine surveillance, the following data were collected using a self-administered structured questionnaire:

1. The SOC questionnaire (in its 13-item short form, SOC-13, [5]) was administered in its Hebrew version [18,19]. Responders reported the degree to which each of the 13 statements represented their attitudes on a 7-point Likert scale. The SOC-13 was summed to obtain one score, with higher scores indicating a higher SOC.

2. The PSS [16], measures the degree to which situations in ones life during the past month are appraised as stressful, un-predictable and uncontrollable. The scale was administered in its Hebrew version [20]. Respondents indicated on a 5-point Likert scale how often they experienced each item ranging from 0 ‘never’ to 4 ‘very often’. The PSS was summed to obtain a single score, with higher scores reflecting a higher degree of perceived stress.

3. Socio-demographic and obstetrical data were collected using an in-house compiled questionnaire.

At the second phase that took place following delivery, data were collected from the medical records of the patients. Data were used to calculate a single dichotomous score of complicated versus uncomplicated delivery based on the above criteria.

Data collection and analysis

The data were encoded using Epi-data software and processed using SPSS 15.0 for Windows. Statistical significance was ascertained using the chi-square test for qualitative variables and Student t-test for continuous variables.

A multiple logistic regression model was constructed to control for confounding variables. p value of less than 0.05 was considered statistically significant. Subjects were excluded from analysis if there were more than two missing entries in either the SOC-13 or PSS questionnaires. In the case of two or fewer missing items, the average response for all other items was entered in place of the missing values.

Results

Subjects recruited

The first phase of the study was completed by 157 women. At the time of the second phase, three women were excluded due to preterm delivery, another six patients were not included because they gave birth at another hospital and an additional three were excluded due to more than two missing entries in either the SOC-13 or PSS questionnaires. Thus, a total of 145 women were included in the final analysis.

Of the 145 women included, 82 (56.6%) met the criteria for complicated labor, whereas 63 (43.4%) had an uncomplicated labor. The demographic characteristics of the two groups are presented
in Table I. Patients with complicated deliveries were more likely to be nulliparous compared to patients with uncomplicated deliveries ($\chi^2 = 7.356, p = 0.007$).

No statistically significant differences were detected regarding maternal age, level of education, place of birth or previous labor complications between the groups.

**Characteristics of delivery complications in the study group**

The frequency of delivery complications is presented in Figure 1. The most frequent complications were augmentation (42.8%), CD (19.3%) and instrument deliveries (9.7%). The total number of women experiencing at least one delivery complication was 82, comprising 56.6% of the studied population.

**Questionnaires’ validity and reliability**

A correlation was sought between the SOC-13 and PSS scores. Similar associations were reported previously [21] as a method of cross-validation. A negative correlation was found, as expected, between the SOC-13 and PSS ($r = -0.627; p < 0.01$).

<table>
<thead>
<tr>
<th>Table I. Demographic characteristics of the two groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Complicated delivery ($n = 85$) Uncomplicated delivery ($n = 60$)</td>
</tr>
<tr>
<td>Maternal age*</td>
</tr>
<tr>
<td>Education*</td>
</tr>
<tr>
<td>High-school</td>
</tr>
<tr>
<td>Higher-education</td>
</tr>
<tr>
<td>Past complicated labor*</td>
</tr>
<tr>
<td>Place of birth*</td>
</tr>
<tr>
<td>Israel</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Nulliparous*</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

*Mean ± standard error, significance tested with student t-test.

$^i$Percent, in parenthesis - frequency (percent excludes missing values), significance tested with $\chi^2$ test.

$^i$Statistically significant.

Figure 1. Frequency of delivery complications.
Soc-13 is higher in women with uncomplicated deliveries

In order to examine our hypothesis that there is an association between a high SOC and uncomplicated mode of delivery, the SOC-13 scores were compared between the groups (Table II). A statistically significantly higher score in the SOC-13 was found in the uncomplicated delivery group (mean = 72.2, SE = 1.32) compared with the complicated delivery group (mean = 67.7, SE = 1.19, t test = 2.48, p = 0.014). No statistically significant difference was found between groups for the PSS score.

SOC-13 inverse association with complicated delivery is attributed to maternal complications

In order to examine whether maternal or neonatal factors contribute to the association between SOC-13 and complicated delivery, two new variables were defined. Maternal labor complications were defined as induction or augmentation of labor, instrument delivery or CD. Neonatal complications included an Apgar score at 5 min below 7, neonatal umbilical artery pH of less than 7.1 and a Base excess of 12 and above.

Maternal labor complications were significantly associated with lower SOC-13 scores (68 vs. 72, p = 0.014, Table III). No association was found between SOC-13 and neonatal factors of complicated delivery (p = 0.35)

SOC-13 score and parity predict uncomplicated delivery

SOC-13 score and parity were associated with uncomplicated delivery as demonstrated above.

Table II. SOC-13 and PSS scales by delivery complication – Student t-test*.

<table>
<thead>
<tr>
<th>Delivery Complication</th>
<th>SOC-13</th>
<th>PSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complicated delivery</td>
<td>67.74 ± mn;1.19</td>
<td>18.82 ± mn;0.59</td>
</tr>
<tr>
<td>Uncomplicated delivery</td>
<td>72.18 ± mn;1.32</td>
<td>17.98 ± mn;0.62</td>
</tr>
<tr>
<td>t test (t, p-Value)</td>
<td>t = 2.48;</td>
<td>p = 0.341,</td>
</tr>
<tr>
<td></td>
<td>p = 0.014</td>
<td>t = -0.955</td>
</tr>
</tbody>
</table>

*Data are expressed as mean ± standard deviation.
Statistically significant.

Table III. SOC-13 and PSS scales by maternal labor complication*.

<table>
<thead>
<tr>
<th>Maternal factors</th>
<th>SOC-13</th>
<th>Neonatal factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complicated labor</td>
<td>67.74 ± 1.19</td>
<td>73.6 ± 3.69</td>
</tr>
<tr>
<td>Uncomplicated labor</td>
<td>72.18 ± 1.32</td>
<td>69.50 ± 0.92</td>
</tr>
<tr>
<td>t test (t, p-Value)</td>
<td>t = 2.487</td>
<td>t = -2.487</td>
</tr>
<tr>
<td></td>
<td>p = 0.014</td>
<td>p = 0.341</td>
</tr>
</tbody>
</table>

*Data are expressed as mean ± standard deviation.
Statistically significant.

Although controlling for parity, using a multiple logistic regression model with uncomplicated delivery as the outcome variable, SOC-13 was found to be an independent factor predicting uncomplicated delivery (OR = 1.042; 95% CI = 1.004–1.08; p = 0.03, Table IV). Nulliparity was also noted as a significant factor inversely predicting uncomplicated delivery in this model (OR = 0.293; 95% CI = 0.113–0.758; p = 0.011).

Discussion

In the present study, the association between SOC and uncomplicated delivery was explored. Validating our hypothesis, women who later had an uncomplicated delivery had a higher SOC. This finding is inline with previous studies demonstrating that high SOC is associated with improved physical health (e.g., Svartvik et al. [22]). Obviously many factors contribute to delivery outcome; among them are obstetric history and medical factors. Within this context, SOC may account for delivery outcome through a combination of psychological and possibly physiological factors. Our findings indicated that the relationship between uncomplicated delivery and SOC is mostly due to maternal factors. Maternal cooperation and involvement are important in identifying and treating potential risk factors during pregnancy and for the successful completion of vaginal delivery as well. Moreover, maternal factors are more likely to be amenable to maternal attitudes and health perception. The decision whether to employ induction or augmentation, as well as the choice of mode of delivery, are susceptible to maternal willpower.

Although perceived stress was negatively correlated with the SOC, the former was not independently associated with uncomplicated delivery. We suggest that this lack of relation is due to the time during which the PSS was administered. PSS taps into a woman’s sense of distress during the last month, whereas participants often completed the questionnaire weeks prior to delivery. As pregnancy is an unstable period, this measure may be susceptible to significant fluctuations within this time period. In contrast, SOC reflects a lifetime experience and may not be as unstable over time.

Table IV. Factors predicting uncomplicated delivery: results from a multiple logistic regression model.

<table>
<thead>
<tr>
<th>Term</th>
<th>B</th>
<th>Standard error</th>
<th>p-Value</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC</td>
<td>0.041</td>
<td>0.019</td>
<td>0.030</td>
<td>1.042</td>
<td>1.004–1.081</td>
</tr>
<tr>
<td>Nulliparity</td>
<td>-1.229</td>
<td>0.485</td>
<td>0.011</td>
<td>0.293</td>
<td>0.113–0.758</td>
</tr>
</tbody>
</table>
Nulliparity was also found to be an independent factor inversely predicting uncomplicated delivery. The difficulty of labor in nulliparous women has been well-appreciated and is reflected among other findings in the differing partograms for these women, as well as in the literature where for example there is a higher incidence of dystocia (e.g., Shields et al. [23]).

In conclusion, our study demonstrated that having an uncomplicated delivery is independently explained by a psychological index of SOC, which may serve as a novel tool for predicting uncomplicated delivery. Clearly, in light of the relatively small effect found, prior to implementing the SOC as a predictive tool, the study should be repeated in a larger population. It has been demonstrated that SOC is a relatively stable disposition in those with higher SOC levels but is more susceptible to changes in those with lower SOC [24]. Thus, based on our findings, further studies are required to explore interventions aimed at increasing SOC and thereby decreasing the rates of complicated deliveries.

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References