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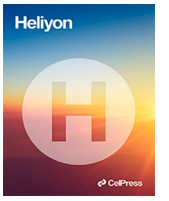

Correlates of higher anxiety scores reported by women admitted for elective caesarean section

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ABSTRACT

Background: An elective caesarean section (CS) has been associated with high anxiety scores, and there are associations between higher anxiety scores and younger age, primigravidae, higher educational level, and previous experience with anaesthesia. In this study, the aim is to measure anxiety scores associated with an elective CS using two measuring scales and identify women's characteristics and obstetrics variables that are associated with higher scores.

Methods: A cross-sectional study was conducted between Nov 15, 2019 and Nov 15, 2020. Women were included if they were 18 years of age or more, had viable pregnancies, and were admitted for an elective CS. Anxiety scores were measured on admission using the visual analogue scale for anxiety (VASA) and then the State-Trait Anxiety Inventory (STAI-Y). Associated factors were studied using logistic regression analyses.

Results: Three hundred women were recruited. Means (SD) for the participant's age and gestation age were 30.5 (5.7) years and 37.6 (1.4) weeks, respectively. Additionally, 29.3% of the participants having a CS were primigravidae and 62.3% were for maternal indications. Furthermore, 55%, 59%, and 61% of the women had scores above the means of VASA and STAI-S components 1 and 2, respectively.

Variables that showed statistically significant associations with higher anxiety scores were that the woman's age was 25–34, the CS was for foetal indications, the choice of anaesthesia was general, and the source of information for the choice of anaesthesia was a layperson.

Conclusion: Higher anxiety scores are prevalent among women admitted for an elective CS. STAI-Y and VASA correlated well, and the short VASA may replace the lengthy STAI-Y in clinical practice. Identification of women with risk factors may help in implementing strategies to reduce anxiety.

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1. Introduction

The World Health Organisation's (WHO) definition of health considers both physical and mental wellbeing [1]. As for physical wellbeing, WHO's recent estimation of the global rate of caesarean sections is 21.1%. Despite international efforts to reduce the rate, it is expected to increase in 2030 to 28.5% [2–4].

To study mental wellbeing, a recent meta-analysis showed that around 50% of patients undergoing surgery suffer from preoperative anxiety, and the prevalence is higher in females than males. This anxiety is probably related to a fear of the failure of the procedure or anaesthesia, or fear of death or unsuccessful recovery [5]. In the postoperative period, Ali et al. [6] showed that preoperative anxiety increased anaesthetic requirements and was associated with higher postoperative pain, analgesics requirements, and a prolonged hospital stay.

Compared to a vaginal delivery, a caesarean section (CS) is associated with higher maternal morbidity and mortality [3] and is associated with significantly higher risks for stress, depression, and anxiety [4]. Additionally, Maheshwari et al. [7] showed that an elective CS was associated with a high anxiety level and that women with high anxiety levels chose general anaesthesia (GA) for their CSs. Furthermore, there was a significant association between anxiety levels and age less than 25 years, primigravidae, higher educational achievement, previous experience with anaesthesia, and source of information about anaesthesia from people other than anaesthetists. Regarding the timing of anxiety, Hepp et al. [8] showed that anxiety levels during a CS were highest on admission and significantly decreased close in time to skin closure. This probably reflects the time when anxious women need more support.

There are various tools for measuring anxiety. There is the State-Trait Anxiety Inventory (STAI-Y), a self-administered inventory with two subscales [9]. Another validated instrument which effectively measures preoperative anxiety is the Visual Analogue Scale for Anxiety (VASA) [10]. Furthermore, the findings in a recent published report on anxiety associated with an elective CS where both STAI-Y and VASA were used showed that the two measuring instruments are positively correlated [8].

Generalised anxiety scores vary among countries and ethnicities [11], but there are limited published reports from the Middle East addressing pregnancy and delivery related anxiety. The aims of our study are.

- To measure anxiety levels associated with an elective CS on admission to the hospital using the validated Arabic language STAT-Y and VASA.
- To study the association between anxiety levels and various women's characteristics and obstetric factors in current and previous pregnancies.

Identification of pregnant women who are more likely to have higher anxiety levels may help in implementing policies to reduce anxiety. In addition, the results of this study may bridge the gap in the current knowledge and facilitate comparisons between countries and races.

2. Methods and materials

2.1. Study design and setting

This was a prospective study of pregnant women who were admitted to the Specialty Hospital between Nov 15, 2019 and Nov 15, 2020. Eligibility criteria included age of 18 years or more, admission for an elective CS, having a viable pregnancy, and ability to complete the self-administered STAI-Y and the VASA. Women were excluded from the study if they had a known psychiatric illness, or were not willing to participate.

2.2. Collected data

The characteristic data that were collected included age, educational achievement, family income, marital status, and duration of marriage. Data related to previous pregnancies and deliveries that were collected included parity, complications in previous pregnancies and deliveries, and complications in a previous CS such as bleeding or injury to surrounding structures. Current pregnancy data that were collected included gestational age on admission, if the pregnancy was planned or not (spontaneous or by assisted conception), history of sub-fertility prior to current pregnancy and current pregnancy complications, indication for a CS, choice of anaesthesia (general or spinal), and the source of information about anaesthesia choice (anaesthetist, obstetrician, midwife, or others).

2.3. Study procedure

In order to minimize bias, every other woman who was admitted for an elective CS was approached by a member of our research team and invited to take part in the study after an explanation of the study aims and procedure, both verbally and in writing. After confirming that the woman fulfilled the inclusion/exclusion criteria, we obtained informed consent from the participant. After informed consent but before any medical intervention such as venepuncture, the characteristics of the participants were collected on a prepared data collection sheet. After that, anxiety levels were measured using first the VASA and then the validated Arabic language version of STAI-Y [12], consisting of two subscales where each has 20 questions. The State Anxiety Scale (STAI-S) addresses how women feel at the moment of filling the form, and the Trait Anxiety Scale (STAI-T) addresses how respondents generally feel. A four-point Likert scale was used to rate responses (1: not at all, 2: somewhat, 3: moderately so, and 4: very much so).

2.4. Sample size calculation

Sample size calculation was based on recruiting seven candidates per item for the STAI-Y questionnaire. The STAI has 40 items and assuming a 5% dropout from the study, 300 women were recruited [13].

2.5. Statistical analysis

Data analysis was performed using IBM SPSS Statistics® for Windows Ver. 22. Armonk, NY and R for Windows Ver 4.0.3 (2020-10-10). Continuous variables are expressed by means and standard deviations, and categorical variables are shown as frequencies and percentages. Factor analysis for mixed data (FAMD) was used to identify the variables that contributed the most to the variation among the study population. Because of the cross-sectional nature of this study, only associations can be described without causality.

Because it was an aim of the study to measure how women feel at the time of admission, the STAI-S data subset was only analyzed, and its internal reliability was found to be low (Cronbach's Alpha = 0.602). Therefore, factor analysis was carried out using Varimax rotation which revealed two anxiety components each with high internal reliability. Component 1 questions which represent the presence of anxiety are 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20 (Cronbach's Alpha = 0.880), and Component 2 questions that confirm the absence of anxiety are 3, 4, 6, 7, 9, 12, 13, 14, 17, and 18 (Cronbach's Alpha = 0.856). Due to the high internal reliability of these two components, the means of the scores for each component were used instead of the total STAI-S scores in the further analyses.

Nonparametric MANOVA was employed to check the associations between the categorical independent variables and the joint anxiety outcome represented by the three variables (VASA and STAI-S Component 1 and 2). Furthermore, Kruskal-Wallis tests were done for these outcome variables individually to check the differences in anxiety levels between the categories of the independent variables. Post-hoc Bonferroni tests were used to correct for multiple testing of comparisons. Ethical approval was granted by the Research Institutional Review Board of the Specialty Hospital, number: 99286/1/5/ت.

Regarding data management and quality control, all study variables were coded prior to starting data collection, and collected information was checked regularly for completeness by another member of the research team. Furthermore, data entry into the statistical software was carried out by only two research members in an attempt to minimize mistakes.

3. Results

3.1. Descriptive statistics

Table 1 summarises the characteristics of the study population. The mean (SD) for participant's age was 30.5 (5.7) years, gestational age was 37.6 (1.4) weeks, and duration of marriage was 6.6 (4.4) years. In addition, 88 women (29.3%) were primigravidae. Previous and current obstetrics details are shown in Table 2. The most common indications for the current CS were maternal indications in 187 women (62.3%).

3.2. Anxiety scores

The mean (SD) of the VASA and STAI-S Components 1 and 2 were 5.8 (2.5), 2.6 (0.7), and 2.3 (0.6), respectively. Furthermore, 55%, 59%, and 61% of the women had scores above the means as measured by VASA and STAI-S Components 1 and 2, respectively. The VASA correlated with STAI-S Component 1 (Spearman's rho = −0.319) and Component 2 (Spearman's rho = 0.522), and both correlations were significant ($p < 0.001$).

Table 1
Characteristics of the study population.

Variable	Category	No.	Percentage
Age groups (years)	18–24	41	13.7
	25–34	171	57.0
	35–45	88	29.3
Education	High school or less	50	16.7
	College	96	32.0
	University	154	51.3
Family monthly income	Less than 750 USD	21	7.0
	750–1500 USD	109	36.3
	More than 1500	170	56.7
Duration of marriage (mean = 4.6 years)	Less than or equal to 4.6	221	73.7
	More than 4.6	79	26.3
Smoking status	Yes	48	16.0
	No	252	84.0
Health insurance	Yes	236	78.7
	No	64	21.3
Companion in labour	Husband	264	88.0
	Family member	34	11.3
	Friend	2	0.7

Table 2
Details of current and previous pregnancies and deliveries.

Variable	Category	No.	Percentage
Gestational age	Less than 37 weeks	52	17.3
	37 weeks or more	248	82.7
Sub-fertility prior to current pregnancy	Yes	53	17.7
	No	247	82.3
Previous miscarriage	Yes	102	34.0
	No	198	66.0
Current pregnancy: spontaneous/ART[a]	Spontaneous	278	92.7
	ART	22	7.3
Current pregnancy complications	No complications	208	69.3
	Complication	92	30.7
	• Maternal	69	23.0
	• Fetal	23	7.7
Number of previous deliveries	Primigravidae	88	29.3
	Multiparous	212	70.7
	Para 1-2	137	45.7
	Para 3 or more	75	25.0
Indication for CS[b]	Maternal	187	62.3
	Fetal	31	10.3
	Maternal request	53	17.7
	Doctor's advice	29	9.7
Choice of anaesthesia in current CS	General	81	27.0
	Spinal	219	73.0
Source of information about anaesthesia in current CS	Anaesthetist	163	54.3
	Obstetrician	59	19.7
	Lay person	65	21.7
	Media	13	4.3
Previous pregnancy complications	Primigravida (88/300)	88	29.3
	Multiparous (212/300)	212	70.7
	• No complications	140/212	66.0
	• Complications	72/212	34.0
	- Maternal	57/212	27.0
	- Fetal	15/212	7.0
Previous intrapartum complications	Primigravida (88/300)		29.3
	Multiparous (212/300)		70.7
	• No complications (203/300)	203/212	96.0
	• Complications (9/300)	9/212	4.0
Previous caesarean section	Primigravidae (88/300)	88	29.3
	Multigravidae (212/300)	212	70.7
	• No previous CS	30/212	14.2
	• Previous CS (182/212)	182/212	85.8
Choice of anaesthesia in previous caesarean sections	No previous CS (118/300)	118/300	39.3
	Previous CS (182/300)	182/300	60.7
	• General anaesthesia	84/182	46.1
	• Spinal anaesthesia	98/182	53.9
Complications in previous anaesthesia	No previous CS (118/300)	118	39.3
	Previous CS (182/300)	182	60.7
	• No complications	175/182	96.0
	• Complications		
	- Failed Spinal	2/182	1.0
	- Spinal headache	5/182	3.0

[a] ART: Assisted reproductive Technologies.
[b] CS: Caesarean section.

Correlations between the Study Variables and Anxiety Scores Measured by Components 1 and 2 of the STAT-S Subscales and VASA.

3.3. Dimension reduction of the independent variables

For the purpose of dimension reduction, factor analysis for mixed data (FAMD) was conducted in R software using FactoMineR and factoextra packages. Through the analysis, the variables that contributed the most to the variation among recruited women were determined. They were age, duration of marriage, parity, history of sub-fertility prior to current pregnancy, timing of the booking visit in current pregnancy, current and previous pregnancy complications, previous intrapartum complications, a previous CS, indication for the current CS, current and previous choices of anaesthetic, and source of information regarding anaesthetic (Table 3).

3.4. Association of the study variables with the three anxiety outcomes simultaneously

Each of the study variables that were identified as contributing the most to the variation between the recruited women was used as

Table 3
Means and standard deviations of components 1 and 2 of the STAI-S subscale and the VASA for the variables contributing the most to the variation in the study population.

Variables	Category	STAI-S Component 1 Mean (SD)	STAI-S Component 2 Mean (SD)	VASA Mean (SD)
Age groups	18–24 years	2.4 (0.73)	2.3 (0.70)	5.8 (2.2)
	25–34 years	2.6 (0.64)	2.2 (0.62)	5.9 (2.6)
	35–45 years	2.6 (0.66)	2.2 (0.67)	5.5 (2.4)
Duration of marriage	<10 years	2.5 (0.67)	2.3 (0.64)	5.9 (2.5)
	≥10	2.7 (0.64)	2.3 (0.65)	5.4 (2.5)
Parity	Primigravidae	2.6 (0.69)	2.1 (0.62)	5.5 (2.8)
	Parity: 1-2	2.5 (0.68)	2.3 (0.66)	6.1 (2.4)
	Parity: 3 or more	2.7 (0.60)	2.2 (0.63)	5.6 (2.4)
History of sub-fertility prior to current pregnancy	Yes	2.6 (0.72)	2.2 (0.57)	5.3 (2.8)
	No	2.6 (0.65)	2.3 (0.66)	5.9 (2.5)
Booking visit	≤12 weeks	2.6 (0.66)	2.3 (0.64)	5.8 (2.5)
	After 12 weeks	2.6 (0.78)	2.1 (0.65)	4.9 (2.2)
Current pregnancy complications	No complications	2.6 (0.68)	2.2 (0.65)	5.6 (2.4)
	Maternal	2.4 (0.67)	2.4 (0.64)	6.4 (2.8)
	Fetal	2.5 (0.44)	2.2 (0.57)	5.3 (2.1)
Indication for current CS	Maternal	2.5 (0.65)	2.3 (0.65)	5.9 (2.5)
	Fetal	2.7 (0.58)	2.1 (0.61)	5.7 (2.1)
	Maternal request	2.6 (0.72)	2.2 (0.57)	5.3 (2.7)
	Doctor's advice	2.6 (0.72)	2.3 (0.75)	6.1 (2.9)
Choice of anaesthetic in current CS	General	2.5 (0.61)	2.4 (0.64)	6.2 (2.5)
	Spinal	2.6 (0.68)	2.2 (0.64)	5.6 (2.5)
Source of information about anaesthetic in current CS	Anaesthetist	2.6 (0.71)	2.2 (0.60)	5.7 (2.3)
	Obstetrician	2.7 (0.57)	2.2 (0.61)	6.6 (3.1)
	Layperson	2.4 (0.63)	2.4 (0.74)	5.6 (2.9)
	Media	2.3 (0.44)	2.6 (0.70)	5.3 (2.8)
Previous pregnancy complications	No complications	2.6 (0.66)	2.2 (0.64)	5.7 (2.4)
	Maternal	2.6 (0.71)	2.3 (0.71)	6.2 (2.8)
	Fetal	2.3 (0.35)	2.3 (0.46)	5.3 (2.8)
Previous intrapartum complications	None	2.6 (0.66)	2.3 (0.64)	5.7 (2.5)
	Bleeding	2.2 (0.77)	2.5 (0.71)	7.6 (2.0)
	Lacerations	2.5 (0.35)	2.3 (0.50)	7.6 (0.21)
History of previous CS	Yes	2.6 (0.63)	2.3 (0.65)	5.8 (2.4)
	No	2.6 (0.71)	2.1 (0.63)	5.7 (2.7)
Choice of anaesthetic in previous CS	No previous CS	2.6 (0.70)	2.1 (0.64)	5.6 (2.7)
	General	2.6 (0.60)	2.4 (0.66)	6.5 (2.6)
	Spinal	2.5 (0.67)	2.2 (0.62)	5.3 (2.1)

the independent variable in nonparametric MANOVA, with VASA and STAI-S Component 1 and 2 as the joint outcome variable.

For the entire study group, only the source of information regarding the choice of anaesthesia was found to be significantly associated statistically with higher anxiety (Wilk's Lambda df1, df2 = 2.287 [9, 715.7] and p-value = 0.016). For multiparous women, the choice of anaesthesia in a previous CS (Wilk's Lambda df1, df2 = 2.107 [6, 414], p-value = 0.003) and indication of the current CS (Wilk's Lambda df1, df2 = 2.200 [9, 501.5], p-value = 0.021) were significantly associated with higher anxiety scores.

3.5. Association of the study variables with the three anxiety outcomes individually

In order to evaluate the associations between the informative variables determined by FAMD and the individual anxiety variables and for the purpose of comparing the three anxiety variables, Kruskal-Wallis tests were conducted (Table 4). Significant results were followed up with Bonferroni-adjusted Mann-Whitney U tests to determine the specific variable categories that significantly differed in anxiety levels.

Age was found to be significantly associated with STAI-S component 1 ($\chi^2 = 6.851$, df = 2, p-value = 0.033). Specifically, STAI-S scores for age group 18–24 (median 2.2) were significantly less than scores of age group 25–34 (median 2.6; Mann-Whitney U statistic = −39.218, adjusted p-value = 0.028). Moreover, the sources of information about the choice of anaesthesia were significantly associated with VASA ($\chi^2 = 11.529$, df = 3, p-value = 0.009). Post hoc testing revealed that women who received their information from a layperson (median VASA = 7.5) had significantly higher anxiety scores compared to women who obtained their information from an obstetrician (median VASA = 5.1; Mann-Whitney U statistic = −50.6, adjusted p-value = 0.007) or anaesthetist (median VASA = 5.3; Mann-Whitney U statistic = −34.3, adjusted p-value = 0.042).

When the whole study population was considered, data analysis showed that the choice of anaesthesia in the current CS and the indication of the CS were not significantly associated with any of the three anxiety scales. Nevertheless, in the subgroup of multiparous women, the results showed a significant association between the choice of anaesthesia in the current CS and VASA (general

Table 4
Comparison between the two STAI-S subscale components and VASA in relation to their association with the variables contributing most to the variation in the study population.

Variables	Statistics	STAI-S Component 1	STAI-S Component 2	VASA
Age groups	X^2	6.85	0.16	1.26
	df	2	2	2
	P value	0.033	0.923	0.533
Duration of marriage	X^2	2.25	.39	2.09
	df	1	1	1
	P value	0.13	0.53	0.15
Parity	X^2	2.19	3.86	4.07
	df	2	2	2
	P value	0.34	0.15	0.13
History of subfertility prior to current pregnancy	X^2	0.11	0.56	2.33
	df	1	1	1
	P value	0.74	0.46	0.13
Booking visit	X^2	0.01	1.04	1.90
	df	1	1	1
	P value	0.93	0.34	0.17
Current pregnancy complications	X^2	4.50	4.49	4.31
	df	2	2	2
	P value	0.11	0.11	0.12
Indication for current CS[a]	X^2	3.05	2.19	1.60
	df	3	3	3
	P value	0.38	0.53	0.66
Choice of anaesthetic in current CS	X^2	.306	1.671	3.538
	df	1	1	1
	P value	0.58	0.20	0.06
Source of information about anaesthetic in current CS	X^2	7.47	6.08	11.53
	df	3	3	3
	P value	0.058	0.108	0.009
Previous pregnancy complications	X^2	3.18	1.41	1.61
	df	2	2	2
	P value	0.20	0.49	0.45
Previous intrapartum complications	X^2	2.67	0.58	5.10
	df	2	2	2
	P value	0.263	0.747	0.078
History of previous CS	X^2	1.90	0.04	1.59
	df	1	1	1
	P value	0.17	0.85	0.21
Choice of anaesthetic in previous CS	X^2	2.84	3.16	12.97
	df	2	2	2
	P value	0.241	0.206	0.002

[a] CS: Caesarean section.

anaesthesia: median = 6.2; spinal: median = 5.3), between the indication of the current CS and both VASA (Mann-Whitney U statistic = −87.3, adjusted p-value = 0.013) and STAI-S component 1 (Mann-Whitney U statistic = −60.7, adjusted p-value = 0.037) and between the choice of anaesthesia in a previous CS and VASA (general: median 6.2; spinal: median 5.2) (Table 4).

4. Discussion

4.1. The anxiety scales

Cronbach's Alpha is used to measure the internal reliability of an instrument, and 0.7 is the suggested value above which the reliability is considered to be acceptable [14]. The internal reliability of the STAI-S subscale was low (Cronbach's Alpha = 0.664). Therefore, the factor analysis method was used to identify subsets of the STAI-S subscale that measure the variance in the data. This method is used in refining clinical measures of inventories [15].

While the STAI-Y is widely used, it is a lengthy instrument, and a recent report showed that a short form of the STAI-Y which consists of five items has comparable psychometric properties and may replace the STAI-Y in clinical practice [16]. Additionally, our results showed that the STAI-S subscale Components 1 and 2 correlated well with the VASA. Therefore, the VASA which is the shorter and faster instrument may replace the lengthy STAI-Y. Additionally, to avoid the potential negative impact of administering a lengthy instrument at the beginning of the study, the VASA was first administered and then the STAI-Y [17].

The results showed that the three different anxiety scales used in the study, namely STAI Components 1 and 2 and the VASA, performed differently in terms of significant associations with the study variables. For example, age was found to be significantly associated with STAI-S Component 1, and source of information about choice of anaesthesia was significantly associated with VASA. This raises the question whether scales which are designed to measure a specific variable perform similarly or not. In support of our findings, in a study about reading anxiety where three scales were used, the author concluded that the scales are notinterchangeable

[18]. The results of another study showed that while the Hamilton Rating Scale for Depression and the Montgomery–Asberg Depression Rating Scale are used interchangeably, their results may be different [19].

Over half of the recruited women had anxiety scores above the means as measured by the VASA and the two components of the STAI- S subscale, which reflects that higher anxiety is prevalent among women who are being admitted for an elective CS. Another published research also showed this finding [20].

Factors Significantly Associated with Higher Anxiety Scores Measured by STAI-S Component 1 and 2 or the VASA Individually or Simultaneously.

Age was found to be significantly associated with STAI-S Component 1. Scores for age group 18–24 years were significantly less than scores of age group 25–34 years. A similar pattern was shown by Yonas et al. [20] in a study about anxiety before an elective CS. Possible explanations may include that older women are more likely to have achieved more education and therefore know more about CSs and/or are more likely to be multiparous and probably had a complicated CS either in the procedure or the anaesthesia. The finding that the age group of 24–35 years showed higher anxiety scores may have an implication in clinical practise, where healthcare practitioners should consider a more detailed explanation of the CS in terms of procedure, anaesthesia types, and potential complications, thereby helping to reduce anxiety.

The current study showed that a history of a previous CS was associated with higher anxiety scores. However, this did not reach a statistical significance. In contrast to our results, a published report showed that women undergoing an elective repeated CS had less anxiety levels than women undergoing their first CS [21]. Possible explanations for the differences between our results and the published report may include different previous experiences with a CS including the indication of a previous CS, variations in preoperative care in different countries, complications during the procedure or anaesthesia, and familiarity with the settings of a CS. Mostafayi et al. [22] showed that familiarity with preoperative care about a CS is associated with lesser anxiety scores and different indications for the CS. In our cohort, while women who had a CS performed for foetal indication reported higher anxiety scores, the association was not statistically significant. This was also shown by Janssen et al. [23]. It is therefore possible that the preoperative anxiety is not related to a single factor. In addition, pregnancy specific anxiety may have an influence on anxiety prior to a CS. We acknowledge that we have not studied pregnancy specific anxiety.

The results showed that choosing general anaesthesia is associated with higher anxiety scores compared to spinal. This finding is supported by another research which measured the cortisol level in women who underwent an elective CS under spinal and general anaesthesia (GA) and showed that the cortisol level was higher in women who had a CS under GA [24]. On the other hand, Akildiz et al. [25] showed that women who had an elective CS under spinal anaesthesia reported to have higher anxiety scores, and the authors suggested that such differences in the results of published reports may be influenced by pregnant women's limited knowledge about the various anaesthetics used for a CS and the discomfort associated with being awake and their educational level. Furthermore, it is possible that differences in preoperative care in different populations may have an impact on the anxiety experienced before a CS.

Data analysis showed a statistically significant association between anxiety scores and source of information about type of anaesthesia. That is, women who received their information from a layperson reported higher anxiety scores compared to women who received their information from an obstetrician or anaesthetist. Therefore, it is possible that providing accurate and reliable information about anaesthesia to pregnant women may help to reduce anxiety levels. In healthcare issues related to obstetrics and gynaecology, women may receive information from different sources including friends, relatives, the internet, and healthcare practitioners [26]. This is important because the contents that non-healthcare workers share with women regarding medical interventions and their potential complications may not be accurate and may add to anxiety levels. Additionally, Barnes et al. [27] showed that the decision-making process of pregnant women about a healthcare product is complex, and they consider the safety of the baby and themselves and the potential complications.

Identifying factors which are associated with higher anxiety in women undergoing a CS may help in implementing strategies to reduce anxiety. Hashemi et al. [28] found that social support such as the presence of a partner or relatives of the woman was associated with less anxiety levels before a CS.

4.2. Study strengths

We used two anxiety measuring scales and studied the positive association between them. This supports the findings of earlier reports, which may have an implication on clinical practice where the short VASA may replace the lengthy STAI-Y. Furthermore, the association between a layperson being the source of information about the type of anaesthesia and the anxiety level should encourage pregnant women to seek information from medical staff, in particular, the anaesthetist and obstetrics team.

4.3. Study limitations

The current study has a number of limitations which may affect the generalizability of the findings. The study was done at a single centre and included a population from the Middle East, reflecting local population and ethnicity Also, recruiting women at the time of an elective CS and the use of a self-reported measure may have affected anxiety scores. Furthermore, we have not reported on pregnancy-specific anxiety prior to a CS in the study population, and we acknowledge that it may had influenced the anxiety scores at the time of the CS. Finally, it was not an aim of the study to report on the interventions which may reduce anxiety scores. Further research is needed to investigate the impact of pregnancy specific anxiety on the anxiety level associated with an elective CS.

5. Conclusion

Higher anxiety scores are prevalent among women who are being admitted for an elective CS, where 55%, 59%, and 61% of the women had scores above the means of VASA and STAI-S components 1 and 2, respectively. Variables that showed statistically significant associations with higher anxiety scores were that the woman's age was 25–34, the CS was for foetal indications, the choice of anaesthesia was general, and the source of information about the choice of anaesthesia was a layperson. Additionally, STAI and VASA correlated well, and VASA may be a substitute for the lengthy STAI. Identifying factors which are associated with higher anxiety in women undergoing a CS may help in implementing strategies to reduce anxiety.

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Author contribution statement

Fida Asali; Ismaiel Abu Mahfouz; Oqba AlKuran; Hatim Jaber: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Lujain Al-Marabhah; Shirin Alatoom; Lana Al Takriti; Zeina Abu Eisheh: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

Data will be made available on request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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