Original Article

Effects of anxiety reduction training on physiological indices and serum cortisol levels before elective surgery

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Abstract

Background: Patients awaiting surgery typically experience significant physical and psychological stress. Vital signs and serum cortisol level are altered in response to anxiety. The aim of this study was to assess the effects of preoperative education on physiological indices and cortisol level of female patients undergoing elective surgeries.

Materials and Methods: In this single-blinded randomized controlled trial, 60 women undergoing gynecological elective surgeries in Kowsar Hospital (Qazvin, Iran) were randomly assigned to either control or intervention group. The patients of the intervention group were assessed based on the nursing process after admission. Subjects with anxiety, inadequate awareness, and fear received necessary training on anxiety reduction techniques. The control group merely received routine care. A questionnaire including demographic characteristics, baseline and preoperative vital signs, and serum cortisol level was completed for all subjects. Data were analyzed by descriptive and inferential statistics (Fisher's exact test, paired and independent t-tests, and Mann–Whitney U test) in $SPSS_{17}$. *P* values less than 0.05 were considered significant.

Results: The two groups were homogeneous in terms of age ($P = 0.20$), marital status ($P = 0.50$), education ($P = 0.10$), employment status ($P = 0.13$), and admission history ($P = 0.30$). There were no significant differences in baseline vital signs between the intervention and control groups. Before surgery, the mean values of vital signs increased in both the groups. However, the increments were less in the experimental group than in the control group. Serum cortisol levels were also lower in the experimental group compared to the control group ($P < 0.01$).

Conclusions: Education based on the nursing process is a non-pharmaceutical and effective method to minimize changes in vital signs and decrease serum cortisol level in patients undergoing gynecological elective surgeries.

Key words: Anxiety, cortisol, education, nursing process, vital signs

Introduction

Surgery is currently used as a treatment option which saves the lives of many patients. However, it may also lead to complications and side effects.[1] Fear, anxiety, uncertainty, and lack of control and self-esteem are among the emotional side effects of surgery.[2-4] Preoperative anxiety can be caused by waiting for the surgery, not having the experience of a surgery, inadequate knowledge about the outcomes, uncertainty about the necessity of surgery, seeing the scalpel, and not trusting the surgeon.[5] This anxiety has negative effects on physiological parameters before and during anesthesia and can also prolong the recovery period.[6]

Various methods have been proposed to assess the level of anxiety. Despite the wide use of mental methods such as questionnaires,[7] some physiological indicators (e.g. systolic and diastolic blood pressure and pulse) also change during stressful situations.[8] In addition, laboratory methods, such as measuring serum cortisol levels, can assess anxiety.[9] Cortisol is a hormone which increases to its highest level after waking up and gradually decreases afterward. High levels of cortisol throughout the day will thus suggest disorders like anxiety.[10]

Although physicians traditionally use medications to reduce postoperative anxiety, alternative treatments

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have attracted increasing attention. Complementary or alternative treatments include listening to relaxing audio, hypnotism, music therapy, touch therapy, and massage.[11] In addition, available evidence indicates that preoperative patient education can reduce individuals' anxiety, increase their knowledge, and hence shorten the recovery period after surgery.[12,13]

In some cases, using the mentioned anxiety control methods will be very expensive and require a lot of equipment. In nursing-based education, a professional nurse examines a patient at admission and provides him/her with the necessary education. This process seems to effectively reduce patient anxiety. Although research has been in favor of the positive impacts of preoperative training on patient anxiety, little information is available about the efficiency of such education and interventions of elective surgeries in female candidates. Many studies have assessed patient anxiety by mental methods like the anxiety questionnaire, Amsterdam Preoperative Anxiety and Information Scale, and Spielberger's State-Trait Anxiety Inventory.[14-17] We, however, examined physiological parameters (vital signs) and serum cortisol levels to identify the effects of preoperative education on anxiety levels of women undergoing elective surgery.

Materials and Methods

This clinical trial was conducted on patients admitted to Kowsar Health Center (Qazvin, Iran) in 2009. Female candidates for elective surgery (tubectomy, hysterectomy, and cystocele and rectocele repair) were included if they were aged 15-65 years and were able to communicate. Women with epilepsy, mental illnesses, drug addiction, thyroid problems, hyperadrenalism, and cardiovascular, respiratory, and neurological diseases were not included. Similarly, individuals with major life crisis in the past 6 months and those using anti-depressants or corticosteroids were not included. None of the subjects received tranquilizers before surgery. Patients were excluded in case of any emergency surgery or if they desired to withdraw from the study.

Considering 95% confidence interval (CI) ($\alpha = 0.05$) and power of 80%, the minimum number of participants in each group was calculated as 30. The researchers referred to the above-mentioned center twice a week (on Saturdays and Tuesdays according to the elective surgery program) and selected eligible individuals. Overall, 60 female elective surgery candidates were selected and allocated to either intervention or control group using block randomization. Since the patients did not know about the grouping procedure, the study was single blind.

After selecting the subjects, they were explained about the study and informed consents were obtained. Moreover, the participants' names were not recorded in order to ensure data confidentiality. The study protocol was approved by the ethic committee of Qazvin University of Medical Sciences (Qazvin, Iran).

On the evening before surgery, the patients in the intervention group were examined based on the nursing process. This process included five steps of assessment, diagnosis, planning, implementation, and evaluation.[18] Therefore, patients were first asked about their major problems, current illness, medical history, family history, and history of surgery, hospitalization, and using specific medications. They were also allowed to express their concerns about the surgery. If anxiety, inadequate awareness about postoperative complications and care and length of hospitalization, or fear of anesthesia were detected, the researcher and the patient started the planning stage.

Considering the preferences of patients, a number of anxiety reduction techniques (e.g. deep breathing, distraction, and repeating religious words) were planned. The patients were then trained to perform the techniques independently. Moreover, pamphlets relevant to the disease and the surgery type and including brief descriptions of surgery, pre- and postoperative care, and possible complications were provided to reduce the patients' anxiety and concerns. In the last stage, the effects of the implemented methods were evaluated and further interventions were designed if any problems persisted. On the surgery day, the patient was accompanied to the operation room and introduced to the surgical team by the researcher.

The control group received routine care including admission and performing necessary examinations, tests, imaging procedures, and medical consultation. This group was also accompanied to the operation room and introduced to the surgical team by the researcher.

After admission, patients' systolic and diastolic blood pressure, heart and respiration rates, and radial pulse were measured three times with 5-minute intervals. The mean values were then recorded as baseline vital signs. The same procedure was repeated on the surgery day before the induction of anesthesia and the values were considered as preoperative (post-intervention) vital signs. Furthermore, 1-cc venous blood samples were obtained from all patients at 8.00 in the morning. The samples were immediately sent to the laboratory in order to determine serum cortisol levels. Finally, a questionnaire including demographics (age, marital status, education, occupation, history of surgery, and type of surgery), baseline and

preoperative vital signs, and serum cortisol levels was filled out for each participant.

The collected data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (independent and paired *t*-tests, and Fisher's exact, Mann–Whitney and Kolmogorov–Smirnov tests) in SPSS for Windows 17.0 (SPSS Inc., Chicago, IL, USA). *P* values less than 0.05 were considered significant.

Results

The two groups matched in terms of contextual variables [Table 1]. In addition, there were no significant differences between the two groups in terms of baseline vital signs [Table 2]. The mean values of preoperative vital signs were higher than baseline vital signs in both groups. However, less increments were observed in the intervention group compared to the control group [Table 3].

The results of Kolmogorov — Smirnov test indicated that serum cortisol levels did not have a normal distribution in the two groups. While the median (interquartile range) of

Table 1: Baseline characteristics of the study groups

	Control	Intervention	*P* value
Age: Mean (SD)	42.43 (13.1)	38.7 (8.2)	0.2†
Marriage status [*n* (%)]			
Married	29 (96.7)	28 (93.3)	0.5*
Single	1 (3.3)	2 (6.7)	
Level of education [*n* (%)]			
Illiterate	15 (50)	7 (23.3)	0.1*
Primary	9 (30)	9 (30)	
Guidance	0 (0)	5 (16.7)	
Diploma	2 (6.7)	6 (20)	
Bachelor	4 (13.3)	3 (10)	
Employment [*n* (%)]			
Yes	28 (93.3)	28 (93.3)	0.1*
No	2 (6.7)	2 (6.7)	
Hospitalization [*n* (%)]			
Yes	12 (40)	7 (23.3)	0.3*
No	18 (60)	23 (76.6)	

†Independent *t*-test *Fisher's exact test

Table 2: The Mean (SD) of vital signs between the groups at admission and pre-operation time

Aspect of vital signs	Time	Control	Intervention	Independent *t*-test	*P* value
SBP (mmHg)	Admission	115.16 (11.35)	114.16 (11.22)	−0.51	0.6
	Pre-operation	134.10 (12.36)	126.23 (12.68)	−2.4	0.01
DBP (mmHg)	Admission	74 (8.5)	74.06 (9.37)	0.02	0.9
	Pre-operation	83.73 (9.7)	81.3 (6.6)	−1.1	0.2
Heart rate (bpm)	Admission	79.46 (5.7)	80.53 (5.6)	0.72	0.47
	Pre-operation	88.6 (8.5)	83.5 (7.9)	−2.39	0.02
Pulse rate (bpm)	Admission	79.33 (5.5)	81.4 (4.4)	1.58	0.11
	Pre-operation	88.23 (8.4)	84.9 (6)	−1.76	0.08
Respiratory rate/min	Admission	16.26 (5.6)	16.86 (6.1)	0.39	0.69
	Pre-operation	24.83 (8.1)	17.06 (3.7)	−2.2	0.03

SBP, systolic blood pressure; DBP, diastolic blood pressure; bpm, beats per minute

Table 3: The Mean (SD) of vital signs within the groups at admission and pre-operation time

Vital signs	Group	Admission	Pre-operation	Dependent *t*-test	*P* value
SBP (mmHg)	Intervention	114.16 (11.22)	126.23 (12.68)	−7.30	0.001
	Control	115.66 (11.35)	134.1 (12.36)	−12.46	0.001
DBP (mmHg)	Intervention	74.06 (9.37)	81.3 (6.6)	−3.92	0.001
	Control	74 (8.5)	83.73 (9.7)	−5.36	0.001
Heart rate (bpm)	Intervention	80.53 (5.6)	83.5 (7.9)	−2.87	0.007
	Control	79.46 (5.7)	88.6 (8.5)	−4.97	0.001
Pulse rate (bpm)	Intervention	81.4 (4.4)	84.9 (6)	−3.65	0.001
	Control	79.33 (5.5)	88.23 (8.4)	−5.05	0.001
Respiratory rate/min	Intervention	16.86 (6.1)	17.06 (3.7)	−0.19	0.8
	Control	12.26 (5.6)	24.83 (8.1)	−2.51	0.01

serum cortisol level in the control group was 582 (191), it was 310 (255) in the intervention group ($P < 0.001$ in Mann–Whitney test).

Discussion

Vital signs are the physiological indicators that change in stressful situations such as hospitalization or waiting for surgery. Different studies have suggested various methods to reduce preoperative anxiety.[19-21] Tameh *et al.* found oral training more effective than written training in decreasing anxiety, heart rate, and systolic and diastolic blood pressure before surgery.[22] Zolfaghari *et al.* reported energy therapy to reduce the mentioned indices.[17] Asilioglu and Celik stated that although preoperative training sessions reduced patient anxiety, their effects were not significant.[4] In the present study, preoperative vital signs increased in both the groups despite the education the intervention group had received. However, the increments were significantly lower in the intervention group.

The majority of previous studies have selected anxiety reduction methods merely based on the researchers' opinions. In contrast, we implemented the appropriate techniques based on the needs and desires of the patients and according to nursing assessments. The short time interval between admission and operation (less than 24 h) may also justify the changes in the intervention group. It seems that recurrent patient visits by nurses, employing the nursing process, and evaluating the conducted interventions at each stage can prevent the changes in patients' vital signs.

Among the several existing indicators to assess the level of anxiety in patients, measuring serum cortisol level is the most accurate since it is not affected by measurement conditions.[23] We found the mean serum cortisol level to be lower in the intervention group than in the control group. Asghari *et al.* reported similar findings.[24] McRee and Pasvogel stated that massage and music therapy did not have significant impact on patients' cortisol levels. They believed that this result might have been caused by the short time interval between the intervention and measurement of cortisol levels.[25]

Conclusion

The participants of the present study were elective surgery candidates. They were thus hospitalized on the evening before the surgery, which made the assessment of baseline serum cortisol levels impossible. Since this was a limitation of our study, further research with longer duration of intervention will better clarify the effects of education on anxiety reduction. It is also recommended to measure patients' serum cortisol levels at their admission and compare the values with preoperative levels to investigate the effectiveness of training before surgery.

Certain methods of anxiety reduction are usually employed without paying adequate attention to the patients' willingness and readiness for selecting and performing the interventions. Nursing-based preoperative education is a systematic approach including assessments, nursing diagnoses, and patient participation. It can hence reduce the patients' anxiety and prevent changes in their vital signs.

Acknowledgments

This study was registered in the Iranian Registry of Clinical Trials (ID: IRCT201106286910N1). Appreciation goes to the Research Deputy of Qazvin University of Medical Sciences for its financial support. We are also grateful to the staff and authorities of the Department of Surgery of Kowsar Hospital.

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How to cite this article: Bahrami N, Soleimani MA, Sharifnia H, Shaigan H, Sheikhi MR, Rezaei ZM. Effects of anxiety reduction training on physiological indices and serum cortisol levels before elective surgery. Iranian J Nursing Midwifery Res 2013;18:416-20.
Source of Support: Nil **Conflict of Interest:** None.