Abstract
The aim of this study was to measure the level of preoperative anxiety in patients scheduled for coronary artery bypass grafting (CABG) to assess the relationship between anxiety and postoperative symptoms. 

Materials and Methods. This descriptive study was conducted at a single university hospital from February to November 2021. Seventy-four CABG patients who completed the Anxiety Specific to Surgery Questionnaire, the Visual Analogue Scale, the Modified Borg Scale, the Rhodes Index of Nausea, Vomiting and Retching were included in the study. The data were analyzed by the mean, standard deviation, frequency distribution, Mann-Whitney U Test, and Spearman’s correlation analysis.

Results. The average age of participants was 65.55 ± 8.35; 66.2% of them were males. The ASSQ total scores of female participants were significantly higher as compared to male participants (p < 0.05). There was a statistically significant positive relationship between the levels of anxiety in patients before CABG and the levels of postoperative pain and dyspnea severity (p < 0.05).

Conclusions. Patients were found to experience predominantly moderate to severe anxiety before CABG, and increased dyspnea complaints and pain in the postoperative period. A coordinated, multidisciplinary approach to preoperative training of healthcare professionals may offer a promising way to provide more efficient and productive services.

Keywords
Coronary Artery Bypass Grafting (CABG); Preoperative Anxiety; Postoperative Symptoms

Introduction
Every year, 17.9 million people die from cardiovascular diseases worldwide. This rate is reported to represent approximately 32% of all deaths globally [1–3]. According to the Turkish Statistical Institute (TUIK), cardiovascular diseases rank first among the causes of death in Turkey (38.4% of deaths in 2018). The TUIK predicts that cardiovascular diseases will be the number one cause of death globally for a long time to come. According to the Prevention and Control Program for Cardiovascular Diseases in Turkish population, mortality from cardiovascular diseases tends to decrease in developed Western countries, while in developing countries, its rate increases. Coronary artery disease (CAD) ranks first among cardiovascular diseases. In Turkey, there are 3.1 million CAD patients, and this number is increasing by 200 thousand annually [4].

As cardiovascular diseases are the leading cause of death globally, the importance of cardiac surgery in their treatment has increased. Surgical interventions for cardiovascular diseases are usually performed to reduce symptoms and prolong the patient’s lifespan or are preferred in cases with surgery as a treatment option [5]. Coronary artery bypass grafting (CABG) is the most preferred treatment for CAD because it is the most efficient and safest treatment option [6].

Anxiety is one of the most serious problems faced by patients before surgery [7–10]. Although there are various definitions for anxiety in the literature, it is generally defined as “the body’s physiological/psychological responses to a perceived threat and unwanted emotional experience in which feelings such as fear, tension, and anxiety are experienced following a traumatic event” [11]. In case of surgery, patients can experience anxiety for different reasons such
as being unable to recover from anesthesia, severe pain, deterioration of body integrity, permanent disability, infection, stay in the intensive care unit, caregiver burden, and risk of death. Furthermore, the factors such as hospital adaptation, concerns about the socio-economic status and privacy may also affect the level of anxiety experienced by patients [8, 12, 13]. Anxiety in the preoperative period is usually considered a normal reaction and its level decreases over time [14]. However, there are various studies indicating that a high anxiety level negatively affects surgery and postoperative recovery [8, 9, 15]. High levels of anxiety and stress that do not go away over time increase the body stress response that results in increasing the use of anesthetics during surgery, more intensive pain in the postoperative period and, accordingly, an increased need for analgesics, gastrointestinal (nausea, vomiting), cardiac (tachycardia) and respiratory (dyspnea) complications affecting adaptation and life quality, extending the length of hospital stay, and increasing treatment costs [14, 16, 17]. Thus, it is important to examine the level of anxiety in patients as it affects the healing process and treatment outcomes and causes postoperative complications [18, 19]. In fact, patients must undergo both physical and psychiatric examinations. Fears, uncertainties, possible complications, and unexpected results are sources of anxiety and stress in patients [20–22].

A review of the literature noted a limited number of studies investigating the effect of preoperative anxiety on symptoms in the postoperative period. Thus, this study aimed at determining the effect of preoperative anxiety levels in patients scheduled for CABG on postoperative symptoms.

Materials and Methods

Study Design

This descriptive study was carried out between February and November 2021.

Sample

The study population included 90 patients scheduled for CABG at the Department of Cardiovascular Surgery, Erzincan Mengücek Gazi Training and Research Hospital, Erzincan, Turkey. The sample included patients who agreed to participate in the study, met inclusion criteria, and provided verbal/written consent. A total of 16 patients were excluded from the study as they did not meet the eligibility requirements. The study was carried out with 74 patients (Fig. 1).

Eligibility Criteria

Patients over 18 years of age with no communication problems, psychiatric disorders, severe cognitive impairments, anxiolytic and/or antidepressant use who were scheduled for CABG were included in the study.

Data Collection Tools

In this study, a 9-item information form including the socio-demographic characteristics such as patients’ age, gender, and education level, as well as disease-related and postoperative characteristics was used.

Anxiety Specific to Surgery Questionnaire (ASSQ)

The ASSQ was first developed by Karanci et al. in 2003 to determine the level of anxiety in patients scheduled for urgent surgery [23]. It is a 5-point Likert-type scale that includes 10 questions related to patient’s worries/anxiety about surgery, with five-option answers from 1 “I totally disagree” to 5 “I totally agree”. Only item 8 “I think I will get rid of all my pain and distress after surgery” is scored in reverse. High scores indicate anxious feelings about pain, death during surgery, postoperative complications, and restrictions. Karancı et al. determined Cronbach’s alpha coefficient of the scale as 0.79.

Visual Analogue Scale (VAS)

The VAS is a scale for grading pain with a scoring system indicating “no pain” on one side and “worst possible pain” on the other side. It is a one-dimensional scale with high reliability and sensitivity that is frequently used in clinics. [24]. This scale ranges from 0 to 10, with 0 points representing “no pain” and 10 points representing “worst possible pain”. The line may be depicted with a horizontal or vertical orientation, but patients state that the level of understanding is better when it is vertical.

Modified Borg Scale (MBS)

The MBS was developed by Borg (1982) to measure perceived effort and exertion during physical exercises. In addition to measuring dyspnea on exertion, it is used to evaluate dyspnea at rest. To determine the severity of dyspnea, there are 10 items, including both verbal and numerical descriptions for dyspnea assessment. The scale scores range from 0 (nothing at all) to 10 (maximal); the score increases as the severity of dyspnea increases [25].

Rhodes Index of Nausea, Vomiting and Retching (RINVR)

The RINVR has eight items rated on a five-point Likert-type scale measuring nausea, vomiting, and retching expe-
rience within the past 24 hours. The total sum of nausea experience, vomiting experience, and retching experience points is the RINVR score. Item responses are scored from 0 “least distress level” to 4 “maximum distress level”. Items 1, 3, 6, and 7 are scored reversely. The highest scale value is 32 indicating increased level of distress; the score of 1-8 indicates mild NVR, 9-16 – moderate NVR, 17-24 – severe NVR, and 24-32 – worst NVR. The scale has three subscales: symptom experience, symptom occurrence, and symptom distress [26].

Data Collection
The study was carried out in two stages (Fig. 1):

Stage I
Before data collection, written consent was obtained from all the participants after a verbal explanation. The patients were asked to fill in the Patient Information Form and ASSQ preoperatively to determine anxiety level of patients scheduled for CABG.

Stage II
The VAS was used to determine the level of pain; the MBS was applied to determine the severity of dyspnea; the RINVR was used to evaluate nausea and vomiting within three days after postoperative patients were transferred from the intensive care unit.

Statistical Analysis
The data were analyzed with the IBM SPSS Statistics 23.0 software package. The values related to the patients’ demographic characteristics, disease and surgery process were reported as numbers, percentages, means, and standard deviation. The nonparametric Mann-Whitney U test was used to compare non-normally distributed groups. Spearman’s correlation analysis was applied to analyze the relationship between two numerical variables.

Results

Demographic Profile
The average age of patients was 65.55 ± 8.35 years, with 40.5% of individuals at the age of 70-78. Of all patients, 66.2% were males, 97.3% were married, 62.2% were primary school graduates, and 91.9% had health insurance.

Clinical Profile
When evaluating disease-related and postoperative characteristics of patients, it was determined that 25.7% of patients (n=19) had a chronic disease, 66.6% of patients with a chronic disease had hypertension, 94.6% (n=70) of participants had no family member with heart disease, 94.6% (n=70) of participants underwent no surgery. Patients were interviewed on average 3.39 ± 1.57 days after surgery. Patients who stayed in the intensive care unit for an average of 2.41 ± 0.63 days were discharged from hospital in an average of 7.22 ± 1.21 days. The most common problems faced by patients in the postoperative period during their stay in the intensive care unit were nausea and vomiting (13.5%, n=10), chest pain (6.8%, n=5), abdominal pain (6.8%, n=5), respectively (multiple responses were given).

Descriptive Statistics Related to Scales
In the preoperative period, the mean ASSQ score of patients was 32.8 ± 10.7. In the postoperative period, moderate pain and mild dyspnea were experienced (the average level of pain was 4.14 ± 2.29, the mean MBS score was 2.02 ± 1.54). In the postoperative period, the mean total score was 24.1 ± 0.91, and patients experienced worst nausea, vomiting, and retching according to the symptom experience, symptom occurrence, and symptom distress sub-dimensions of this scale (Table 1).

| Table 1. Descriptive statistics related to scales. |
|-----------------------------------------------|
| Mean±SD | Min-Max |
| ASSQ    | 32.8±10.7 | (10-50) |
| Pain level | 4.14±2.29 | (0-9) |
| MBS     | 2.02±1.54 | (0-8) |
| RINVR   |            |        |
| Nausea experience | 7.77±1.04 | (6-11) |
| Vomiting experience | 13.14±2.17 | (8-15) |
| Retching experience | 3.27±1.49 | (2-8) |
| Total symptom experience (0-32 points) | 24.1±0.91 | (21-28) |
| Nausea occurrence | 6.06±0.44 | (5-7) |
| Vomiting occurrence | 8.81±1.41 | (6-10) |
| Retching occurrence | 1.59±0.73 | (1-4) |
| Total symptom occurrence (0-20 points) | 16.4±0.89 | (13-19) |
| Nausea distress | 1.70±0.80 | (1-4) |
| Vomiting distress | 4.33±0.81 | (2-5) |
| Retching distress | 1.67±0.79 | (1-4) |
| Total symptom distress (0-12 points) | 9.12±1.30 | (7-12) |

Comparison of Mean Scale Scores According to the Patients’ Demographic Characteristics
There was no statistically significant difference between gender groups by pain level, dyspnea, and mean RINVR score (p > 0.05), while a statistically significant difference was found by the mean ASSQ scores (p < 0.05). Accordingly, anxiety levels in females were higher than those in males (p < 0.05). There was no statistically significant difference between health insurance and smoking in terms of pain level, dyspnea and mean RINVR scores (p > 0.05) (Table 2).

Spearman’s correlation analysis, applied to determine whether there was a relationship between the scales used in the study, found that there was a statistically significant positive correlation between the levels of anxiety in patients before CABG and the levels of postoperative pain and dyspnea severity (p < 0.01); preoperative anxiety was found to have no effect on the postoperative RINVR (p > 0.05) (Fig. 2).
Table 2. Comparison of scale scores according to the patients’ demographic characteristics.

| Variables     | ASSQ Mean±SD | Pain level Mean±SD | MBS Mean±SD | RINVR Mean±SD |
|---------------|--------------|-------------------|-------------|---------------|
| **Gender**    |              |                   |             |               |
| Female        | 36.5±7.84    | 4.20±2.19         | 2.04±1.27   | 24.2±0.89     |
| Male          | 30.9±11.6    | 4.12±2.35         | 2.01±1.68   | 24.1±0.93     |
| *p*=0.04      | *p*=0.84     | *p*=0.47          | *p*=0.41    |               |
| **Health insurance** |        |                   |             |               |
| Available     | 32.9±10.6    | 4.10±2.29         | 1.93±1.45   | 24.1±0.63     |
| Not available | 31.8±13.6    | 4.66±2.33         | 3.00±2.36   | 24.5±2.58     |
| *p*=0.90      | *p*=0.56     | *p*=0.28          | *p*=0.88    |               |
| **Smoking**   |              |                   |             |               |
| Yes           | 30.8±12.2    | 4.61±2.49         | 2.07±1.53   | 24.0±1.26     |
| No            | 33.6±10.1    | 3.96±2.20         | 2.00±1.56   | 24.2±0.75     |
| *p*=0.36      | *p*=0.24     | *p*=0.69          | *p*=0.36    |               |

Figure 2. Scale relationships. *** – *p*<0.01.

Discussion

Preoperative anxiety predominates in patients before surgery [8–10]. Patients feel nervous and stressed before surgery because they have negative thoughts about the postoperative process and hospitalization. Fears such as possible postoperative complications, pain, bleeding, dependency on others can increase patients’ anxiety [7–10]. There are studies reporting that preoperative anxiety negatively affects patients both psychologically and physiologically [18–22]. Preoperative anxiety has a high incidence rate, ranging from 11% to 80% in different clinical disciplines [27, 28] and can alter the postoperative process as well. If mismanaged, it can delay postoperative recovery, increase patients’ need for postoperative medical intervention, and prolong the discharge process [19, 29].

In studies with patients who were scheduled for cardiac surgery, the incidence of anxiety varied from moderate to high. Such a wide range in results can be explained by using different scales and questionnaires for assessing the level of anxiety, as well as different patient groups [30–32]. In this study, patients experienced predominantly moderate to severe anxiety.

In the literature, some socio-demographic variables
were reported to influence the level of anxiety [7, 33–36]. In our study, the ASSQ scores of patients were found to be statistically significant by gender factor (p < 0.05).

The reason why women are more prone to anxiety than men is not yet clearly known. However, some hypotheses have been offered, including biological factors arisen from female sex hormones, and psychosocial factors [37]. We can relate more anxiety in females to the fact that females can more easily express their feelings or concerns about whether their family role will change after cardiac surgery [7, 33–36]. In our study, females experienced more anxiety, and this finding was consistent with the results of other studies [8, 17, 38–40].

Pain is one of the most prevalent symptoms in patients after CABG [41]. It is most intensely felt within the first 24 hours after surgery. The perception of pain is affected by factors related to surgical trauma and anesthesia method, as well as by psychological factors [42]. According to the literature, a high level of anxiety, emotional changes and pessimistic attitudes can increase postoperative pain feeling [18–21]. Anxiety has been noted to increase the level of pain and the need for analgesics increases the level of postoperative neuroendocrine stress response [14]. In this study, preoperative anxiety affected postoperative pain [22, 42–44] and patients experienced moderate pain in the postoperative period (4.14 ± 2.29).

Due to the complexity of surgery, various complications can occur during/after surgery. Dyspnea is one of these postoperative symptoms experienced by patients undergoing CABG [45]. Dyspnea (shortness of breath or inability to breathe adequately) is frequently observed in anxious individuals. Anxiety causes changes in respiratory rate and respiratory volume and decreases carbon dioxide (PaCO2) levels in the blood and alveoli [40, 46]. In our study, patients had mild dyspnea (the mean MBS score – 2.02 ± 1.54) and the severity of dyspnea increased as the level of anxiety increased. Previous studies supported our findings [47–49]. There was a strong relationship between dyspnea and anxiety, and this study revealed that reducing anxiety before surgery could be a prospective way to reduce postoperative respiratory symptoms.

Postoperative nausea and vomiting (PONV) are one of the most common postoperative complications usually occurring the immediate 24 postoperative hours and continuing to 72 hours [50–52]. In various studies, the prevalence of PONV ranges from 25% to 30%; however, there are studies reporting its rate as high as 80% [53, 54]. Although it is not a life-threatening complication, it can cause dehydration, electrolyte imbalance, wound dehiscence, pulmonary aspiration, and delayed discharge [55]. The factors such as anxiety, female gender, previous history of nausea and vomiting, postoperative opioid use, and pain may increase the risk of postoperative nausea and vomiting [56, 57]. In our study, patients experienced high levels of nausea-vomiting-retching in the postoperative period according to the RINVR (the total RINVR score – 24.1 ± 0.91) and the sub-dimensions of symptom experience, symptom occurrence, and symptom distress. There was a significant relationship between patients’ preoperative anxiety and postoperative nausea-vomiting, in other words, patients who had high preoperative anxiety experienced more postoperative nausea and vomiting [58]. These results were consistent with the results obtained by Majumdar et al. (2019) and Laufenberg-Feldmann et al. (2019) who suggested that preoperative anxiety increased postoperative nausea [20, 33].

**Limitations of the Study**

The results of this study were limited to the opinions of patients who agreed to participate in the study at the selected university hospital. Therefore, the results of the study could be generalized for these patients only.

**Conclusions**

Patients were found to experience predominantly moderate to severe anxiety before CABG, and increased anxiety complaints and pain in the postoperative period. However, there was no relationship between anxiety and nausea-vomiting. A coordinated, multidisciplinary approach to preoperative training of healthcare professionals may offer a promising way to provide more efficient and productive services.

**Ethical Statement**

This study was carried out in accordance with the principles of the World Medical Association Declaration of Helsinki. The ethical approval required for this study was obtained from the University Clinical Research Ethics Committee (Date: January 26, 2021, Issue: E-21142744-804.01-60911).

**Informed Consent**

Informed consent was received from the patients. The participants were ensured to have the right to refuse to participate without penalty if they wished and that all the information received would be kept confidential.

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**Conflict of Interest**

Nurten Arslan Isik is an Editorial Board Member on the journal, but was not involved with the reviewing or decision process. Izzet Emir declares that there is no conflict of interest.

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