JOURNAL OF CLINICAL MEDICINE OF KAZAKHSTAN (E-ISSN 2313-1519)
Original Article DOI: https://doi.org/10.23950/jcmk/15865

Knowledge Level of Patients Undergoing Coronary Angiography

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Received: 2024-09-16.
Accepted: 2025-01-17.

J Clin Med Kaz 2025; 22(1): 50–57

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Abstract

Aim: This study aimed to determine the level of knowledge and related factors of patients undergoing coronary angiography.

Methods: It is a descriptive cross-sectional study. Between January and March 2021, the sample consisted of 256 patients admitted to the cardiology clinic of a training and research hospital for coronary angiography. Data was obtained using the "Patient Information Form" and the "Coronary Angiography Patient Information Form".

Results: Of the patients in the sample, 51.2% were aged 45-59 years. Among those who underwent coronary angiography, 40.6% had a history of previous coronary angiography. A total of 27.3% of the cases reported having stents in their coronary vessels. The majority of the sample (97.7%) was informed by physicians, while the rate of information provided by nurses was 36.4%. The mean total knowledge score of the patients about coronary angiography was 0.65 ± 0.13. There were significant differences in the mean total knowledge scores according to age group, educational level, presence of chronic disease, receiving information about coronary angiography, and the need for information about the angiography procedure ($p<0.05$).

Conclusion: Patients' level of knowledge about coronary angiography is slightly above average and needs to be improved. Moreover, nurses should be more active in patient education and increase their awareness in this field.

Keywords: coronary angiography, coronary artery disease, nurses, patient education

Introduction

Cardiovascular disease, especially coronary artery disease (CAD), is the leading cause of mortality and morbidity worldwide. The World Health Organization (2020) estimates that there were 55.4 million deaths worldwide in 2019 and 17.9% of these deaths were due to CAD [1]. According to the Turkish Statistical Institute (2019), circulatory system diseases are the most common cause of death with a rate of 36.8%. Among circulatory system diseases, ischemic heart disease (39.1%) is ranked first [2]. Combined with further advances in technology, medical and surgical methods are used to reduce the mortality and morbidity of CAD. The most accurate of diagnostic methods is coronary angiography (CAG), which is considered the gold standard among interventional therapies for clinical diagnosis [3-5]. Coronary angiography is a minimally invasive intervention in which special wires are advanced into the coronary arteries through special catheters inserted into the peripheral arteries and a radio-opaque substance is administered to visualize the coronary arteries fluoroscopically under x-rays [6, 7].

Improvements in CAG have made it a preferred choice for patients due to its feasibility, shorter and easier procedure [8, 9]. Some patients may not consider CAG a serious operation, and patients who will undergo CAG for the first time generally believe that their heart disease will disappear and their treatment will be completed after the procedure based on their knowledge acquired from written, oral, and visual media forms. Even if some patients who have had this intervention before may be experienced to a certain extent, they may make errors in adhering to post-procedural self-care guidelines in the hospital environment after the intervention and in-home care after discharge [10]. Coronary angiography is an invasive procedure that causes complications as well as being a widely used method in the diagnosis and treatment of CAD. Vascular problems are usually encountered at the CAG site. These complications include hematomas, bleeding, arteriovenous fistula, pseudoaneurysm, arterial occlusion, retroperitoneal

hematomas, cardiac arrhythmia, femoral neuropathy, contrast agent allergy, and infections. In addition, excessive use of radiopaque material also increases the rate of renal failure [11, 12]. Additionally, some patients may experience stress, anxiety, depression and fear of death for various reasons before invasive interventions such as CAG [13, 14]. Mild anxiety before CAG is common among patients. However, when it reaches the level of severe anxiety, patient outcomes such as prolonged hospital stay, refusal of procedure, and cardiac events may be negatively affected. Some factors that may cause anxiety in patients include the waiting time for CAG, stress about the outcome of angiography, fear of the cardiac catheterization unit, and a complication of angiography. Furthermore, the most common cause of anxiety is poor knowledge of the angiography procedure. An assessment of the level of knowledge and anxiety of the patient before angiography is one of the important responsibilities of healthcare professionals [15]. In fact, a significant relationship was found between patients' the level of knowledge about angiography and anxiety levels in patients undergoing CAG [15–17].

Although CAG is the most reliable method used for visualization of coronary arteries, it carries risks such as vascular complications, infections and increased anxiety in patients. Nurses involved in the care of individuals undergoing CAG play an active role in managing the diagnosis and treatment of patients at risk with a healthy process and improving clinical outcomes with patient education. While coronary angiography should be regarded in its entirety as a whole procedure, nursing interventions before, during, and after the procedure should be handled separately [12, 18]. Therefore, before the CAG, nurses should inform patients by taking into consideration various factors such as the patient's age, gender, educational status, anxiety, and level of knowledge about the disease [18–20]. Patient education, prevention, early diagnosis, and intervention of complications that may occur after CAG are possible through increased awareness, adequate theoretical knowledge and experienced nursing care [21]. This study was conducted to evaluate the level of knowledge of patients undergoing CAG and to determine the relevant factors, which are important given the increasing use of CAG in the diagnosis and treatment of CAD.

Methods

Study Design and Setting

This is a descriptive cross-sectional study. The study was carried out on patients who planned to undergo CAG in the cardiology department of a training and research hospital in Istanbul between January and March 2021.

Population and Sample

The population consisted of outpatients and inpatients who came in to the cardiology clinic of the hospital and underwent CAG between January 1 and March 31, 2021. The sample calculation is based on the number of patients in 2020 during the period of the study. The sample size was determined using the sample size formula with a known population. At least 214 patients would have to be included in the sample for a population of 1018 with a confidence interval of 90% with a margin of error of alpha 0.05, and the study was conducted with 256 patients. The sampling criteria were patients who were treated as outpatients or inpatients for CAD for the duration of the study, were 18 years of age or older, could read and speak Turkish, had no communication problems, and had agreed to participate in the study.

Data Collection

The questionnaire forms were given to the patients before the procedure, and the patients were asked to fill them in. The purpose and method of the study was explained to the patients, they were told that it would take 15-20 minutes to fill out the forms and written informed consent was obtained from the patients. Data was collected using the Patient Information Form and Coronary Angiography Patient Information Form.

Patient Information Form: The form was prepared by the researcher following the literature review [10, 22, 23] and included questions about the descriptive and clinical characteristics of the patients.

Coronary Angiography Patient Information Form: This form was created by the researchers in line with the literature [10, 20, 23, 24]. The form consists of 25 questions about matters for consideration before and after CAG. Correct answers to the statements in the information form were scored as "1" point and incorrect answers were scored as "0" points. Items 3, 4, 6, 7, 9, 16, and 22 were reversed and scored as they contained incorrect statements. The mean scores of the patients' responses to each item ranged between "0" and "1" points. The total score of the information form consists of the sum of the average score given to each item. A total score closer to 1 indicates that the patient has more knowledge about CAG.

The items in the questionnaire form were presented to two cardiology physicians and two academics in the field of internal medicine nursing for examination in terms of comprehensibility, readability, and expressiveness, and expert opinions and suggestions were obtained. After receiving their opinions, a pilot study was conducted on 10 patients. Following the pilot study, the items were found to be appropriate in terms of comprehensibility and applicability. The 10 patients included in the pilot study were excluded from the scope of the study. The internal consistency coefficient of the patients' responses to the information form was calculated with Kuder-Richardson Formula 20 (KR-20) (KR = 0.632).

Data Analysis

For data analysis, the IBM 21.0 (Statistical Package for Social Sciences IBM Corp., Armonk, NYC, USA) statistical program was used. A normal distribution was accepted if the Kurtosis and Skewness values obtained from the intra-item scales were between +3 and -3. According to the variables with two groups, the difference between the total knowledge scores was analyzed with t-test and the difference between the variables with three or more groups was analyzed with the ANOVA test.

Ethics Consideration

The ethics committee approval was received from the Non-Interventional Research Ethics Committee with the decision dated 30.11.2020 with number 2020/45-04, and following this, permission was then obtained from the hospital where the study was conducted. Informed written consent was obtained from patients who agreed to participate in the study. This study was conducted in accordance with the Declaration of Helsinki.

Results

Descriptive and Clinical Characteristics of the Patients

The age range of the patients was 45-49 years (51.2%) and 58.6% were male. The majority of patients were married (85.9%), had graduated from primary school (45.3%), and had income equal to expenses (37.9%). Of the patients, 71.9% had chronic diseases, 56.3% had hypertension, and 40.6% had previously undergone CAG. It was determined that 14.1% of the patients had undergone angiography once before and 27.3% had a stent implantation in the heart. The rate of patients informed about CAG by physicians and nurses was 97.7% and 36.4%, respectively (Table 1).

Table 1 Descriptive and clinical characteristics of patients (N=256)

Characteristics		n	%
Age	18-44	39	15.2
	45-64	131	51.2
	Over 65 years old	86	33.6
Gender	Male	150	58.6
	Woman	106	41.4
Marital status	Married	220	85.9
	Single	36	14.1
Educational level	Primary School	116	45.3
	Middle School	27	10.5
	High School	63	24.6
	Graduate	35	13.7
	Postgraduate	15	5.9
Employment status	Working	122	47.7
	Not working	134	52.3
Profession	Worker	29	11..3
	Officer	42	16.4
	Self-employment	21	8.2
	Retired	64	25.0
	Housewife	57	22.3
	Not working	43	16.8
Income status	Income less than expenditure	75	29.3
	Income equal to expenditure	97	37.9
	Income more than expenditure	84	32.8
Cigarette use	Yes	136	53.1
	No	120	46.9
Duration of smoking (n=136)	Using for 0-5 years	2	0.8
	5-10 years of use	9	3.5
	10-20 years of use	20	7.8
	More than 20 years of use	105	41.0
Alcohol use	Yes	41	16.0
	No	215	84.0
Presence of chronic disease	Yes	184	71.9
	No	72	28.1
*If yes	Hypertension	144	56.3
	COPD-asthma	28	10.9
	Diabetes	89	34.8
	Heart disease	65	25.4
	Other chronic diseases	63	24.6
Previous CAG procedure	Yes	104	40.6
	No	152	59.4
Number of CAG (n=104)	1 time	36	14.1
	2 times	32	12.5
	3 times	20	7.8
	4 times or more	16	6.3
Stent presence	Yes	70	27.3
	No	186	72.7
Education about coronary angiography	Yes	92	35.9
	No	164	64.1
*Information received from whom about CAG procedure	I learned from my close circle	138	53.9
	I learned from the internet, social media, television	77	30.1
	I was informed by the physician	250	97.7
	I was informed by the nurse	93	36.4
Need for information about coronary angiography	Yes	211	82.4
	No	45	17.6
*If yes Subjects you would like to receive information about	I would like information about what to do before the procedure	88	34.4
	I would like to get information about the subjects that I should pay attention to after the procedure	183	71.5
	Others (post-procedure patient follow-up, access to health workers, etc.)	60	23.4

**means more than one option can be marked; CAG: Coronary angiography*

Table 2 Distribution of responses to the Coronary Angiography Patient Information Form

	Incorrect Answer		Correct Answer		Mean	SS
	n	%	n	%		
1. Coronary angiography is a diagnostic intervention to identify a blockage in a blood vessel.	3	1.2	253	98.8	0.99	0.11
2. Coronary angiography is an intervention to place a stent in the patient's vessel.	202	78.9	54	21.1	0.21	0.41
3. During the intervention, general anesthesia should be applied and the patient should be put to sleep.	72	28.1	184	71.9	0.72	0.45
4. It is an intervention performed only through the groin.	132	51.6	124	48.4	0.48	0.50
5. Radio-opaque material is given during the intervention.	97	37.9	159	62.1	0.62	0.49
6. During the intervention, the patient's blocked veins are cleared.	177	69.1	79	30.9	0.31	0.46
7. Hospitalization is required one day before the intervention.	120	46.9	136	53.1	0.53	0.50
8. Fasting 4-6 hours before the intervention is sufficient.	60	23.4	196	76.6	0.77	0.42
9. Fluid/water intake should be stopped 4-6 hours before the intervention.	194	75.8	62	24.2	0.24	0.43
10. The groin is shaved before the intervention.	12	4.7	244	95.3	0.95	0.21
11. Electrocardiography, doctor's orders, laboratory results, medications and surgery reports, if any, should be brought to the intervention.	7	2.7	249	97.3	0.97	0.16
12. Surgical clothes are put on before the intervention.	0	0.0	256	100	1.00	0.00
13. Coronary angiography is an intervention that takes as little as 15-45 minutes.	32	12.5	224	87.5	0.88	0.33
14. In the post-processing zone a sandbag is placed to stop the bleeding.	11	4.3	245	95.7	0.96	0.20
15. Hospitalization is not required after the intervention.	156	60.9	100	39.1	0.39	0.49
16. Food is not eaten or consumed immediately after the intervention.	50	19.5	206	80.5	0.80	0.40
17. At least 2.5-3 liters of water should be consumed after the intervention.	15	5.9	241	94.1	0.94	0.24
18. Bed rest is required for 4-6 hours after the intervention.	15	5.9	241	94.1	0.94	0.24
19. There may be bleeding, swelling, etc. in the intervention area after the intervention.	76	29.7	180	70.3	0.70	0.46
20. Nausea, vomiting, dizziness, headache,weakness, and chest pain may occur after the intervention.	89	34.8	167	65.2	0.65	0.48
21. After the intervention, fluid intake and urine are monitored.	144	56.3	112	43.8	0.44	0.50
22. All cardiac disorders disappear after the intervention.	155	60.5	101	39.5	0.39	0.49
23. You can shower/bath 24 hours after the intervention.	170	66.4	86	33.6	0.34	0.47
24. Driving, sports, etccan be done immediately after the intervention	118	46.1	138	53.9	0.54	0.50
25. Return to routine life 24 hours after the intervention.	135	52.7	121	47.3	0.47	0.50
Coronary Angiography Patient Information Form	**X̄ ± SD Min Max**					
Total Score	0.65 ±0.13 0.36 0.96					

SD: Standard deviation

Table 3 Comparison of Coronary Angiography Patient Information Form in terms of patients' characteristics

Variables		Partiscipants	Coronary Angiography Patient Information Form	t/F	p
		n (%)	Ort±Sd		
Age	30-44 years1	39 (15.2)	0.71 ± 0.11	F: 13.609	**0.000*** 1>3; 2>3
	45-64 years2	131 (51.2)	0.66 ± 0.13		
	65 years and older3	86 (33.6)	0.60 ± 0.11		
Gender	Male	150 (58.6)	0.66 ± 0.13	t: 0.866	0.387
	Woman	106 (41.4)	0.64 ± 0.13		
Education	Primary school1	116 (45.3)	0.61 ± 0.11	F: 17.626	**0.000*** 1<4; 1<5; 2<4; 2<5 3<4; 3<5
	Middle school2	27 (10.5)	0.60 ± 0.10		
	High school3	63 (24.6)	0.65 ± 0.11		
	Graduate4	35 (13.7)	0.77 ± 0.11		
	Postgraduate5	35 (5.9)	0.74 ± 0.14		
Chronic disease	Yes	184 (71.9)	0.64 ± 0.13	t: -2.277	**0.024***
	No	72 (28.1)	0.68 ± 0.12		
Having had a CAG before	Yes	104 (40.6)	0.64 ± 0.12	t: -1.090	0.277
	No	152 (59.4)	0.66 ± 0.12		
Number of CAG	1	36 (14.1)	0.66 ± 0.14	F: 1.358	0.260
	2	32 (12.5)	0.65 ± 0.11		
	3	20 (7.8)	0.60 ± 0.11		
	≥ 4	16 (6.3)	0.62 ± 0.11		
Education about CAG	Yes	92 (35.9)	0.70 ± 0.12	t: 5.297	**0.000***
	No	164 (64.1)	0.62 ± 0.12		
Need for information about CAG	Yes	211 (82.4)	0.70 ± 0.12	t: 3.043	0.003*
	No	45 (17.6)	0.62 ± 0.12		

*CAG: Coronary angiography; F: ANOVA test; t: t test; *p<0.05*

Coronary Angiography Patient Information Form Scores

Analyzing the responses of the patients to the items of the information form, it was determined that they gave the most correct answers to the items "Surgical clothes are put on before the intervention (100%)", "Coronary angiography is a diagnostic intervention to identify a blockage in a blood vessel (98.8%)", "Electrocardiography, doctor's orders, laboratory results, medications and surgery reports, if any, should be brought to the intervention (97.3%)". The items to which the patients gave the least correct answers were "Coronary angiography is an intervention to place a stent in the patient's vessel" (21.1%), "Fluid/water intake should be stopped 4-6 hours before the intervention" (24.2%), and "During the intervention, the patient's blocked veins are cleared" (30.9%). According to the responses given by the patients, the mean total knowledge score for CAG was 0.65±0.13 (Table 2).

Comparison of Information Form Score Averages According to Descriptive and Clinical Characteristics of Patients

There was a statistically significant difference between the age groups in terms of total knowledge score ($p<0.05$). The results showed that the mean knowledge score of those aged 30-44 was the highest. A weak, negative ($r=-0.289$) and significant relationship was found between the age groups of the patients and the Coronary Angiography Knowledge Form score ($p<0.01$). Compared to the groups with different levels of education, total knowledge score showed a significant difference ($p<0.05$). Per these results, the mean knowledge score of those with bachelor's and master's degrees was higher than those with primary, secondary, and high school degrees. The difference in total knowledge score between the groups with chronic disease was statistically significant ($p<0.05$). For those without chronic disease, the mean knowledge score was higher than the mean knowledge score of those with chronic disease. A statistically significant difference was found between the total knowledge scores of patients who received education about CAG ($p<0.05$). The mean knowledge scores of patients who received training about CAG were higher than those who did not receive training (Table 3).

Discussion

As with any invasive procedure, the CAG procedure may lead to some complications. Information provided to patients before CAG may prevent psychological problems as well as physiological complications. Therefore, evaluating the knowledge level of the patients and providing education in line with their needs could be important in terms of the effectiveness and applicability of the education and patient care outcomes. The present study addresses this important aspect of patient care and emphasizes the need to improve educational efforts, particularly for nursing staff. The study also presents areas for improvement in patient education and care in the context of CAG and suggestions for increasing nurse involvement in patient education.

Discussion of Findings Related to Coronary Angiography Patient Knowledge Score

Patient education is one of the most important dimensions of patient-centered care. Determining which subjects patients want to be informed about and prioritizing them can make education more effective and efficient. Organizing patient education according to the information needs of patients may contribute positively to the expected patient care outcomes and increase patient satisfaction and nursing care quality [25, 26]. In this study, the mean total knowledge score obtained in the study was 0.65 ± 0.13. As the minimum score obtained from the form is 1 and the maximum score is 5, it can be concluded that the total knowledge score of patients is slightly above the average value (0.5). This shows that the level of knowledge of the patients regarding CAG should be improved. The study by Shaheen et al. reported that patients did not have adequate knowledge about CAG, with only 6% patients having good knowledge, 42% moderate and 52% poor knowledge [15]. In some studies, the patients were found to have poor knowledge before the intervention, while the education offered to the patient after the intervention, that is, before cardiac catheterization, increased the knowledge score [16, 17, 27]. Post-angiography individuals may need education on many subjects to adapt to the new situation and develop effective coping behaviors. However, some patients may need less information, while others may not want to receive too much information because they do not need it. Missing or incorrect information can lead to different interpretations or perceptions of the importance of information, while too much information can lead to cognitive overload in patients. Due to this overload, patients may forget the information they have received or feel more stressed. Therefore, the first step in meeting individual information needs is to identify and understand them. The results of the assessment may provide important data for planning treatment and care in line with patient needs.

Regarding some items obtained from the Coronary Angiography Patient Information Form, 51.6% of the patients stated that CAG was performed only through the inguinal region. In the study of Yılmaz et al. [28], 77.1% of the patients answered the question from which vein the CAG was performed from the inguinal vein [28]. CAG is performed by using brachial arteries with the Sones method and femoral arteries and radial arteries with the Judkins (Seldinger) method [27, 29]. Although the most appropriate decision in this regard is made together with the physician according to the patient's condition, patients should be informed in detail about the types of CAG methods.

In the Coronary Angiography Patient Information Form, 76.6% of the patients responded correctly to the item that it is sufficient to fast for 4-6 hours before the procedure, and the correct response rate to the item that water/liquid intake should be stopped 4-6 hours before the procedure was 24.2%. According to the 2011 guidelines of the American Society of Anesthesiologists, the patient's oral intake should be terminated at least 4-6 hours before the CAG, while fluid intake can be continued up to 2 hours before the intervention [30].

In the Information Form, 95.7% of the patients gave the correct answer to the item "A sandbag is placed to stop bleeding in the intervention site after CAG". After CAG, the intervention site of the patients is closed by applying a tight bandage and tampon. Following taking the patient's to bed, a sandbag is placed on the site where the intervention was performed and the location is observed for bleeding [31, 32]. However, with advancing and developing technology, observation of the intervention site in terms of bleeding has become more practical. Hemostasis of the intervention site can be performed with special closure devices without the need for sandbags, tight tampons, and bandages. But since these devices are not widely used or preferred in practice, sandbagging is the most common method to stop bleeding.

In the study, 56.3% of the patients gave incorrect answers to the item "Fluid intake and urine are monitored after the CAG". In the Nursing Guideline published by the Turkish Society of Cardiology in 2007, the patient's intake is monitored with oral intake after CAG. Since a contrast radio-opaque substance that facilitates the visualization of coronary arteries is given during the intervention, the patient's fluid intake is encouraged and monitored to prevent dehydration and nephropathy that may be caused by the contrast material in the patient after the intervention. In this way, the removal of the contrast material from the body is accelerated. Intravenous fluid intake and blood transfusion

are provided according to the physician's order and the patient is observed every hour and recorded on the patient observation form [33]. Of the patients, 60.5% gave an incorrect answer to the item "All cardiac disorders disappear after CAG". Incorrect answers were given by 66.4% of the patients to the item that a shower/bath can be taken 24 hours after the intervention, 46.1% to the item that driving, sports, etc. can be done immediately after the intervention and 52.7% to the item that routine life can be resumed 24 hours after the intervention. Education contributes to making changes in the lifestyle of the patients, developing appropriate coping methods in their adaptation to the disease, and increasing their comfort levels [24]. As such, the patient can return to their homes or to their usual social environments after the procedure. The intervention site should be observed by the patient or his/her relatives for at least 24 hours after leaving the hospital. In case of bleeding, swelling, or redness, the nearest health institution should be consulted. The patient can take a shower with a warm bath 24 hours after the intervention without rubbing the site of the intervention and without keeping it too hot. The patient can drive after the intervention but should avoid fast and sudden foot movements, activities that will use excessive force and effort, and protect the intervention site from impacts. The patients should be told that they can do sports, exercise, and go on daily walks at a light pace 24 hours after the intervention [23, 31, 34].

In this study, the nurses were significantly more behind than physicians in angiography education. One reason for physicians to take part in more training on angiography is that physicians may also provide information while recommending this procedure to the patient. Likewise, in a study conducted by Şatıroğlu et al. [10], the majority of patients (77%) stated that they had been informed about CAG by physicians and half of the patients (50.7%) they found the information provided by physicians sufficient. In a different study [16], patients' source of information was mostly physicians (87%), but the majority of participants reported that this information was inadequate. With that in mind, providing in-house in-service trainings to increase the awareness of nurses on this issue is very important. Studies show that nurses received in-service training on the care of patients undergoing cardiac catheterization procedures and found their level of knowledge sufficient [11] or that the participants' in-service training was not at the desired level [35].

Discussion of the findings related to the comparison of information form scores according to the descriptive and clinical characteristics of the patients

With the development of science and technology, CAG has become practical. The patient undergoing the procedure is both diagnosed and treated with stents and angioplasty in the same session, except for elective conditions [36, 37]. In this study, more than half of the patients reported that they had not previously undergone CAG. Similarly, in Gören's study [38], the rate of those that did not have a previous CAG was 51.6%, while this rate was 63.72% in the study of Yılmaz et al. [23]. In our study, no statistically significant difference was found when the knowledge scores of individuals who stated that they had previously undergone CAG were compared with individuals who had not undergone CAG. It is expected that patients who have had previous CAG have higher knowledge levels than those who have not. However, education should be repeated even if patients have previous experience. Previous training may not have been effective and sufficient, and patients may not have understood or may have forgotten. In a study [10], it was reported that patients who will undergo CAG for the first time may "simplify" the procedure and may think that all cardiovascular diseases will be eliminated or that their treatment will be completed after the intervention with the information they have heard and seen from their close environment or as a result of their research in written oral and visual media.

In this study, 98.2% of the participants stated that the CAG is a diagnostic method, while the same participants responded that CAG is an application in which a stent is placed with 21% in another question. In the study conducted by Şatıroğlu et al. [10], the rate of those who responded correctly that CAG was a diagnostic procedure for CAD was 36%, and the rate of those who said that their disease would be treated and the heart vessel would be opened was 32%. In the study by Yılmaz et al. [28], 44% of the patients responded to the question of the purpose of CAG as visualization of the vessels and 37% as opening of the vessels. In the same study, it was stated that fear of surgery, incorrect or incomplete information, and uncontrollable anxiety of the individual may affect the individual's compliance with diagnosis and treatment [28]. Considering the results, individuals know what CAG is, but they lack information about the purpose of the procedure.

In the current study, the mean scores of those who needed information about CAG and those who received education on this subject were found to be higher, which is expected. Those who want to be informed may have done more research or their willingness to learn may be higher than others. Education is the best process realized in line with the individual's teaching-learning process. This is a way in which the desired behaviors can be taught to the individual and those around him/her most easily. Patient education is the basis of nursing interventions before, during, and after the CAG procedure. It was found that the mean scores of those who needed information about CAG and those who received training on this subject were higher, which is expected [19]. Balcı and Enç [13] found that audio-visual (video) training given before CAG had a positive effect on physiological and psychosocial parameters after the procedure. The World Health Organization Regional Office for Europe drew attention to the importance of health education in achieving the "Health for All Goals" and emphasized that all nurses are health educators. The responsibility of nurses for patient education has also been emphasized in the reports of national and international studies and the laws and regulations related to nursing. All these developments have led nursing to take a professional educational role [39]. It is very important to plan patient education considering age, gender, and educational level. Particularly when it comes to imaging and diagnosis or treatment of a vital organ such as the heart with a minimally invasive procedure such as CAG, it is important to plan by paying attention to these [23].

In addition to diagnosis and treatment, health perception and disease management are very important in cardiovascular diseases. External factors that individuals experience in accessing information greatly affect the disease and the individual. Studies show that individuals aged 40 years and older are exposed to a higher risk of CAD with advancing age [22, 40, 41]. When the responses of the age groups to the CAD information form were compared, statistically significant differences were found in total information scores. With increasing age, the need for information is higher in individuals. It may be related to the increasing needs of individuals and their dependency on others. In addition, with the death of one of the spouses, patients may be left alone. This may have increased the patients' awareness of their diseases or current problems. In the study, the total knowledge score of individuals who did not have a chronic disease was found to be higher. Individuals who do not have chronic diseases may need more information because they have not experienced such problems before. This study shows that the mean knowledge score of patients with higher education was higher than the others.

As a result of advancing age and emerging chronic diseases,

people encounter more problems due to the weakening of the immune system, adaptation difficulties, and problems in coping with stress. These bring on not only biological and physical, but also mental and social problems [42]. Similarly, participants aged between 31 and 60 years had good knowledge, while participants older than 60 years had poor knowledge. Also, a significant association was found showing that educated participants had good knowledge compared to illiterate participants [16].

Limitations

This study was conducted in a public hospital. Therefore, the results of this study cannot be generalized to all patients with CAD. A larger sample size in public and private hospitals is recommended for future studies. In addition, the information form is limited to the knowledge and practices related to CAD developed by the researcher.

Conclusion

Patients' level of knowledge about CAG procedures is above the mean value. The rate of patients being informed about CAG by nurses is lower than that of physicians. As the age increases, the mean knowledge score of the patients decreases. According to the results of the study, the mean knowledge scores of patients with a bachelor's degree, patients without chronic diseases, and patients who need information about the procedure are higher. In addition, the mean score of those who received education about CAG was also found to be higher.

There is a need to increase and improve the level of knowledge of patients about CAG. In patient education, it is important to use patient-appropriate education methods and to repeat/update information even if the patients have been previously informed or have knowledge on the subject. Moreover, the awareness of nurses working in cardiology services, coronary intensive care units, and angiography laboratories of healthcare institutions about patient education related to CAG should be increased. In planning the training to be given to the patient, the individual characteristics of the patient should be taken into consideration, and educational needs should be determined. Additionally, nurses should have qualified and sufficient knowledge about both the care and interventional practices of patients planned for CAG and should be able to evaluate the results of these practices on the patient.

Author Contributions: Conceptualization, B. T., A. K.; methodology, B. T. and A. K.; validation B. T. and A. K.; formal analysis B. T. and A. K.; investigation, B. T. and A. K.; resources, B. T. and A. K.; data curation, B.T. and A.K.; writing – original draft preparation, B. T. and A. K.; writing – review and editing, B. T. and A. K.; visualization, B. T. and A. K.; supervision, A. K.; All authors have read and agreed to the published version of the manuscript.

Acknowledgments: The authors thank the patients who participated into the study.

Disclosures: There is no conflict of interest for all authors.

Funding: None

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