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The Prevalence of Anxiety Among Patients Undergoing Computed Tomography Examinations in Saudi Arabia

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Abstract

***Background*:** Patient anxiety during medical imaging procedures is common, with a reported prevalence of 49%–95%. Contributing factors include the characteristics of the imaging equipment and the anticipation of a diagnosis. While anxiety related to magnetic resonance imaging (MRI) has been extensively studied, few studies have investigated anxiety related to computed tomography (CT) in Saudi Arabia. Therefore, this study aimed to assess the prevalence of anxiety among patients undergoing CT examinations in Saudi Arabia.

***Methods and Results*:** From March to June 2024, a prospective observational study was conducted at two hospitals in Saudi Arabia. The study included 100 patients aged 12 years or older undergoing various CT examinations. Data were collected using a specially designed checklist and the State-Trait Anxiety Inventory, Form Y1. Variables such as patient demographics, type of CT examination, use of contrast media, observed signs of anxiety, and effects on image quality were recorded.

Anxiety was observed in 34% of the patients and was more prevalent in female (20%) than in male (14%) patients. Adults aged 18–64 years experienced anxiety more frequently (27%) than adolescents (4%) and geriatric patients (3%). Anxiety was also more prevalent among patients undergoing contrast-enhanced CT scans (22%) than among those undergoing non-contrast scans (12%). Similarly, anxiety was more prevalent among patients without prior CT or MRI experience (CT: 24%, MRI: 29%). Anxiety contributed to patient movement during scans, leading to image artifacts and, in some cases, the need for repeat examinations.

***Conclusion*:** Anxiety is a significant concern among patients undergoing CT examinations, particularly among female patients, adults, and patients receiving contrast media. Its presence can adversely affect image quality due to increased motion artifacts. It is crucial for radiology departments to recognize and address patient anxiety to enhance image quality and patient care. **(International Journal of Biomedicine. 2024;14(4):654-658.)**

Keywords: anxiety • computed tomography • image quality • contrast media • radiology

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Introduction

Patient anxiety is common during medical imaging procedures, with a reported prevalence of 49%–95%.[1,2] This may be due to the specific characteristics of the operation or the anticipation of a diagnosis.[3-5] The emergence of multi-detector computed tomography (CT) scanners and the expansion of diagnostic applications with the introduction of novel procedures performed under CT guidance[6] have led to an increase in the number of CT examinations.

The parts of a CT machine can make some patients feel anxious.[7] In such cases, medical care and special skills

are needed to reduce patient anxiety and increase CT image quality. Several factors can cause apprehension before and during a CT examination. Some people are intimidated by the large size of CT scanners or have technophobia.[8] Other people are apprehensive of the prospect of having cancer or becoming infertile due to the ionizing radiation used in CT procedures. Moreover, the lateral movement of a CT scanner can cause anxiety, especially if the patient is not already familiar with this movement. Some patients may feel anxious merely at the sight of the CT aperture. The laser beam used to position the patient correctly may also cause fear. Moreover, the gantry rotation sounds, whose intensity varies among machines, may cause anxiety to patients, especially those unfamiliar with these sounds and those with phonophobia. The administration of contrast media before a CT examination may increase anxiety, especially when it entails a prolonged overall procedure.[2]

Anxiety during a CT procedure may cause the patient to move, which may cause image artifacts. Specifically, movement may cause blurring and degrade spatial resolution. This may necessitate a reexamination, thereby increasing radiation exposure. Thus, to ensure good image quality and prevent additional radiation exposure, it is important to avoid patient movement due to anxiety.[9]

Several studies have investigated anxiety during medical imaging procedures.[1,2,10] Forshaw et al.[1] showed that anxiety was common before such procedures and was mostly attributed to the results. The authors concluded that psychological preparation could help to reduce preprocedural anxiety. Heyer et al.[11] found that anxiety was related not only to magnetic resonance imaging (MRI) but also to CT procedures and that women seemed to be more susceptible to anxiety than men. Bezzina et al.[12] reported that providing patients with information about CT procedures might improve their knowledge but did not help reduce their anxiety.

Because anxiety is a psychological condition, it is important to consider the cultural and knowledge factors that may affect it. No previous studies have investigated patient discomfort during CT procedures in the Kingdom of Saudi Arabia. Thus, this study aimed to determine the prevalence of anxiety during such procedures and its effects on image quality.

Materials and Methods

This prospective observational study was conducted at two hospitals in Jeddah, Saudi Arabia, from March to June 2024. The study involved 100 patients undergoing CT examinations. The age of participants ranged from 12 to over 65 years. Ethics approval was obtained from the radiology department. The prospective participants were offered a brief explanation of the study's aim and provided written informed consent prior to participation. Patients who refused to provide informed consent were excluded. Patients less than 18 years old and unconscious patients transferred from the emergency room for CT examinations were also excluded.

A special checklist consisting of three sections was designed to collect patient data. The first section concerned age, gender, type of CT study, organ under examination, and use of contrast media. The second section concerned observations of the patients from the beginning until the end of each CT examination, such as facial expression, presence of anxiety, movement during the examination, trembling, and dizziness. Procedure duration, image quality, and the potential need for reexamination were also recorded in this section. The third section included questions for the patients after the examination. These questions concerned the patients' psychological states—for example, whether they felt discomfort during the examination and were anxious before or during it. The patients were also asked whether they had previously undergone a CT or MRI examination. The checklists were completed by three researchers.

Measurement of Anxiety Levels

Anxiety levels were measured using the State-Trait Anxiety Inventory (STAI), specifically Form Y1.[13] The STAI is a standardized self-report questionnaire consisting of 40 questions divided into two subscales of 20 items: Y1, which concerns state anxiety—that is, temporary anxiety in a specific circumstance; and Y2, which concerns trait anxiety—that is, more general anxiety as a personality trait.

Statistical Analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS). A descriptive statistical analysis was performed to examine the frequencies and percentages of the participants. Moreover, a cross-tabulation was performed to assess the relationships between certain variables.

Results

Of the 100 patients enrolled in the study, 51 (51%) were male, and 49 (49%) were female. Their ages were distributed as follows: adolescents, 12–17 years (n = 9, 9%); adults, 18–64 years (n = 82, 82%); and geriatric patients, ≥65 years (n = 9; 9%; Table 1).

Table 1.

Gender and age distributions

	n	%
Gender		
Male	51	51
Female	49	49
Age group		
Adolescents (12–17 years)	9	9
Adults (18–64 years)	82	82
Geriatric patients (≥65 years)	9	9

The CT examinations were classified into 10 types according to their frequency as follows (Figure 1): head and neck (33%), abdomen and pelvis (21%), abdomen (17%), chest (10%), lower limbs (8%), chest and abdomen (4%), whole body (3%), upper limbs (2%), pelvis (1%), and spine (1%).

The duration of the CT procedure (from the time at which the patient was placed on the CT table until the end of the examination) was divided into three categories: short

(1–5 min), medium (6–12 min), and long (13–20 min). Of the 100 patients, 78 (78%) had short scan times, 20 (20%) had medium scan times, and 2 (2%) had long scan times (Table 2).

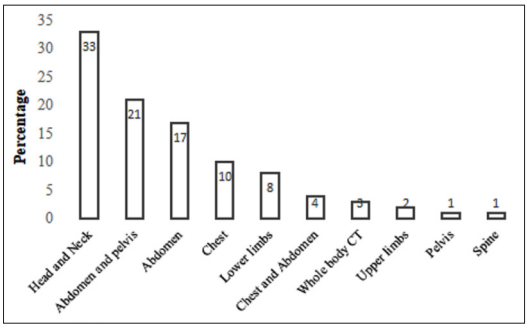

***Fig. 1**. Distribution of CT examinations.*

The procedures were also categorized into examinations with and without contrast agents. Of the 100 CT exams, 47 (47%) were performed after contrast medium administration, and 53 (53%) were performed without a contrast medium (Table 2).

Table 2.

Distributions of scan times and contrast medium administration status

	%
Scan time	
Short (1–5 min)	78
Medium (6–12 min)	20
Long (13–20 min)	2
Contrast medium	
Yes	47
No	53

Approximately 34% of the patients were above the threshold level (cutoff) of anxiety. The prevalence of anxiety varied according to gender, with women having a higher rate of anxiety than men (20% vs. 14%; Table 3).

Table 3.

Distribution of anxiety levels by gender

Gender	Anxiety score (%)			
	0	1	2	3
Male	37	6	6	2
Female	29	5	6	9
Total	66	11	12	11

In terms of age groups, anxiety was more prevalent among adults (27%) and less prevalent among adolescents (4%) and geriatric patients (3%; Table 4). Moreover, short scan times were more frequently associated with anxiety (25%; Table 5). Furthermore, contrast-enhanced examinations were more frequently associated with anxiety than examinations without contrast agents (22% vs. 12%; Table 6). Finally, anxiety was more prevalent among patients who had no history of CT (24%) or MRI examinations (29%; Tables 7 and 8).

Table 4.

Distribution of anxiety levels by age

Age group	Anxiety score (%)			
	0	1	2	3
Adolescents (12–17 years)	5	–	–	4
Adults (18–64 years)	55	3	3	21
Geriatric patients (≥65 years)	6	2	1	–
Total	66	5	4	25

Table 5.

Distribution of anxiety levels by scan time

Scan time	Anxiety score (%)			
	0	1	2	3
Short (1–5 min)	53	4	6	15
Medium (6–12 min)	12	1	–	7
Long (13–20 min)	1	–	1	–
Total	66	5	7	22

Table 6.

Distribution of anxiety levels by contrast agent administration status.

Contrast agent	Anxiety score (%)			
	0	1	2	3
Yes	25	4	2	16
No	41	1	2	9
Total	66	5	4	25

Table 7.

Distribution of anxiety levels by CT examination history status

CT history	Anxiety score (%)			
	0	1	2	3
Yes	41	2	1	7
No	25	2	4	18
Total	66	4	5	25

Table 8.

Distribution of anxiety levels by MRI history status

MRI history	Anxiety score (%)			
	0	1	2	3
Yes	25	1	–	4
No	41	3	5	21
Total	66	4	4	25

Discussion

This study investigated patient anxiety and its causes during CT examinations. Over the last three decades,

studies on MRI-related anxiety have demonstrated that claustrophobia is a major factor that may result in poor image quality or even the termination of an examination.[14–16] In contrast, because many clinicians and patients regard CT examinations as convenient, the association between CT and patient anxiety has not been adequately studied.[11,17] Our results indicate a high prevalence (34%) of anxiety among patients undergoing CT examinations, which is comparable to that reported in previous studies.[2,17] Although the narrowness and length of a CT gantry cannot be compared to those of an MRI gantry, our findings suggest that the position of a patient during a CT scan may have a significant impact on anxiety development.

Our results also show that female patients exhibited higher anxiety levels than male patients, which is also in line with previous studies.[2,11] Our findings are also consistent with previous studies reporting a higher prevalence of anxiety disorders among women, both in the general population[18] and in the context of various medical therapies.[19–21]

Our results do not demonstrate a clear association between age and anxiety, although they indicate slightly higher anxiety levels with greater age. This is in contrast to previous studies reporting a lower prevalence of claustrophobia during MRI scans among 65- and 70-year-old patients.[11,22] Our findings provide valuable insights for clinical practice, as they suggest that no age group is at a higher risk of experiencing CT-related anxiety. Consequently, it should be expected that patients of any age may experience anxiety.

The scan time may be a good indicator of anxiety, especially when it is long, particularly in the case of uncooperative patients. However, our results do not indicate a relationship between scan times and anxiety levels.

Our results also indicate a high anxiety rate (22%) among participants undergoing contrast-enhanced CT examinations. This is comparable to the anxiety rate of 25.4% among patients undergoing contrast-enhanced CT scans reported by Heyer et al.[11] Similarly, Yucell et al.[23] found that the use of intravenous contrast caused anxiety in most patients scheduled for CT examinations.

Our findings also suggest that most patients with a history of CT or MRI examinations did not experience anxiety during their CT examinations. However, the rate of anxiety was also low among patients with no previous CT or MRI experience. This is in line with a previous study reporting that most patients undergoing examinations for the first time did not experience state anxiety.[17] These findings suggest that experience and knowledge of radiological modalities can help reduce anxiety. Moreover, patients with a history of MRI examinations may experience less anxiety during a CT scan because an MRI examination is more complex than a CT examination.

One limitation of this study is that the participants were not reassessed after the CT examinations. Another limitation is that the expense of the investigation was not taken into account as a confounder. Finally, because this study focused on state anxiety, preexisting conditions or background mental problems were not examined.

Conclusion

This study suggests that 34% of the patients undergoing CT scans experience anxiety, with higher rates among women, adults, and those receiving contrast media. Anxiety can cause patients to move during a CT scan, which may result in artifacts and low image quality, potentially leading to the need for reexamination, which increases radiation exposure. Anxiety is more prevalent among patients unfamiliar with CT or MRI scans. This highlights the need for better patient preparation. Radiology departments should implement anxiety-reducing strategies, such as clear communication and supportive environments. Moreover, future research should explore interventions for further reducing anxiety to ensure diagnostic accuracy.

Competing Interests

The authors declare that they have no competing interests.

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