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Anxiety Levels among Stroke Patients Prior to Digital Subtraction Angiography (DSA) During Hospitalization: A Cross-Sectional Study

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Abstract

Background: Stroke is a serious acute cerebrovascular disease caused by impaired blood supply to the brain. To accurately evaluate cerebral vascular conditions in stroke patients, Digital Subtraction Angiography (DSA) is used as the gold standard diagnostic examination. Despite its high diagnostic value, the DSA procedure can cause anxiety due to the unfamiliar environment, concerns about the risks of the procedure, and a lack of patient understanding of the procedure. This study aims to describe the level of anxiety in stroke patients undergoing DSA during their treatment.

Methods: A descriptive cross-sectional study was conducted on 60 stroke patients scheduled for DSA during their treatment at a referral hospital in Aceh Province. Data were collected from November 2025 to January 2026. Respondents were recruited using a purposive sampling technique. Anxiety levels were measured using the State-Trait Anxiety Inventory (STAI-S) questionnaire. Data were analyzed descriptively using frequency distribution, percentage, mean, standard deviation, and min-max.

Results: The assessment results showed that all respondents (n = 60; 100%) were in the severe anxiety category (range 45–80) with an average STAI-S score of 63.45 ± 4.739, min 54 and max 73.

Conclusion: All stroke patients undergoing DSA experienced significant anxiety during the pre-procedure period. These findings demonstrate the high psychological burden experienced by patients prior to DSA procedures and underscore the importance of developing effective interventions to reduce anxiety and improve patient psychological preparedness prior to the procedure.

Keywords: Stroke, Digital Subtraction Angiography, Anxiety, Inpatients

Introduction

Stroke is an acute cerebrovascular disease that occurs due to impaired blood flow to the brain, either due to blockage or rupture of cerebral blood vessels, which can cause permanent brain tissue damage [1, 2]. Globally, stroke is the second leading cause of death and the third leading cause of disability, with approximately 11.9 million new cases each year [3, 4]. The burden of stroke tends to be higher in Asian countries compared to Europe and North America, mainly due to limited health resources and the high prevalence of risk factors [5]. In Indonesia, stroke remains a leading cause of death and disability with a prevalence of 8.3 per 1,000 population, while in Aceh Province the prevalence reaches 8.8 per 1,000 population [6]. In addition to increasing the risk of death, stroke also causes various long-term functional limitations, such as motor disorders, balance, activities of daily living, and decreased quality of life for patients [7, 8].

Rapid and accurate diagnosis and evaluation are essential components of stroke management. One of the gold standard examinations for assessing cerebral vascular conditions is Digital Subtraction Angiography (DSA) [9]. DSA is an invasive procedure that uses a catheter, guidewire, and contrast medium to visualize cerebral blood vessels in detail, thus helping to detect stenosis, aneurysms, vascular occlusions, and assess collateral circulation in stroke patients [10]. Since 2021, DSA procedures have been routinely performed at referral hospitals in Aceh Province as part of stroke diagnostic and therapeutic services. Despite its high diagnostic benefits, DSA is often perceived as a stressful procedure by patients. The invasive nature of the procedure, the use of a catheter and contrast medium, the unfamiliar environment of the catheterization laboratory, and concerns about the examination results and possible complications can trigger anxiety before the procedure is performed [11].

Anxiety is an emotional response to a perceived threat, characterized by changes in cognitive, affective, physiological, and behavioral aspects [12]. In stroke patients, anxiety can be exacerbated by uncertainty about the disease condition, functional

limitations experienced, and a lack of understanding regarding the procedure to be undergone. Pre-procedure anxiety not only impacts the patient's psychological condition, but can also affect physiological stability. Activation of the sympathetic nervous system due to anxiety can cause an increase in blood pressure, heart rate, respiratory rate, and other hemodynamic changes that have the potential to disrupt patient comfort and increase the risk of complications during the procedure [11]. Various studies have shown that anxiety is a common psychological problem experienced by patients before undergoing invasive procedures. In patients undergoing coronary angiography, anxiety levels are reported to be mild to moderate and require treatment before the procedure is performed [13]. More recent research also shows that approximately 35% of patients scheduled for elective coronary angiography experience clinically significant anxiety before the procedure [14]. In addition, in patients undergoing endoscopy, pre-procedural anxiety is known to increase pain perception, the need for sedation, and reduce patient cooperation during the procedure [15]. Although various studies have reported anxiety in patients undergoing invasive procedures, information regarding the level of anxiety in stroke patients undergoing DSA is still limited, especially in Indonesia and Aceh Province. Understanding the picture of patient anxiety in the pre-DSA period is needed to support the development of educational strategies and interventions to improve patient psychological readiness and optimize service outcomes. Therefore, this study aims to describe the level of anxiety in stroke patients undergoing DSA during the treatment period.

Materials and Methods

Study Design

A descriptive cross-sectional study was used.

Population and Sample

The study population consisted of all pre-DSA stroke patients treated in the neurological disease ward and the sample consisted of 60 respondents. The inclusion criteria for respondents were (a) Male or female patients aged 18 to 65 years, (b) fully conscious, (c) cooperative in the study, (d) pre-DSA patients with ischemic or hemorrhagic stroke who underwent DSA for the first time and had received a schedule, and (e) not currently taking anti-anxiety medication. The exclusion criteria were (a) patients who experienced decreased consciousness, (b) patients who experienced hearing loss, and (c) patients who experienced mental disorders.

Time and Location of Study

This research was conducted from November 2025 to January 2026 at a referral hospital in Aceh Province, Indonesia.

Data Collection Method

Data collection was conducted by the researcher herself, then the researcher introduced herself to the respondents, explained the purpose of the study, and obtained informed consent data from them. After providing an explanation, the researcher asked the respondents to read the consent form. If the respondents agreed to participate, they were asked to sign the consent form. After the respondents signed the consent form, the researcher began collecting demographic data regarding age, gender, education, occupation, income, marital status, stroke duration, number of DSAs performed, whether they had received pre-DSA information, and hemodynamic measurements. After that, the researcher assessed the level of pre-DSA anxiety using the State Trait Anxiety Inventory questionnaire (STAI) state section (STAI-S).

Data Collection Tools

This study used a questionnaire as a data collection tool. The questionnaire consisted of three parts: A and B. Questionnaire A contained questions regarding sociodemographic data, specifically age, gender, education, occupation, income, marital status, stroke duration, number of DSAs, whether pre-DSA information was received, and patient hemodynamics (blood pressure, pulse, respiratory rate, and temperature). Furthermore, Questionnaire B consisted of the STAI-S questionnaire. Interpretation of anxiety levels based on the STAI-S is a total score of 20-29 indicates no anxiety, 30-37 mild anxiety, 38-44 moderate anxiety, and 45-80 severe anxiety [16]. The STAI-S questionnaire is a standard questionnaire that is known to have good construct validity, with factor *loading values* ranging from 0.51 to 0.81, convergent validity with correlation coefficients ranging from 0.73 to 0.85 against other standard anxiety measures and an internal reliability value (Cronbach's alpha) reported at 0.92 [17].

Ethical Consideration

All research procedures were conducted after obtaining approval from the research site's ethics committee, under number 284/ETIK-RSUDZA/2025.

Data Analysis

It was conducted descriptively using frequency distribution, percentage, mean, standard deviation and min-max to describe the demographic characteristics of respondents and the anxiety level of pre-DSA stroke patients.

Results and Discussion

Data about respondent characteristics show in the table 1.

Table 1: Respondent characteristics (n=60)

Respondent Characteristics	n (%)
Age, years	
Mean (SD)	52.17 ±9.485
Min-Max	21-65
Gender	
Male	40 (66.7%)
Female	20 (33.3%)
Education	
Elementary school	5 (8.3%)
Secondary school	24 (40%)
Higher Education	31 (51.7%)
Employment	
Housewife	7 (11.7%)
Private Sector	5 (8.3%)
Civil Servants	13 (21.7%)
Self-employed	12 (20.0%)
Others (Laborers, Farmers, Merchants)	23 (38.3%)
Income (Rupiah)	
≤ Rp. 4,000,000	33 (55%)
> Rp. 4,000,000	27 (45%)
Marital Status	
Unmarried	5 (8.3%)

Married	51 (85%)
Divorced	4 (6.6%)
Duration of Stroke	
≤ 1 Year	83 (71.7%)
> 1 Year	17 (28.3%)
First DSA	
Yes	60 (100%)
Have Received Pre-DSA Information	
No	60 (100%)

Table 1 shows that the average age is 52.17 ± 9.48 years, most respondents (66.7%) are male, 51.7% have graduated from higher education, 38.3% work informally (laborers, farmers or traders), 55% income < Rp 4,000,000, 85% are married, 71.7% stroke duration <1 year, 100% for each first time DSA and have not received information about DSA before. Frequency distribution of anxiety levels of pre-DSA stroke patients during hospitalization is shown in table 2.

Table 2: Frequency Distribution of Anxiety Levels in Pre-DSA Stroke Patients During Hospitalization

Anxiety level STAI-S	Frequency (f)	Percentage (%)	Mean ± SD	Min-Max
Severe (45-80)	60	100	63.45 ± 4.739	54-73

Table 2 shows that all respondents (60; 100%) experienced severe anxiety before undergoing DSA, with a mean of 63.45 ± 4.739 and a min-max of 54-73. As indicated by the STAI-S score which was in the severe anxiety category range (45–80).

This study showed that all stroke patients who were about to undergo DSA experienced severe anxiety with a mean STAI-S score of 63.45 ± 4.739. This finding indicates that the period before DSA is a phase that causes a very high psychological burden for stroke patients. The average score that was far above the limit for the severe anxiety category indicates that anxiety before DSA not only occurred in some patients, but was experienced consistently by all respondents in this study. The high level of anxiety found can be explained by the characteristics of DSA as an invasive procedure that involves the installation of an intra-arterial catheter, the use of contrast media, radiation exposure, and is performed in a catheterization laboratory environment that is unfamiliar to most patients [10]. In addition, all respondents in this study were patients undergoing DSA for the first time and had not received pre-DSA information. This condition has the potential to increase uncertainty and the perception of threat regarding the procedure that will be undergone. According to the uncertainty in illness theory, a lack of information about the disease or medical procedure can increase the perception of uncertainty, thereby triggering higher anxiety [18].

The findings of this study are consistent with those of a study reporting that patients undergoing cerebral angiography experienced significant anxiety before the procedure. This study demonstrated that anxiety was a major concern for patients before cerebral angiography, and multimedia-based education significantly reduced anxiety levels. These findings suggest that a lack of understanding of the procedure and the environment contributes to anxiety before cerebral angiography [19]. These findings are also supported by a study evaluating patients undergoing various cerebrovascular procedures, including cerebral angiography and other neurointerventional procedures. This study found that anxiety and depression were common psychological problems in patients undergoing cerebrovascular procedures. The authors emphasized that attention to the patient's psychological well-being is often lower than attention to the neurological and procedural aspects, even though anxiety can impact the patient's experience during treatment [20]. More recent findings from the ONIRIC study also demonstrated that patients undergoing elective neuroendovascular procedures experienced significant levels of anxiety symptoms before the procedure. Interestingly, anxiety levels tended to decrease after the procedure was completed. These results indicate that most patient anxiety is related to anticipation of the procedure to be undertaken, uncertainty about the outcome of the procedure, and concerns about possible complications [21]. These findings support the results of this study which show that the pre-DSA phase is a period of high psychological vulnerability in stroke patients.

The characteristics of the respondents in this study also provide an explanation for the high levels of anxiety found. The average age of respondents was 52.17 years, indicating that most patients were of productive age. In this age group, stroke is not only seen as a threat to health, but also to the ability to work, fulfill family roles, and maintain economic well-being. This condition can exacerbate the psychological burden already experienced by patients prior to the DSA procedure. Most respondents were male (66.7%), married (85%), and had a college education (51.7%). Although higher education is often associated with a better understanding of health information, higher education levels did not appear to contribute to reduced anxiety in this study. This is likely due to the lack of specific information about DSA that could help patients understand the procedure. Thus, a high level of education does not automatically guarantee low anxiety if the patient's information needs are not met.

The majority of respondents (71.7%) had a stroke duration of less than one year. During this period, patients are still adapting to the physical and psychological changes caused by the stroke. Uncertainty regarding prognosis, the possibility of recurrence, and the risk of long-term disability can increase susceptibility to anxiety. When patients are then faced with an invasive procedure such as DSA, the accumulation of pre-existing stress has the potential to exacerbate the anxiety response. From a clinical perspective, high levels of anxiety before DSA require attention from healthcare providers because they can affect the patient's physiological condition. Activation of the sympathetic nervous system due to anxiety can increase blood pressure, heart rate, and tissue oxygen demand [12]. In stroke patients, these hemodynamic changes have the potential to affect clinical stability and patient comfort during the procedure. Therefore, anxiety assessment before DSA should be considered as part of the routine evaluation of stroke patients.

The findings of this study have important implications for nursing practice and stroke care. The fact that all respondents experienced severe anxiety suggests the need to develop structured interventions before DSA. Based on previous findings, multimedia-based education may be a promising strategy to improve patient understanding of the procedure and reduce anxiety [19]. Furthermore, providing clear and consistent information, counseling, family support,

and relaxation techniques can be considered as part of patient preparation before undergoing DSA. This study has several limitations. First, it was conducted at a single hospital, so generalization of the results requires caution. Second, the cross-sectional descriptive design does not allow for identification of causal relationships between patient characteristics and anxiety levels. Third, all respondents were patients undergoing DSA for the first time and had not received pre-DSA information, so variation in anxiety levels was very limited.

Conclusion

All stroke patients undergoing DSA experienced significant anxiety during the pre-procedure period. These findings demonstrate the high psychological burden experienced by patients prior to DSA procedures and underscore the importance of developing effective interventions to reduce anxiety and improve patient psychological preparedness before the procedure.

Recommendations

Further research is recommended to explore factors associated with pre-DSA anxiety and evaluate the effectiveness of various educational and psychological interventions in reducing anxiety in stroke patients undergoing DSA.

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