

Assessment of Anxiety Related to Radiological Investigations in a Teaching Hospital: The Physiologic and Cognitive Responses as well as Cofounders.

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ABSTRACT

Anxiety is defined as an abnormal and overwhelming sense of apprehension and fear which is usually characterized by physical signs (such as tension, sweating and increased pulse rate), also by doubt concerning reality and nature of the threat, and self-doubt about one's capacity to cope with it. Patients undergoing investigations in the hospitals are prone to increased anxiety levels. This study aimed to assess for the impact of radiological investigations on patients' level of anxiety. It was a cross sectional study conducted on 120 adult patients who presented at the Radiology Department of UNIMED Teaching Hospital for investigations including ultrasound scan, X-rays, MRI, and CT. Patient's informed consent were sought and obtained from willing and suitable patients. After completion of the questionnaire, the patients' Blood pressure and pulse rate were recorded before patients proceeded to the examination room for the procedure and also repeated immediately after the procedure. This study revealed that eighty-eight (70%) patients had current or State anxiety while seventy patients (56%) had Trait or 'being prone to' anxiety. Also, the pulse rate which is an objective way of measuring anxiety shows significant drop in the value after investigations compared to the pre-investigation with a p value of 0.002. This shows that the fear of the procedure itself or the outcome may have been the cause of the increased state anxiety. In conclusion, hospital related anxiety can be due to a number of factors and is worse in patients with preexisting anxiety disorder.

Key words: Anxiety, Cognitive, Diagnosis, Investigation, Physiology, Radiology.



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INTRODUCTION

Anxiety is a common experience. It can be defined as an abnormal and overwhelming sense of apprehension and fear often marked by; physical signs (such as tension, sweating and increased pulse rate), by doubt concerning reality and nature of the threat, and self-doubt about one's capacity to cope with it.¹ The mental or cognitive responses in anxiety include fear, unease, repetitive negative thoughts, difficulty in concentration and depersonalization while, the physiological responses include changes in heart rate, respiratory rate, body temperature and blood pressure.² It has been reported in the literature that radiological procedures could trigger anxiety responses in patients. The various factors identified include the fear of the unfamiliar hospitals environment, worry about injections, concern about what the procedure entails and likely outcome of the examination. Such anxiety may account for incomplete tests, cancellations of the procedure and distorted neurological images.² While patients may ordinarily be psychologically stable, some may have background anxiety, which may not be connected to the medical condition but may be triggered by the thought of some of the factors listed above. The usefulness in exploring the relationship between anxieties among those undergoing radiological procedures arises because of the possibility of a connection between one's level of anxiety during tests and the test outcome which include delays in carrying out the tests, incomplete tests, incorrect test or test cancellations.⁴ Few studies have explored the relationship between performing radiological investigations and anxiety levels in patients. The available studies were mostly done in high income earning countries while there is a dearth of data from sub-Saharan Africa. Furthermore, the physiologic component of anxiety (blood pressure and pulse rates) as well as recognized cofounders such as cost of investigations, diagnosis and presence of a preexisting mental disorder were explored in this study.

This study therefore aimed to determine the prevalence of State and Trait anxiety among patients undergoing various radiological investigations before and after the procedure in a Tertiary Hospital. The findings from this study will provide additional evidence for the need to create Hospital Policies that will include interventions which will allay patients' fears and worries prior to radiological procedures

MATERIALS AND METHODS

Study design

The proposed study design was cross-sectional.

Sample size determination

A previous study conducted in Italy in 2016² showed that 91% of patient undergoing radiological procedures developed anxiety symptoms. Following the sample size calculation formula⁸ using a known prevalence rate, the estimated sample size was calculated thus $n = Z^2P(1-P) / d^2$ where, n = sample size, Z = Z statistic for a level of confidence, P = expected prevalence or proportion and d = precision (in proportion of one; if 5%, $d=0.05$) Z statistic (Z): For the level of confidence of 95%, which is conventional, Z value is 1.96. $P=0.91$ $d=0.05$ $n = (1.96)^2 0.91(1-0.91) / 0.05^2$ $n = 120.96$ Approximately 120 patients were required for this study

Sampling/ interview detailing inclusion and exclusion criteria

The study population comprise all adult patients who presented at the Radiology Department of UNIMED Teaching Hospital for any examination (ultrasound scan, X-rays, MRI, and CT) and who agreed to participate in the study after an initial brief introduction. The Patients who were judged to be too ill and or refuse / unwilling to participate were excluded from the study.

Patient's informed consent were sought and obtained from willing and suitable patients. Anonymity and confidentiality were maintained. Patients were assured that their participation or non-participation in the study will not negatively interfere with their investigation and or outcome. A willing patient was provided with a copy of the consent form, which had been explained to the patient by a member of the Investigation Team, prior to being given the questionnaire. Help was offered to the patients in the completion of the questionnaires, especially for those who were not well educated and did not have an accompanying literate relative. After completion of the questionnaire, the patients' Blood pressure and pulse rate were recorded before patients proceed to the examination room for the procedure. Immediately after the Radiological examination, the patients were also approached by a member of the investigation team for a repeat of their blood pressure and pulse rate. Participants with high anxiety levels were attended to by the mental health expert who was part of the research team.

Data analysis

the information contained in the questionnaires were entered electronically using Statistical Package for Social Sciences (SPSS) 20 and analyzed. Statistical significance was set at p less than 0.05.

Instruments of data collection

The following instruments were used for data collection.

A socio-demographic and clinical characteristics questionnaire: this was designed by the researchers to elicit information on the bio data of the patients as well as other characteristics such as diagnosis, cost of investigation, if patient had a pre-existing mental health condition and so on State-Trait Anxiety Inventory (STAI): this is an instrument developed by Spielberger in 1970.⁹ It is used to measure the presence and severity of current symptoms of anxiety and a generalized propensity to be anxious. Two versions are

available but the adult version was used for this study.⁹ The instrument consists of 2 subscales, the state anxiety scale and the trait anxiety scale. The State Anxiety Scale (S-Anxiety) evaluates the current state of anxiety while, the Trait Anxiety Scale (T-Anxiety) evaluates relatively stable aspects of "anxiety proneness," including general states of calmness, confidence, and security.¹⁰ The STAI has 40 items, 20 items allocated to each of the S-Anxiety and T-Anxiety subscales. Responses for the S-Anxiety scale assess intensity of current feelings "at this moment": 1) not at all, 2) somewhat, 3) moderately so, and 4) very much so. Responses for the T-Anxiety scale assess frequency of feelings "in general": 1) almost never, 2) sometimes, 3) often, and 4) almost always. The test-retest reliability coefficients on initial development ranged from 0.31 to 0.86, with intervals ranging from 1 hour to 104 days.^{10,11,13} A cut off score 41 for S-Anxiety subscales and 44 for T-Anxiety subscale¹³ was applied for this study

RESULTS

In this study, one hundred and twenty five (125) patients (82 or 65.6% females and 43 or 34.4% males) completed the questionnaires. *The mean age of males was 41.8 ± 17.6 years, while that of females was 31.5 ± 12.3 years.* The majority of the participants 69 (55.2%) were married. Eighty nine (71.2%) of the participants had tertiary level of education, and Seventy nine (63.2%) of them were employed. Further details are depicted in Table 1. As detailed in Table 2, most of the patients (79 or 63.2%) in the study were registered for ultrasound scan while pain was the most common reason for a radiological investigation (45 or 36.0%). The investigations carried out by the participants were less than or equal to Five thousand Naira (NGN5000) for the majority (110 or 88.0%). First timers for radiological investigations accounted for about two-thirds (85 or 68%) of the participants. On the State-Trait anxiety questionnaire, eighty-eight (70.0%) of the

patients had current anxiety on (STAT 1) while, seventy (56.0%) had trait or 'being prone to' anxiety demonstrated by STAT 2. These facts are graphically demonstrated in Figures 1 & 2. Prior to the examinations, the pulse rate was normal in 119 (95.2%) of the patients with the remaining 6 patients (4.6%) showed pulse rate adjudged to be increased. After the examination, only 5 (4.0%) of the patients demonstrated elevated pulse rates (see Figure 3). This reduction of anxiety level depicted by changes in pulse rates was shown to be significant statistically ($P < 0.002$) as illustrated in Table 7. Although, the study demonstrated high systolic blood pressure in Forty-eight (34.4%) of the patients after the examination, as opposed to Forty-two (33.6%) before the examination as illustrated in figure 4, this increased proportion of those with high systolic blood pressure was not significant statistically (see Table 7). No statistically significant differences were observed when State and Trait anxiety levels were compared with socio-demographic and clinical characteristics; such as age, gender, marital status, if receiving treatment for a mental illness and so on, of respondents (see Tables 3 & 4). Also, the differences observed when comparing state and trait anxiety levels with investigation related characteristics (cost of investigation, type of investigation and if doing investigation for the first time) were not statistically significant. This is illustrated in Tables 5 and 6.

Table 1: Socio-demographic and clinical characteristics of respondents

Variable	N	%
Age		
< 20	15	12.0
20 - 29	39	31.2
30 - 39	30	24.0
40 - 49	20	16.0
50+	21	16.8
Mean (SD)		
	Female 31.5±12.3	
	Male 41.8±17.6	
Gender		
Male	43	34.4
Female	82	65.6
Tribe		
Yoruba	105	84.0
Others*	20	16.0
Marital status		
Married	69	55.2
Not married	56	44.8
Educational status		
Primary	12	9.6
Secondary	24	19.2
Tertiary	89	71.2
Occupation		
Civil servant/professional	27	21.6
Business/trading/farming	52	41.6
Unemployed/Retired/Others**	12	9.6
Student	34	27.2
Address		
Ondo state	122	97.6
Ekiti state	2	1.6
Are you receiving treatment for mental illness?		
yes	5	4.0
no	120	96.0
Name of mental illness		
does not know	5	4.0
Not applicable	120	96.0

*other tribes (Igbo -17; Edo 3)

**other occupations (Clergy -1; Musician 1; house keeper -1)

Table 2: Investigation related characteristics of

	Variable	n %	
Investigation	Ultrasound scan	79	63.2
	CT scan	2	1.7
	X-ray	42	33.6
	MRI	2	1.5
Reason for investigation	Routine	26	20.8
	Infertility	8	6.4
	Cough	5	4.0
	Urinary symptoms	9	7.2
	Pain	45	36.0
	Swelling	11	8.8
	Fever	5	4.0
	Nasal congestion	1	.8
	Pregnancy anomaly	3	2.4
	Bleeding	2	1.6
	Abdominal symptoms	10	8.0
Cost of investigation	< 5000	110	88.0
	5000 - 10000	4	3.2
	> 10000	11	8.8
First time of doing test	Yes	85	68.0
	No	40	32.0
How many times test has been done previously?	1 - 3	27	21.6
	4-6	10	8
	7+	3	2.4
	Not applicable	85	68.0

Table 3: Comparison of state anxiety with socio-demographic and clinical characteristics of respondents

STAT 1 graded	Variable	absent<= 41		present> 41		Statistics
		N	%	N	%	
Age	< 20	7	18.0	8	20.1	LR = 3.60 df = 4 p = 0.46
	20 - 29	11	29.7	28	31.8	
	30 - 39	10	27.1	20	22.7	
	40 - 49	5	13.5	15	17.0	
Gender	50+	4	10.8	17	19.4	Chi-sq. = 0.01 df = 1 p = 0.91
	Male	13	35.1	30	34.1	
Tribe	Female	24	64.9	58	65.9	Chi-sq. = 1.24 df = 1 p = 0.27
	Yoruba	29	78.4	76	86.4	
Marital status	Others	8	21.6	12	13.6	Chi-sq. = 0.05 df = 1 p = 0.82
	Married	21	56.8	48	54.5	
Educational status	Not married	16	43.2	40	45.5	LR = 1.23 df = 3 p = 0.75
	Primary	3	8.1	9	10.2	
	Secondary	7	18.9	17	19.3	
Occupation	Tertiary	27	73.0	62	70.5	LR = 2.85 df = 2 p = 0.24
	Civil servant/professional	8	21.6	19	21.6	
	Business/trading/farming	16	43.2	36	40.9	
Address	Unemployed/retired/others	2	5.5	10	11.4	LR = 0.27 df = 1 p = 0.60
	Student	11	29.7	23	26.1	
	Ondo state	35	94.6	87	98.9	
Are you receiving treatment for a mental illness	Ekiti state	1	2.7	1	1.1	LR = 0.27 df = 1 p = 0.60
	Edo state	1	2.7	0	.0	
	yes	2	5.4	3	3.4	
	no	35	94.6	85	96.6	

Table 4: Comparison of trait anxiety with socio-demographic and clinical characteristics of respondents

STAT 2 g rated	variable	absent<= 41 present> 41				Statistics
		N	%	N	%	
Age	< 20	7	12.7	8	11.4	Chi-sq. = 2.32 df = 4 p = 0.68
	20 - 29	16	29.2	23	32.9	
	30 - 39	13	23.6	17	24.3	
	40 - 49	7	12.7	13	18.6	
	50+	12	21.8	9	12.8	
Gender	Male	20	36.4	23	32.9	Chi-sq. = 0.17 df = 1 p = 0.68
	Female	35	63.6	47	67.1	
Tribe	Yoruba	47	85.5	58	82.9	Chi-sq. = 1.56 df = 1 p = 0.69
	Others	8	14.5	12	17.1	
Marital status	Married	31	56.4	38	54.3	Chi-sq. = 0.05 df = 1 p = 0.82
	Not married	24	43.6	32	45.7	
Educational status	Primary	7	12.7	5	7.1	Chi-sq. = 2.80 df = 2 p = 0.25
	Secondary	13	23.6	11	15.7	
	Tertiary	35	63.7	54	77.2	
Occupation	Civil servant/professional	7	12.7	20	28.6	Chi-sq. = 5.34 df = 3 p = 0.15
	Business/trading/farming	26	47.3	26	37.1	
	Unemployed/retired/others	7	12.7	5	7.2	
	Student	15	27.3	19	27.1	
Address	Ondo state	53	96.4	69	98.6	LR = 1.69 df = 2 p = 0.43
	Ekiti state	1	1.8	1	1.4	
	Edo state	1	1.8	0	.0	
Are you receiving treatment for a mental illness	yes	2	3.7	3	4.2	LR = 0.02 df = 1
	no	52	96.3	68	95.8	

Table 5: Comparison of state anxiety levels with some investigation related characteristics of Respondents

Cost of investigation	STAT 1 graded				Statistics
	absent<= 41		present> 41		
	n	%	n	%	
< 5000	33	89.2	77	87.5	LR = 0.79
5000 - 10000	1	2.7	3	3.4	df = 2
>10000	3	8.1	8	9.1	p = 0.96
Type of Investigation	STAT 1 graded				Statistics
	absent anxiety <=44		present anxiety >44		
	n	%	n	%	
Ultra sound scan	26	70.3	53	60.2	LR = 2.88 df = 3 p = 0.41
X- Ray	10	27.0	32	36.3	
CT scan	0	0	2	2.3	
MRI	1	2.7	1	1.2	
First time doing test	STAT 1 graded				Statistics
	absent<= 41		present> 41		
	n	%	n	%	
yes	25	67.6	60	68.2	Chi sq = 0.005
no	12	32.4	28	31.8	df = 1 p = 0.95

Table 6: Comparison of trait anxiety

Cost of Investigation in Naira	STAT 2 graded				Statistics
	absent anxiety <=44		present anxiety >44		
	n	%	n	%	
< 5000	46	83.6	64	91.4	LR = 2.29
5000 - 10000	3	5.5	1	1.5	df = 2
>10000	6	10.9	5	7.1	p = 0.32

Type of Investigation	STAT 2 graded				Statistics
	absent anxiety <=44		Present anxiety >44		
	n	%	n	%	
Ultra sound scan	36	65.5	43	61.4	
X- ray	17	30.9	25	35.7	LR = 5.89
CT Scan	2	3.6	0	0	df = 3
MRI	0	0	2	2.9	p = 0.12

First time doing test	STAT 2 graded				Statistics
	absent anxiety <=44		present anxiety >44		
	n	%	n	%	
yes	38	69.1	47	67.1	Chi sq = 0.54
no	17	30.9	23	32.9	df = 1 p = 0.82

levels with some investigation related characteristics of

Table 7: Change in anxiety

		Paired Samples t-test					
		Mean	N	St. Dev.	Std. Err.	t	p
Pair 1	stat 1 score	44.84	125	8.547	.764	-0.354	0.724
	stat 2 score	45.09	125	8.590	.768		
Pair 2	pulse rate before investigation	77.94	125	12.784	1.143	-3.142	0.002*
	pulse rate after investigation	79.63	125	12.346	1.104		
Pair 3	Systole before	119.79	125	16.236	1.452	-1.236	0.2219
	systole after	120.45	125	14.633	1.309		
Pair 4	diastole before	77.26	125	11.221	1.004	0.276	0.783
	diastole after	77.12	125	10.393	.930		

* Significant difference at p <0.05 level of significance

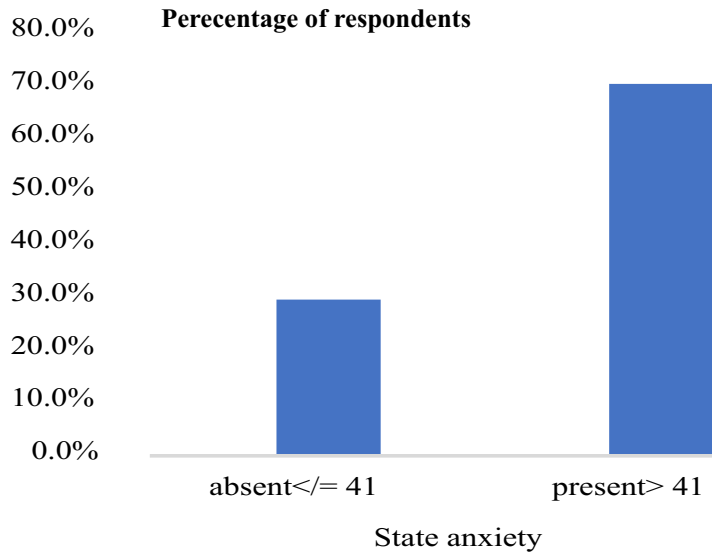


Figure 1 is a bar chart showing proportion of respondents with state anxiety present or absent

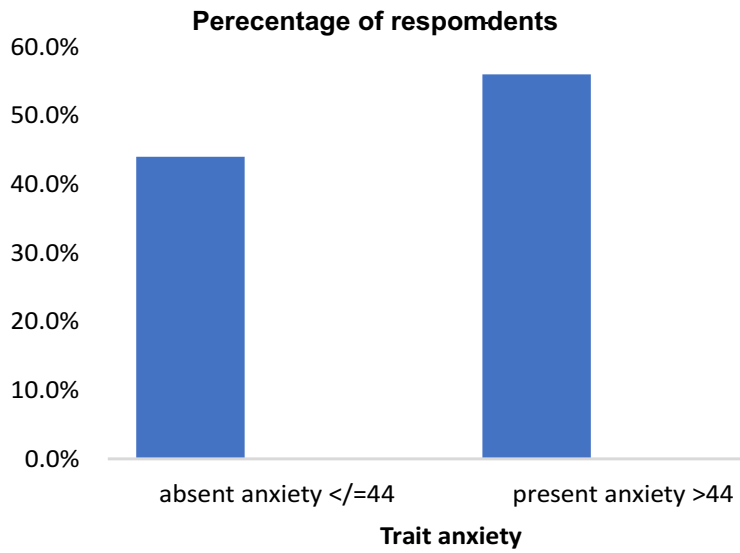


Figure 2 is a bar chart showing proportion of respondents with Trait anxiety present or absent

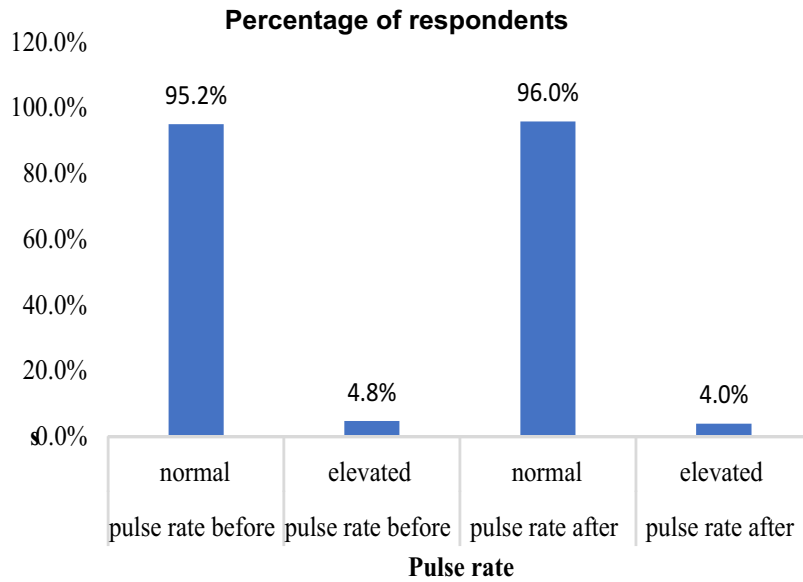


Figure 3 is a bar chart showing changes in pulse rate before and after investigations

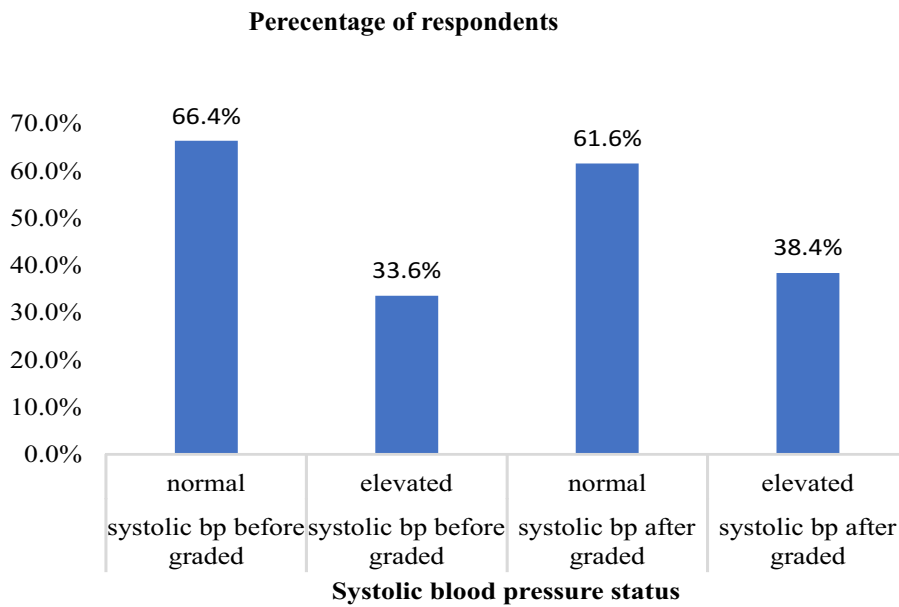


Figure 4 is a bar chart showing changes in systolic blood pressure before and after investigations

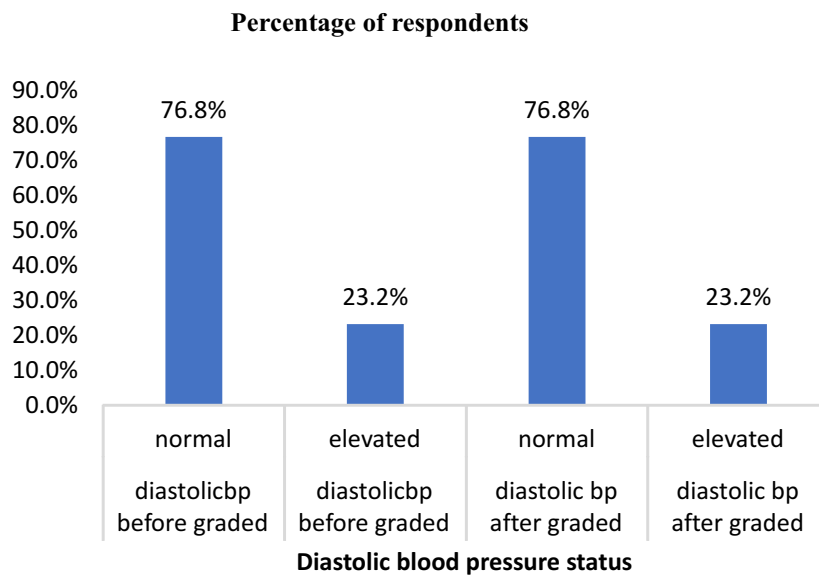


Figure 5 is a bar chart showing changes in diastolic blood pressure before and after investigations

DISCUSSION

This study assessed for the impact of radiological investigations on anxiety using both subjective and objective measures of anxiety. The subjective measure was done by administering the State - Trait Anxiety inventory while, the objective measure was done by checking the participants' blood pressure and pulse rates before and after radiological investigations. This study revealed that on the state-trait anxiety questionnaire, Eighty-eight (70.0%) patients had current or state anxiety while, Seventy (56.0%) had trait or 'being prone to' anxiety. This finding is higher than 45.8% on the State anxiety and, 14.8% on probable anxiety disorder in a previous study conducted in Nigeria using similar instruments.³ This high level of current anxiety could be attributed to uncertainty regarding outcome of investigation as it relates to diagnosis and prognosis of health condition. Uncertainty and worry often lead to anxiety as a primary physiological adaptation, which can result in a

simple emotional reaction to a possible “dangerous condition” in some individuals or, for others it can result in or exacerbate a psychological disorder. The former is usually acute unlike the latter which may run a chronic course.¹⁴ Acute or state anxiety can be experienced in critical moments such as during the execution of examinations, waiting for the report, during the communication of the diagnosis and diagnostic procedures and during the treatment (surgery, chemotherapy, radiotherapy) or when the patient is told about the recurrence of his disease. This form of anxiety may present with both psychological and somatic symptoms.¹⁵ Generally, the experience of anxiety feelings or the occurrence of anxiety disorders may be associated with different aspects of illness such as from the experience of symptoms of illnesses, to diagnosis, and even treatment. Another aspect relating to anxiety are the phobias. The phobia for hospitals (nosocomephobia) or for hospital personnel may occur

prior to hospital admission and may date back to early childhood in most instances.¹⁶ Certain aspects of visiting the hospital may elicit anxiety more than others, such as going for surgery, being given an injection and waiting for laboratory or other investigation results.¹⁷ Claustrophobia, a specific phobia in which individuals experience fear in relation to being in enclosed places¹⁸ comes to mind when considering anxiety in association with radiological examinations because, Magnetic Resonance Imaging (MRI) and Computerized Tomography (CT) scans require the individual to remain in an enclosed space, alone, for a duration of time. This relationship could not be fully explored because of the few number of participants undergoing these investigations in this study. Another study noted that 37% of patients undergoing MRI had moderate-severe anxiety due to multifaceted reasons, including but not limited to fear of the unknown, and pain.¹⁹ This could possibly explain the finding of high levels of state anxiety among participants as the commonest reason for investigation was pain symptom reported by about one third of patients in this study. Pain is a general term that describes uncomfortable sensations in the body²⁰ which emanates from the activation of the nervous system. Experiencing pain varies, ranging from annoying to debilitating sensations. It may feel like a sharp stab, dull ache, throbbing, pinching, stinging, burning, or sore. Pain may be consistent, it may start and stop frequently, or it may occur only under some conditions. It may be acute, developing suddenly and lasting for a short period of time. Or it may be chronic, with ongoing sensations that last or return repeatedly over several months or years. Pain rates are expected to rise due to the increased prevalence of musculoskeletal and neurological diseases, increased life expectancy in addition to increased proportion of elderly in societies.²¹ The results of epidemiological studies show that the prevalence of pain-associated conditions is between 10% and 40% approximately.^{21,22} The literature also shows that pain is more frequently experienced by

females and by older people, which is consistent with the epidemiological presentation of the main drivers of pain, i.e. headache and musculoskeletal disorders.²³ Harris et al studied prediction of anxiety in 118 patients undergoing MRI scans using the MRI fear survey.²⁴ The survey significantly predicted the number of panic attack symptoms and state anxiety experienced during MRI examinations. They also found that noise and being confined were the most unpleasant features identified by 48.3% of the participants.²⁴ Chapman et al. also studied MRI-related anxiety in healthy male volunteers and found that anxiety was highest during the first MRI scan but dropped to control levels or below during the second scan.²⁵ Although this study did not report a significant relationship between numbers of times radiological investigations were done with anxiety levels whether state or trait anxiety. The most common radiological investigation done for the patients in this study was ultrasound scan (63.2%). This finding is similar to 54.2% reported in another Nigerian study³ but contrary to that conducted in a developed country² which reported low level of Ultrasound and high level of CT. Ultrasound scan may be common in our environment because it is easily accessible, non-invasive and relatively cheap compared to other investigations. This is supported by the fact that most of the participants spent less than NG ₦5000 for their investigations. The cost of medical interventions in general is an important factor because of the prevailing socioeconomic instability and out of pocket payment for health care in Nigeria. But surprisingly, the cost of the investigation was not significantly related to anxiety levels experienced by the patients. On the objective measure of anxiety which was done before and after investigations, the pulse rate of patients significantly dropped after investigation. This reiterates the stance that, the fear of the procedure itself or the outcome may have been the cause of the increased state anxiety. Greater patient comfort and less invasiveness are the promises on offer from newer diagnostic and therapeutic imaging procedures in

radiology. The prevailing reliance on technical solutions, however, may distract from the psychological, emotional, or subjective aspects of the patient encounter.²⁶ Patients awaiting therapeutic procedures commonly report anxiety,²⁷ fears about the unknown, pain, possibility of further interventions, complications, destruction of body image, disruption of life plans, loss of control, disability, and loss of life.²⁸ Attention to patient's acute distress before and during procedures is important because distress may cause hemodynamic instability, procedural complications, and other adverse events.²⁹ Stress and anxiety may cause adverse events through elevated levels of blood pressure, heart rate, coronary constriction, and elaboration of stress hormones.³⁰ Policies which will incorporate adequate counseling prior to investigations is necessary to reduce anxiety associated with radiological investigations and its consequences.

CONCLUSION

Hospital related anxiety can be due to a number of factors and is worse in patients with preexisting anxiety disorder. Training and Seminars should be organized for health care givers to educate them on the importance of being compassionate with their patients and also to allay the patients' fears as anxiety can have a negative impact on the outcome of their management.

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