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Cognitive Function and Psychiatric Status of Patients Undergoing Surgery Before and after General Anaesthesia in Ekiti State Tertiary Institutions

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Abstract:

This study investigates the cognitive function and psychiatric status of patients undergoing surgery before and after exposure to Combined Inhalation Intravenous Anaesthesia (CIIA) and Total Intravenous Anaesthesia (TIVA) in tertiary institutions in Ekiti State. The research aims to assess immediate post-operative changes in cognitive function and psychiatric status among surgical patients receiving different anaesthesia methods. Using a quantitative descriptive research design, data was collected from a sample of 148 surgical patients across three tertiary hospitals in Ekiti State. The Mini-Mental State Examination (MMSE), Generalized Anxiety Disorder 7 (GAD-7), and Patient Health Questionnaire 9 (PHQ-9) were utilized to evaluate cognitive function and psychiatric status before and after anaesthesia. Findings indicate that while some minor variations were observed in cognitive and psychiatric measures post-anaesthesia, the majority of patients exhibited stable mental health indicators. Statistical analyses revealed no significant associations between socio-demographic variables (age, ethnicity, education) and cognitive or psychiatric outcomes post-anaesthesia. This study contributes to understanding the immediate impacts of anaesthesia on cognitive and psychiatric states in surgical patients, emphasizing the need for tailored perioperative care strategies. Healthcare providers should prioritize comprehensive patient education and routine mental health screening to manage expectations and mitigate potential postoperative complications.

Keywords: Cognition Function, Psychiatric Status, Patients, Surgery, General Anaesthesia,

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Introduction

The safety of general anaesthesia has increased drastically over the past 20 years; however, there is continued opportunity for assessment, evaluation and treatment of intraoperative awareness (Coppens, 2022). The incidence of anaesthesia awareness varies by multiple factors affecting it. According to the statistics from all the Tertiary Hospitals in Ekiti State obtained in the second half of the year 2019 and the first 3 months of 2020, 70% of medical surgeries done were under general anaesthesia. Considering the high use of this type of anaesthesia, addressing this issue is one of the most significant issues.

Severe complication of anaesthesia may significantly influence the cognitive and psychological functions of the patients, even causing post-traumatic stress disorder (PTSD) (Deug et al.,2023; MacKenzie et al., 2020). Until recently, the commonly used methods for intraoperative awareness monitoring include depth of anaesthesia monitoring and brain-function monitoring. However, the advantages of the methods remain unclear, due to the diverse anaesthetic conditions, such as age, race, gender, acid–base imbalances in drugs administered to the patients, and so on (Leslie et al., 2020). Therefore, identification of the risk factors regarding awareness may be an effective approach to guide intraoperative awareness intervention.

The major methods of general anaesthesia are combined intravenous and inhaled anaesthesia (CIIA) and the total intravenous anaesthesia technique is inherently more complex, placing reliance on mechanical ventilation, infusion pumps and drug infusion lines. Some comparative studies have shown inferior operating conditions with intravenous techniques compared with inhalation anaesthesia (Bajwa et al., 2023; Lopez et al., 2017). However, with the optimal drugs, both techniques seem to achieve satisfactory operating conditions and good control. Personal preference is undoubtedly important in determining the selection of intravenous and inhaled techniques. Considerations include previous experience and biases, an inclination towards a simple or complex approach and the choice of controlled or spontaneous ventilation (Folino, 2023). One approach to understanding the critical mechanisms by which general anaesthetics suppress awareness is to seek invariant changes in the human brain as patients lose and regain consciousness under the effects of a variety of anaesthetic agents (Smith et al., 2023).

Psychiatric patients are at increased risk for perioperative complications, as their biological response to stress is impaired. The increased complications are associated with physical disorders, antipsychotic or hazardous health behaviour and interactions between antipsychotics and anaesthetic drugs. Thus, the anaesthesiologist must not only be aware of the dose adjustment of the anaesthetic agents but also learn how to manage their perioperative course (Maria Martinez-Baladejo et al., 2023). For example, patients with hysteria require fewer anaesthetic agents than those with neurotic depression or anxiety state. Similarly, organic psychosis requires less than acute functional psychosis, which in turn requires less than chronic psychosis (Maria Martinez-Baladejo et al., 2023).

Depression is the most common psychiatric disorder, affecting 10–20% of the population, and is characterized by sadness and pessimism. Its cause is multifactorial, but pharmacological treatment is based on the presumption that its manifestations are due to a brain deficiency of dopamine, norepinephrine and serotonin or altered receptor activities. Up to 50% of the

patients with major depression hypersecretion cortisol and have abnormal circadian secretion (Maria Martinez-Baladejo et al., 2023).

Abrupt cessation of antidepressants is associated with the risk of developing withdrawal symptoms, known as discontinuation syndrome. The common symptoms are nausea, abdominal pain and diarrhoea, sleep disturbance, somatic symptoms (sweating, lethargy and headache) and, finally, affective symptoms (low mood, anxiety and irritability). These reactions start abruptly within a few days of stopping the antidepressant, are short-lived (a few days to 3 weeks) and end if the antidepressant is reintroduced (Humeidan et al., 2021).

Bipolar disorder is characterized by marked mood swings from depressive episodes to manic episodes with normal behaviour in between these episodes. Valproate is the drug of choice for treating acute episodes. Mood stabilizers are used to treat bipolar affective disorders. Lithium and valproate remain a mainstay of treatment. In some cases, olanzapine and other antipsychotics are also used at the beginning of treatment to control excitement and agitation. Lithium inhibits the release of thyroid hormones and results in hypothyroidism. Lithium is eliminated by the kidneys and, therefore, if renal function is compromised or there is dehydration, lithium levels rise dramatically. Toxic blood concentration produces confusion, sedation, muscle weakness tremors and slurred speech. Cardiac problems may include sinus bradycardia, sinus node dysfunction, AV block, T wave changes, hypotension and ventricular irritability. Lithium toxicity occurs when levels are >1.5 mmol/L and is exacerbated by dehydration, diuretics and renal impairment (Deug et al., 2023).

Sodium depletion decreases renal excretion of lithium and can lead to lithium toxicity. To prevent significant renal absorption of lithium, it is reasonable to administer sodium-containing IV fluids during the perioperative period. Stimulation of urine output with thiazide diuretics must be avoided. ECG monitoring should be done to monitor various cardiac abnormalities due to lithium. The association of sedation with lithium suggests that the anaesthetic requirement may be decreased in these patients. Duration of both depolarizing and non-depolarizing muscle relaxants may be prolonged in the presence of lithium; therefore, neuromuscular monitoring should be used. In the postoperative period, when the patient has normal ranges of potassium, sodium and creatinine, and is haemodynamically stable, able and allowed to drink, lithium should be restarted, with control of blood levels within 1 week. This is most important because the psychiatric risk of recurrence or relapse is hazardous (Gao et al.,2023; Wildes et al., 2019). The only reason not to stop lithium is minor surgery with local anaesthesia.

Anaesthetics whether general or regional anaesthesia, whatsoever are best suited for schizophrenic patients remains controversial. Bronchospasm and persistent hypotension during spinal anaesthesia were reported in a chronic schizophrenic patient (MacKenzie et al., 2020). They suggested that 21% of the patients' receiving antipsychotics had serious side effects, such as extrapyramidal symptoms, sedation or hypotension, and disturbances of the cardiovascular and autonomic nervous systems. Minor cardiovascular adverse effects such as postural hypotension and tachycardia are extremely common in schizophrenic patients taking antipsychotics. The heart rate during anaesthesia tends to increase in schizophrenic patients due to the use of antipsychotic drugs (Vlisides et al., 2019). Schizophrenic patients treated with chlorpromazine are especially prone to develop hypotension after anaesthesia induction.

Deiner et al. (2020) suggested that surgical stress worsens the psychotic symptoms after surgery in schizophrenic patients. Schizophrenic patients are at greater risk of developing postoperative confusion than normal patients. It is associated with increased cortisol and norepinephrine because psychological disturbances in schizophrenic patients have been extensively related to the hyper-secretion of cortisols. Increased rates of infectious disease have been demonstrated in schizophrenic patients. This may be a consequence of dysregulation of the immune system. Life-threatening water intoxication often occurs in chronic schizophrenic patients. Water intoxication is associated with vasopressin hyper-secretion as a result of chronic administration of antipsychotics (Folino et al., 2023; Mahanna-Gabrielli et al., 2019).

In a study conducted by Wang et al (2020), three universal protocols (orientation, cognitive stimulation, and mobilization) were implemented along with targeted protocols based on specific risk factors for each patient. Among 281 patients older than 70 years, this tailored, family-involved program reduced postoperative delirium, with rates of 19.4% in the control group vs 2.6% in the intervention group. Moreover, physical and cognitive function was improved in the intervention group compared with the control group at 30 days after discharge. Another targeted prehabilitation study in which 699 older adult participants (60 years) used preoperative cognitive exercises targeting memory, speed, attention, flexibility, and problem-solving functions resulted in decreased delirium incidence, with rates of 13.2% in the intervention group vs 23.0% in the control group.

Postoperative cognitive dysfunction is a fairly common occurrence; approximately 9.9% of patients have a cognitive level change after the surgery (Harris & Chung,2013). Inducement of emergence delirium, a state of psychomotor agitation with disorganized thinking and emotional distress after emerging from general anaesthesia, causes the patient discomfort and may even be harmful to the care if their behaviour turns agitated or violent (Bullard et al., 2023; Card et al., 2015). A study done by Card et al. (2015) describes that 19% of the 400 enrolled patients in the study had agitated emergence and 31% had delirium signs when admitted to the post-anaesthesia care unit, with hypoactive features being the most prominent. No specific nursing interventions exist for treating postoperative delirium, but postoperative monitoring, early mobilization and patient guidance help in preventing injury or damage during hyperactive delirium (Maria Martinez-Baladejo et al., 2023).

Failure to use brain function monitors when appropriate has also been reported to be a risk. However, to date, no anaesthesia brain monitor has been adequately validated in the presence of neuromuscular blocking drugs. Therefore, the ASA Task Force on Intraoperative Awareness Practice Advisory Statement recommends the use of a brain function monitor on a case-by-case basis for selected patients who are at risk of awareness. Intraoperative awareness has been linked to certain types of surgery. Descriptive studies and case reports have revealed an incidence of 0.2-0.4% in nonobstetric and noncardiac surgery, 0.4% in caesarean section, and 0.3-4% in cardiac surgery. Major trauma surgeries have a high incidence of intraoperative awareness due to hypovolemia and hemodynamic instability necessitating light anaesthesia (Osunmakinde & Gbenga-Epebinu 2020). Rigid bronchoscopy and microlaryngeal endoscopic surgery both of which are associated with excessive stimulation, have an increased risk of awareness reported at 1-7%.

Also, Samuelsson et al (2020) found that acute emotion such as fear, panic and helplessness was significantly related to late psychological symptoms. Therefore, it is recommended that professional psychiatric assessment, therapy and follow-up should be provided and constitute standard practice for all patients who report an episode of anaesthetic awareness. One double-blind randomized clinical trial compared the efficacy of the prophylactic administration of midazolam and placebo during the ambulatory procedure and reported a lower incidence of intraoperative awareness in the midazolam group.

Other two randomized clinical trials also reported reduced recall in patients administered midazolam but subsequent intraoperative awareness was not examined. Thus, the ASA Task Force recommends the use of prophylactic benzodiazepine on a case-by-case basis for selected patients such as patients requiring smaller dosages of anaesthetics, with the caution that delayed emergence might accompany the use of benzodiazepines.

The broad objective of this study is to assess the cognitive function and psychiatric status of patients exposed to CIIA and TIVA undergoing surgery before and after general anaesthesia.

Research Hypotheses

Ho1: There is no significant relationship between participants' socio demographic profiles (age, gender and race) and their psychiatric status after exposure to CIIA and TIVA.

Ho2: There is no significant relationship between the socio-demographic profiles of participants and their cognitive function after exposure to CIIA and TIVA.

Ho3: There is no significant difference between the psychiatric status of patients before and after exposure to CIIA and TIVA.

Ho4: There is no significant difference between intraoperative awareness of the cognitive function and psychiatric status of the patients exposed to CIIA and TIVA.

Research Methods

This study adopted a quantitative (descriptive) research design. The study population comprised all surgical patients obtained from the hospital record for nine months in three tertiary institutions in Ekiti State. The surgical patients, that is, patients booked for different types of surgery included those who receive CIIA and TIVA. The sample size was determined using the Leslie Kish Formula

$$N = \frac{N}{1 + N(e)^2}$$

n = sample size

N = population size

e = level of precision

N = 203

e = 0.05

$$N = \frac{203}{1+203(0.05)^2}$$

$$N = \frac{203}{1+0.507}$$

$$N = \frac{203}{1.507}$$

n = 135, adding a 10% non-response rate, therefore, the sample size was 148.

Table 1: Proportionate distribution of sample size across the research settings

S/N	Tertiary Institutions	Patients' population	Percentage	Proportionate sample size
1.	Ekiti State University Teaching Hospital, Ado – Ekiti	75	36.9	55
2.	Federal Teaching Hospital, Ido – Ekiti	96	47.3	70
3.	Afe Babalola University Teaching Hospital, Ado – Ekiti	32	15.8	23
	Total	**203**	**100.0**	**148**

A consecutive sampling technique was used to select the patients for this study. The design of experiments, also known as total enumerative sampling, is a sampling technique in which every subject meeting the criteria of inclusion is selected until the required sample size is achieved.

The study's inclusion criteria require that participants meet several specific conditions. Eligible patients must be over 18 years of age, undergoing general anesthesia for surgery, and possess normal mental status. Additionally, they should fall under the American Society of Anesthesiologists (ASA) classification of I to II, receive general anesthesia, and be scheduled for postoperative extubation. Patients must also be receiving treatment in the selected hospitals and express a willingness to participate in the study. The exclusion criteria include patients with anesthetic contraindications, those who died in the hospital either intra-operation or post-operation, and those not present in the research setting at the time of data collection. Furthermore, patients who are unable to complete the postoperative questionnaire within 48 hours, those with psychological or severe mental disorders after surgery, and those unwilling to participate in the study are also excluded.

Adapted questionnaire was used to elicit information from surgical patients. Section A of the instrument contains information on the socio-demographic characteristics of the respondents. **Section B of the instrument contains information** on the Cognitive function of the patient's undergoing surgery. Mini-Mental State Examination (MMSE) designed by Anthony et al (1982) was used to measure the cognitive function of the respondents. It seeks orientation to place and time, short-term memory, episodic long-term memory, subtraction, as well as the ability to construct a sentence and oral language ability. The MMSE consist of 11 simple questions or tasks that looks at various functions including: arithmetic, memory and orientation. The score is the number of correct items. The measure yields a total of 30. A score of 23 or less is generally accepted cutoff point indicating the presence of cognitive impairment (Richinskas & Curyto, 2022)

Section C of the instrument contains information on the Psychiatric status of patients. The Generalized Anxiety Disorder 7 (GAD-7) questionnaire by Spitzer et al., (2006) and the Patient Health Questionnaire 9 (PHQ-9) by Kroenke et al. (2001) were used to measure the psychiatric status of the patients. The PHQ-9 is a clinical validated screening tool that healthcare providers use to screen for depression, and to diagnose and monitor the severity of the condition, is of the tools use to determine the level of depression, before and after anaesthesia.

The PHQ-9 consists of 9 questions that ask respondents how often they have been bothered by any of the following "problems" in the past two weeks before surgery. The questions address sleep, energy, appetite and other possible symptoms of depression. The score is calculated based on how frequently a person experiences these feelings. Each "not at all" response is scored as 0; each "several days" response is 1; each "more than half the days" response is 2; and each "nearly every day" response is 3. The sum value of these responses gives total score.

The instrument was subjected to face and content validity. The items in the questionnaire were presented to experts in the field of Tests and Measurement, in the nursing field, and the supervisors for reviewing, correction and appraisal after which necessary corrections were made.

Data was collected after getting the necessary approval from the Ethical Committee of each of the research settings. Each respondent was met in their wards a night before surgery during pre anaesthetic review by the anasethetist on call and they were briefed with the research objectives and informed written consent was obtained from the participants to ensure the right of the subject.

The cognitive function was estimated by Mini-Mental State Examination (MMSE). MMSE is a commonly used method for cognitive status evaluation, including the following aspects: orientation to place and time, short-term memory, episodic long-term memory, subtraction, as well as the ability to construct a sentence and oral language ability. The maximum score of the examination was 30, and patients with a score <24 were defined as having cognitive impairment. The examination was performed for the patients before surgery and within 2 weeks postoperative.

Two weeks after the operation, the patients received psychiatric examinations, including anxiety and depression. The anxiety symptoms of the patients were evaluated by the Generalized Anxiety Disorder 7 (GAD-7) questionnaire, while the Patient Health Questionnaire 9 (PHQ-9) was used to estimate their depression status.PHQ-9 and GAD- 7 are unidimensional reliable, and valid tools for screening depression and anxiety seeking psychological treatment after exposure to anaesthetics agents (Saunders et al.,2023).

The medical information of the patients as well as the results of postoperative evaluation was recorded. The research questions were answered using descriptive statistics. The continuous variables were shown as mean ± standard deviation, and analyzed by Student t-test. All the statistical analyses were performed using the latest SPSS version 28.0 software (IBM). P value (<.05) was considered statistically significant.

Results

As presented in Table 1, 44.4% of the respondents were aged 58-72 years, Yoruba 93 (68.9%), Muslim by religion 60 (44.4%) with tertiary level of education 56 (41.5%). Less than half were civil servants 60 (44.4%).

Table 1: Socio-demographic characteristics (N= 135)

Socio-demographic characteristics		Frequency (N= 135)	Percentage
Age	18-27	10	7.4
	28-42 years	10	7.4
	43-57 years	40	29.6

	58-72 years	60	44.4
	Above 72 years	15	11.1
	Total	**135**	**100**
Religion	Christianity	59	43.7
	Islam	60	44.4
	Christianity	16	11.9
	Total	**135**	**100**
Educational level	Not educated	15	11.1
	Primary	13	9.6
	Secondary	32	23.7
	Tertiary	56	41.5
	Postgraduate	19	14.1
	Total	**135**	**100**
Ethnicity	Yoruba	93	68.9
	Igbo	15	11.1
	Hausa	7	5.2
	Others	20	14.8
	Total	**135**	**100.0**
Occupation	Civil servant	35	25.9
	Artisans	60	44.4
	Trading	10	7.4
	Student	8	5.9
	Retirees	22	16.3
	Total	**135**	**100.0**

Cognitive function of patients exposed to CIIA and TIVA of the patient undergoing surgery before and after anaesthesia

Table 2 provides a detailed analysis of the cognitive function of patients exposed to Controlled Inhalation Anaesthesia (CIIA) and Total Intravenous Anaesthesia (TIVA) before and after anaesthesia, using a patient's health questionnaire. The result shows that majority of the respondents lose interest or pleasure in doing things 74 (54.8%), Feeling down, depressed 85 (63.0%), or hopeless, Trouble falling or staying asleep, or sleeping too much 81 (60.0%), Feeling tired or having little energy 59 (43.7%) Poor appetite or overeating 60 (44.4%) Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual 70 (51.9%), and Thoughts that you would be better off dead or hurting yourself in some way 96 (71.1%) while the majority did not feel bad about themselves 106 (78.5%) and not having Trouble concentrating on things, such as reading the newspaper or watching television 80 (59.3%) several days before anaesthesia.

However, after anaesthesia, a greater proportion of the respondents lose interest or pleasure in doing things 73 (54.0%), Feeling down, depressed 87 (64.4), or hopeless, Trouble falling or staying asleep, or sleeping too much 83 (61.5%), Feeling tired or having little energy 61

(45.2%), Poor appetite or overeating 62 (45.9%), Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual 69 (51.1%), and Thoughts that you would be better off dead or of hurting yourself in some way 99 (73.3%) several days while the majority did not feel bad about themselves (73.3%) and not having Trouble concentrating on things, such as reading the newspaper or watching television 76 (56.3%) after anaesthesia.

Table 2: Cognitive function of patients exposed to CIIA and TIVA of the patient undergoing surgery before and after anaesthesia

Cognitive function of patients exposed to CIIA and TIVA	Before Anesthesia				After Anesthesia			
	Not at all	Several days	More than half the days	Nearly everyday	Not at all	Several days	More than half the days	Nearly everyday
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Little interest or pleasure in doing things	36(26.7)	*74(54.8)	25(18.5)	0 (0.0)	30(22.2)	73(54.0)	32(23.7)	0 (0.0)
Feeling down, depressed, or hopeless	35(25.9)	*85(63.0)	10(7.0)	5(3.7)	34(25.1)	87(64.4)	9(6.6)	5(3.7)
Trouble falling or staying asleep, or sleeping too much	34(25.2	81(60.0)	15(11.1)	5(3.7)	32(23.7)	83(61.5)	14(10.40	6(4.4)
Feeling tired or having little energy	10(7.4)	59(43.7)	56(41.5)	10(7.4)	8(5.9)	61(45.2)	53(39.3)	13(9.6)
Poor appetite or overeating	35(25.9)	60(44.4)	10(7.4)	8(5.9)	32(23.7)	62(45.9)	12(8.9)	7(5.2)
Feeling bad about yourself – or that you are a failure or have let yourself or your family down	106(78.5)	25(18.5)	4(3.0)	0 (0.0)	99(73.3)	31(22.9)	5(3.7)	0 (0.0)
Trouble concentrating on things, such as reading the newspaper or watching television	80(59.3)	40(29.6)	10(7.4)	5(3.7)	76(56.3)	43(31.8)	12(8.8)	4(2.9)
Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	31(23.0)	70(51.9)	25(18.5)	9(6.7)	29(21.5)	69(51.1)	27(20.0)	10(7.40
Thoughts that you would be better off dead or hurting yourself in some way	39(28.9)	96(71.1)	0(0.0)	0(0.0)	36(26.7)	99(73.3)	0(0.0)	0(0.0)

Figure 1 summarizes the cognitive function of patients exposed to Combined Inhalation Intravenous Anesthesia (CIIA) and Total Intravenous Anaesthesia (TIVA) before and after anaesthesia. The results showed that more than half of the respondents maintained a high cognitive function both before 76 (56.3%) and after 77 (57.0%) anaesthesia. While there was a minor increase in the percentage of patients with low cognitive function after anaesthesia.

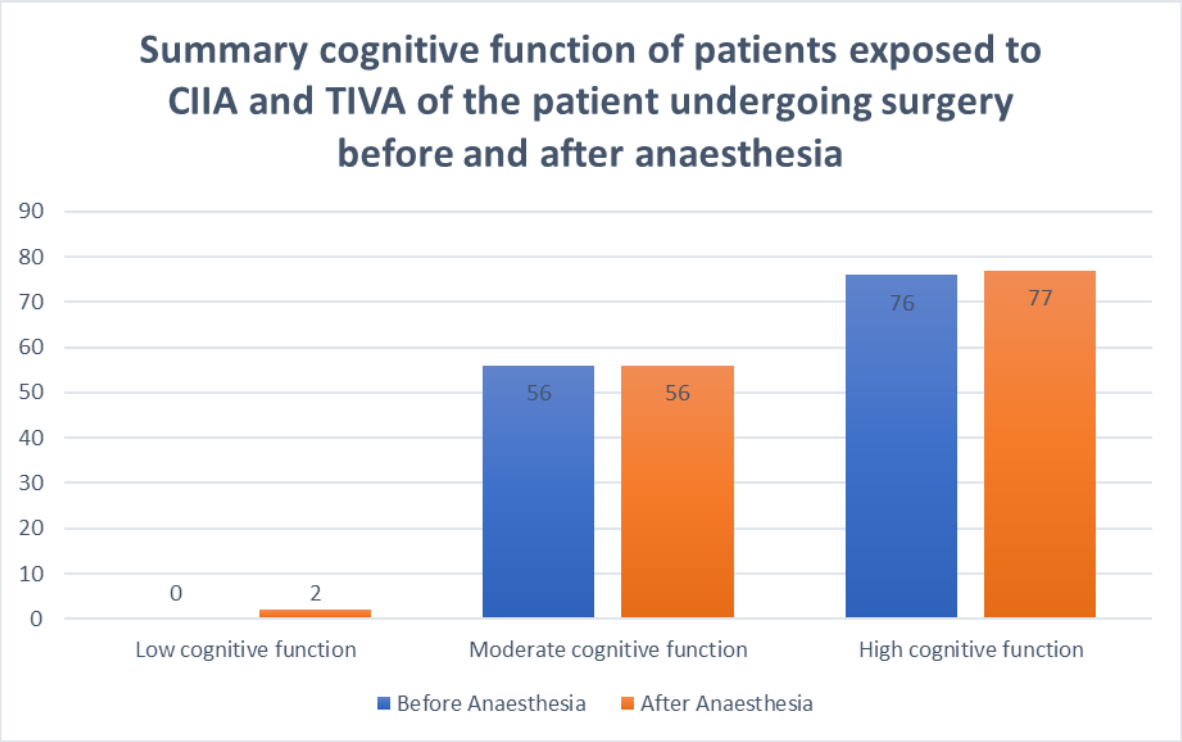

Figure 1: Summary of cognitive function of patients exposed to CIIA and TIVA

Table 3 provides a detailed analysis of the psychiatric status of patients exposed to Combined Inhalation Intravenous Anaesthesia (CIIA) and Total Intravenous Anaesthesia (TIVA) before and after anaesthesia, as assessed by the GAD-7 questionnaire. The data is organized into various psychological symptoms, with each entry representing the frequency and percentage of patients reporting specific experiences. The result showed that the majority of the respondents felt nervous, anxious, or on edge, several days before anaesthesia 74 (54.8%) which slightly after anaesthesia 73 (54.1%); 67 (49.6%) worried too much about different things several days before anaesthesia with slightly decreased after anaesthesia 65 (48.1%); 78 (57.8%) had trouble relaxing several days which slightly increased after anaesthesia, 69(51.1%) experience being so restless and it's hard to sit before anaesthesia which slightly increases after anaesthesia 70 (51.9%); 68 (50.4%) becomes easily annoyed/ irritated nearly every day before anaesthesia with slight increase after anaesthesia 65 (48.1%); 59 (43.7%) felt being afraid as if something awful might happen prior anaesthesia but the slight increase was observed after anaesthesia. Also, 59 (43.7%) were afraid as if something awful might happen several days before anaesthesia with a slight increase as well after anaesthesia 60 (44.4%).

Table 3: Psychiatric status of patients exposed to CIIA and TIVA of the patient undergoing surgery before and after anaesthesia

Cognitive function of patients exposed to CIIA and TIVA	Before Anaesthesia				After Anaesthesia			
	Not at all	Several days	More than half the days	Nearly everyday	Not at all	Several days	More than half the days	Nearly everyday
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Feeling nervous, anxious or on edge	16(11.9)	74(54.8)	36(26.7)	9(6.7)	13(9.6)	73(54.1)	37(27.4)	12(8.9)
Not being able to control worrying	43(31.9)	82(60.7)	6(4.4)	0(0.0)	41(30.40	83(61.5)	7(5.2)	0(0.0)
Worrying too much about different things	21(15.6)	67(49.6)	36(26.7)	11(8.1)	22(16.3)	65(48.1)	37(27.4)	11(8.1)
Trouble relaxing	13(9.60	78(57.8)	36(26.7)	8(5.9)	16(11.9)	79(58.5)	33(24.4)	7(5.1)
Being so restless and it is hard to sit	22(16.3)	69(51.1)	36(26.7)	8(6.9)	20(14.8)	70(51.9)	38(28.1)	7(5.1)
Becoming easily annoyed/ irritated	61(45.2)	68(50.4)	6(4.4)	0(0.0)	62(45.9)	65(48.1)	8(5.9)	0(0.0)
Feeling afraid as if something awful might happen	8(5.9)	59(43.7)	43(31.9)	25(18.5)	6(4.4)	60(44.4)	43(31.9)	26(19.2)
Feeling afraid as if something awful might happen	8(5.9)	59(43.7)	43(31.9)	25(18.5)	7(5.2)	60(44.4)	41(30.4)	27(20.0)

Psychiatric status of patients exposed to Combined Inhalation Intravenous Anaesthesia (CIIA) and Total Intravenous Anaesthesia (TIVA) before and after anaesthesia showed that before anaesthesia, none of the patients had poor psychiatric status (0.0%), however, after anaesthesia, 0.7% of patients had poor psychiatric status, indicating a marginal shift in this category. The majority 76 (56.3%) of patients had fair psychiatric status before anesthesia which slightly decreased to 74 (54.8%). Furthermore, 59 (43.7%) had good psychiatric status levels before anaesthesia with a slight increase in 60 (45.9%) after anaesthesia as presented in Figure 4.2

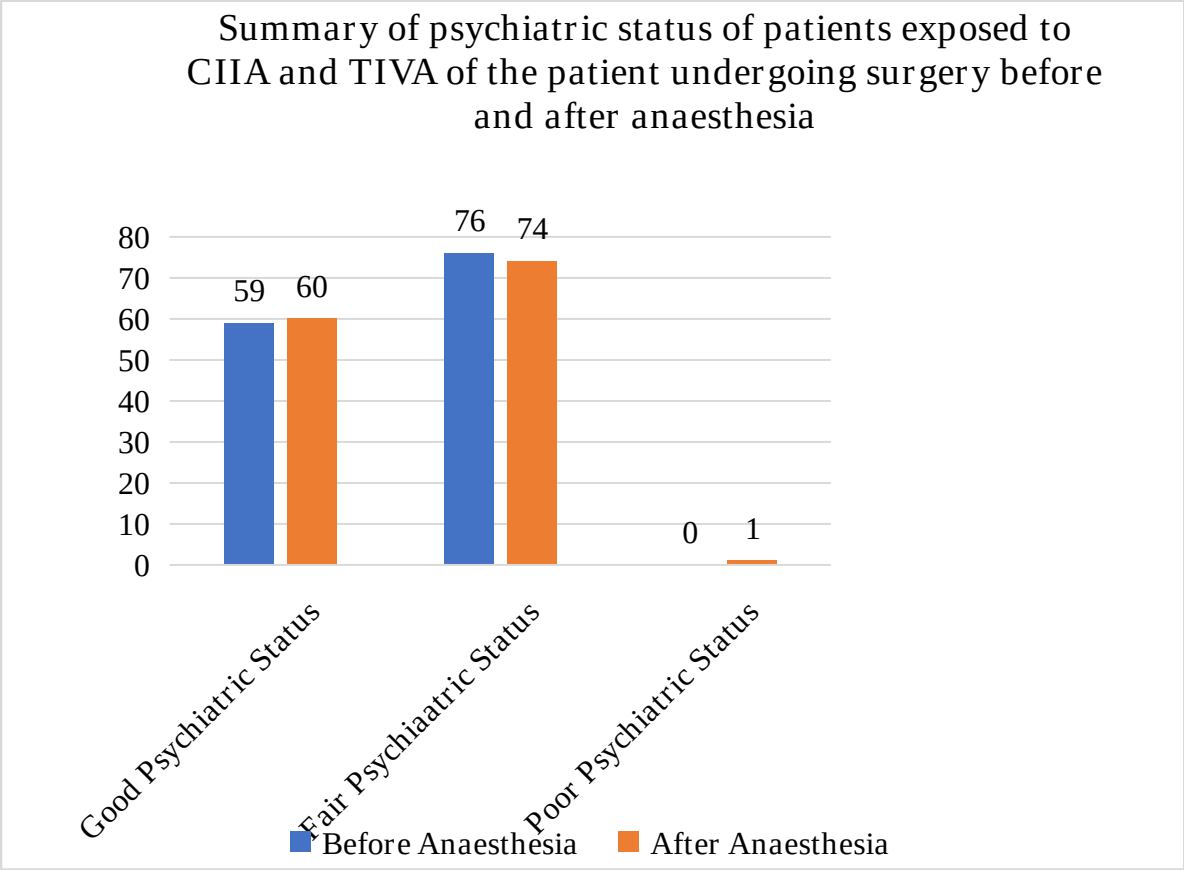

Figure 2: Summary of psychiatric status of patients exposed to CIIA and TIVA of the patient undergoing surgery before and after anaesthesia

Test of Hypotheses

Hypothesis One: There is no significant relationship between socio-demographic profiles and their psychiatric status after exposure to CIIA and TIVA

Table 4 showed that there was no statistically significant relationship between socio-demographic characteristics of age (χ^2 = 3.854, df = 8, p = 0.426), ethnicity (χ^2 = 0.944, df = 6, p = 0.815), level of education (χ^2 = 3.266, df = 8, p = 0.514) and psychiatric status of the respondents at 0.05 level of significance.

Table 4: Relationship between socio-demographic profiles and their psychiatric status after exposure to CIIA and TIVA

	Psychiatric Status					
	Poor (%)	**Fair (%)**	**Good (%)**	**X²**	**df**	**P**
Age	**F (%)**	**F (%)**	**F (%)**			
18 - 27	0 (0.0)	3 (2.2)	7 (5.2)	3.854	8	.426
28 - 42	0 (0.0)	5 (3.7)	5 (3.7)			
43 - 57	0 (0.0)	24 (17.8)	16 (11.9)			
58 - 72	0 (0.0)	34 (25.2)	26 (19.3)			
Above 72	0 (0.0)	10 (7.4)	5 (3.7)			
Ethnicity						

Yoruba	0 (0.0)	50 (37.0)	43 (31.9)	0.944	6	.815
Igbo	0 (0.0)	9 (6.7)	6 (4.4)			
Hausa	0 (0.0)	4 (3.0)	3 (2.2)			
Others	0 (0.0)	13 (9.6)	7 (5.2)			
Level of Education						
Not Educated	0 (0.0)	6 (4.4)	9 (6.7)	3.266	8	0.514
Primary	0 (0.0)	6 (4.4)	7 (5.2)			
Secondary	0 (0.0)	19 (14.1)	13 (9.6)			
Tertiary	0 (0.0)	35 (25.9)	21 (15.6)			
Post Graduate	0 (0.0)	10 (7.4)	9 (6.7)			

Hypothesis Two: There is no significant relationship between socio-demographic profiles and their cognitive functions after exposure to CIIA and TIVA

There was no statistically significant relationship between socio-demographic characteristics of age (χ^2 = 7.038, df = 8, p = 0.134), ethnicity ((χ^2 = 0.277, df = 6, p = 0.964), level of education (χ^2 = 2.666, df = 8, p = 0.615) and cognitive function of the respondents at 0.05 level of significance as shown in Table 5.

Table 5: Association between socio-demographic profiles and their cognitive function after exposure to CIIA and TIVA

	Cognitive Function					
	Low	**Moderate**	**High**	**X²**	**df**	**P**
Age	**F (%)**	**F (%)**	**F (%)**			
18 - 27	0 (0.0)	1 (0.7)	9 (6.7)	7.038	8	.134
28 - 42	0 (0.0)	4 (3.0)	6 (4.4)			
43 - 57	0 (0.0)	20 (14.8)	20 (14.8)			
58 - 72	0 (0.0)	25 (18.5)	35 (25.9)			
Above 72	0 (0.0)	9 (6.7)	6 (4.4)			
Ethnicity						
Yoruba	0 (0.0)	42 (31.1)	51 (37.8)	0.277	6	.964
Igbo	0 (0.0)	6 (4.4)	9 (6.7)			
Hausa	0 (0.0)	3 (2.2)	4 (3.0)			
Others	0 (0.0)	8 (5.9)	12 (8.9)			
Level of Education						
Not Educated	0 (0.0)	9 (6.7)	6 (4.4)	2.666	8	0.615
Primary	0 (0.0)	4 (3.0)	9 (6.7)			
Secondary	0 (0.0)	13 (9.6)	19 (14.1)			
Tertiary	0 (0.0)	25 (18.5)	31 (23.0)			
Post Graduate	0 (0.0)	8 (5.9)	11 (8.1)			

Hypothesis Three: There is no significant difference between the psychiatric status of patients exposed to CIIA and TIVA after surgery

Table 6 shows that the t-test value of 1.093 was not significant because the P value (0.276) > 0.05. This implies that the null hypothesis was not rejected. Hence, there was no significant difference between the psychiatric status of patients exposed to CIIA and TIVA.

Table 6: T-test Analysis showing the difference between the psychiatric status of patients exposed to CIIA and TIVA after surgery

Variations	N	Mean	SD	df	T-test	P
CIIA	93 (72.1)	15.19	2.00	127	1.093	0.276
TIVA	36 (27.9)	14.78	1.78			

Hypothesis Four: There is no significant difference between the cognitive function of patients exposed to CIIA and TIVA after surgery

Table 7 shows that the t-value of 0.223 was not significant because the P value (0.824) > 0.05. This implies that the null hypothesis was not rejected. Hence, there was no significant difference between the cognitive function of patients exposed to CIIA and TIVA.

Table 7: T-test Analysis showing the difference between the cognitive function of patients exposed to CIIA and TIVA after surgery

Variations	N	Mean	SD	df	$_{cal}$	P
CIIA	93 (72.1)	17.66	2.27	127	0.223	0.824
TIVA	36 (27.9)	17.75	1.79			

P>0.05

Discussion of Findings

The findings from the study showed that 60 (44.4%) of the respondents were aged 58-72 years, Yoruba 93 (68.9%), and Muslim by religion 60 (44.4%) with a tertiary level of education 56 (41.5%). Less than half were civil servants 60 (44.4%). Kent et al. (2015) reported a mean age of 41 years with ages ranging from 7-64 years, mostly females

The findings also sheds light on the cognitive function of patients exposed to Combined Inhalation Intravenous Anaesthesia (CIIA) and Total Intravenous Anaesthesia (TIVA) before and after surgery. The analysis in Table 4.4, focusing on mental health indicators before and after anaesthesia, provides insight into the immediate cognitive impact in the aftermath of anaesthesia. While some minor variations were observed, the majority of responses suggest a limited impact on mental health, which aligns with the notion that transient cognitive changes can occur but are often reversible. This finding is in line with Bharadwaj and Kamah (2019) and Harris and Chung (2013) who both agreed that, following anesthesia, there was generally a limited immediate cognitive impact, with minor variations observed in mental health indicators.

Emergency delirium, characterized by psychomotor agitation, disorganized thinking, and emotional distress after emerging from general anaesthesia, is another aspect discussed in the literature (Card et al., 2015). The study by Card et al. (2015) reported that 19% of patients had agitated emergence, and 31% exhibited delirium signs upon admission to the post-anesthesia care unit. Awareness during anaesthesia is a known risk, and its psychological sequelae can be profound (Lennmarken et al., 2019). Patients experiencing awareness may suffer from immediate distress and long-lasting mental symptoms, leading to dissatisfaction with anaesthesia and fear of subsequent procedures (Samuelsson et al., 2020).

The stable cognitive function indicators may suggest that the majority of patients did not experience significant awareness-related distress immediately after the surgery.

The findings indicated that, in general, the psychiatric status of patients remained relatively stable before and after anaesthesia. While some minor variations were observed in the reported symptoms, the majority of patients did not exhibit significant changes in anxiety levels, worry, or other psychological symptoms in the immediate aftermath of anaesthesia. Previous findings suggest that psychiatric patients may be at an increased risk for perioperative complications due to impaired biological stress responses (NV Investigators, 2019). The current analysis aligns with this notion, demonstrating that the psychiatric status of patients undergoing surgery with CIIA and TIVA remained stable before and after anaesthesia, suggesting effective perioperative management.

The literature emphasizes the importance of dose adjustment of anaesthetic agents for psychiatric patients, considering factors such as the type of psychiatric disorder and the pharmacological treatment received (NV Investigators, 2019). The observed stability in psychiatric status in the current findings may indicate successful perioperative management in tailoring anaesthesia to the specific needs of psychiatric patients. Depression, a common psychiatric disorder, is associated with altered neurotransmitter activities, and its treatment involves addressing deficiencies in dopamine, norepinephrine, and serotonin (NV Investigators, 2019). Abrupt cessation of antidepressants can lead to withdrawal symptoms known as discontinuation syndrome, and appropriate management is crucial (Humeidan et al., 2021). While the current analysis does not specifically address patients undergoing anaesthesia with a history of antidepressant use, the stability in psychiatric status may indicate successful perioperative care in managing potential discontinuation syndrome symptoms. Bipolar disorder, characterized by marked mood swings, requires mood stabilizers for treatment (Chen et al., 2014). Patients with schizophrenia may experience cardiovascular adverse effects related to antipsychotic medications, and special considerations are needed during anaesthesia (Vlisides et al., 2019). The literature suggests that surgical stress may worsen psychotic symptoms in schizophrenic patients, emphasizing the importance of tailored perioperative care for this population (Deiner et al., 2020). While the current analysis does not explicitly discuss schizophrenia, the observed stability in psychiatric status may suggest effective perioperative strategies for patients with psychiatric disorders.

The study investigated the association between socio-demographic factors and psychiatric status after exposure to Combined Inhalation Intravenous Anesthesia (CIIA) and Total Intravenous Anesthesia (TIVA). The results indicated no statistically significant association between age groups, ethnicity, level of education, and psychiatric status post-exposure to CIIA and TIVA. The absence of significant differences in psychiatric status across age groups aligns with existing literature (Smith, 2019; Monk et al., 2008), suggesting that age may not be a decisive factor in determining psychiatric outcomes after anesthesia. The finding that ethnicity did not significantly correlate with psychiatric status is supported by previous studies (McGrirt et al., 2017; Subramaniam et al., 2013; Brattwall et al., 2010), indicating that individual patient characteristics and comorbidities may play a more substantial role. The lack of a significant relationship between educational attainment and psychiatric status after

exposure to CIIA and TIVA is consistent with the literature (Maranets et al., 2015; Royse et al., 2011), emphasizing the complex nature of factors influencing mental health post-anesthesia.
The study also investigated the association between socio-demographic factors and cognitive function after exposure to Combined Inhalation Intravenous Anesthesia (CIIA) and Total Intravenous Anesthesia (TIVA). The results indicated no statistically significant association between age groups, ethnicity, level of education, and cognitive function post-exposure to CIIA and TIVA. The finding that age groups did not significantly correlate with cognitive function aligns with existing literature (Imaoka et al., 2018; Evered et al., 2011; Monk et al., 2008), suggesting that age alone may not be a robust predictor of cognitive outcomes after anesthesia. The absence of a significant association between ethnicity and cognitive function is supported by previous studies (Imaoka et al., 2018; Evered et al., 2016; Subramaniam et al., 2013), indicating that individual patient characteristics and medical factors may have a more substantial influence. The lack of a significant relationship between educational attainment and cognitive function after exposure to CIIA and TIVA is consistent with the literature (Evered et al., 2018; Royse et al., 2011), emphasizing the complex interplay of factors affecting cognitive function after surgery.
The findings also revealed no significant difference in cognitive function between patients exposed to Combined Inhalation Intravenous Anaesthesia (CIIA) and Total Intravenous Anaesthesia (TIVA), as indicated by the t-value of 0.223 and a p-value of 0.824. This suggests that the choice of anesthesia method may not be the sole determinant of cognitive outcomes in the perioperative period. The conclusion that anesthesia method may not be the sole determinant of cognitive outcomes aligns with existing literature (Evered et al., 2018; Wildes et al., 2018), which emphasizes the multifactorial nature of cognitive function postoperatively. Authors argue that a comprehensive understanding of cognitive outcomes requires consideration of factors beyond anesthesia technique, such as patient characteristics, comorbidities, and the surgical procedure itself. This perspective emphasizes the need for a patient-centered approach to perioperative cognitive function (Berger et al., 2019; Evered et al., 2016).

Conclusion

The examination of cognitive function, both before and after anaesthesia, indicates overall stability in mental health indicators. While some minor variations were observed, the majority of responses suggest a limited impact on mental health in the immediate aftermath of anaesthesia. The analysis also highlights that the majority of patients maintained a high cognitive function both before and after anaesthesia. The psychiatric status assessment demonstrates that the psychiatric status of patients undergoing surgery with CIIA and TIVA remained relatively stable before and after anaesthesia. While there were some minor variations in reported symptoms, the overall impact on psychiatric status in the immediate aftermath of anaesthesia appears limited.

Recommendations

1. Healthcare providers, particularly anaesthesiologists, should prioritize comprehensive preoperative counselling to inform patients about the potential experiences during and after anaesthesia, addressing concerns related to intraoperative awareness and cognitive function. Improved patient education can contribute to managing expectations and potentially reduce anxiety and psychological symptoms post-surgery.

2. Postoperative care teams, including nurses and psychologists, should incorporate routine mental health screening tools to assess patients for postoperative cognitive dysfunction and psychiatric symptoms. The stability observed in cognitive and psychiatric status immediately post-anaesthesia necessitates ongoing monitoring to identify potential delayed effects.

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