

Prevalence of Anaesthesia Complications in Orthopaedic Surgeries and its Related Factors

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Abstract

Background: The use of anaesthesia is helpful for managing the stress and pain of the patients and influences the body response. Cortisol, catecholamine, cytokines, and glucagon are among the hormones that the body releases in response to stress and surgical injury. Essential physiological processes become unbalanced as a result of the body's reaction to surgery. Moreover, the aftereffect of the body's inherent ability to re-establish physiological equilibrium and preserve health is undermined by anaesthetics and muscle relaxants. There are various complications that occurred after the surgeries using the anaesthesia that involve the vomiting, hypoxia, hypothermia, shivering, nausea, and cardiovascular instability. The most frequent side effects were, in that order, respiratory issues, hypotension, bradycardia and tachycardia, neurological issues, delirium, and delayed awakening.

Aim: The study aims to determine the prevalence of anaesthesia complications in orthopaedic surgeries and its related factors.

Method: This was a descriptive and cross-sectional study. The study population consisted of patients who underwent orthopaedic surgery in the operating rooms of BB MCH, Balangir, Odisha, FM MCH, Balasore, Odisha and SCB MCH, Cuttack, Odisha from December 2019 to December 2022 and met the inclusion criteria. The following formula was used to calculate the required sample size. Based on Miller's anaesthesia procedure, general anaesthesia was administered to all study participants. The operating room's temperature was set to 21°C during procedures. The patient was taken to the PACU after surgery. The patients had their hearts monitored by a recovery nurse at the time of their admittance to the recovery room.

Results: The results of the logistic regression analysis showed a positive and significant relationship between the kind of surgery (hemiarthroplasty) and the time of surgery (evening). Link between trembling and pain ($\beta=0.652$, $t=38.31$, $P<0.05$) and shivering (β

=0.437, $t=18.19$, $P<0.05$). Moreover, gender, age, and the kind of operation limb fractures and intra-medullary nail were all significantly linked with nausea ($\beta =0.777$, $t=52.08$, $P<0.05$). Moreover, the duration of anaesthesia and the kind of anaesthesia (full venous anaesthesia) were substantially and favourably correlated with vomiting ($\beta =-2.40$, $t=175.68$, $P<0.05$). Moreover, smoking, gender, and the length of anaesthesia were all positively and substantially linked with tachycardia ($\beta =-3.89$, $t=118.74$, $P<0.05$).

Conclusion: The relatively high frequency of post-anaesthesia problems in orthopaedic procedures highlights the value of PACU staffing that is skilled and using the right monitoring tools. Such actions reduce patient mortality and morbidity while reducing hospital expenses.

Keywords: Complications, Post-Anaesthesia Nursing, Orthopaedic Surgeries, Shivering, Postoperative Nausea, Vomiting.

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Background

To manage the condition of the patient during the surgery, the use of general anaesthesia is essential. It has been used for various surgeries that last for more than an hour [1]. According to analysis, the use of anaesthesia is helpful for managing the stress and pain of the patients and influences the body response. Cortisol, catecholamine, cytokines, and glucagon are among the hormones that the body releases in response to stress and surgical injury [2]. Essential physiological processes become unbalanced as a result of the body's reaction to surgery. Moreover, the aftereffect of the body's inherent ability to re-establish physiological equilibrium and preserve health is undermined by anaesthetics and muscle relaxants [3].

General anaesthesia, which is frequently used for lengthy procedures like orthopaedic surgeries, has more difficulties than spinal anaesthesia. According to various clinical studies, about one-third of patients who are admitted to the recovery room experience at least one anaesthesia-related problem [4,5]. Researchers have also shown that anaesthesia and surgery may cause stresses like hormonal and inflammatory that raise the possibility of problems [6]. Due to the high number of traffic accidents, weight gain, poor

nutrition, the prevalence of osteoporosis, and the elderly not employing protective equipment, orthopaedic procedures are very common in various countries [7].

There are various complications that occurred after the surgeries using the anaesthesia that involve the vomiting, hypoxia, hypothermia, shivering, nausea, and cardiovascular instability [8,9]. The most frequent side effects were, in that order, respiratory issues, hypotension, bradycardia and tachycardia, neurological issues, delirium, and delayed awakening [10,11]. Their research found that the type of surgery, emergency surgery, and anaesthetic duration of 2-4 hours had the biggest effects on the occurrence of problems. According to the relevant statistics, abdominal and orthopaedic surgery had the highest incidence of complications [12,13]. The current study sought to ascertain the prevalence of anaesthesia difficulties and their associated factors in orthopaedic procedures due to the high prevalence of orthopaedic surgery and the comparatively high incidence of complications following anaesthesia.

Aim

The study aims to determine the prevalence of anaesthesia complications in

orthopaedic surgeries and its related factors.

Method and material

This was a descriptive and cross-sectional study. The study population consisted of patients who underwent orthopaedic surgery in the operating rooms BB MCH, Balangir, Odisha, FM MCH, Balasore, Odisha and SCB MCH, Cuttack, Odisha from December 2019 to December 2022 and met the inclusion criteria. The following formula was used to calculate the required sample size. In this formula, the frequency of the anaesthesia complications was considered to be 50%. Therefore, considering $d=0.05$, $P=0.50$, and $q=1$, a sample size of 385 was obtained; however, 400 subjects were recruited for further accuracy.

Patients undergoing orthopaedic surgery like total hip replacement, hemiarthroplasty, limb fractures, intramedullary nail, being between the ages of 18 and 60, having no systemic diseases like cardiovascular, respiratory, diabetes, not being dependent on narcotics or psychotropic drugs, and being willing to participate in the study were the inclusion criteria for this study. Emergency orthopaedic procedures that took longer than three hours were also excluded, as

were fractures with intra-abdominal hemorrhage, burst viscera, and rib fractures imbedded in the lungs.

The Cronbach's alpha coefficient of this tool was calculated to be 0.89 in the current investigation. Vomiting was assessed based on how frequently people vomited, and a mercury thermometer placed in the axilla was used to determine the temperature. The first researcher and the recovery nurse connected a monitor to the patient to record the patient's heart rate, blood pressure, and respiration rate.

Based on Miller's anaesthesia procedure, general anaesthesia was administered to all study participants. The operating room's temperature was set to 21°C during procedures. The patient was taken to the PACU after surgery. The patients had their hearts monitored by a recovery nurse at the time of their admittance to the recovery room. Then, the first researcher or recovery nurse measured and recorded the anaesthesia complications, such as shivering, pain, nausea, and vomiting, as well as vital signs (pulse & blood pressure, respiration, temperature), at the time of admission to recovery, as well as half an hour, and one hour later.

Results

Table 1: Clinical characteristics

Variables	Mean	SD
Age (Years)	37.14	14.14
Duration of anaesthesia (Minute)	136.96	1.34
Surgeon's experience (Years)	3.1	1.07

Table 1 has provided the information about the mean of the age, duration of surgery and experience of the surgeon. According to analysis, the mean age of the participants was 37.12 ± 14.14 , mean duration of surgery was 136.96 ± 1.34 and experience of surgeon was 3.1 ± 1.07 .

Table 2: Clinical characteristics and demographics

Variables		Numbers	Percentage
Gender	Male	319	79.7
	Female	81	20.3
Education	Under diploma	73	18.3

	Diploma	193	48.8
	Above diploma	134	33.5
Type of surgery	Total hip replacement	50	12.5
	Hemiarthroplasty	72	18
	Limb fracture	195	48.8
	Intra-medullary nail	83	20.8
Surgery time	Morning	184	46
	Afternoon	77	19.3
	Evening	74	18.5
	Night	65	16.3
Anaesthesia method	Inhalation anaesthesia	50	12.5
	Balanced anaesthesia	141	35.3
	Complete venous anaesthesia	209	52.3
Smoking	Yes	163	40.8
	No	237	59.3

Table 2 has provided the information related to clinical characteristics of the patients. According to analysis, majority of patients were female (79.8%). Education level of patients were diploma (48.8%) followed by the above diploma (33.5%). Additionally, highest number of surgeries done for limb fracture (48.8%) followed by

intra-medullary nail (20.8%). Apart from this most numbers of surgeries were done in morning time (46%). The method that used for offering anaesthesia was complete venous anaesthesia (52.3%) and balanced anaesthesia (35.3%). Apart from this, 59.3% patients were not having habit of smoking.

Table 3: Relationship between complication of surgery and demographic of patients

Variables		Shivering	Pain	Nausea	Vomiting	Tachycardia	Hypertension	Tachypnea
Age		R=0.12	R=0.24	R=0.43	R=0.87	R=0.57	R=0.21	R=0.32
		P=0.91	P=0.001	P=0.41	P=0.07	P=0.11	P=0.02	P=0.11
Gender	Male	P=0.12	P=0.5	P=0.46	P=0.57	P=0.24	P=0.24	P=0.78
	Female	P=0.16	P=0.0005	P=0.04	P=0.73	P=0.72	P=0.02	P=0.36
Education level		P=0.12	P=0.01	P=0.94	P=0.18	P=0.21	P=0.0001	P=0.92
Duration of anaesthesia		R=0.31	R=0.42	R=0.31	R=0.87	R=0.23	R=0.89	R=0.28
		P=0.01	P=0.005	P=0.002	P=0.78	P=0.03	P=0.99	P=0.01
Surgeon's experience		R=0.78	R=0.68	R=0.87	R=0.64	R=0.61	R=0.54	R=0.81
		P=0.98	P=0.87	P=0.48	P=0.81	P=0.23	P=0.29	P=0.78

Type of surgery	P= 0.0001	P= 0.0001	P= 0.0001	P= 0.54	P= 0.20	P= 0.008	P= 0.87
Surgery time	R= 0.58	R= 0.41	R= 0.72	R= 0.64	R= 0.61	R= 0.92	R= 0.89
	P= 0.14	P= 0.81	P= 0.97	P= 0.93	P= 0.38	P= 0.86	P= 0.26
Anaesthesia method	P= 0.007	P= 0.0001	P= 0.001	P= 0.04	P= 0.03	P= 0.03	P= 0.87
Smoking	P= 0.98	P= 0.42	P= 0.72	P= 0.34	P= 0.34	P= 0.86	P= 0.17

Table 3 has analyzed the relationship between the complications of surgery and clinical data of the participants. According to analysis, the results of the logistic regression analysis showed a positive and significant relationship between the kind of surgery (hemiarthroplasty) and the time of surgery (evening). Link between trembling and pain ($\beta=0.652$, $t=38.31$, $P<0.05$) and shivering ($\beta =0.437$, $t=18.19$, $P<0.05$). Moreover, gender, age, and the kind of operation limb fractures and intra-medullary nail were all significantly linked with nausea ($\beta =0.777$, $t=52.08$, $P<0.05$). Moreover, the duration of anaesthesia and the kind of anaesthesia (full venous anaesthesia) were substantially and favourably correlated with vomiting ($\beta =-2.40$, $t=175.68$, $P<0.05$). Moreover, smoking, gender, and the length of anaesthesia were all positively and substantially linked with tachycardia ($\beta =-3.89$, $t=118.74$, $P<0.05$).

Discussion

General anaesthesia, which is frequently used for lengthy procedures like orthopaedic surgeries, has more difficulties than spinal anaesthesia. According to various clinical studies, about one-third of patients who are admitted to the recovery room experience at least one anaesthesia-related problem. There are various complications that occurred after the surgeries using the anaesthesia that involve the vomiting, hypoxia, hypothermia, shivering, nausea and cardiovascular instability. The most frequent side effects

were, in that order, respiratory issues, hypotension, bradycardia and tachycardia, neurological issues, delirium, and delayed awakening. According to outcome of current study, majority of patients were female (79.8%). Education level of patients were diploma (48.8%) followed by the above diploma (33.5%). Additionally, highest number of surgeries done for limb fracture (48.8%) followed by intra-medullary nail (20.8%). Apart from this most numbers of surgeries were done in morning time (46%). The method that used for offering anaesthesia was complete venous anaesthesia (52.3%) and balanced anaesthesia (35.3%).

Moreover, the results of the logistic regression analysis showed a positive and significant relationship between the kind of surgery (hemiarthroplasty) and the time of surgery (evening). Link between trembling and pain ($\beta=0.652$, $t=38.31$, $P<0.05$) and shivering ($\beta =0.437$, $t=18.19$, $P<0.05$). Moreover, gender, age, and the kind of operation limb fractures and intra-medullary nail were all significantly linked with nausea ($\beta =0.777$, $t=52.08$, $P<0.05$). Moreover, the duration of anaesthesia and the kind of anaesthesia (full venous anaesthesia) were substantially and favourably correlated with vomiting ($\beta =-2.40$, $t=175.68$, $P<0.05$). Moreover, smoking, gender, and the length of anaesthesia were all positively and substantially linked with tachycardia ($\beta =-3.89$, $t=118.74$, $P<0.05$).

As per the outcome of the study of Kiani et al., (2021) [14], vomiting 91.8% of all events and blood pressure fluctuations 5% of all complications were the most and least frequent, respectively. Pain, motion sickness, and hypertension were all strongly linked with gender ($P < 0.05$). The data from the Pearson correlation coefficient showed a significant association ($P < 0.05$) between the mean ratings for shivering, pain, nausea, tachycardia, and tachypnea and the length of anaesthesia. Shivering, pain, blood pressure, and nausea were all significantly correlated with the types of operation ($P < 0.05$). The duration and completeness of intravenous anaesthesia were both strongly correlated with pulse rate ($P < 0.05$).

Moreover, the outcome of the study of Abebe et al., (2022) [15] has the similar findings compared to current study. The findings of study have suggested that 54.8% of surgical patients admitted to the PACU experienced problems. [16] The most frequent forms of PACU complications were those that were respiratory-related and postoperative nausea/vomiting. It was found that having a female gender was substantially linked with an increased risk of PACU problems (adjusted odds ratio [AOR] = 2.928; 95% CI: 1.899-4.512). AOR = 5.406; 95% CI: 2.418-12.088, which indicated a higher risk of connection with PACU problems, was found for anesthetic durations beyond 4 hours. Moreover, complications in the PACU were linked to the occurrence of intraoperative complications (AOR = 2.238; 95% CI: 0.991-5.056) during operation. Patients who experience problems in the PACU had a high correlation with a stay of more than 4 hours (AOR = 2.177; 95% CI: 0.741-6.401).

Conclusion

According to the results of the current study, vomiting was the most common post-anaesthesia complication in

orthopaedic procedures. Blood pressure, nausea, and gender were all substantially correlated. The incidence of shivering and nausea, the degree of pain, pulse, and respiration rate were all significantly correlated with the length of anaesthesia. Complete intravenous anaesthesia, the length of anaesthesia, and pulse rate were all significantly correlated. Thus, recovery room nurses need to be trained in this area due to the high occurrence of complications in orthopaedic surgery.

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