

## ORIGINAL ARTICLE

**A STUDY OF INCIDENCE OF AWARENESS IN GENERAL ANESTHESIA WITH INHALATIONAL AGENT (HALOTHANE)**Sreeraghu G.M<sup>1</sup>, Hemanth Kumar<sup>2</sup>, Sreeharsha S<sup>3</sup>, Dwideep Chandra<sup>4</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: BACKGROUND AND OBJECTIVES:** Awareness during general anesthesia is a frightening experience, which may result in serious emotional injury and post-traumatic disorders. Awareness have been reported with many anesthetic techniques, particularly surgical patient populations such as those requiring anesthesia for Obstetrics, Major trauma, and cardiac surgery are known to experience a high incidence (7-43%) of awareness. In our study we have made an attempt to evaluate the incidence of awareness in surgical patients under general anesthesia using inhalational agent (Halothane) with Nitrous oxide. In this study we have evaluated the incidence of awareness by using Blood Pressure, Heart Rate, Sweating, Tears score intraoperatively and interviewing patients post-operatively by standard questionnaire. **MATERIALS AND METHODS:** Hundred patients undergoing surgical procedures under general Anesthesia were randomly selected for the study. They were posted to undergo surgery from November 2011 to July 2013. **Parameters observed:** Intra-operatively Blood Pressure, Heart Rate, Sweating, Tears scoring was done at 0 minutes in the operation theatre before induction and 10 minutes after intubation and monitored every 10 minutes till the end of surgery. All the patients were interviewed in the post-operative period soon after complete recovery and 24 hours later again with a set of 10 questions (Questionnaire method). **RESULTS:** In our study we have a standard interview questionnaire in the post operative period to study the incidence of awareness. We found that none of the patients had conscious recall of the events during surgery. In our study of 100 patients none of the patients had awareness. Injection atropine 20 mcg/kg body weight and injection pethidine 1mg/kg body weight were given as premedication. Induction agent used was injection thiopental sodium 5mg/kg body weight and maintained with Nitrous oxide, Halothane as inhalational agent and muscle relaxation was achieved with injection pancuronium 0.1mg/kg body weight. There was an increase in blood pressure and heart rate > 30 mm of hg or 30 beats/min greater than the base line respectively (score 2 on Blood Pressure, Heart Rate, Sweating, Tears score), were seen in 5 seconds. However there were no abnormalities seen in three records and the heart rate were in normal range (score 0 or 1 Blood Pressure, Heart Rate, Sweating, Tears score). With regards to more objective parameters in the anesthetic records, increase in blood pressure (>30 mm of hg) and heart rate (.30 beats/min) were observed in 67% of the awareness cases and 21% in matched controls. (p=0.001). The concentration of halothane was increased from 0.2% to 0.6% in one patient who had both sweating and tears and with a sweating score of 2 in PRST scoring. 2 patients had tears and 1 patient had sweating and none of the patients had awareness. In our study patients who had anxious mental status pre-operatively showed exaggerated blood pressure intraoperatively.

**KEYWORDS:** Awareness, General Anesthesia, Halothane.

**INTRODUCTION:** Awareness during general anesthesia is a frightening experience, which may result in serious emotional injury and post traumatic disorders <sup>1</sup>.

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Anesthetists have some time been complacent about possibility of awareness during anesthesia however patients who have been aware and able to recall the events in detail, especially the experience of pain may suffer post traumatic stress syndrome. Awareness in the absence of pain or recall may have no untoward sequelae.

Awareness have been reported with many anesthetic techniques, particularly surgical patient populations such as those requiring anesthesia for Obstetrics, major trauma, and cardiac surgery are known to experience a high incidence (7-43%)<sup>2</sup> of awareness. In general, the percentage of population who suffer awareness during general anesthesia is small. However, even a fraction is high if we consider the number of clinical situations in which general anesthesia is used. It is therefore important that anesthesiologists should be able to identify changes in depth of anesthesia that can threaten conscious awareness.

The incidence of conscious awareness with explicit recall and severe pain has been estimated at less frequent than 1/3000 general anesthetics. Conscious awareness with explicit recall but no complaints of pain has been reported in the literature with an incidence of 05-2%. With 7-72%, conscious awareness without explicit recall and possible implicit recall shows a very wide range of variation and its occurrence probably depends on the anesthetic drugs used. Subconscious awareness with possible implicit recall has an incidence of up to 80%, but there are many methodological problems in demonstrating implicit memory of intraoperative events.<sup>3</sup>

Inadequate depth of anesthesia leading to sympathetic surge is considered as main cause of awareness. There is no monitoring device to assess depth of anesthesia which is economical and can be used in all surgical patients undergoing surgical procedures, hence clinical signs of sympathetic surge are used to monitor depth of anesthesia with the understanding that adequate depth of anesthesia avoids awareness.

In our study we have made an attempt to evaluate the incidence of awareness in surgical patients under general anesthesia using inhalational agent (Halothane) with Nitrous oxide. In this study we have evaluated the incidence of awareness by using Blood pressure, pulse rate, Sweating, Tears score intra-operatively and interviewing patients post-operatively by Standard Questionnaire.

**AIM OF THE STUDY:** To determine the incidence of awareness in patients undergoing surgical procedures under general anesthesia using inhalational agent (Halothane) with Nitrous oxide.

**OBJECTIVES:** The concentration of inhalational anesthetic, required to suppress the sympathetic surge (PRST score) (Systolic blood pressure, Heart rate, Sweating, Tears)

- To evaluate the PRST (Systolic blood pressure, Heart rate, Sweating, Tears) score as a predictor of awareness.
- To evaluate whether intraoperative objective assessment (Blood pressure, Pulse rate, Sweating, Tears score) post operative subjective assessment (Standard Questionnaire).

### **MATERIALS AND METHODS:**

**Source of data:** Hundred patients undergoing surgical procedures under general Anesthesia were randomly selected for the study. They were posted to undergo surgery from November 2011 to July 2013.

**Inclusion criteria**

- Patient of either sex
- Patients of age more than 18 years.
- Patient undergoing surgery under general anaesthesia
- Patient with ASA grade 1 and ASA grade 2.

**Exclusion criteria**

- Patient age less than 16 years.
- Obstetric and intracranial injury.
- Mental confusion.
- Patient age above 60 years.
- Patient with ASA Grade 3 and ASA Grade 4 risk.

**Pre-operative Period:** On the eve of surgery all the patients were visited and evaluated thoroughly by the anesthesiologist as regards to the history and general physical examination.

An informed written consent was obtained from the patient or his/her relative.

Injection atropine 20micro gm/kg. body weight and injection pethidine 1mg/kg body weight was administered intramuscularly as premedication half an hour before shifting to the operating room on the day of surgery.

**Intra operative period:** Once the patient was shifted to the operating room, the patient was connected to the routine monitors which included ECG, Non invasive blood pressure, and Pulse oximeter. All resuscitation equipments like intubation trolley with airways. Laryngoscopes, endotracheal tubes, along with drugs Atropine, mephenteramine, thiopentone, vecuronium were kept ready. The anesthesia machine was also checked along with the oxygen delivery system.

A wide bore intravenous access was obtained and secured.

Baseline heart rate and blood pressure were noted.

All patients were induced with injection thiopentone sodium 5mg/kg. body weight and intubated after muscle relaxation achieved with 0.1 mg vecuronium. Intraoperatively anesthesia was maintained with 50:50 nitrous oxide in oxygen with 0.2 to 0.6 %of halothane using circle absorber system.

Intraoperatively PRST scoring was done at 0 minutes in the operation theatre before induction and 10 minutes after intubation and monitored every 10 minutes till the end of surgery.

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Index	Condition	Score
Systolic blood pressure	< control + 15	0
	< control + 30	1
	> control + 30	2
Heart rate	< control + 15	0
	< control + 30	1
	> control + 30	2
Sweating	Nil	0
	Skin moist	1
	Visible beads of sweat	2
Tears	No excess tears in open eyes	0
	Excess tears in open eyes	1
	Tears over flowing	2

**Post Operative Period:** All patients were interviewed in the post operative period.

**First Interview:** After total recovery from anesthesia in recovery room.

**Second Interview:** 24 hours post operatively in the ward.

## Interview Questions:

- 1) What did you notice?
  - a) Sounds
  - b) Tactile sensations
  - c) Visual perceptions
  - d) Pain
  - e) Paralysis
- 2) Did you feel something in your mouth or throat?
- 3) What went through your mind?
- 4) Did you believe you were dreaming?
- 5) How long did it last?
- 6) Did you try to alert anyone?
- 7) How was your preoperative mental status?
- 8) Have there been any consequences?
- 9) Did you inform the anaesthesiologists/ Hospital staff?
- 10) Have you changed your opinion about anaesthesia?

## RESULTS:

AGE IN YEARS	NO OF CASES	PERCENTAGE
16-30	46	46
31-45	38	38
46-60	16	16
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AGE IN YEARS	NO OF CASES	PERCENTAGE
16-30	30	65
31-45	27	71
46-60	9	56

**TABLE -2: SEX DISTRIBUTION (MALE)**

AGE IN YEARS	NO OF CASES	PERCENTAGE
16-30	16	35
31-45	11	29
46-60	7	44

**TABLE -3: FEMALES**

MENTAL STATUS	PERCENTAGE
RELAXED	55
ANXIOUS	38
FRIGHTENED	7

**TABLE-4: PRE –OPERATIVE MENTAL STATUS**

SURGERY	NO OF CASES	PERCENTAGE
UROLOGY	22	22
ORTHOPAEDICS	21	21
PLASTIC SURGERY	15	15
ENT	6	6
GYNAECOLOGY	5	5
DENTAL	7	7
GENERAL SURGERY	24	24

**TABLE -5: TYPE OF SURGERY**

DURATION	NO OF CASES	PERCENTAGE
100	20	20
80	30	30
60	50	50

**TABLE -6: DURATION OF SURGERY**

SYSTOLIC BLOOD PRESSURE		DREAM NO	DREAM YES	TOTAL
STABLE	COUNT	69	3	72
STABLE	% WITH DREAMS	96	4	100%
INCREASED	COUNT	28	0	28
INCREASED	% WIYH DREAMS	100	0	100%
<b>TOTAL</b>	COUNT	97	3	100
<b>TOTAL</b>	% WITH DREAMS	100	100	100%

**TABLE-7: SYSTOLIC BLOOD PRESSURE AND DREAMS**

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HEART RATE		DREAM NO	DREAM YES	TOTAL
STABLE	COUNT	84	3	87
STABLE	% WITH DREAMS	97%	3%	100%
INCREASED	COUNT	13	0	13
INCREASED	% WITH DREAMS	100	0	100%
<b>TOTAL</b>	COUNT	97	3	100
<b>TOTAL</b>	% WITH DREAMS	100	100	100%

TABLE -8: HEART RATE AND DREAMS

MENTAL STATUS			SYSTOLIC BLOOD PRESSURE NORMAL	SYSTOLIC BLOOD PRESSURE ABNORMAL	TOTAL
	RELAXED	COUNT	49	6	55
	RELAXED	% WITH COUNT	89%	11%	100%
	ANXIOUS	COUNT	20	18	38
	ANXIOUS	% WITH COUNT	53%	47%	100%
	FRIGHTENED	COUNT	3	4	7
	FRIGHTENED	% WITH COUNT	43%	57%	100%
	<b>TOTAL</b>	COUNT	72	28	100
	<b>TOTAL</b>	% WITH COUNT	100%	100%	100%

TABLE-9: SYSTOLIC BLOOD PRESSURE AND MENTAL STATUS

**DISCUSSION:** Awareness during general anesthesia is a frightening experience, which may result in serious emotional injury and post traumatic stress disorder.

Patients who are given general anesthesia expect not to be aware of any of the events between the induction of anesthesia and recovery of consciousness after completion of surgery. Conscious awareness with recall is a major concern to both patients and anesthetists. If pain is experienced during surgery, it can lead to serious psychological sequelae like insomnia, anxiety, depression and nightmares.<sup>4</sup>

The most important aspect of awareness is what the patient can remember consciously. It is been seen that the most appropriate method to investigate is through a structured interview questionnaire in the post operative period.<sup>5</sup>

In our study we have a standard interview questionnaire in the post operative period to study the incidence of awareness. We found that none of the patients had conscious recall of the events during surgery.

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W.H.D LIU. et al in 1991<sup>4</sup> reported a 0.2% incidence of recall of events and the incidence of dreams was noted in 0.9% in their study. In our study 3% patients had the incidence of dreams, but the dreams were not unpleasant.

O. Nordstorm et al in 1997<sup>6</sup> reported an incidence of dreaming as 2.7% which is similar to our study.

Seppo O.V, Ramta, Ritta Laurila et al 1998<sup>7</sup> in their study reported the incidence of awareness with recall as 0.4%-0.7% and the patients experienced pain. They studied 4818 patients (1215 male and 3603 female) who underwent elective surgery under general anesthesia. Of these patients 2612 (54.2%) were interviewed (608 male and 2004 female) and rest of the patients were excluded due to lack of entering the details in the post anesthesia care unit of the elective male and female 50.5% and 55.6% were interviewed respectively. A variety of drugs used as the general anaesthetic. 60% of the patients received usually diazepam (50%) or oxycodone (9%) as premedication. Either, thiopental (in 59%) or propofol (38%) was used for induction of anesthesia and maintained with nitrous oxide and a volatile anesthetic (isoflurane 49%, enflurane 11%) and supplemented with opioid (fentanyl 70%, alfentanil 28%) muscle relaxation was achieved with atracurium. For short surgical procedures only an induction bolus dose and additional boluses of intravenous anesthetic were used.

In our study of 100 patients none of the patients had awareness. Injection atropine 20 mcg/kg body weight and injection pethidine 1mg/kg body weight were given as premedication. Induction agent used was injection thiopental sodium 5mg/kg body weight and maintained with nitrous oxide, halothane as inhalational agent and muscle relaxation was achieved with injection pancuronium 0.1mg/kg body weight.

N. Merman et al in 1993<sup>5</sup> reported the incidence of awareness which included sound (89%), pain (39%) in 26 patients and were associated with anxiety and had recall of events during anesthesia but none of the patients experienced dreams. Their study included patients undergoing laparoscopic surgeries, cardiac, obstetric and orthopedic surgeries. Only few patients received premedication, induction agent used were injection thiopental, propofol, methohexital and maintained with volatile anesthetic isoflurane, sevoflurane and muscle relaxants used were vecuronium, succinyl chloride. Intraoperatively opioids like sufentanil, alfentanil were given. Twelve anesthetic records were reviewed, different types of anesthetic technique were used varying from a volatile anesthetic supplemented with different kind of anesthetic agents (n=6) to total intravenous anesthesia (n=5) and a combined general –epidural anesthesia.

There was an increase in blood pressure and heart rate > 30 mm of hg or 30 beats/min greater than the base line respectively (score 2 on Blood pressure, Pulse rate, Sweating, Tears score), were seen in 5 seconds. However there were no abnormalities seen in three records and the heart rate were in normal range (PRST score 0 or 1). With regard to more objective parameters in the anesthetic records, increase in blood pressure (>30 mm of hg) and heart rate (>30 beats/min) were observed in 67% of the awareness cases and 21% in matched controls. (p=0.001).

In our study none of the patients had awareness. Our study group included ASA class 1 and class 2 coming for elective surgery under general anesthesia and patients above 16 years of age and less than 16 years of age. Obstetric, laparoscopic, cardiac and neuro surgeries were excluded in our study. All the patients were premedicated with Injection atropine 20 mcg/kg body weight and injection pethidine 1mg/kg body weight. Induction agent used was injection thiopental sodium



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5mg/kg body weight and maintained with nitrous oxide, halothane as inhalational agent and muscle relaxation was achieved with injection pancuronium 0.1mg/kg body weight.

Karen. B. Domino et al in 1999<sup>1</sup> in their study reported 1.9% of patients having awareness which included awake paralysis and recall of events during general anesthesia. All claims for intraoperative awareness were reviewed by the reviewers to identify the patterns of causation and standard of care. Awareness claims accounted for 79(1.9%) of 4, 183 claims in the database, including 18 claims for awake paralysis and 16 claims for recall during general anesthesia. The majority of claims involves women (77%), younger than 60 years of age (89%), ASA class 1. Class 2, who underwent elective surgery (87%). Most (94%) claims for awake paralysis represented substandard care involving errors of labeling, administration, whereas care was substandard in only 43% of the claims for recall during general anesthesia.

In our study none of the patients had awareness. A standard care was taken in labeling and administration of the drugs.

The study is based on intra-operative symptomatic assessment and post-operative Questionnaire method and hence is bound to be biased subjectively.

Study can be utilized as an adjunct to other monitoring techniques like Bispectral index, Entropy in order to assess depth of Anesthesia and avoid intraoperative awareness.

**SUMMARY:** 100 patients undergoing surgical procedures under general anesthesia using halothane and nitrous oxide were studied in detail and the following conclusion were drawn.

None of the patients had awareness as assessed by the structured interview questionnaire post operatively.

3 patients complained of dreams and the dreams were not unpleasant. All the 3 patients who experienced dreams were in age group of 31-45 years and were male.

28 patients had an increase in systolic blood pressure and were treated with 0.2% to 0.4% concentration of halothane and none of patients had awareness.

The concentration of halothane was increased from 0.2% to 0.6% in one patient who had both sweating and tears and with a sweating score 2 in PRST scoring.

2 patients had tears and 1 patient had sweating and none of the patients had awareness.

In our study patients who had anxious mental status pre-operatively showed exaggerated blood pressure intraoperatively (anxious -38%, Frightened – 53%)

Our study cannot be taken to quite the incidence of awareness due to reduced sample size. The sample size should be more to get clinically significant level of results.

**CONCLUSION:** In our study using standardized anesthetic care there was no evidence of awareness among 100 patients studied. Intra-operative PRST score does not appear to correlate with the incidence of awareness.

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