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ORIGINAL ARTICLE

Intraoperative Hypothermia and Post-Operative Anesthesia Recovery in Patients Age Above 65 Years Undergoing Abdominal Surgery

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ABSTRACT

Objective: To evaluate the impact of hypothermia on post-anesthesia recovery time in patients above 65 years' age undergoing abdominal surgery.

Methodology: This cross sectional study was conducted on 300 patients who underwent abdominal surgery at LUHMS between October 2022 and October 2023. Temperatures of nasopharynx was recorded at the end of anesthesia induction (T0), and subsequently T1 at 0.5 hours, T2 at 1 hour, T3 at 1.5 hours, T4 at 2 hours, T5 at 2.5 hours, T6 at 3 hours, T7 at 3.5 hours, T8 at 4 hours, T9 at 4.5 hours, T10 at 5 hours, T11 at 5.5 hours, and T12 at 6 hours after the start of anesthesia.

Results: The prevalence of adverse events (hypoxemia, nausea or vomiting, shivering) was high in patients with Hypothermia as compared to Non-Hypothermic patients. In hypothermia Group, hypoxemia, nausea/vomiting, and shivering were 46.4%, 18.7%, and 21.1%, respectively. Whereas, in Non-hypothermia Group, hypoxemia, nausea/vomiting, and shivering were 44.0%, 15.4%, and 17.6%, respectively. The mean time of anesthesia recovery of Hypothermia Group was higher than the Non-hypothermia Group, 98.16±5.06 minutes, and 96.69±6.39 minutes, respectively.

Conclusion: Intraoperative hypothermia incidence remained high in patients with old age who underwent abdominal surgery, even after active warming. This mild hypothermia led to prolong anesthesia recovery time and shivering incidence.

Keywords: Intraoperative hypothermia, Anesthesia recovery, Abdominal surgery, Elderly patients, Shivering

INTRODUCTION

Intraoperative hypothermia is a common issue during anesthesia, defined below 36℃ core body temperature from initial point of anesthesia to the end of surgical procedure[1]. This condition, which does not include therapeutic hypothermia, can be classified based on its severity. Furthermore, mild hypothermia, moderate hypothermia, and severe hypothermia defined as (34℃-35.9℃), (32℃-33.9℃) and (below 32℃)[2,3].

Old age patients having age above 65 years are at greater risk to develop hypothermia because of their less capacity of central nervous system as well as pre-existing disease and poor nutritional values[4]. As per Advance Recovery after Surgery guidelines hypothermia maintinence and during or after surgery is essential to reduce surgical complications or post-operative morbidity and mortality[5].

Recent research indicates that intraoperative hypothermia incidence in patients who were operated under general anesthesia which ranges from 50-70%[6]. It was also shown in literature hypothermia incidence is more common in elderly patients as compared to younger patients who were operated for abdominal injuries or illness[6]. This vulnerable condition may be attributed because of low metabolic rate, degenerative changes in body, poor tolerance, reduced function, and inadequate compensatory abilities[7].

All these conditions are responsible for rapid hypothermia in surgical patients[8]. Hypothermia during surgery can cause numerous side effects like slow wound healing, cardiovascular incident, higher surgical site infection, increased oxygen consumption in post-operative period, and deranged coagulation profile[9,10]. But limited studies were conducted on intraoperative hypothermia and its association with anesthesia recovery time. This study was planned to fulfill the local research gap on this topic.

METHODOLOGY

This cross sectional study was conducted on 300 old age (above 65 years) patients at LUHMS between October 2022 and October 2023. Patients aged 60 years or older; those who underwent abdominal surgeries, including gastrointestinal, liver, pancreatic, biliary, or splenic surgery; those having pre-operative body temperature between 36-37°C included in the study. Patients with deviated nasopharynx, hyperthyroidism, conditions that can alter body temperature, deranged coagulation profile and having infectious disease were excluded.

The temperature of operation theater was maintained between 22°C and 24°C. After induction of anesthesia traditional method of warming with blanket was adopted along with 38^0C heaters. Temperature monitoring was done with nasopharyngeal method and regularly monitored in preo-anesthesia time. Probe was lubricated with lignocaine gel before insertion and depth of insertion determined by the distance from the nasal tip to lobe of ear. Tape was fixed with adhesive tape and connected to the temperature monitoring module of the monitor, allowing continuous and dynamic monitoring of the patient's nasopharyngeal temperature. Temperatures of nasopharynx was monitored at the end of anesthesia induction (T0), and subsequently T1 at 0.5 hours, T2 at 1 hour, T3 at 1.5 hours, T4 at 2 hours, T5 at 2.5 hours, T6 at 3 hours, T7 at 3.5 hours, T8 at 4 hours, T9 at 4.5 hours, T10 at 5 hours, T11 at 5.5 hours, and T12 at 6 hours after the start of anesthesia.

Patients with a nasopharyngeal temperature below 36°C for more than 5 minutes were classified as part of the hypothermia group, while those with a nasopharyngeal temperature of 36°C or above, or those with a temperature below 36°C but for less than 5 minutes, were classified as part of the non-hypothermia group.

SPSS version 27 was used for data analysis, after calculation of mean and frequency of numerical and categorical variables p value was considered as significant.

RESULTS

A total number of 300 patients, who met the inclusion criteria, were included in this study. Out of 300 patients, 209 (69.7%) were included in Hypothermia Group whereas 91 (30.3%) were included in Non-hypothermia Group. (Figure. No. 1). The distribution of age, gender, BMI, ASA status, operation time, blood transfusion and

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type of surgery had found to be equal, and the differences were statistically insignificant, (p>0.050). (Table. No. 1).

The prevalence of adverse events (hypoxemia, nausea or vomiting, shivering) was higher in Hypothermia Group than Non-Hypothermia Group. In hypothermia Group, hypoxemia, nausea/vomiting, and shivering were 97 (46.4%), 39 (18.7%), and 44 (21.1%), respectively. Whereas, in Non-hypothermia Group, hypoxemia, nausea/vomiting, and shivering were 40 (44.0%), 14 (15.4%), and 16 (17.6%), respectively. The mean time of anesthesia recovery of Hypothermia Group was higher than the Non-hypothermia Group, 98.16±5.06 minutes, and 96.69±6.39 minutes, respectively. But the differences were statistically insignificant, (p>0.050). (Table. No. 2).

The Postoperative hospitalization of Hypothermia Group was slightly higher than the Non- Hypothermia Group, 9.46±2.68 days and 8.30±2.23 days, respectively. (Table. No. 3).

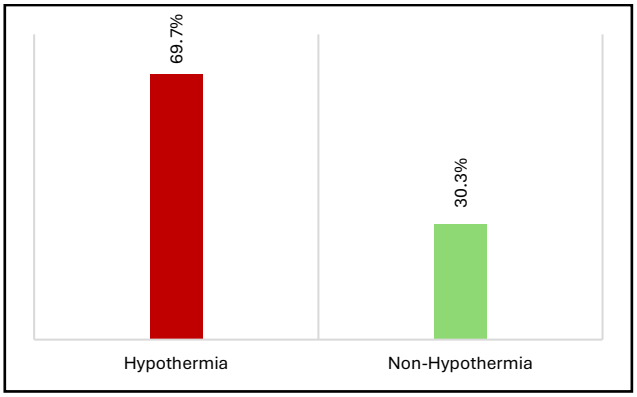

Figure 1: Distribution of hypothermia

Table 1: Demographic and baseline profile of the study groups

Variable	Group		p-value
	Hypothermia	Non-Hypothermia	
Age (years)	62.10±6.64	65.70±5.92	0.623
Gender			
Male	145 (69.4)	52 (57.1)	0.060
Female	64 (30.6)	39 (42.9)	
BMI (kg/m^2)	28.89±2.93	27.49±3.27	0.307
ASA status			
I	111 (53.1)	55 (60.4)	0.240
II	98 (46.9)	36 (39.6)	
Operation time (minutes)	219.92±32.38	225.74±28.58	0.764
Blood transfusion	9 (4.3)	3 (3.3)	0.689
Type of surgery			
Opened	121 (57.9)	50 (54.9)	0.635
Laparoscopic	88 (42.1)	41 (45.1)	
N (%), Mean ± S.D			

Table 2: Adverse events during anesthesia recovery period of the study groups

Adverse events	Group		p-value
	Hypothermia	Non-Hypothermia	
PACU hypoxemia	97 (46.4)	40 (44.0)	0.161
PACU nausea/vomiting	39 (18.7)	14 (15.4)	0.568
PACU shivering	44 (21.1)	16 (17.6)	0.490
Time of anesthesia recovery(minutes)	98.16±5.06	96.69±6.39	0.410
N (%), Mean ± S.D			

Table 3: Postoperative hospitalization of the study groups

Hospitalization (postoperative)	Group		p-value
	Hypothermia	Non-Hypothermia	
Postoperative hospital stays (days)	9.46±2.68	8.30±2.23	0.603
Mean ± S.D			

DISCUSSION

The primary outcome of the study was inadvertent intraoperative hypothermia, which was defined as a core body temperature below 36°C sustained for at least 5 minutes during the intraoperative period[11]. Temperature of body was monitored using an esophageal probe. Patients who exhibited a nasopharyngeal temperature below 36°C for more than 5 minutes were categorized into the hypothermia group, whereas those who maintained a nasopharyngeal temperature of 36°C or above, or had a temperature below 36°C for less than 5 minutes, were categorized into the non-hypothermia group.

In this study male gender, operative time and open surgical technique were found associated with hypothermia but results were in significant. Another study was conducted by Yin et al[12] reported similar finding that indicate that open surgical technique and gender are more prone to hypothermic conditions after abdominal surgery and intraoperative warming.

In this study hypothermia was observed in 69.7% of patients after intraoperative warming. The incidence of hypothermia observed, despite the application of active intraoperative warming, aligns closely with findings from previous studies by Bo Yu-Mei[13], who reported a rate of 66.49%, and Emmert et al[14], who reported a rate of 64.3%. However, this incidence is notably higher than the 39.26% reported by Dong Tao et al[15]. The disparity in these findings may be attributed to differences in the specific sites used for temperature monitoring across the studies.

Dong Tao et al.,[15] reported the core body temperature was monitored at the tympanic membrane. This choice of monitoring site might explain the increased hypothermia incidence observed in elderly patients during surgery in our study, where the nasopharynx was selected as the site for core body temperature monitoring. The difference in monitoring sites could contribute to variations in temperature readings and, consequently, the differing rates of hypothermia.

The study shows higher rate of shivering during the recovery from anesthesia was significantly higher in the hypothermia group, aligning with the findings reported by Yi et al[16] Similarly, research by Eberhart LH et al[17] also identified intraoperative hypothermia as a key risk factor for postoperative shivering in patients.

The mean time of anesthesia recovery of Hypothermia Group was higher than the Non-hypothermia Group, 98.16±5.06 minutes, and 96.69±6.39 minutes, respectively. Mild to moderate hypothermia can cause prolong anesthesia recovery time, aligning with findings from Tanaka et al[18] and Zhou et al[19], who observed that hypothermia reduces metabolic rate, decreases blood flow to the liver and kidneys, and extends anesthetic drug metabolism. In another study conducted by Batcik et al[20] reported that routine monitoring and control of hypothermia is necessary for surgical patients because it can prolong the recovery time and increase the post-operative complications.

CONCLUSION

Intraoperative hypothermia incidence remained high in elderly patients who underwent abdominal surgery, even after active warming. This mild hypothermia led to prolong anesthesia recovery time and shivering incidence.

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