

Perioperative hypothermia in colorectal surgeries: are we doing enough to prevent it?

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Abstract

Objectives: To determine the incidence of hypothermia in patients undergoing colorectal surgery, and to identify factors that increase vulnerability to perioperative hypothermia.

Methods: The retrospective study was conducted at the Aga Khan University Hospital, Karachi, and comprised medical records from May 2012 to June 2017 related to all patients aged >16 years of either gender who underwent colorectal procedures. Analysis about predictors of perioperative hypothermia was done using Stata 12.

Results: Of the 100 patients, 69(69%) were males. The overall mean age was 50.2±16.7 years. Majority cases had elective presentation 72(72%). Incidence of perioperative hypothermia was noted in 74(74%) patients. Postoperative morbidity was 16(16%), while mortality was 4(4%). Elective presentation and hypothermia before surgery were significantly associated with occurrence of intraoperative hypothermia (odds ratio: 4.5 and 1.3 respectively).

Conclusion: Perioperative incidence of hypothermia was found to be quite high despite appropriate measures. Factors responsible need to be explored and rectified.

Keywords: Hypothermia, Colorectal surgeries, Perioperative. (JPMA 70: 304; 2020)

<https://doi.org/10.5455/JPMA.294692>

Introduction

Hypothermia is defined as a core temperature of <36°C and is divided into mild (32-36°C), moderate (28-32°C) and severe (< 28°C) categories.¹ Perioperative hypothermia, which is experienced by 50-90% of surgical patients, is a preventable cause of morbidity.² During preoperative period, patients can get hypothermic while waiting for surgery. Intraoperatively during the first 30-40 minutes of anaesthesia, body temperature can drop to <35°C due to loss of thermoregulatory heat-preserving mechanisms and anaesthetics-induced peripheral vasodilation.³

Risk of adverse outcomes like wound infection, sepsis, multiple organ failure, myocardial infarction (MI) and even mortality is increased by hypothermia.⁴ Furthermore, coagulopathy in hypothermic patients is known to increase fluid and blood transfusion requirements.⁵ Moreover, patients tend to remember hypothermia as one of the worst aspects of their perioperative experiences.³

When looking at the measures that have been taken, majority of studies report methods of warming intraoperatively to successfully reduce hypothermia and its consequences. Others have suggested preoperative warming.⁶ As core temperature gradually declines into

the zone of hypothermia, early intervention to prevent declining trends may be more beneficial than merely targeting absolute temperature values intraoperatively. With attention towards maintaining normothermia intraoperatively, warming blankets, circulating water mattresses and prewarmed intravenous (IV) fluids have been used.⁷

The current study was planned to determine the incidence of hypothermia in patients undergoing colorectal surgery, and to identify factors that increase vulnerability to perioperative hypothermia.

Materials and Methods

The retrospective study was conducted at the Aga Khan University Hospital (AKUH), Karachi, and comprised medical records from May 2012 to June 2017 related to all patients aged >16 years of either gender who underwent colorectal procedures. AKUH is a tertiary care hospital with nine general surgeons performing colorectal surgeries.

Data related to patients with missing records and those who had concomitant procedures performed with colorectal surgery were excluded.

After approval was obtained from the institutional ethics review committee, patients who underwent colorectal surgeries were identified using the International Classification of Diseases (ICD) codes for colorectal surgery.⁸ Data was collected on a specifically designed

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questionnaire. Body temperature at five different time points perioperatively was labelled as: T1: Preoperative temperature; T2: Temperature before induction in the operation theatre; T3: The minimum intraoperative temperature; T4: Temperature at the end of surgery; and T5: Temperature after the patient's arrival in the recovery room.³

Data analysis was done using Stata 12. Means with standard deviations were calculated for continuous variables. Frequencies and percentages with Chi square, Fishers Exact and McNemar test were applied for categorical variables. Univariate logistic regression analysis was done to find significant predictors of intraoperative hypothermia. Multivariable logistic regression analysis was done to find independent predictors of intraoperative hypothermia and to adjust for potential confounders. Conditional logistic regression was used to determine factors associated with changes of temperature status from before surgery to intraoperative setting.

Results

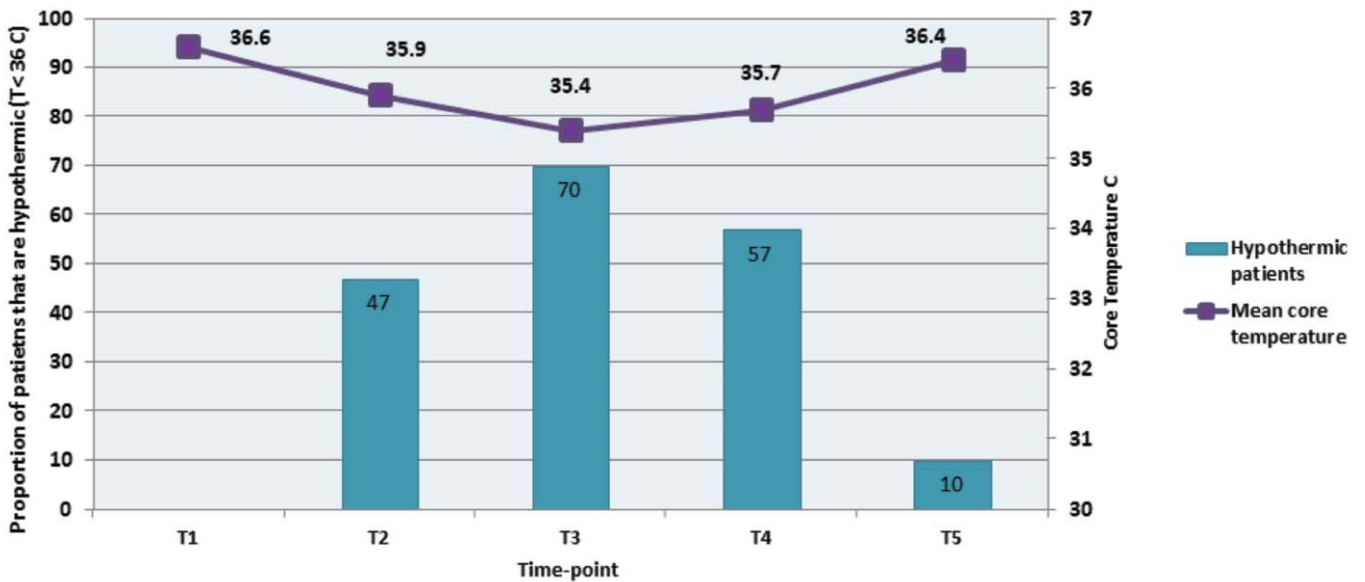
Of the 389 records retrieved, 100(25.7%) were included and, of them, 69(69%) were males. The overall mean age was 50.2±16.7 years, and mean body mass index (BMI) was 23.87±5.7kg/m². Majority cases had elective

Table-1: Demographics and operative details.

Variables		Number Or Mean± SD* N = 100
Age (Years)		50.2±16.7
Gender (Male)		69
BMI# (Kg/m2)		23.9±5.7
Mode of Presentation	Elective	72
	Emergency	28
Warming Blankets		100
Epidural Analgesia		68
Surgery Type	Open	91
	Laparoscopic	5
	Lap Converted to Open	4
Operative Time (Min)	Open	187±78
	Laparoscopic	258±78
	Lap Converted to Open	288±130
ASA\$ Category	I	7
	II	54
	III	31
	IV	8

*SD: Standard Deviation
#BMI: Body Mass Index
ASAS: American Society of Anaesthesiologists.

presentation 72(72%). All the 100(100%) patients received warming blankets intraoperatively (Table-1).



*Time Points:
T1: Preoperative temperature
T2: Temperature before induction in the operation theatre.
T3: The minimum intraoperative temperature.
T4: Temperature at the end of surgery.
T5: Temperature after the patient's arrival in the recovery room.

Figure-1: Percentage of hypothermic patients along with mean core temperatures at different peri-operative time points.*

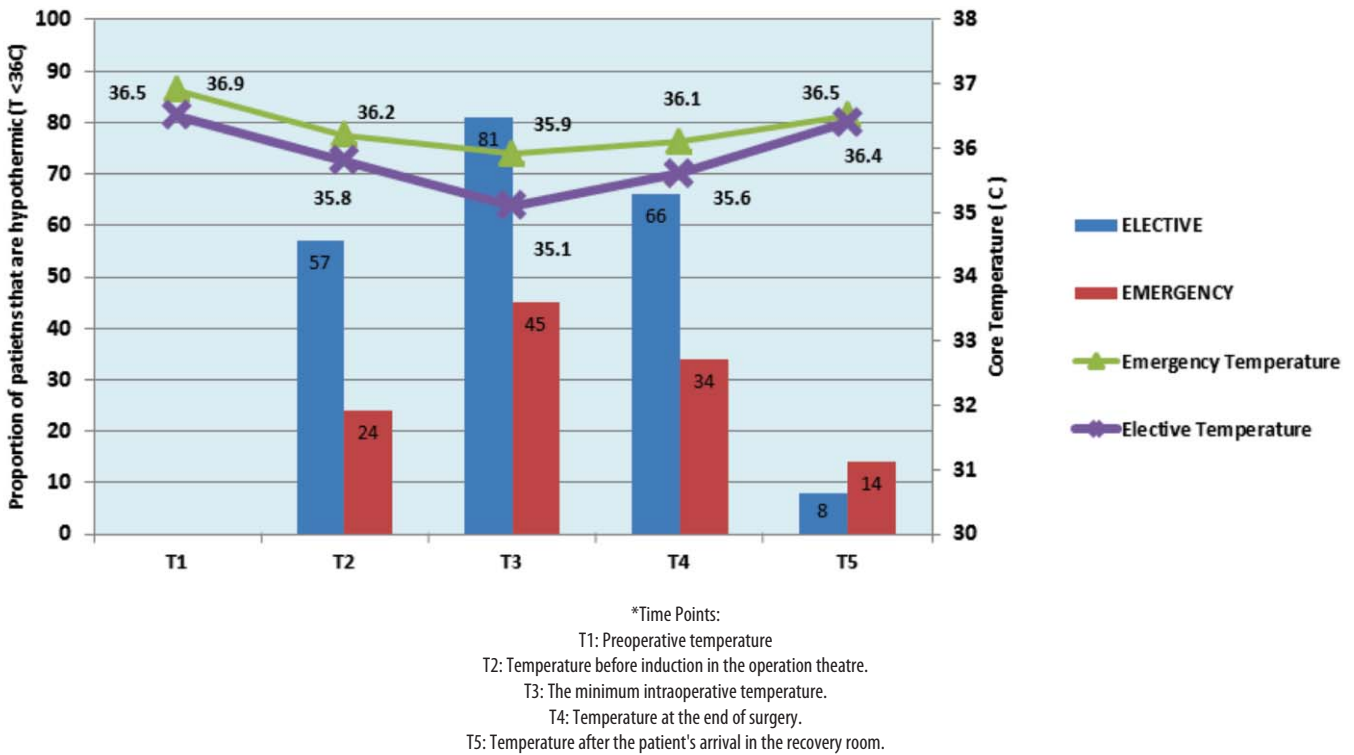


Figure-2: Percentage of hypothermic patients along with mean core temperatures for elective and emergency surgeries at different time points.*

Table-2: Factors associated with Intra-operative hypothermia.

Factors	Univariate p value	Multivariate p value	Odds Ratio (95% Confidence Interval)
Mode of Presentation	0.002	0.05	4.5 (2.9 - 9.8)
Hypothermia Before Induction	<0.01	<0.01	1.3 (1.1 - 2.1)
Age	0.8	-	
Gender	0.8	-	
BMI#	0.4	-	
Epidural	0.51	-	
Open Vs Laparoscopic	0.34	-	
Duration of Surgery	0.74	-	
ASA\$ Category	0.3	-	

#BMI: Body Mass Index
 ASAS: American Society of Anaesthesiologists.

Overall incidence of perioperative hypothermia was 74(74%). None of the study patients was hypothermic preoperatively, while almost 46(46%) were hypothermic before induction in the operation theatre (OT). Intraoperative hypothermia was recorded in 69(69%) patients at which point mean temperature was 35.4±1.3°C. In the recovery room, 10(10%) patients were hypothermic (Figure-1). Proportion of hypothermic patients admitted electively was higher than those admitted via emergency room (Figure-2).

Univariate and multivariate logistic regression analysis showed that patients who presented electively were 4.5 times more prone to developing intraoperative hypothermia, and the odds of being hypothermic intraoperatively was 1.3 times more in patients who were hypothermic before induction (Table-2).

Mode of admission and patients' age turned out to be significantly associated factors (p<0.05). Odds ratio (OR) for mode of admission was 4.25 (95% CI: 1.1-8.1) (p=0.0006), while for age interval of 10 years, OR turned out to be 1.21 and (95% CI: 1.1-2.1) (p=0.0001).

Postoperative morbidity was 16(16%), while mortality was 4(4%), and all of them suffered from hypothermia at some point in the perioperative period.

Discussion

Perioperative hypothermia is one of the preventable causes of postoperative morbidity,² and, hence, reduces risk of sepsis, multiple organ failure, cardiovascular incidents, myocardial infarctions and even mortality.⁴

The current study demonstrates a high frequency of perioperative hypothermia (74%) in patients undergoing colorectal surgery despite active efforts made towards intraoperative warming. Significant

drop in core temperature occurred before the start of surgery which is also reported earlier.³ The core temperature further dropped intraoperatively to as low as 35.1°C.

Greater proportion of hypothermia in electively admitted patients compared to emergency admissions can be due to false sense of protection about the need to prevent hypothermia in patients admitted electively. Fewer epidurals and shorter preoperative waiting times in emergency settings could also be potential factors responsible for this finding. The benefits of pre-warming with methods including passive insulation, forced-air warming and electrically warmed blankets have been well described,^{9,10} but this is yet to be adopted as routine in most centres.

Age being a significant predictor of hypothermia is likely due to decreasing body's physiological reserves with age and relatively more time needed to rewarm from any decreases in core temperature.^{11,12} Patients with higher BMI can conserve core heat better due to greater fat insulation and a smaller surface area-to-volume ratio, minimising heat losses through the skin. Heat conservation in obese patients may confer advantage during critical illness.¹³ Though our study was not aimed at looking at morbidity as a result of perioperative hypothermia, morbidity related to hypothermia is a known phenomenon.⁴ Careful management of preoperative core temperature may reduce the incidence of hypothermia and thus resulting in morbidity.

In terms of limitations, part of variability in body temperatures could be due to core temperature having been measured intraoperatively through nasopharyngeal probe, while at the rest of the time points, the temperature was measured through oral cavity.

Conclusion

Frequency of hypothermia was found to be more intraoperatively compared to the rest of perioperative periods. Factors responsible need to be explored and

rectified. Electively admitted patients having more frequency of hypothermia reflected a false sense of protection regarding the need to prevent hypothermia. This needs to be further explored.

Disclaimer: None.

Conflicts of Interest: None.

Source of Funding: None.

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