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Original Research Article

Perioperative Hypothermia in Pediatric Surgery

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Abstract: ***Aim of the study***: To study the risk factors and the clinical consequences of perioperative hypothermia in pediatric surgery. ***Patients and Method***: It was an observational and descriptive prospective study conducted over a period of two (2) months from December 10th, 2021 to February 10th, 2022. Were inclueded in the study children from 0 to 15 years old who were done general anesthesia with tracheal intubation in a elective surgery that lasted 30mn at least. The variables studied were: age, gender, American Society of Anesthesiologists (ASA) status, type of surgery, the means used for prevention, perioperative incidents, intraoperative transfusion, patient's temperature before induction and during surgery until extubation, duration of the surgery, duration of anesthesia. ***Results***: During the period of our study, 89 patients were collected. The average age was 4,79 ± 3,53 years with extremes of 14 days and 15 years. The most represented age group was that of 1 month to 5 years with 61% of cases. Male gender represented 66.29% of cases, a sex ratio of 1.96. Perioperative hypothermia was noted in 64.04% of the patients, it was moderate in 95% of cases and severe in 3% of cases; all the age groups were concerned but newborns were the most susceptible. The room temperature fluctuated around an average of 27 ± 2,7°C with extremes of 24.6°C and 30°C. Digestive surgery predominated with a frequency of 57.30%. ASA I was the most represented class in 65% of cases. Risk factors were age, the type of surgery, a high ASA level, duration of the surgery and blood transfusion. All the patients who received transfusion presented hypothermia. The most common consequences of perioperative hypothermia were wake-up delay in 35% and bradycardia. ***Conclusion***: Perioperative hypothermia is very common in pediatric surgery. Then, it should be prevented effectively to avoid its complications.

Keywords: Hypothermia, Pediatric surgery, Prevention, Hospital of Niamey.

INTRODUCTION

Perioperative hypothermia is a common problem responsible for life-threatening complications. In general anesthesia, hypothermia results from the inhibition of thermoregulation, a decrease of body heat production and exposure to cold environment. Its consequences are not negligible: impaired hemostasis, chills, decrease of immune defense. Hypothermia should be systematically prevented, with a target of maintaining the body temperature around 36.5°C [1, 2]. The aim of our study is to study the risk factors and clinical consequences of perioperative hypothermia in pediatric surgery at ¨Hôpital National Amirou Boubacar Diallo¨ (HNABD) of Niamey.

PATIENTS AND METHOD

It was an observational and descriptive prospective study conducted over a period of two months from December 10th, 2021 to February 10th, 2022. Were inclueded in the study children from 0 to 15 years old who were done general anesthesia with tracheal intubation in a planned surgery that lasted for 30mn at least. The variables studied were: age, gender, ASA status, type of surgery, the means used for prevention, perioperative incidents, intraoperative transfusion, patient's temperature before induction and during surgery until extubation, duration of the surgery, duration of anesthesia. Moderate hypothermia: Core temperature between 34-36°C; Severe hypothermia: Core temperature below 34°C.

RESULTS

During the period of our study, 89 patients were been collected. The average age was 4,79 ± 3,53 years with extremes of 14 days and 15 years. The age group of 1 month to 5 years was the most represented with 61%

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of cases (Table I). Male gender predominated with 66.29% of cases, sex ratio of 1.96. Perioperative hypothermia was noted in 64.04% of the patients, it was moderate in 95% of cases and severe in 3% of cases; all the age groups were concerned but newborns were the most susceptible. The room temperature fluctuated around an average of 27 ± 2,7°C with extremes of 24.6°C and 30°C.

Digestive surgery predominated with a frequency of 57.30% (Figure 1). ASA I status was the most represented class in 65% of cases. Hypothermia was reported in all the operated patients with ASA III status, and in 68.96% of patients with ASA II (Figure 2).

The average duration of the surgery was 69.87 ± 42.72 min with extremes of 30 min and 190 min. The average duration of anesthesia was 99.66 ± 49.34 min with extremes of 39 min and 240 min.

The incriminated risk factors of hypothermia were age, the type of surgery, a high ASA level, duration of the surgery and blood transfusion; all the patients who received transfusion presented hypothermia. The most common consequences of perioperative hypothermia were wake-up delay in 35% and bradycardia (Figure 3).

Table I: Distribution of patients by age group

Age range	Number	Percentage (%)
< 1 month	2	2,24
1 - 12 months	13	14,60
12 – 24 months	3	3,37
24 - 5 years	29	32,58
5 – 10 years	28	31,46
10 – 15 years	14	15,73
Total	**89**	**100**

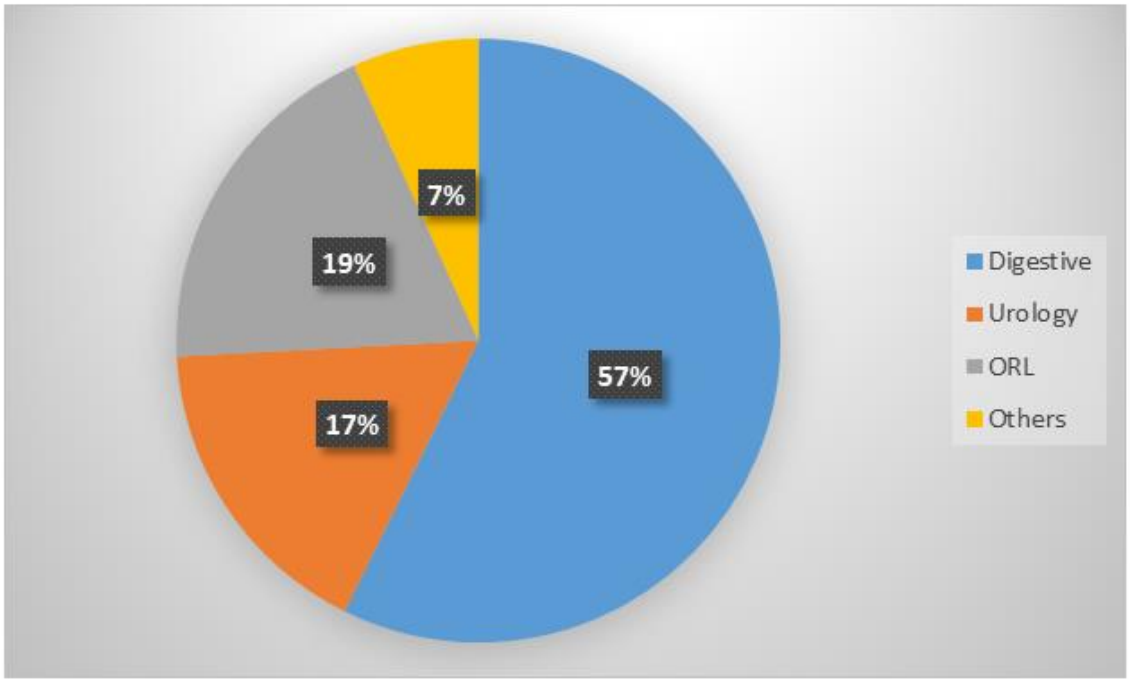

Figure 1: Distribution of patients by the type of surgery

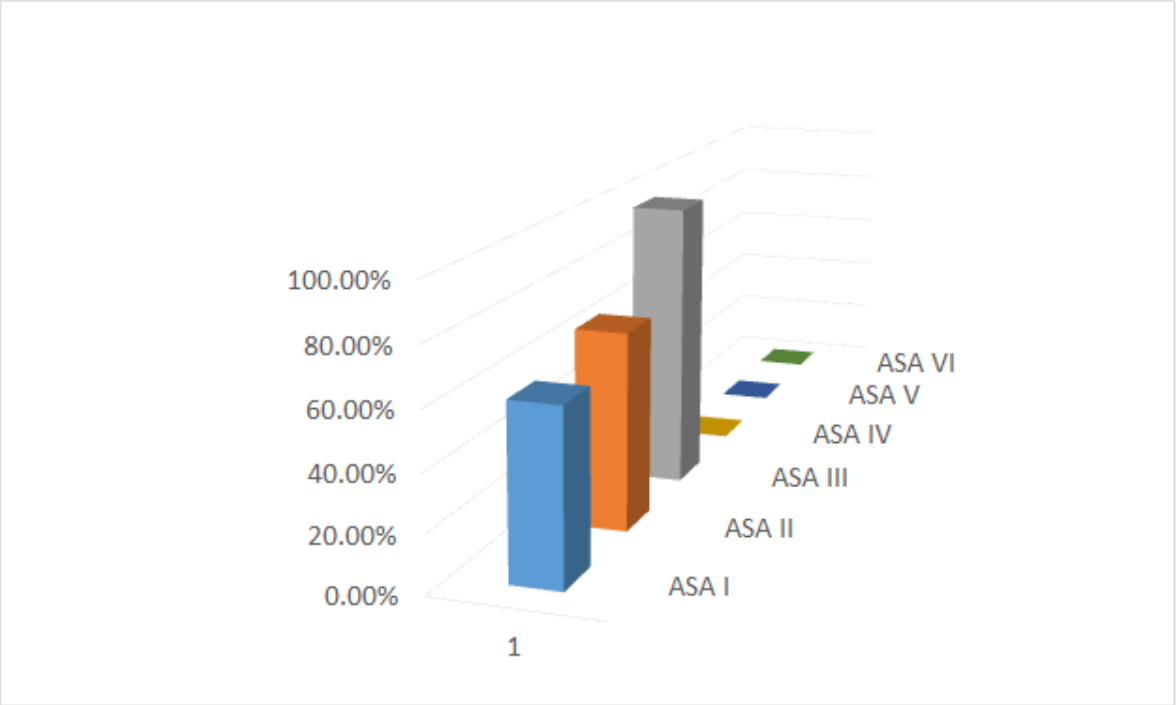

Figure 2: Distribution of patients by ASA status

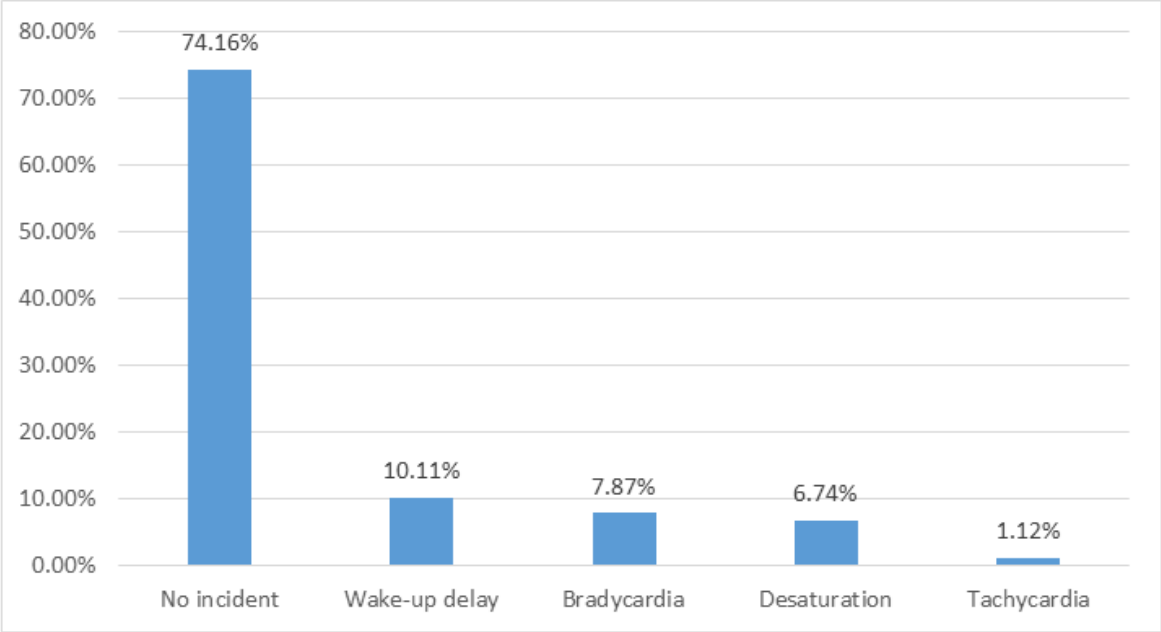

Figure 3: Distribution by incidents

DISCUSSION

During the period of our study, 89 patients were collected. The average age of our patients was 4.79 ± 3.53 years with extremes of 14 days and 15 years, the most represented age group was which of 1 month to 5 years. We report a male predominance with a sex ratio of 1.96. Aguemon A and col had reported a sex ratio of 1.35 and an average age of 40 years with extremes of 3 years and 83 years [3]. The control of room temperature in operating room is an important element in the prevention of hypothermia. The average temperature in operating room was 27 ± 2.7°C, and it was superior to 26°C in more than 90% of cases. This value is above which is recommended for a better prevention of intraoperative hypothermia, 24°C-26°C in newborns and superior to 21°C in infants an adults [3, 5]. Fifty seven of our patients (64,04%) had presented hypothermia. Our result is inferior to which of Aguemon A and al. who found a frequency of 97.5%. Into the 57 cases of hypothermia, 94.73% of the patients had presented moderate

hypothermia and 5.26% presented severe hypothermia. Aguemon A *et al*., had found 80% cases of moderate hypothermia and 20% of severe hypothermia [3]. All the operated newborns had presented hypothermia. Regardless of the age of the patient, the risk of hypothermia is permanent, and more likely in extreme ages [4]. All the patients classified ASA III had presented perioperative hypothermia. In our study, 63.15% of the patients who underwent digestive surgery had presented hypothermia, of which 25% was moderate and 62.5% was severe. Surgery with open abdominal and thoracic cavities is more likely to lead to hypothermia [3, 6]. In our serie, 3.38% of patients presented hypothermia before induction, it accentuated the risk of occurrence of perioperative hypothermia; 20.23% of patients were taken to post anesthesia care units (PACU) with a persistant hypothermia. Several authors had shown the efficiency of body warming in the prevention of perioperative hypothermia [2, 7, 8]. All our patients that received tranfusion had presented perioperative hypothermia, of which 81.81% of moderate forms and 18.18% of severe forms. This testifies to the important role played by non-warmed infusion solutions and transfusion bags in the occurrency of hypothermia [10, 11]. In our serie, 70.03% of our patients had presented hypothermia-related incidents of which wake-up delay was the most common in 35% of cases followed by bradycardia in 29.1% of cases. Aguemon A *et al*., Also founded wake-up delay to be the most commly incident with a rate of 57.5% [3]. Hypothermia, by modifying the pharmakinetics and the pharmacodynamics of the anesthesia agents, would lead to a delay in their metabolism responsible for the wake-up delay. It was also demonstrated that hypothermia, by provoking a vasoconstriction, can induce decreasing of the coronary perfusion which could lead to cardiovascular complications such as myocardial ischemia and cardiac rhythm disorders [1, 6].

CONCLUSION

Perioperative hypothermia is very common in pediatric surgery. While children are relatively more vulnerable, balance must be maintained between heat loss and its production through an efficient prevention. Means of warming should be therefore set up emergently to avoid hypothermia and its intra and postoperative consequences.

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