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Risk Factors of Peri-intubation Cardiac Arrest in Critically Ill Pediatric Patients Presenting to the Emergency Department of a Low-Middle-Income Country: A Case-Control Study

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ABSTRACT

Background

Peri-intubation cardiac arrest is defined as cardiac arrest that occurs within 20 minutes of airway management **[1]**. Incidence in the pediatric population ranges from 0.7% to 1.7% **[2, 3]**. Identifying pre-intubation risk factors may improve preparedness and outcomes during emergency intubations. This study aims to identify clinical and physiological predictors associated with peri-intubation cardiac arrest in pediatric patients undergoing emergency airway management in a tertiary care emergency department.

Methods

A retrospective case-control study was conducted at the emergency department of a tertiary care hospital in Karachi, Pakistan, from January 2019 to June 2023. Pediatric patients (<18years) who experienced cardiac arrest within 20 minutes of intubation were included as cases. For each case, four controls were randomly selected from the same cohort who were intubated without arrest. Pre-intubation clinical data, laboratory parameters, and vital signs were analyzed. Multivariable logistic regression was used to identify independent predictors of peri-intubation cardiac arrest.

Results

A total of 125 pediatric patients were included, 25 cases and 100 controls. Multivariate analysis identified several independent predictors of peri-intubation cardiac arrest. Age less than one year (aOR:10.97; p=0.028), hypoxemia (SpO_2<92%) (aOR:5.48; p=0.047), elevated heart rate (aOR:2.88; p=0.029), low systolic blood pressure (aOR:6.16; p=0.043), elevated shock index (≥1.2) (aOR:5.52; p=0.046), modified shock index ≥1.3 (aOR:11.11; p=0.048), lactate ≥2 mmol/L (aOR:15.64; p=0.023), and capillary refill time >3 seconds (aOR:7.55; p=0.042), were found to be independent predictors of peri-intubation cardiac arrest **(Table 1)**.

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Conclusion

Pre-intubation physiological instability is strongly associated with peri-intubation cardiac arrest in pediatric patients. Early recognition of high-risk features such as hypoxemia, tachycardia, hypotension, elevated lactate levels, delayed capillary refill time, and elevated shock indices may allow for better preparation and resuscitation planning. These findings support the need for structured pre-intubation assessment protocols in emergency settings.

Keywords

Peri-intubation, Cardiac arrest, Emergency Department, Pediatric, Risk factors

TABLE 1 - Crude (cOR) and Adjusted odds ratios (aOR) with 95% Confidence Interval for clinical characteristics of patients with peri-intubation cardiac arrest

Factors	Univariate		Multivariable level	
	cOR [95% CI]	p-value	aOR [95% CI]	p-value
Age less than 1 year	2.82 [1.11 -7.13]	0.029	10.97 [1.3 -62.3]	0.028
Low Systolic Blood Pressure	2.6 [1.03 -6.57]	0.044	6.16 [1.9 -42]	0.043
Elevated Heart Rate	3.69 [1.29 -10.61]	0.015	2.88 [1.4 -20.62]	0.029
Hypoxemia <92%	3.55 [1.36 -9.27]	0.01	5.48 [1.86 -34.79]	0.047
Elevated Shock Inex (≥1.2)	3.27 [1.26 -8.53]	0.015	5.52 [1.03 -29.56]	0.046
Lactic Acid >2 mmol/L	3.55 [1.23 -10.2]	0.019	15.64 [1.46 -67.95]	0.023
Elevated modified shock index ≥1.3	6.19 [1.38 -27.81]	0.017	11.11 [4.56 -78.46]	0.048
Capillary refill time > 3sec	10.8 [4.59 -55.88]	0.029	7.55 [3.35 -86.36]	0.042

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Author contributions

All authors contributed equally and validated the final version of record.

Declarations

Conflicts Of Interests

The Authors declare that there is no conflict of interest.

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Registration

No registration applicable.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical approval

The research has been approved by the Ethical Review Committee of the Aga Khan University Hospital, Karachi, Pakistan (2023-8659-24735).

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