



Incidence and Risk Factors of Delirium in Children and Adolescents Undergoing Surgery in the Hospital

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Abstract

Background: In children, risk factors for delirium include anesthetics such as sevoflurane, surgeries such as dentistry and ENT, autism, and ADHD.

Objectives: The present study was conducted to determine the rate of delirium in children and adolescents hospitalized for surgery.

Methods: In this cross-sectional study, 75 children and adolescents hospitalized for surgery were evaluated for delirium. The instrument used was the Cornell Assessment of Pediatric Delirium (CAPD), which has 2 sections and 4 questions in each section. The Kernel tool was scored by an anesthesiologist once per shift and every 12 hours until the patient was discharged. In all cases, ethical codes were observed in the research. Data analysis was performed in SPSS 16 software.

Results: Results showed a total of 75 patients were studied, of which 56% were in the adolescent age range and female gender, 84% had surgery duration less than 45 minutes, and 53.3% were hospitalized due to non-emergency surgeries. The incidence of delirium in patients was 11 (14.7%), which in Table 1 showed that there is a relationship between delirium and gender ($P = 0.003$), type of inpatient ward ($P = 0.02$), surgery duration ($P = 0.02$), coexisting disease ($P = 0.000$), and type of surgery ($P = 0.006$). Also, out of 86 patients studied, 11 patients had delirium and 64 patients did not. It was also related to gender 0.04 [4.16 (1.00 - 17.8)], type of inpatient ward 0.02 [0.27 (0.073 - 1.06)], surgery duration 0.04 [4.00 (0.95 - 16.79)], and type of surgery 0.006 [0.088 (0.011 - 0.73)].

Conclusions: Although the incidence of delirium was low in this study, it is necessary to identify factors affecting the occurrence of delirium and to implement interventions to prevent delirium in patients undergoing surgery.

Keywords: Risk Factors, Delirium, Children, Adolescents, Surgery

1. Background

Despite the increase in diseases or accidents in the group of children and adolescents, due to the advances made in the field of medicine, the mortality of these patients has decreased. Among these measures, it is possible to mention the performance of specialized surgeries in the group of people under 18 years of age and subsequent hospitalization of the patient in the PICU, which has reduced the complications of diseases in this age group and increased their quality of life (1-3).

Attention to the mental health of patients is important (4, 5).

Pediatric delirium is defined as a disturbance that causes changes in the psychomotor domain in the patient, including involuntary and non-targeted behaviors, lack of recognition and awareness of time and place, and staring at the surroundings. Delirium in the ICU is a clinical syndrome that is accompanied by acute impairment in cognition and consciousness that can be accompanied by fluctuations throughout the day. Delirium is accompanied by symptoms such as impaired attention and awareness, history, laboratory

findings, and physical examination, occurring in a short period of time during the day with fluctuations in severity (6-8). More than 25% of children admitted to the PICU have symptoms of delirium, which may affect their mortality. In fact, a critically ill child is exposed to sedative drugs due to surgery and has an inappropriate experience during the illness. Therefore, this experience may prevent the child and family from returning to normal activities and cause perceptual-motor disorders (9-13).

In children, risk factors for delirium include anesthetics such as sevoflurane, surgeries such as dentistry and ENT, autism, and ADHD. Other causes include severe illness, length of hospital stay, male gender, medications taken by the patient, underlying diseases in the patient, poor ward environment, younger age, previous history of delirium, and a positive family history of delirium (14-17). The presence of delirium in children increases medical and healthcare costs, and its prevention is a priority (18). Unlike adults, which are associated with cognitive impairment, in children, delirium is more associated with behavioral changes. Also, although not all patients admitted to the PICU develop delirium, delirium is a common disorder and is more prevalent in patients with inflammatory or infectious disorders (10). Delirium screening is not performed in some PICUs. For this reason, there is little information about the incidence, consequences, time course, manifestations, and risk factors of delirium (16, 19, 20).

2. Objectives

Given that the goal of surgery is to improve the patient's condition and avoid any complications after surgery, a study was conducted to determine the rate of delirium in children and adolescents hospitalized for surgery.

3. Methods

In this cross-sectional study, children and adolescents hospitalized for surgery were evaluated for delirium in 2025. Inclusion criteria included age between 6 and 18 years, absence of communication disorders or cerebral palsy before surgery, informed parental consent to participate in the study, absence of coma in the patient, and absence of physical injuries affecting delirium. Patients with a history of surgery within the last month were excluded from the study.

The instrument used was the Cornell Assessment of Pediatric Delirium (CAPD), which has 2 sections and 4 questions in each section. The Cornell tool uses the

child's observable behavior to assess consciousness and cognition, and a CAPD score of ≥ 9 indicates the presence of delirium in the patient (21, 22). Delirium in children and adolescents was classified into 3 categories: Recovery, meaning positive but improved delirium; continuous, meaning persistent delirium in the patient; and intermittent, meaning periods of positive delirium (20). The Kernel tool was scored by an anesthesiologist once per shift and every 12 hours until the patient was discharged. In all cases, ethical codes were observed in the research. Data analysis was performed in SPSS 16 software.

4. Results

According to the findings (Tables 1 and 2), a total of 75 patients were studied, of which 56% were in the adolescent age range and female gender, 84% had surgery duration less than 45 minutes, and 53.3% were hospitalized due to non-emergency surgeries. The incidence of delirium in patients was 11 (14.7%), which in Table 1 showed that there is a relationship between delirium and gender ($P = 0.003$), type of inpatient ward ($P = 0.02$), surgery duration ($P = 0.02$), coexisting disease ($P = 0.000$), and type of surgery ($P = 0.006$).

According to the findings in Table 2, out of 86 patients studied, 11 patients had delirium and 64 patients did not. It was also related to gender 0.04 [4.16 (1.00 - 17.8)], type of inpatient ward 0.02 [0.27 (0.073 - 1.06)], surgery duration 0.04 [4.00 (0.95-16.79)], and type of surgery 0.006 [0.088 (0.011-0.73)].

5. Discussion

Although intensive care unit admission helps to maintain the health of patients, it also leads to complications in patients (23-26). According to the findings, the incidence of delirium in children and adolescents was 14.7%. This rate was reported as 22% in the meta-analysis study of Erfani et al. (27), 61% in the study of Meyburg et al. (28), 24.4% in ophthalmic surgery in the study of Yu et al., 34.5% in ENT surgery in the study of another source (29), and 27% in the study of Silver et al. (9). According to the findings, factors such as gender, type of inpatient ward, surgery duration, type of surgery, and coexisting disease were associated with delirium. In a meta-analysis study by Zhu et al. in 10 articles with 4343 children admitted to PICU, it was shown that factors effective in causing delirium included developmental delay, duration of hospitalization, mechanical ventilation, and benzodiazepine use (30), which is consistent with the results of this study.

Table 1. Comparison of Demographic Characteristics of Patients in the Two Groups

Variables	No Delirium (N = 64)	Delirium (N = 11)	Overall (N = 75)	P-Value
Age				0.45
Pediatric	27 (42.2)	6 (46.2)	33 (44)	
Adolescent	37 (57.8)	7 (53.8)	42 (56)	
Gender				0.04
Male	25 (39.1)	8 (72.7)	33 (44)	
Female	39 (60.9)	3 (27.3)	42 (56)	
Fever				0.51
Yes	17 (26.6)	6 (46.2)	21 (28)	
No	47 (73.4)	7 (53.8)	54 (72)	
Pain				0.29
Moderate to severe	40 (62.5)	7 (53.8)	45 (60)	
None-mild	24 (37.5)	6 (46.2)	30 (40)	
Type of inpatient ward				0.02
Ward	43 (67.2)	4 (36.4)	47 (62.7)	
PICU	21 (32.8)	7 (63.6)	28 (37.3)	
Surgery duration (min)				0.04
> 45	8 (12.5)	4 (36.4)	12 (16)	
< 45	56 (87.5)	7 (63.6)	63 (84)	
Coexisting disease				0.000
Yes	0 (0)	2 (18.2)	2 (2.7)	
No	64 (100)	9 (81.8)	73 (97.3)	
Type of surgery				0.006
Emergency	34 (53.1)	1 (9.1)	35 (46.7)	
Non-emergency	30 (46.9)	10 (90.9)	40 (53.3)	

Table 2. Predicting Delirium (Multivariable Logistic Regression)

Variables	OR (95% CI)	P-Value
Gender	4.16 (1.00 - 17.8)	0.04
Type of inpatient ward	0.27 (0.073 - 1.06)	0.02
Surgery duration	4.00 (0.95 - 16.79)	0.04
Type of surgery	0.088 (0.011 - 0.73)	0.006

Alvarez et al. conducted a prospective observational study in the CICU over a 10-week period among people aged from birth to 21 years. 89% of patients admitted due to surgery, 57% of patients were mechanically ventilated, and 10 children were intubated after admission. Also, patients aged 6 - 12 years had 13 (13%) and 13 (13%) in the age range of 13 - 21 years, with the overall incidence of delirium in patients being 57% and 31% of patients having a continuous pattern of delirium symptoms. In terms of factors effective in causing this disorder, it was shown that 64% of cases were less than 1 year old, 64% of people had mechanical ventilation, and factors such as male gender, CPB time, primary diagnosis, and benzodiazepines were effective in causing it (20).

In the study by Beshah, 88 children with ENT surgery aged 2 - 12 years were examined for emergence delirium, of which 30 (34.1%) had moderate to severe pain symptoms. Factors such as age, gender, premedication used, and pain were associated with ED. Also, the incidence of PED was 21.6% (31). Studies have been conducted on the incidence of delirium in children with internal diseases and chronic diseases. In the study of Traube et al., who evaluated children with cancer aged 0 - 21 years admitted to the pediatric ward over a 3-month period, the ever-delirious status of the patients was examined. According to the findings, ever delirious was significantly associated with age, DNR status, primary diagnosis, reason for admission, narcotics, postoperative status, GCSF, benzodiazepines, but was

not associated with chemotherapy, anticholinergics, CNS disease, transplant history, and sex (32). The small sample size and lack of diversity in the types of surgeries performed are weaknesses of this study, and further studies are needed in this field.

5.1. Conclusions

Although the incidence of delirium was low in this study, it is necessary to identify factors affecting the occurrence of delirium and to implement interventions to prevent delirium in patients undergoing surgery.

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Footnotes

Authors' Contribution: A. V., G. E., and M. S. conceived the study, performed data analysis, and wrote the manuscript, collected data and wrote the manuscript, interpreted the results and wrote the manuscript, designed the study, wrote, and edited the manuscript.

Conflict of Interests Statement: The authors declared no conflict of interests.

Data Availability: The data presented in this study available for readers upon request.

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Informed Consent: Informed consent was obtained from the parents of the patients.

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