

Validation of Pecarn Clinical Score in Children of Age Less than 6 Years Presenting to Emergency Department with Minor Head Trauma: A Cross Sectional Study

Dr. Vaisakh R Vijay¹, Dr. Jobin Jose M², Dr. Jeevan Jayakumar³, Dr. Jerin Miriam Johnson⁴, Dr. Yasir Sulaiman⁵

Department of Emergency Medicine, Amala Institute of Medical Sciences, Thrissur, India

Abstract: *Introduction:* Head trauma in children is a common reason for medical evaluation in Emergency Department. The PECARN criteria is the most frequently applied guideline in those groups. This study seeks to determine the diagnostic performance of PECARN clinical score. *Methodology:* All PECARN negative children were kept under observation for 6 hours in the ED. During this time they were monitored for symptoms and signs of traumatic brain injury. If any symptoms occur during observation or parents insist for imaging, CT head was taken. Telephonic follow up done after ED discharge, and were asked for symptoms and signs of traumatic brain injury. *Results:* Out of 109 PECARN negative children, CT head was done in 78 children. CT head was normal for 59 children (54.1%). CT brain showed skull fractures/IC bleed among 19 children. Upon 24 hour follow up of the children, six children had symptoms. All other children were asymptomatic after discharge. *Conclusion:* Among 109 PECARN negative children, 19 (17.4%) children had head injury. The PECARN rule successfully identified 90 patients with no clinically - important traumatic brain injuries

Keywords: PECARN Score, Minor Head Trauma

1. Introduction

Blunt head trauma in pediatric age group is a common reason for medical evaluation in Emergency Department (ED). Due to the frequency and clinical importance of minor head trauma in pediatric patients, several studies tried to develop reliable and practical prediction rules aiming to identify patients who have sustained a traumatic brain injury. The PECARN criteria is the most frequently applied guideline. The clinical evaluation of children younger than 6 years old with minor head trauma is a challenge for many clinicians. This results in great variation in practice when deciding whether to obtain a computed tomography (CT) scan, observe, or immediately discharge the patient because the majority of patients have few or subtle signs of traumatic brain injury (TBI). This study seeks to determine the diagnostic performance of PECARN clinical score.

2. Methodology

Study Method: Single centre hospital based cross sectional study

Study Setting: Emergency Department of Amala Institute of Medical Sciences, Thrissur

Study Period: From February 2021 till July 2022

Study Subjects: All PECARN negative minor head trauma patients of age < 6 years admitted to emergency department observation unit of the hospital

Inclusion Criteria:

- All PECARN negative children < 6 years of age

Exclusion Criteria:

- Patients not willing for observation, CT scan
- Patients not able to follow up after multiple attempts over phone

Sampling Method: Consecutive sampling

Sample Size Calculation

$$n = (Z_{1-\alpha/2})^2 \frac{SN(1-SN)}{w^2}$$

α =Significance level

SN=Sensitivity (92.3%)

w=Absolute precision (5%)

$$n = 109$$

Outcome Measures:

- Number of patients who had findings of skull fractures and/or intracranial haemorrhage in CT head
- Number of patients in whom follow up was uneventful

Ethical Issues

Study was done after obtaining permission from Institutional Research Committee

Data Analysis

The data was entered in to the Microsoft excel worksheet and the analysis performed using SPSS 23. Result of continuous measurements are presented on arithmetic mean \pm standard deviation (AM \pm SD) and results on categorical measurements are presented in number (%). Significance assigned at 5% level.

3. Results

Age

The mean age of study participants was 2.89 ±1.37 years. Median age was 3 years. The minimum age was 1 year and the maximum 5 years.

Gender

Of the 109 children, 62 (56.9%) were males

Table 1: Distribution of study participants based on gender

Gender	Frequency		Percent
	Female	47	43.1
Male	62	56.9	
Total	109	100.0	

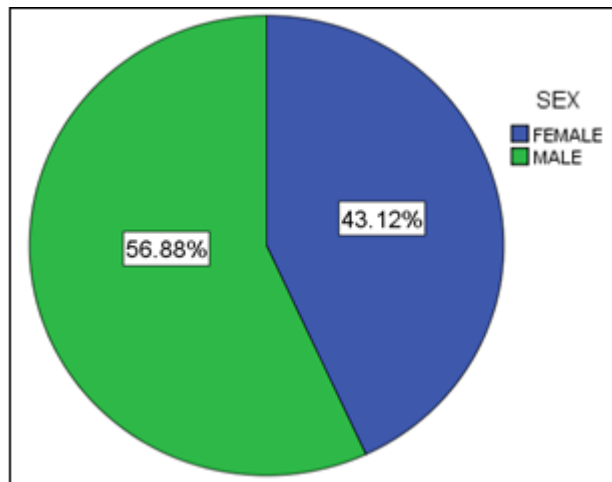


Figure 1: Distribution of study participants based on gender

CT HEAD Findings

The various findings in CT head are shown in table 2

Table 2: CT Head findings in study participants

CT Head findings	Frequency		Percent
	NORMAL STUDY	59	54.1
NOT DONE	31	28.4	
LEFT PARIETAL SDH	2	1.8	
LEFT TEMPORAL BONE FRACTURE	2	1.8	
RIGHT OCCIPITAL BONE FRACTURE	2	1.8	
LEFT TEMPORAL SDH	1	0.9	
LEFT FRONTAL BONE FRACTURE	1	0.9	
LEFT PARIETAL BONE FRACTURE AND EDH	1	0.9	
POSTERIOR FALX CEREBRI SDH	1	0.9	
LEFT TEMPORAL EDH	1	0.9	
RIGHT OCCIPITAL BONE FRACTURE EXTENDING TILL FORAMEN MAGNUM	1	0.9	
RIGHT PARIETAL BONE FRACTURE	1	0.9	
RIGHT SIDE EDH, RIGHT FRONTAL BONE FRACTURE	1	0.9	
RIGHT TEMPORAL BONE FRACTURE	1	0.9	
RIGHT TEMPORAL EDH	1	0.9	
RIGHT TEMPORAL SDH	1	0.9	
TENTORIUM CEREBRI SAH	1	0.9	
THIN EXTRA AXIAL HEMORRHAGE IN RIGHT PARITAL CONVEXITY	1	0.9	
Total	109	100.0	

Follow up

24 hour follow up

Upon 24 hour follow up of the children, three were found to have vomiting and three were had incessant cry. All other children were asymptomatic after discharge.

Table 3 and figure 2 depict the details

Table 3: Condition of children upon 24 hour follow up

Child Condition upon 24 hour follow up	Frequency	Percentage
Stable, no complaints	103	94.5
Incessant cry	3	2.75
Vomiting	3	2.75
Total	109	100

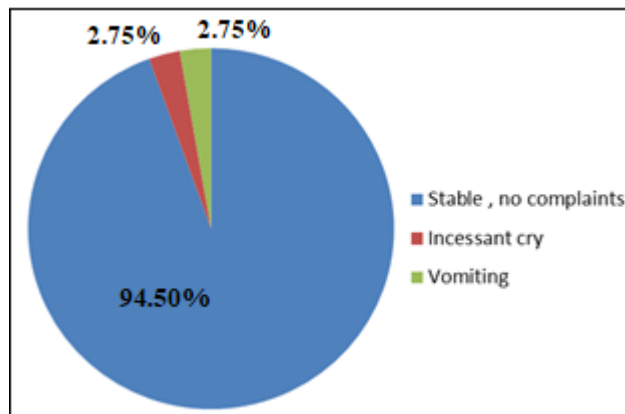


Figure 2: Condition of children upon 24 hour follow up

7 day and 30 day follow up

On following up on the 7th day and 30th day, it was observed that none of the children were having any complaints and all were stable.

Head injury

At the end of evaluation, 19 (17.4%) children were had head injury as shown in table 4.

Table 4: Details of head injury confirmed

	Frequency		Percent
	Head injury	Absent	90
Present		19	17.4
Total		109	100.0

4. Discussion

Out of 109 children studied, a majority were males and median age was 3 years. CT brain was normal in 59 children (54.1%) and in 31 children (28.4%) CT brain was not performed as they were asymptomatic during observation period. CT brain showed skull fractures/IC bleed in 19 children. During the first 24 hour follow up, 3 children had complaints of vomiting and other 3 had complaints of incessant cry. All other children were asymptomatic. During 7 day and 30 day follow up, no child had any symptoms. At the end of evaluation, it was found that 19 children had head injury even though they were PECARN score negative.

5. Conclusion

Among 109 PECARN negative children, 19 (17.4%) children had head injury. The PECARN criteria successfully identified 90 patients with no clinically - important traumatic brain injuries. However PECARN criteria could not identify those 19 children with traumatic brain injury and the accuracy of identifying patients without traumatic brain injury is 82.56% in this study. However, more studies with larger sample size, across multiple centres would be necessary to assess the accuracy of PECARN criteria.

References

- [1] Homer CJ, Kleinman L. Technical report: minor head injury in children. *Pediatrics*.1999 Dec; 104 (6): e78. doi: 10.1542/peds.104.6. e78. PMID: 10586012.
- [2] Mastrangelo M, Midulla F. Minor head trauma in the pediatric emergency department: Decision making nodes. *Curr Pediatr Rev* [Internet].2017 [cited 2022 Oct 8]; 13 (2): 92–9. Available from: <http://www.eurekaselect.com/article/82626>
- [3] Dietrich AM, Bowman MJ, Ginn - Pease ME, et al. Pediatric head injuries: can clinical factors reliably predict an abnormality on computed tomography? *Ann Emerg Med* 1993; 22: 1535.
- [4] Quayle KS, Jaffe DM, Kuppermann N, et al. Diagnostic testing for acute head injury in children: when are head computed tomography and skull radiographs indicated? *Pediatrics* 1997; 99: E11.
- [5] Schunk JE, Rodgerson JD, Woodward GA. The utility of head computed tomographic scanning in pediatric patients with normal neurologic examination in the emergency department. *Pediatr Emerg Care* 1996; 12: 160.
- [6] Gruskin KD, Schutzman SA. Head trauma in children younger than 2 years: are there predictors for complications? *Arch Pediatr Adolesc Med* 1999; 153: 15.

- [7] Traumatic brain injury [Internet]. Nih. gov. [cited 2022 Oct 8]. Available from: <https://www.ninds.nih.gov/health-information/disorders/traumatic-brain-injury>
- [8] Centers for Disease Control and Prevention. Injury prevention & control: traumatic brain injury & concussion [accessed 2016 Jan 22] <http://www.cdc.gov/traumaticbraininjury/data/rates.html>.
- [9] Levin HS, Shum D, Chan RC. Understanding traumatic brain injury: current research and future directions. New York (NY): Oxford University Press; 2014
- [10] Rutland - Brown W, Langlois JA, Thomas KE, Xi YL. Incidence of traumatic brain injury in the United States, 2003. *J Head Trauma Rehabil*.2006; 21 (6): 544