



Original Article

Evaluation of BATiCH Score for the management of Paediatric Blunt Abdominal Trauma

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Abstract

Introduction: Blunt abdominal trauma is a frequent reason for hospital admission and a significant cause of death in children. Early diagnosis is important to reduce the mortality and morbidity. Computed tomography (CT) scan is currently the best diagnostic, but due to the cost and availability of CT scan, a non-invasive scoring system calculated using readily available parameters such as physical examination findings, abdominal ultrasound, and routine laboratory parameters may be useful. The aim of the study was to evaluate the association of Blunt Abdominal Trauma in Children (BATiCH) score between conservative and operatively treated patients of paediatric blunt abdominal trauma.

Methods: It was a hospital based prospective comparative observational study carried out in Paediatric Surgery Department of Chittagong Medical College Hospital (CMCH) from June 2021 to September 2023. Patients with blunt abdominal trauma were enrolled prospectively as per set inclusion and exclusion criteria. Physical examination findings, abdominal ultrasound, and routine laboratory profile were recorded. Patients were discharged when discharge criteria were achieved, and they were followed up for 1 month after discharge. BATiCH score was compared between patients who

needed laparotomy and those who were treated conservatively.

Results: Mean $\pm$ SD BATiCH score was 8.74 ± 3.324 in conservative treatment group and 15.25 ± 2.315 in surgical treatment group ($p < 0.001$). Median (IQR) length of hospital stay was 5 (4-8) days in conservative treatment group and 20 (12.5-25.5) days in surgical treatment group ($p < 0.001$). The length of hospital stays (days) of the patients according to BATiCH score ≤ 7 and > 7 . Median (IQR) length of hospital stay was 4 (3-6.25) days in patients with BATiCH score ≤ 7 and 7.5 (5-12) days patients with BATiCH score > 7 ($P = 0.001$)

Conclusion: BATiCH score was significantly greater in patient who needed laparotomy after blunt abdominal trauma than those of patient, treated conservatively.

Key words: Blunt abdominal trauma, Children, BATiCH score, conservative treatment, laparotomy

Introduction

Trauma is one of the leading causes of childhood mortality. More than 20 million children are injured each year globally and unintentional injury is the leading cause of death for children in all age groups over 1 year of age. Blunt abdominal trauma is a frequent cause for the presentation of children to the Emergency Department. Children are prone to sustain injuries to intra-abdominal organs after blunt abdominal trauma because of their different anatomy and relatively immature musculoskeletal system.¹ The presence of multiple scoring systems for assessing injured children helps in categorizing blunt abdominal traumas (BAT), and such scoring systems have made it easy to predict patients who need rapid intervention.² Among children, the computed tomography (CT) scan is considered by many of the criteria standard for assessing intra-abdominal injury in hemodynamically stable patients.³ CT scan however has multiple

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disadvantages.⁴ Karam and Sanchez proposed a score, Blunt Abdominal Trauma in Children (BATiCH) score, that would allow ruling out of significant intra-abdominal organ injuries following blunt abdominal traumas (BAT) that can be a helpful adjunct in the assessment of the presence of abdominal trauma in children and can help to determine which patients might benefit from a computed tomographic scan and/or further treatment and which might not.^{5,6} The present study was designed to find out the association of this score between patients who needed laparotomy and those who were treated conservatively for blunt abdominal trauma.

Material and Methods

It was a hospital-based prospective comparative observational study carried out in the Department of Paediatric Surgery, Chittagong Medical College Hospital, Chattogram, Bangladesh from June 2021 to September 2023 after approval from the Ethical Committee (CMC/PG/2022/876). Children below 12 years of age with blunt abdominal trauma admitted to the Paediatric surgery ward were enrolled consecutively. Patients with blunt abdominal trauma with a history of laparotomy done elsewhere were excluded. Ten parameters with the best negative predictive values were used to build BATiCH score. The following points were attributed for these items: abnormal abdominal ultrasound (4 points), abdominal pain (2 points), peritoneal irritation (2 points), hemodynamic instability (2 points), aspartate aminotransferase >60 IU/L (2 points), alanine aminotransferase >25 IU/L (2 points), white blood cell count (1 point), $> 9.5 \times 10^3$ /cumm, LDH >330 IU/L (1 point), lipase >30 IU/L (1 point), and creatinine >50 $\mu\text{g/L}$ (1 point).

The general objective was to assess the usefulness of the BATiCH scoring system in the management of patients with paediatric blunt abdominal trauma. The specific objectives were to compare the BATiCH score between conservative and operatively treated patients of paediatric blunt abdominal trauma and compare the length of hospital stay and mortality.

After admission, clinical assessment (Pulse, Blood pressure, Temperature, Respiratory rate, GCS, hemodynamically stability, sign symptoms of peritoneal irritation) was done and the following

investigations were performed (initial workup): Abdominal Ultrasonography, AST (aspartate aminotransferase), ALT (alanine aminotransferase), LDH (lactate dehydrogenase), serum Lipase, Complete blood count (white blood cell count), Serum Creatinine. The patient was discharged after fulfillment of discharge criteria (feels well, afebrile for 24 hours, regular normal bowel movement, tolerating oral feeding for 24 hours, normal vitals parameter). All patients in the study were monitored until discharge or death to observe the outcome. Patients were followed up 1 month from discharge.

All relevant data were recorded on a pre-tested data sheet after getting informed written consent for the study. Normally distributed data are presented as mean $\pm$ SD and skewed data are presented as median and interquartile range (25%–75%). Between these groups, continuous (age, length of hospital stay, BATiCH score) and categorical variables (sex, period of occurrence of trauma, complication, solid organ injury, PICU referral, mortality, types of treatment conservative vs laparotomy) were analyzed. Student's t-test was used to analyze normally distributed continuous variables, while the Mann–Whitney U-test was used for skewed distributed continuous variables. Categorical variables were compared using the Chi-square test. $P < 0.05$ was considered statistically significant. Statistical analysis was performed using SPSS 25.0 software (IBM Inc., New York, USA).

Results

Among a total of 42 patients, 34 were treated conservatively, and 8 needed laparotomies. The mean age in the conservative group was 07.16 ± 03.19 years vs 07.87 ± 03.75 years in the surgery group. 70.6% were male in the conservative group and 50% were male in the surgery group.

Most of the injuries were due to road traffic accidents and falls from height (Table 1). Battery rickshaw was the largely affected vehicle and tree were the place from where fall from height occurred mostly. From 6 AM to 6 PM was the vital time for maximum injuries. Road was the main place of accidents. Some associated injuries were found in both treatment groups of patients. The difference was statistically not significant ($p > 0.05$) among the treatment groups.

Table 1: Injury details of two treatment groups (n=42)

	Conservative Group n (%)	Surgery Group n (%)
Mechanism of injury		
Road Traffic Accident	21 (61.8%)	04 (50.0%)
Fall from height	10 (29.4%)	02 (25.0%)
Fall of heavy object	02 (05.9%)	01 (12.5%)
Assault	01 (02.9%)	01 (12.5%)
Vehicle type (n=26)		
Battery Rickshaw	13 (61.9%)	02 (40.0%)
CNG/ Three wheelers	03 (14.3%)	01 (20.0%)
Motor vehicle	04 (19.0%)	01 (20.0%)
Others	01 (04.8%)	01 (20.0%)
Fall from height (n=12)		
From tree	05 (50.0%)	02 (100%)
From building/structure	04 (40.0%)	00 (00%)
Same level-slipping/stumbling	01 (10.0%)	00 (00%)
Time of occurrence		
12 PM-6 PM	20 (58.8%)	04 (50.0%)
6 PM-12 AM	03 (08.8%)	01 (12.5%)
12 AM-6 AM	02 (05.9%)	01 (12.5%)
6 AM-12 PM	09 (26.5%)	02 (25.0%)
Place of occurrence		
Home	06 (17.6%)	01 (12.5%)
Road	22 (64.7%)	04 (50.0%)
Play ground	01 (02.9%)	01 (12.5%)
Tree	05 (14.7%)	02 (25.0%)
Associated injury		
Present	16 (47.1%)	02 (25.0%)
Absent	18 (52.9%)	06 (75.0%)

ns= not significant; P value reached from Chi-square test

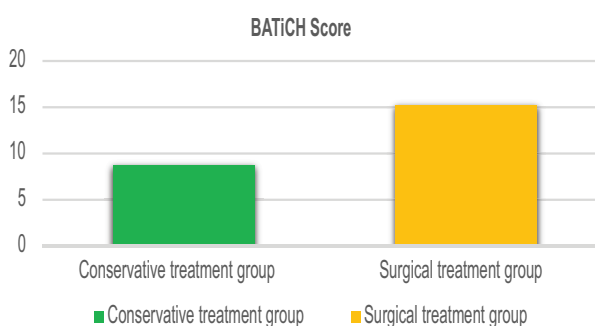
In conservative treatment group, 29 (85.3%) patients had no organ injury (table II). On the other hand, in surgical treatment group, each patient had some organ injury. Statistically highly significant ($p < 0.001$) difference was found between the groups concerning organ injury. But in case of complications, maximum patients of both groups had no complications ($p > 0.05$).

Table 2: Distribution of organ injury and complications of two study groups (n=42)

	Conservative Group n (%)	Surgery Group n (%)
Organ injury		
Absent	29 (85.3%)	0 (0.0%)
Stomach	0 (0.0%)	01 (12.5%)
Small gut	0 (0.0%)	02 (25.0%)
Liver	02 (5.9%)	02 (25.0%)
Kidney	02 (5.9%)	01 (12.5%)
Small & Large gut	0 (0.0%)	01 (12.5%)
Liver & Spleen	01 (2.9%)	0 (0.0%)
Others	0 (0.0%)	01 (12.5%)
Complications		
Absent	30 (88.2%)	06 (75.0%)
Infection	04 (11.8%)	02 (25.0%)

ns= not significant; hs= highly significant
P value reached from Chi square

The mean $\pm$ SD BATiCH score was 8.74 ± 3.324 in the conservative treatment group and 15.25 ± 2.315 in the surgical treatment group (Figure 1). The p-value shows a statistically highly significant difference between the treatment groups ($p < 0.001$).

**Figure 1: Mean $\pm$ SD BATiCH Score of the treatment groups (n=42)**

Median (IQR) length of hospital stay was 5 (4-8) days in conservative treatment group and 20 (12.5-25.5) days in surgical treatment group (Figure 2). According to p value, statistically highly significant difference was found between the study groups ($p < 0.001$).

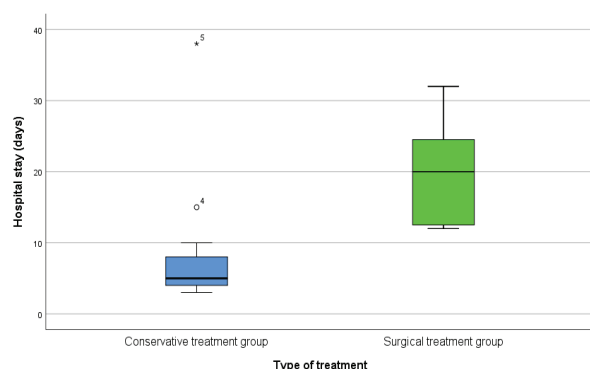


Figure 2: Length of Hospital stay of the patient groups (n=42)

Median (IQR) length of hospital stay was 4 (3-6.25) days in patients with BATiCH score ≤ 7 and 7.5 (5-12) days patients with BATiCH score > 7 (figure 3). According to p value, statistically highly significant difference was found ($p=0.001$).

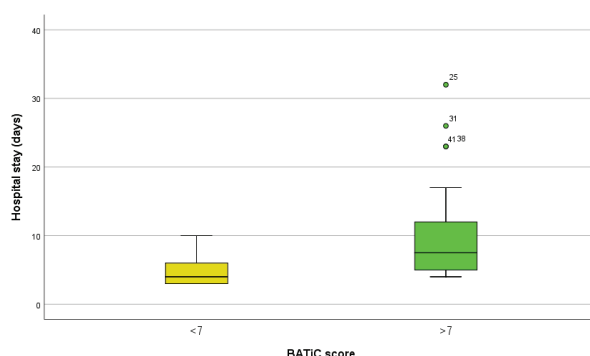


Figure 3: Length of Hospital stay of the patients according to BATiCH score (n=42)

Discussion

Trauma is a condition that is time sensitive. Assessment, resuscitation, and definitive care are crucial, especially in the first hour of trauma management. There is evidence that earlier decisive care in trauma centers reduces mortality and patient suffering.² The BATiCH score was based on the original score by Karam et al. designed to rule out abdominal injury.⁵ The present study reveals that the BATiCH score was significantly greater in patients who needed laparotomy after blunt abdominal trauma than in patients treated conservatively.

In this study, the mode of injury was road traffic accident in the majority of cases (61.8%), followed by fall from height (29.4%). Chowdhury et al. found that the most common mechanisms of abdominal

injuries were also RTA (42.86%), fall (26.53%), and "stab or cut injury" (18.37%).⁷ Another study by Qadri et al. narrated that road traffic accidents [52 (54.16%)] and falls from height [40(41.66%)] were the most common mode of injury observed in both male and female children that led to paediatric trauma.⁸ It indicates that there is a lack of safety precautions in daily life and during movement in the paediatric age group.

Concerning the time of presentation after trauma of the patients shows majority of the patients came after the golden time of trauma. In the conservative treatment group, 21 (61.8%) patients, and in the surgical treatment group, 6 (75.0%) patients came to the hospital after > 6 hours of trauma. There was no statistically significant ($p=0.734$) difference between the groups regarding time of presentation after trauma. As this center is a tertiary care center, many of the cases were referred from other primary, and secondary care centers this explains the reason for some delays. However, this type of outcome indicates that appropriate trauma management facilities are lacking in the locality and the injured patient had to travel a long distance to reach the appropriate trauma care center. There is a need for more trauma care centers in this country.

In this study, the mean $\pm$ SD BATiCH score was 8.74 ± 3.324 in the conservative treatment group and 15.25 ± 2.315 in the surgical treatment group. The p-value shows a statistically significant difference between the treatment groups ($p<0.001$). Similarly, their study by de Jong et al. found median BATiCH scores of patients with and patients without intra-abdominal injury were 9.2 (range, 6.6-15.4) and 2.2 (range, 0.0-10.6) respectively ($p < 0.001$).⁶ This high BATiCH score indicates significant intraabdominal trauma which might need surgery. Hence the BATiCH score can be a dependable tool for the assessment of trauma severity and the need for surgery in paediatric blunt abdominal trauma

Regarding the length of hospital stay of the patients between the treatment groups. The median (IQR) length of hospital stay was 5 (4-8) days in the conservative treatment group and 20 (12.5-25.5) days in the surgical treatment group. A statistically significant difference was found between the study groups ($p<0.001$). De Jong et al. also stated that abdominally injured patients stayed in the hospital for a longer period (9.1 days [0-93 days] vs. 1.9 days [0-

89.5 days], $p < 0.01$).⁶ So more BATiCH scores indicate more prone to hospital stay.

In this study, there is no event of PICU admission, readmission, or conversion to surgical procedure. BATiCH score seems to be a useful tool in the management of blunt trauma abdomen in paediatric age.

This study had some limitations such as; ultra sonographies were performed by multiple operators, surgery was done by multiple surgeons, laboratory tests were done by different laboratories, severity of organ injuries were not evaluated and there was no comparison to other scoring system.

Conclusion

BATiCH score is significantly greater in patients who need laparotomy after blunt abdominal trauma than in patients treated conservatively, which can help determine treatment approach whether conservative or operative in blunt trauma abdomen of the paediatric age group. Moreover, this may help to predict the probable hospital stay whether prolonged or short duration, and may help in the counseling and clinical management of paediatric blunt abdominal trauma patients.

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