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Original Article

The Effect of Implementing Evidence-Based Care Bundle on Traumatic Brain Injury Patients' Physiological Parameter

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1.ABSTRACT

Background: Traumatic brain injury (TBI) is a prominent cause of death and disability globally, with long-term consequences. For the millions of TBI survivors, the implementation of new guidelines for neuroprotection and restoration may enhance TBI patient outcomes. **Aim**: This study aimed to assess the effect of care bundle implementation on TBI patients' physiological parameters. **Method**: A quasi-experimental design was used to conduct this study in the emergency department of the Emergency Hospital at Mansoura University. A sample of 52 patients was randomly assigned to the bundle group (n = 26) or the control group (n = 26). The bundle group received the bundle and the control group received routine care. Data were collected using traumatic brain injury patients' outcome tool. **Results**: The findings showed improvement in the bundle group patients' physiological parameters, but not statistically significant, except for oxygen saturation (P= 0.049). **Conclusion:** The application of the evidence-based care bundle can improve TBI patients' physiological parameters. **Recommendations:** Nurses in emergency departments can integrate this bundle into TBI patient care. Moreover, assessment of the long-term impact of this bundle in intensive care units and rehabilitation centers is urged.

Key words: Evidence-based care bundle, Physiological parameters, Traumatic brain injury

2.Introduction:

Traumatic brain injury (TBI) is a prominent cause of death and disability globally **(Dewan et al, 2019)**. It is associated with lifetime consequences involving cognitive deficiencies and physical, emotional, and behavioral problems. Every day, about 165 people die as a result of TBI in the United States **(Centers for Disease Control and Prevention [CDC], 2021)**. In England, it affects 22.1 per 1000 people yearly **(Gerritsen, Samim, Peters, Schers & van de Laar, 2018).** It primarily affects young males from traffic accidents **(Okidi et al., 2020).** In 2016, it was reported in 262 264 Egyptians **(GBD 2016 Traumatic Brain Injury and Spinal Cord Injury Collaborators, 2019)**. According to **Taha and Barakat (2016)**, 20.3% of 2124 TBI patients had severe injuries.

A traumatic brain injury is "a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head, or a penetrating head injury" **(CDC, 2021, P.1)**. It can be classified using the Glasgow coma score (GCS) as mild (13-15), moderate (9–12), and severe, which ranges from 3 to 8 **(Okidi et al., 2020)**. The symptoms of TBI can range from temporary loss of consciousness to severe, irreversible brain damage **(American Academy of Family Physicians, 2020)**. Management can be difficult if symptoms that develop after the injury are not identified **(Valente & Fisher, 2011)**.

For the millions of TBI survivors, a greater knowledge of damage mechanisms and new guidelines for neuro-protection and restoration may enhance TBI patient outcomes **(Stocchetti & Zanier, 2016)**. Management of TBI patients places a significant load on emergency services because more than 40% of patients' mortality occurs within the first 24 hours after injury **(Vigué, Matéo & Ghout, 2012)**. Therefore, emergency care should be the main focus of management to decrease the mortality rate in emergency settings **(Obermeyer et al., 2015)**.

Damkliang, Considine, Kent, and Street (2014) found that there are no particular evidence-based practice recommendations available for the emergency nursing treatment of patients with severe TBI. So the authors *developed an evidence-based care bundle for TBI patient care. The term bundle is defined as "a structured way o*f improving the processes of care and patient outcomes: a small, straightforward set of evidence-based practices—generally, three to five—that, when performed collectively and reliably, have been proven to improve patient outcomes" **(Institute for Healthcare**

Improvement, 2022, P1). The integration of care bundles in emergency management has been found to improve patient clinical outcomes **(Hortmann, Heppner, Popp, Lad & Christ, 2014)** and lower the death rate (**Viale et al., 2015**).

The TBI evidence-based care bundle is the initial emergent nursing care that focuses on the identification of TBI by assessing the patient's conscious level. It includes interventions that maintain the airway with an endotracheal tube *and* protect the C-spine, and ensure proper oxygenation (partial pressure of O_2 greater than 60 mmHg) and systolic blood pressure (SBP) greater than 90 mmHg. It also involves inserting peripheral venous access, monitoring heart rate (HR), oxygen saturation (SPO_2) using a pulse oximeter, measuring end-tidal CO_2 ($ETCO_2$) using a chronograph, and computerized tomography (CT) scanning **(Damkliang et al., 2015; Varghese, Chakrabarty & Menon, 2017)**.

The physiologic criteria can help healthcare providers identify TBI patients quickly and evaluate their condition by assessing vital signs **(Pearson, Ovalle, Faul & Sasser, 2012)**. The HR and the respiratory rate (RR) are significant parameters to assess the patients' circulatory outcome. As well, monitoring arterial blood pressure is an early indicator of sufficient fluid resuscitation **(Varghese et al., 2017)**. Hypoxia and hypotension in TBI patients were highly associated with their outcome and could be used as TBI patients' outcome predictors **(Okidi et al., 2020)**.

Significance of the Study

Road traffic accidents (RTAs), which are the main cause of TBI in Egypt **(Alshaimaa, Sultan, Zakaria & Elshehawi, 2018)**, are still happening at a higher rate **(Central Agency for Public Mobilization and Statistics [CAPMAS], 2020)**. Thus, comprehensive healthcare management across the whole chain of the brain trauma process involving emergency care is critical for a better outcome **(Pélieu, Kull & Walder, 2019)**. The evidence suggests that different bundles of care application in the emergency department (ED) facilitate patients' care **(McCarthy et al., 2013)**, improves their clinical outcomes (**Ladbrook, Khaw, Bouchoucha, & Hutchinson, 2021**), and reduces mortality rate (**Viale et al., 2015**).

The TBI care bundle is not yet used in most Egyptian hospitals, despite the availability of equipment needed for its implementation. In addition, research that investigated the effect of this bundle on the patients' outcomes is scarce, particularly in Egypt. This inspired us to conduct this study.

Research Aim

The present study aimed to assess the effect of care bundle implementation on TBI patients' physiological parameters.

Research Hypothesis

Patients who get the care bundle will have better physiological parameters than patients who get routine emergency hospital care.

3.Method

Research Design

A quasi-experimental-two group pre/post design was used in this study. This design examines the effect of one or more independent variables on the dependent variables with no or slight randomization **(Handley, Lyles, McCulloch, & Cattamanchi, 2018; Polit & Beck, 2020)**.

Setting

The study was carried out in the ED of Mansoura University Emergency Hospital. It includes two rooms: an accident resuscitation room and a medical resuscitation room. The nurse-to-patient ratio is 1:2 in both rooms.

Sample

This study included a convenience sample of 52 patients aged more than or equal 18 years with GCS less than or equal to 12. Patients who had cardiovascular, metabolic, neurological disorders, and addictive cases were excluded.

Sample size calculation

Power analysis and sample size software was used to calculate the sample size. The calculations were based on a prior study by **Damkliang et al. (2015)**. The authors implemented a care bundle for TBI patients and found that there were improvements in their outcomes. With one striking difference, transfer to the ICU was 5% in the control group and 36% in the research group. There was no mortality in the study group, whereas the control group had a 10% mortality rate. As a result, the control group sample size of 26 and the bundle group sample size of 26 provide 85% power to detect a 0.3100 difference in group proportions. The two-sided Z-test with pooled variance was used and achieved a significance level of 0.0164.

Data Collection Tool

One tool was used to collect the data developed by the primary researcher (PR) based on reviewing relevant literature **(Damkliang et al., 2015; Froutan et al., 2020; Pearson et al., 2012)**.

Traumatic Brain Injury Patients' Outcome Tool

It involved two parts:-

Part I: Patient's Socio-Demographic and Health Relevant Data

This section covers patients' personal data on admission involving age, gender, admission date, GCS **(Teasdale & Jennett, 1974)**, Revised Trauma Scale **(Champion et al., 1989)**, mechanism of injury, and type of trauma.

Part II: Patients' Physiological Parameter Record

This section addresses the effect of implementing the evidence-based care bundle on the physiological parameters of TBI patients. These parameters encompassed HR, RR, SBP, diastolic blood pressure (DBP), MAP, SPO_2, and $ETCO_2$.

Validity and Reliability

Five professionals in Critical Care and Emergency Nursing, and Medicine evaluated the tool's content validity. Their suggestions and modifications were considered. The inter-observer reliability of the tool (the PR and emergency health care provider measured the same item at the same time and their results were compared) was determined using the intraclass correlation coefficient test. The result was 0.99 with a P-value of < 0.001, which indicates both observers' perfect agreement.

Pilot Study

A pilot study was carried out in September 2019 including six patients (10% of the total sample) from the study setting to test the clarity, feasibility, and applicability of the data collection tool. Those patients were excluded from the main study sample.

Ethical Considerations

The Research Ethics Committee of Faculty of Nursing, Mansoura University granted ethical permission for this study. The patient's next of kin were informed about the details of the study. They were informed that participation in the study was entirely voluntary and that they had the right of allowing or disallowing their patients to participate. They were also told that they have the right to terminate their patients' participation at any stage. Furthermore, they were guaranteed that their patient's data would be kept confidential because there would not be any link between the patient's name and the published data.

Data collection process

Data collection started in October 2019 and completed in May 2020It involved three stages as follows:

Preparation stage

The emergency hospital's administrative authorities gave their official approval to the PR to carry out the study. The data collection tool and the written informed consent were prepared. The tool's validity and reliability was tested. Some of the nurses who were responsible for TBI patients' care were chosen and educated about the evidence-based care bundle. They were trained on the bundle implementation in one orientation meeting and two educational meetings, each meeting took around 40 minutes.

Intervention stage

All patients presented to the ED were screened to ensure that they were free from exclusion criteria at this stage. Section I of the tool was used to collect demographic and health-related data from patients. Patients were randomly assigned into two groups using a lottery randomization procedure. The care bundle was demonstrated immediately for the bundle group after they were presented to the ED. This bundle was adopted from **Damkliang et al. (2014)**, which presented in figure1. Demonstration of the bundle for every patient ranged between 45 and 120 minutes. This variation in the duration of bundle application is owing to the availability of performing CT scan. The control group received routine emergency nursing care, which involved: connecting a cardiac monitor, performing endotracheal intubation if necessary, applying a neck collar, administering IV fluids to the patient, and doing a CT scan

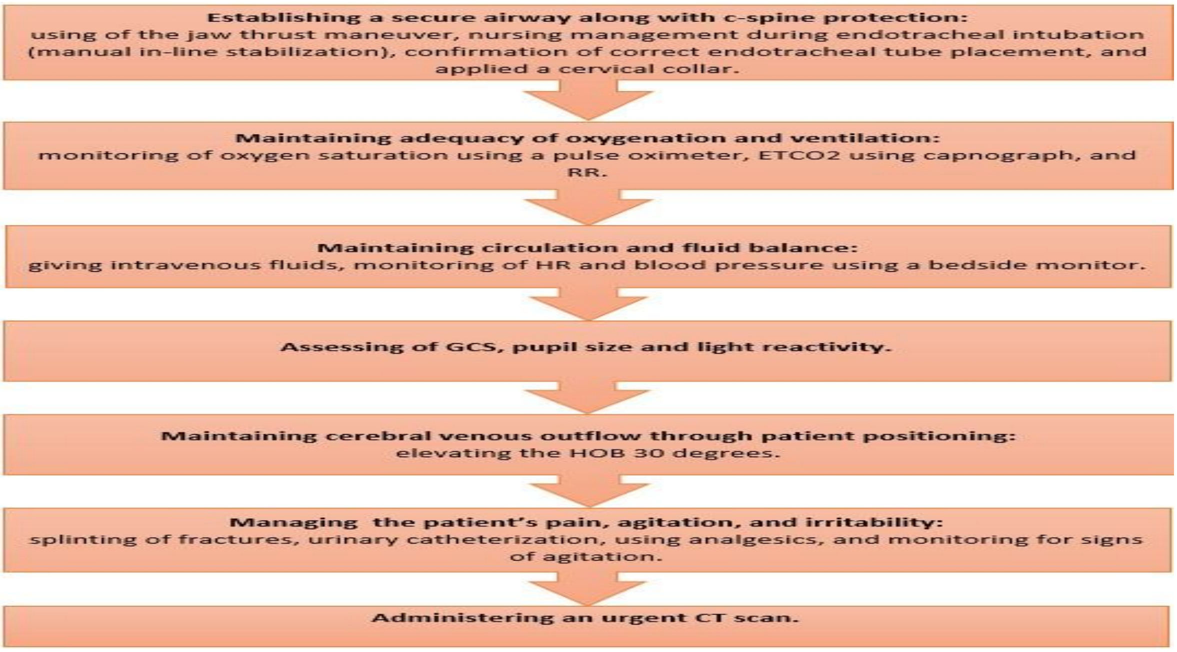

Figure 1. The Evidence-Based Care Bundle

Evaluation phase

During this phase, patients' physiological parameters, including HR, SBP, DBP, MAP, SpO_2, and $ETCO_2$ were measured for the total sample using section II of the tool. These variables were immediately monitored when the bundle was implemented for the bundle group or routine hospital care for the control group. The RR was excluded from the physiological parameters assessment after patient admission as all patients were manually ventilated by the manual resuscitation bag. There were no mechanical ventilators available in the ED.

Data Analysis

The Statistical Package of Social Sciences (SPSS) version 25 was used to enter and analyze the data. Frequencies (n) and percentages (%) were used to express qualitative data. The mean and standard deviation (SD) were used for normally distributed quantitative data, while the interquartile range (IQR) was used for quantitative data that was not normally distributed. The Chi-Square test or Fisher's exact test were used to compare the qualitative data of the two groups. On the other hand, the means of the two groups were compared using the Z-test. For comparing quantitative, normally distributed data of the two groups, the independent-Samples t-test was employed, and for not normally distributed data, the Mann-Whitney-U test was used.

A single continuous dependent variable was compared between two groups with two readings (pre/post intervention) in each group using one-way analysis of covariance (ANCOVA). If the p-value for any of the tests used was ≤ 0.050, the results were considered statistically significant.

4.Results

Table 1 presents the demographic characteristics of the studied sample**.** The results revealed that more than half of the patients in studied sample have age ranged between 30-50 years old. The majority (84.6%) of the bundle group and 69.2% of the control group were males. Only half of the patients in the bundle group were married compared to 80.8% in the control group. However, a highly statistically significant difference (p = 0.0006) was noted in marital status between the two groups. Additionally, 61.5 % of both groups were employed. No statistically significant differences were detected between both groups regarding age, gender, or occupation (p = 0.535, 0.188 &1.000 respectively) indicating the similarity of the studied groups before the intervention.

Table 2 shows the health profile data of the studied groups**.** The results exhibited that 61.5% of the bundle group and 69.2% of the control group had a single trauma. Moreover, 69.2% of the bundle group compared with 88.5% of the control group had TBI as a result of RTAs. Most of the bundle and control groups (80.8% & 76.9%, respectively) had no co-morbidities. Additionally, 73.1% of the bundle group and 57.7% of the control group were categorized according to the revised trauma scale as patients needed immediate care. According to the GCS categories, 67.9% of the bundle group compared with 57.7% of the control group had a severe TBI. No statistically significant differences were noted between the studied groups regarding their health profile data

Table 3 compares the physiological parameters of the studied groups. A statistically significant difference was found between the studied groups regarding the SPO_2 ($P < 0.001$) on admission and follow-up. However, no statistically significant differences were detected between both groups as regards the $ETCO_2$, SBP, DBP, MAP, and HR. Nevertheless, the mean of physiological parameters in the bundle group was better than the mean of the control group on follow-up concerning the $ETCO_2$, SBP, DBP, MAP and HR compared with the mean on admission.

Table 1 *Demographic Characteristics of the Studied Groups*

Variables	(n=52)		Significance test	
	Bundle Group n=26 N *(%)*	Control Group n=26 N *(%)*	χ^2	*P*-value
Age categories				
• 18 - 30 years	7 (26.5%)	4 (15.4%)	χ^2=1.250	0.535
• >30 – 50 years	15 (57.7%)	16 (61.5%)		
• >50 years	4 (15.4%)	6 (23.1%)		
Gender				
• Male	22 (84.6%)	18 (69.2%)	χ^2= 1.733	0.188
• Female	4 (15.4%)	8 (30.8%)		
Marital status				
• Single	13 (50%)	3 (11.5%)	*FET*	**0.0006**
• Married	13 (50%)	21 (80.8%)		
• Widow	0 (0%)	1 (3.8%)		
• Divorced	0 (0%)	1 (3.8%)		
Occupation				
• Employed	16 (61.5%)	16 (61.5%)	*FET*	1.000
• Unemployed	8 (30.8%)	8 (30.8%)		
• Retired	2 (7.7%)	2 (7.7%)		

Data are expressed as numbers (N) and frequency (%). $\chi 2$: Chi-square test, FET: Fissure Exact Test, *p* is significant if ≤ 0.05.

Table 2 *Health Profile Data of the Studied Groups*

Variables	(n=52)		Significance test	
	Bundle Group N. (%)	Control Group N. (%)	Z / χ^2	*P* value
Trauma type				
• Single	16 (61.5%)	18 (69.2%)	χ^2 = 0.340	0.560
• Multiple	10 (38.5%)	8 (30.8%)		
Mechanism of injury				
• RTA	18 (69.2%)	23 (88.5%)	*FET*	0.173
• Assault	1 (3.8%)	0 (0%)		
• Fall	7 (26.9%)	3 (11.5%)		
Presence of co-morbidities				
• No	21 (80.8%)	20 (76.9%)	χ^2 = 0.115	0.734
• Yes	5 (19.2%)	6 (23.1%)		
RTS Median (IQR)	9.5 (9-11)	10 (9-11)	*Z* = -1.325	0.185
RTS categories				
• Urgent	7 (26.9%)	11 (42.3%)	χ^2 = 1.359	0.244
• Immediate	19 (73.1%)	15 (57.7%)		
GCS Median (IQR)	6 (4-8.5)	7 (5-12)	*Z* = -1.432	0.152
GCS categories				
• Moderate	6 (23.1%)	11 (42.3%)	χ^2 = 2.185	0.139
• Severe	20 (76.9%)	15 (57.7%)		

Data are expressed as numbers (N) and frequency (%). Z: Mann-Whitney, $\chi 2$: Chi-square test, FET: Fissure Exact Test, RTA: Road traffic accident, RTS: Revised trauma score, IQR: inter Quartile Rate, GCS: Glasgow coma score, *p* is significant if ≤ 0.05.

Table 3 *Comparing the Physiological Parameters Between the Studied Groups*

Variables	*On admission*				*On follow-up*			
	Bundle Group *n=26*	**Control Group** *n=26*	**Significance test**		**Intervention group** *n=26*	**Control Group** *n=26*	**Significance test**	
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	*T*	*P-value*	$\bar{X} \pm SD$	$\bar{X} \pm SD$	*t*	*P-value*
SPO_2	93.5 ± 9	94.8 ± 8.9	-0.528	*0.600*	98.7 ± 1.6	92.2 ± 12.9	2.540	***0.017***
P value **<0.001**								
$ETCO_2$	29.4 ± 4.8	29.6 ± 5.9	-0.084	*0.934*	32.1 ± 5	30.5 ± 5.9	0.835	0.410
P value = 0.196								
SBP	124.3 ± 25.4	126.4 ± 27.6	-0.283	0.779	126.3 ± 19.1	124 ± 24.2	0.382	0.704
P value = 0.196								
DBP	69.9 ± 15.6	71.8 ± 19.6	-0.399	0.692	76.5 ± 12.9	72.1 ± 14.4	1.166	0.249
P value = 0.150								
MAP	87.8 ± 17.4	92.7 ± 28	-0.750	0.457	93 ± 12.6	89.2 ± 16.7	0.946	0.349
P value = 0.088								
HR	90.2 ± 25	87.7 ± 15.4	0.434	0.666	93.1 ± 22.7	86.4 ± 15.2	1.264	0.212
P value = 0.152								

Data expressed as $\bar{X}$: Mean, SD: standard deviation, t: Independent-sample t-test, p is significant if ≤ 0.05.

5.Discussion

Physiologic parameters such as HR, RR, SPO_2, SBP, and $ETCO_2$ can be used to reliably assess the impact of various stimuli on patients. These parameters are simple to measure in clinical practice **(Goepfort et al., 2017)**. Therefore, this study focused on investigating the effect of implementing the bundle on TBI patients' physiological parameters.

Demographic characteristics of the studied groups

The results of the current study revealed that more than half of both groups were males in the age group between 30 and 50 years old. This may be because males in this age are the working class that bears the burdens of life and go out in search of livelihood thereby, they are more exposed to trauma. These findings are in agreement with **Paci, Infante-Rivard, and Marcoux (2017)** who found that most of the studied patients were middle-aged men during the assessment of TBI in the workplace. Our findings are also congruent with other studies (**Robba et al., 2020; Stiefel et al., 2005)**.

Two studies conducted in Singapore at different times to assess the demographic profiles of TBI patients reported that males were predominant in the sample **(Lee, Seow & Ng, 2006; Liew et al., 2019)**. Regarding patients' age, the results of **Lee et al. (2006**) were similar to our findings. However, the results of **Liew et al. (2019)** contradict our findings**.** According to **Peeters et al. (2015)**, the incidence of TBI was higher among patients in age groups < 25 and > 75 years. The authors explained this discrepancy by the mechanism of injury, as the most common cause of injury among elderly and pediatric patients was falling.

Health profile data of the studied groups

The results showed that nearly two thirds of the bundle group and more than half of the control group had a single trauma that is compatible with **Watanitanon et al. (2018)**. Moreover, RTA was the dominant cause of TBI in both groups. According to CAPMAS, car accidents increased by 17.8 percent in Egypt in 2019, with human error being the leading cause, followed by technical vehicle defects.

Deme (2019) reported that the RTA in Africa has three main causes: human, environmental, and mechanical. In Egypt, human factors ranked first. The authors also stated that the most common human factors are addiction, teenage drivers, increasing speed, street racing, disregarding the use of seat belts, mobile usage during driving, long distance driving, and sleeping. From our reflections, other reasons could be related to the absence of road lights, poor condition of trucks associated with overloads, and improper turns.

Our findings are supported by other studies which reported that RTA was the most common mechanism of injury **(Lee et al., 2006; Paolo et al., 2019; Verma, Kumar, Jain, Gouda and Kumawat,2021)**. Conversely, some studies illustrated that the highest percentage of TBI was related to falls **(Liew et al., 2019; Lui, Fook-Chong & Teo, 2020; Mollayeva et al., 2019; Tverdal et al., 2020)**. This difference is due to the nature of the sample, as in the four cited studies, patients were elderly.

In the present study, most of both groups were free from co-morbidities, with no statistically significant difference between both groups. This was expected considering that the recruited patients were in the middle age. Similarly, other investigations reported that younger patients had fewer co-morbidities than older patients (**Rau et al., 2017; Robba et al., 2020)**. In the current study, the revised trauma scale ranged between 9 and 11 in both groups. This could be because the majority of the patients received care in the ambulance. This is consistent with other research findings (**Mansour, Abou Eisha & Asaad, 2019; Verma et al., 2021)**.

According to the GCS categories, more than two thirds of the bundle group and more than half of the control group had severe TBI. This is in harmony with the findings of other studies which reported that patients with severe TBI were more than patients with moderate TBI **(Brennan, Murray, & Teasdale, 2018; De Silva et al., 2009; Lui et al., 2020; Miller, Daugherty, Waltzman, & Sarmiento, 2021; Paolo et al., 2019)**. Most patients in our study had a TBI from RTA, which complicated the injury and made it more severe. In Egypt, people with mild TBI may not seek medical help in hospitals, while people with moderate TBI may visit clinics rather than hospitals, and only severely TBI patients go to hospitals. Thus, the rate of moderate TBI is lower than that severe TBI in the study setting. This view is supported by **Whiteneck, Cuthbert, Corrigan, and Bogner (2016)**.

Liew et al. (2019) illustrated that patients admitted to the ED with moderate TBI were the majority. This dissimilarity could be due to the age of patients and the mechanism of injury. Most of their patients were elderly and had unwitnessed falls that resulted in TBI.

Comparing physiological parameters between the studied groups

A traumatic brain injury patient's chance of survival greatly depends on the level of SPO_2 and BP. Low levels of SPO_2 and MAP were significantly associated with higher death rates **(Mauritz, Janciak, Wilbacher, Rusnak & Australian Severe TBI Study Investigators, 2007; Para et al., 2018)**. The results of the current study revealed a highly statistically significant difference between the studied groups regarding the SPO_2 on follow-up. One of the reasons behind the SPO_2 improvement in the bundle group was that the RR was under the control of individual variations. As mentioned before, the patients were manually ventilated.

Oxygenation in the ambulance followed by emergency appropriate ventilation by bag-valve mask also had an important role in the SPO_2 enhancement in the bundle group patients with moderate and severe TBI. This is supported by **Spaite et al. (2019)** who noticed a higher rate of survival among TBI patients who received ventilation before ED admission, followed by intubation on hospital admission. Matching with our findings, a study conducted by **Damkliang et al. (2015)** to assess the effect of the evidence-based care bundle on severe TBI patients' outcomes. This study illustrated that TBI patients had higher O_2 saturation after the implementation of the bundle.

The mean of physiological parameters of the bundle group was better than in the control group on follow-up regarding $ETCO_2$, SBP, DBP, MAP, and HR compared to these parameters on admission. However, the enhancement did not achieve statistically significant differences between the two groups. Appropriate neck collar positioning, elevating HOB 30 degrees, adequate monitoring of vital signs, and efficient ventilation that maintains a normal level of $ETCO_2$ are interventions of the evidence-based care bundle that were implemented for the bundle group. This could be the reason for the physiological parameters enhancement in the bundle group.

In congruence with our findings, **Damkliang et al.'s (2015)** study revealed that bundle implementation enhances TBI patients' SBP. In addition, **Alshaimaa et al.'s (2018)** results illustrated that TBI patients who were conservatively treated had better SBP and DBP than patients who were surgically treated.

On the other hand, **Zhao et al. (2021)** assessed the effect of fluid management (which is one element of the bundle) in postoperative patients with severe TBI and found a slight increase in HR in the control group compared to the treatment group. However, there was no difference in MAP between both groups on the first day of injury. This discrepancy may be due to differences in the study sitting and the time of assessment, as the cited study assessed patients at ICU admission and after surgery.

Ng, Lim, and Wong (2004) found a small reduction in TBI patients' MAP during the evaluation of the effect of HOB elevation of 30 degrees which is inconsistent with our findings. This difference could be owing to that the investigators assessed the effect of position only, and did take into consideration the effect of aggressive fluid resuscitation on MAP during TBI patients' management.

6.Conclusion and Recommendations

The findings of the current study provide evidence that the incorporation of the bundle in TBI patients' care can improve their physiological parameters, particularly SPO_2. Therefore, emergency nurses should be trained on implementing this bundle and should incorporate it in TBI patients' care. Future research is needed to assess the effect of the bundle on TBI patients in various settings such as ICUs and rehabilitation institutions.

7.Limitations

The limited sample size and the collection of data from one ED at one hospital restrict the generalizability of the study findings. Besides, there was no opportunity for long-term follow-up, so we have no data on long-term disability or mortality after discharge from the ED.

8.Acknowledgment

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9.Declaration of Competing interests

There are no potential conflicts of interest.

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