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Hospital Risk Factors Affecting Mortality and Morbidity in Polytraumatized Patients and Their Outcome

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ABSTRACT

Background: Trauma is the leading cause of mortality among young individuals worldwide. Brain trauma and massive bleeding are the most severe complications of poly trauma. Another important complication is aspiration pneumonia that requires early detection and management.

Objectives: The aim of the work was to assess the intra hospital risk factors namely aspiration pneumonia and hypovolemic shock that affecting mortality and morbidity in polytraumatized patients and their outcome as regards hospital mortality and length of stay.

Patient and Method: This study was conducted on 56 polytrauma patients attending at Al-Azhar University Emergency Hospital, Damietta from November 2018 to October 2019. They were divided into two groups: patients with hypovolemic shock group and patients with aspiration pneumonia group. Furthermore, they were divided into survivors and non survivors groups. All patients subjected to resuscitation and stabilization, history taking, examination and laboratory and radiological investigations.

Results: Hypovolemic shock and aspiration pneumonia showed statistically significant differences between both groups as regards mode of admission and duration till hospital arrival with a higher percentage of patients admitted after ER resuscitation or arriving early to hospital developing hypovolemic shock. While as, those patients admitted directly to ICU or arriving late to hospital developing aspiration pneumonia. The mortality rate in this study was 23.2% among poly trauma patients. Comparison between survivors and non-survivors revealed that older age had higher incidence of mortality in poly trauma patients.

Conclusion: It could be concluded that aspiration pneumonia and hypovolemic shock were good predictors for morbidity and mortality in polytrauma.

Keywords: Polytrauma, Hypovolemia, Aspiration pneumonia, Mortality, Morbidity.

INTRODUCTION

Trauma injury is the leading cause of mortality and hospitalization worldwide and the leading cause of potential years of productive life lost. Severe trauma is a major global public health issue, contributing to about 1 in 10 mortalities and resulting in the annual worldwide death of more than 5.8 million people **(1)**. Before arrival at the hospital, the availability of advanced life support does not greatly improve the outcome for major trauma when compared to the administration of basic life support **(2)**.

Hospitals with designated trauma centers have improved outcomes when compared to hospitals without them, and outcomes may improve when persons who have experienced trauma are transferred directly to a trauma center **(3)**. Management of intrahospital polytraumatized patients often requires the help of many healthcare specialists including physicians, nurses, respiratory therapists, and social workers. Cooperation allows many actions to be completed at once. Generally the first step of managing trauma is to perform a primary survey that evaluates a person's airway, breathing, circulation, and neurologic status **(4)**.

In-hospital complications that arise during the treatment of traumatic injuries are important causes of morbidity and mortality. The occurrence of in-hospital complications is detrimental to the patient's clinical condition and contributes to an increase in the consumption of resources, length of stay, hospital costs, repeat surgery, medical treatment, development of legal issues, and costs. Apart from mortality, in-hospital complications are among the most frequently measured and reported outcomes used as an indicator of quality, and their continuous evaluation can identify possible flaws in the process of care **(5)**.

Several studies have investigated the causes of death in trauma patients. Baker et al found that brain injury accounted for a majority of deaths, at 50%. Heart or aortic injury (17%), hemorrhage (12%), sepsis (10%), lung injury (6%), burn (3%), and liver injury (2%) accounted for the remainder. The majority of patients with major cardiac, vascular, or liver injury died of hemorrhage. Shackford and colleagues also found that head injury was the most common cause of death, and when combined with spinal cord injury, neurologic injuries were responsible for 49% of deaths **(1)**.

The aim of this study was to assess the intra hospital risk factors namely aspiration pneumonia and hypovolemic (hemorrhagic) shock that affecting mortality and morbidity in polytraumatized patients and their outcome as regards hospital mortality and length of stay.

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PATIENT AND METHOD

This study included a total of 56 recent polytrauma patients, attending at Al-Azhar University Emergency Hospital, Damietta. This study was conducted between November 2018 to October 2019.

The included patients were 22 to 47 years of both sexes with no history of advanced medical disease.

Exclusion Criteria: Patients with history of advanced medical disease, transferred from another hospital and pregnant females.

The included subjects were divided into two groups; **Group 1 (aspiration pneumonia)** consisted of 26 patients and **Group 2 (hypovolemic shock)** consisted of 30 patients. Furthermore, they divided into survivor and non-survivor groups.

All patients were subjected to resuscitation and stabilization, history taking, examination and laboratory and radiological investigations.

Ethical considerations:

Study protocol received approval from Institutional Review Board (IRB) – Mansoura Faculty of Medicine. Administrative approval and official permissions were obtained from the Dean, Al-Azhar Faculty of Medicine, and the Manager of AUEH prior to data collection. Verbal consent was obtained from patients included in the study or their guardians following guarantee of data confidentiality to them.

Statistical analysis

The collected data was revised, coded, processed and analyzed using SPSS program (Statistical Package for Social Science) for windows version 20 (SPSS Inc., Chicago, IL, USA). The data were presented as number and percentages for the qualitative data, mean, standard deviations and ranges for the quantitative data with parametric distribution and median with inter quartile range (IQR) for the quantitative data with non-parametric distribution. The appropriate tests of significance were conducted. Chi-square test was used in the comparison between the two groups with qualitative data and Fisher exact test was used instead of the Chi-square test when the expected count in any cell found less than 5. Independent t-test was used in the comparison between the two groups with quantitative data and parametric distribution and Mann-Whitney test was used in the comparison between two groups with quantitative data and non-parametric distribution. P value < 0.05 was considered significant.

RESULTS

Demographic data revealed that 69.6% of patients were males and 30.4% of them were females, their ages ranged from 22 to 47 years with a mean age of 31.46±7.60 years (table 1).

Table (1): Demographic data of patients

		No	%
Gender	Female	17	30.4%
	Male	39	69.6%
Age (years)	Mean±SD	31.46±7.60	
	Range	22-47	

Mode of admission is shown in table (2): 73.2% of patients were admitted to intensive care unit after ER resuscitation whereas 26.8% of them were admitted to ward after ER resuscitation.

Table (2): Mode of admission

		No	%
Mode of admission	Admission to ward after ER resuscitation	15	26.8%
	Admission to intensive care unit after ER resuscitation	41	73.2%

Estimated complications ware seen in table (3): showed that 46.4% of patients had aspiration pneumonia and 53.6% of them had hypovolemic shock.

Table (3): Occurrence of complications

		No	%
Complications	Aspiration pneumonia	26	46.4%
	Hypovolemic Shock	30	53.6%

The outcome of our patients showed that by the end of the study, 76.8% of patients were survivors. Whereas, 23.2% of them were non-survivors table (4).

Table (4): Outcome by the end of the study

		No	%
Outcome	Alive	43	76.8%
	Died	13	23.2%

The duration from trauma till arrival to hospital showed a statistically significant difference between aspiration pneumonia and hypovolemic shock groups (p value 0.034) with 66.7% of patients who arrived early to hospital developing hypovolemic shock whereas 61.5% of patients who arrived late to hospital developed aspiration pneumonia (table 5).

Table (1): Comparison between aspiration pneumonia and hypovolemic shock groups as regards duration from trauma till arrival to hospital

		Aspiration pneumonia (No.=26)		Hypovolemic shock (No.=30)		Chi square test	
		No	%	No	%	x^2	P value
Duration from trauma till arrival to hospital	Early	10	33.3%	20	66.7%	4.455	0.034*
	Late	16	61.5%	10	38.5%		

Regarding hospital length of stay, there was a statistically significant difference between aspiration pneumonia and hypovolemic shock groups (p value 0.034) with 42.1% of patients who stay long duration in hospital in hypovolemic shock whereas 57.9% of patients stay long duration in hospital in aspiration pneumonia (table 6).

Table (6): Comparison between aspiration pneumonia and hypovolemic shock groups as regards hospital length of stay

		Aspiration pneumonia (No.=26)		Hypovolemic shock (No.=30)		Chi square Test	
		No	%	No	%	x^2	P value
Hospital length of stay	Long duration	11	57.9%	8	42.1%	4.487	0.034*
	Short duration	15	40.5%	22	59.5%		

As regard type of complications, there were no statistically significant differences found between survivors and non-survivors (p value 0.213) with 18 of aspiration pneumonia patients were survivors (69.2%) and 8 (30.8%) non survivors. While 25 (83.8%) of hypovolemic shock patients were survivors and 5 (16.2%) non survivors (table 7).

Table (7): Comparison between survivors and non-survivors as regards type of complications

		Survivors (No. = 43)		Non-survivors (No. = 13)		chi square test	
		No	%	No	%	x^2	P value
Type of complications	Aspiration pneumonia	18	69.2%	8	30.8%	1.554	0.213
	Hypovolemic shock	25	83.3%	5	16.7%		

The duration from trauma till arrival to hospital showed no statistically significant differences between survivors and non-survivors in aspiration pneumonia group (p value 0. 346) and in hypovolemic shock group (p value 0.165) (table 8).

Table (8): Comparison between survivors and non-survivors in aspiration pneumonia and hypovolemic shock groups as regards duration from trauma till arrival to hospital

		Outcome				Chi square Test	
		Survivors (No. = 18)		Non-survivors (No. = 8)			
		No.	%	No.	%	x^2	P value
Duration from trauma till arrival to hospital in aspiration pneumonia group	Early	8	80%	2	20%	0.885	0.346
	Late	10	62.5%	6	37.5%		
Duration from trauma till arrival to hospital in hypovolemic shock group	Early	18	90%	2	10%	1.920	0.165
	Late	7	70%	3	30%		

Length of hospital stay in aspiration pneumonia group and hypovolemic shock group showed a statistically significant difference in the outcome in aspiration pneumonia group (p value 0.024) with 54.5% of patients with long hospital stay ending up as non-survivors whereas 86.7% of patients with short hospital stay were survivors. Also, a statistically significant difference in the outcome in hypovolemic shock group (p value 0.0007) with 30.7% of patients with long hospital stay ending up as non-survivors whereas 7.7% of patients with short hospital stay were survivors (table 9).

Table (9): Outcome in aspiration pneumonia group based on hospital length of stay

		Outcome					
		Survivors		Non-survivors		Chi square Test	
		No	%	No	%	x^2	P value
Hospital length of stay in aspiration pneumonia group	Long duration	5	45.5%	6	54.5%	5.06	0.024*
	Short duration	13	86.7%	2	13.3%		
Hospital length of stay in hypovolemic shock group	Long duration	5	62.5%	4	30.7%	7.143	0.007*
	Short duration	20	90.9%	1	7.7%		

DISCUSSION

The current study revealed that 53.6% of patients were found to have hypovolemic shock and 46.4% of them were found to have aspiration pneumonia as complications. By the end of the study, 76.8% of the patients survived whereas 23.2% of them died.

El-Mestoui *et al.* [6] reported that there was a lower mortality rate of hospitalized polytrauma patients, and they found that 19.1% of their patients died during their hospital stay. A possible explanation of this difference might be the non-comparable patient and injury characteristics added to the effect of different sample size as well as different study location. Another important explanation of this difference is the different age group included in both studies as 9.8% of patients included in their study were in the pediatric age group, which were not included in this study. This is supported by the finding that age has a statistically significant effect on the outcome in this study as well as in other studies.

The current study showed that a highly statistically significant difference (p=0.003) was found between both groups as regards mode of admission as 86.67% of patients were admitted after ER resuscitation developed hypovolemic shock and 58.53% of patients were admitted directly to intensive care unit developed aspiration pneumonia. This finding is also supported by results of the study performed by **Prin and Li [7]**. This study was a retrospective study aiming to describe the annual incidence of ICU admission for adult trauma patients and to assess the risk factors for hospital complications and mortality in these patients. They found that the development of hospital course complications was more common amongst patients admitted to the ICU. This finding also comes in line with what was published by **Gaieski and Mikkelsen [8]** as they mentioned that trauma was one of the most common causes of hypovolemic shock.

The current study revealed no statistically significant differences between aspiration pneumonia and hypovolemic shock groups as regards hospital length of stay. This can be explained by the fact that aspiration pneumonia and hypovolemic shock occurred in these patients as complications and occurrence of complications was found to be associated with a statistically significant increase in the length of stay **[9].**

As for the outcome in aspiration pneumonia and hypovolemic shock groups based on hospital length of stay, the present study revealed a statistically significant difference (p= 0.024) in the outcome in aspiration pneumonia group with 54.5% of patients with long hospital stay ending up as non-survivors whereas 86.7% of patients with short hospital stay were survivors. On the other hand, no statistically significant differences were found in the outcome in hypovolemic shock group with hospital length of stay. Different results were reported by **El-Mestoui *et al.* [6]** who found a significantly shorter hospital length of stay in case of non-survivors and this difference might be explained by the different causes of death as they mentioned that 91% of their deaths were due to consequences of the primary injury with CNS injury as a predominant cause of death, followed by exsanguination and with 24% of deaths occurring in the emergency department.

Comparison between survivors and non-survivors in the present study revealed that a highly statistically significant difference (p=0.002) was found as regards age with survivors being of younger age. Otherwise, no statistically significant differences were found between both groups as regards gender, duration from trauma till arrival to hospital, development of shock, development of pneumonia, presence of hypertension or presence of diabetes.

Consistent with results of this study, similar results were published by **Mondello *et al.* [9]** who found that older age was one several characteristics that were strongly associated with death after trauma and each one year increase in age was associated with a 2% increase in the odds of mortality. Similarly, **El-Mestoui *et al.* [6]** mentioned that older age was an important predictor of mortality after major trauma. Results of this study also come in line with those published by **Zhu *et al.* [10]** as they found that mortality was significantly increased with age.

As regard type of complications our study showed that no statistically significant differences were found between survivors and non-survivors whatever the type of complications developed.

As for the impact of development of complications on mortality rate, similar results were published by **Mondello *et al.* [9]** as they found that mortality was not significantly different between patients with and without complications. On the other hand, findings of this study differ from results published by **Abd-Allah *et al.* [11]** who performed their study on 67 trauma patients aiming to assess and find a way to predict outcomes in trauma patients admitted to the critical care department using admission data (clinical and laboratory) and scoring systems. They found that the incidence of pneumonia and sepsis was significantly higher in non-survivors when compared to survivors. This difference might be explained by the different type of complications considered in both studies.

CONCLUSION

It could be concluded that aspiration pneumonia and hypovolemic shock were good predictors for morbidity and mortality in polytrauma. Also, the mode of admission and duration till hospital arrival were the main predictors of morbidity and older age was the main predictor of mortality in polytraumatized patients.

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