

## **BLUNT ABDOMINAL TRAUMA IN PEDIATRICS VERSUS GERIATRICS:- " COMPARATIVE STUDY OF AETIOLOGY, MANAGEMENT, OUTCOME AND COST EFFECTIVENESS"**

By

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*Blunt abdominal trauma is still a big problem and a matter of argument, not only in the algorithm of diagnosis but also, in the way of management. Pediatric and geriatric patients are similar in many aspects of trauma care system, and both are similar to adults trauma data that mentioned in many previous studies. The differences are few, and do not affect the overall algorithm of trauma care system. So, in management of a trauma patient never look for the age, but for the severity and pathology of injuries. Age serves only as a guide, and background in trauma management, because of each age has its specific physiology and co-morbidity, that may be needed to be in mind.*

**Patients and methods:** -Prospective studies from May- 1998 to November 2000 include 84 victims sustained blunt abdominal trauma, and were admitted to Emergency Hospital. Victims were divided into two groups according to their ages: group I pediatric group :

*Consisted of 56 patients with age from 6 months up to 15 years group II Geriatric group: consisted of 28 patients with age above 50 years to 66 years. All patients were resuscitated, assessed clinically, and investigated laboratory and radiologically. Then were taken to either non-operative or operative management.*

**Results:** The study included 84 patients divided into two groups according to their ages the geriatric group: 28 patients their ages ranged from 51- 66 years with mean age of  $55 \pm 4-36$  years, The pediatric group their age ranged from 6 months to 15 years with mean age  $7.5 \pm 3.94$  years.

*Motor vehicle accident was the most common cause in both groups, in pediatric group (48.2%) and geriatric group (64.4%) followed by falling from height, in pediatric group (21.4%) while (28.6%) in geriatric group.*

*Ultrasound positive results in pediatric group were 98.2% and 100% in geriatric group while plain x-ray was useless.*

*Most cases in both groups were managed by operative procedures 60.7% in pediatric group and 53.6% in geriatric group. The commonest pathology found at laparotomy in both groups was splenic lacerations: pediatric group 26.8%, 25% in Geriatric group, followed by liver lacerations and retroperitoneal haematoma.*

*All mortality was due to severity of the injury and not due to post- management morbidity.*

*On conclusion age alone does not predict outcome, so once a trauma patient reaches the resuscitation area, decisions pertaining to treatment and outcome should be based on measured severity of illness rather than age or trauma type.*

**Key words:** Blunt abdominal trauma - Pediatrics - Geriatrics - comparative study

## INTRODUCTION

Injuries of the abdomen are serious, potentially lethal and often difficult to manage (Kennedy et al., 1981) (1). Mortality rate in victims of blunt abdominal trauma remains unnecessarily high and related not only to the severity of the injury and age, but also to the delay in the diagnosis and management protocol (William et al., 1975.) (2)

Although there are many similarities in the management of pediatrics and geriatrics trauma patients, the accident pattern is quite differ since most pediatrics injuries are the result of blunt trauma whereas injuries in geriatrics are divided between blunt and penetrating injuries; Moreover, the trauma scores utilized to evaluate injury severity in elderly are inadequate for the pediatric patient (Coran, 1989.) (3) In elderly; there is gradual loss of functional reserve in all body systems, lead to deficiency diseases.

The anatomic and physiologic differences between children and elderly have allowed for development of different management protocols for blunt abdominal trauma. Non operative management initially described for spleen injury, has been successfully extended to liver, kidney, and combined abdominal injuries in pediatric patients (Takishima et al., 1996) (4) The non operative management of blunt abdominal trauma is now routine in children with stable vital signs (Schwartz and Kangah, 1994.) (5)

### *Aim of the work*

The aim of this prospective randomized study was to compare blunt abdominal trauma in pediatrics versus geriatrics as regards; aetiology; pathophysiology, clinical presentation, diagnostic modalities, treatment protocols, outcome and cost effectiveness.

## PATIENTS AND METHODS

A prospective study over 30 months from May-1998 to November 2000 include 84 victims sustained blunt abdominal trauma, and were admitted to Emergency Hospital, Faculty of Medicine Mansoura University, Egypt. It was the M.D thesis of the first author.

### *Patients selection:*

-From all trauma victims patients who sustained blunt abdominal trauma were selected. The program was designed to focus on patients 15 years and under, and 50 years and above.

-The victims were divided into two groups according to their ages: -

Group I: Pediatric group.

Consisted of 56 patients with age from 6 month up to 15 years.

Group II: Geriatric group.

Consisted of 28 patients with age above 50 years.

### *Patients Management:*

All patients were resuscitated according to the advanced trauma life support guidelines. Those patients having an indication for surgery on basis of clinical examination and / or investigatory data were taken to the operating room for laparotomy and dealing with the pathology.

Those patients having no indication for immediate laparotomy were selected for non-operative management.

### *Methods of Assessment:*

Serial assessment was done by.

A- Clinical assessment with full body examination each half hour in the first 24 hours then hourly, especially for the following signs:

- 1- Vital signs- Blood pressure Heart rate, Respiratory rate, Temperature and Urinary output.
- 2- Abdominal examination
- 3- B- Investigatory assessment:
- 4- 1-Full laboratory assessment Hemoglobin, Heamatocrite, White blood cell count.
- 5- 2-Serial peritoneal tapping, blind aspiration or guided by abdominal Ultrasound every 2 hours.
- 6- 3-Full radiological assessment especially, abdominal plain x-ray (erect/supine), abdominal ultrasound and/or Computerized scanning / when indicated.

### *Patients follow up:*

All patients were followed in the out patient surgical clinic every week after discharge. The follow up period ranged from 6-30 months.

### *Statistical analysis :-*

The quantitative data were presented in the form of mean and standard deviation and student t-test was used as test of significance between the two groups. The qualitative data were presented in the form of number and percentage and chi-square test was used as a test of signification between the two groups. Significance was considered when P valve less than 0.05, high significance P valve less than 0.01 and extreme significance when P value more than 0.005.

## RESULTS

The study included 84 patients sustained blunt abdominal trauma, and were divided into two groups according to their ages, Pediatric group 56 patients, their ages ranged from 6 months to 15 years, (mean +SD= 7.5+ 3.94 years). 37 patients (66.1%) of these were males and 19 patients (33.9%) were females.

The geriatric group: 28 patients. their ages ranged from 51 years- 66 years with a mean age of 55 ± 4-36 years. 24 patients (85.7%) of these were males and 4 patients (14.3%) were females.

Comparison between both groups as regard mechanism of trauma and methods of transport were summarized in Fig. (1). It showed that motor vehicle accident (M.V.A) was the most common cause in both groups, in pediatric group (48.2%), and in geriatric group (46.4%). followed by falling from height (FFH) in both groups. In pediatric group (21.4%), in geriatric group (28.6%). But these findings have insignificant statistical analysis (P=0.87, P=0.46 respectively). Carts accident occurred in 16.1% of pediatric patients, while, did not occur in geriatric patients with significant statistical analysis (P=0.024). Transport to hospital by direct private methods, represents the most common method in both groups with insignificant statistical analysis between both groups (P=0.124). Fig(2).

Comparison between both groups as regard clinical presentation on admission showed the revised trauma

score (R.T.S) in most of the cases in both groups was good Fig.(3), the mean of RTS was 10.8±1.7, 11.1±1.1 in pediatric, and geriatric groups respectively, with insignificant statistical analysis between both groups (P=0.23) Fig.(3) It also showed that most of the cases in both groups has multiple body trauma, in pediatric group (75%) and in geriatric group (82.1 %).Fig. (4).

Plain x-ray was useless (positive result in pediatric group 1.8% and in geriatric group 0.0%), abdominal ultrasound (positive result in pediatric group 98.2% and in geriatric group 100%) and peritoneal tapping (positive result in pediatric group 87.5% and in geriatric group 85.7%) were very useful in diagnosis intrabdominal injuries.

Comparison between both groups as regards methods of management and pathology of trauma was summarized in table (1) and Fig (5). It showed that most of the patients in both groups were transmitted to hospital after one hour with highly significant statistical analysis between both groups (P = 0.01). Time to operating room in both groups was less than one hour, with insignificant statistical analysis (P=0.41). Although total time of hospital stay was more when operative management was used, it has insignificant statistical analysis between both groups table (2). The rate of morbidity and mortality in both groups where proportionally similar with insignificant statistical analysis. All mortality was due to severity of injury and not due to post management morbidity Fig. (6).

**Table (1) : Non operative management and pathology of trauma of studied groups**

Patients groups		Non operative management									
		No	%	Possible pathology							
				SL		LL		R.P.H		Uncertain	
				NO	%	No	%	NO	%	NO	%
Pediatrics N= 28		22	39.3	1	1.8	12	21.4	2	3.6	7	12.5
Geriatric N= 28		13	46.4	3	10.7	6	21.4	2	7.2	2	7.2
Test	2 X= P	0.39 0.53 (Ns)		2.71 0.09 (NS)		0.23 0.53 (NS)		0.32 0.57 (NS)		1.16 0.25 (NS)	

N.B: Test of significant is chi-square test.

SL = Splenic laceration.

LL = Liver laceration

RPH = Retroperitoneal hematoma

Uncertain diagnosis e.g. hematoma of GIT wall, small mesenteric tear, capsular tear of solid organs,

**Table (2) Timing significance of the studied groups.**

Patients group		Timing											
		T.T.A/H					T.O.R/H					T.H.S/day Mean + SD	
		≤ 1h		>1h		Mea ± SD	≤ 1h		>1h		Mea ± SD	NOM	OM
No	%	NO	%	No	%		NO	%					
Pediatrics	N= 56	12	21.4	44	73.5	3.2 ± 2.69	25	73.5	9	26.5	5.2 ± 12.81	5.3 ± 2.1	10.6 ± 7.21
Geriatrics	N= 28	0	0	28	100	14 ± 33.15	8	53.3	7	64.7	4.4 ± 5.05	4.5 ± 2.1	7.3 ± 3.51
Test	2 X = P =	7.0 0.01 (HS)				t=2.51 0.01 (HS)	1.93 0.16 (NS)				t=0.04 0.41 (NS)	t = 1.2 0.53 (NS)	t = 1.64 0.12 (NS)

N.B: Chi-square test was used except in Mean ± SD student t-test was used.

TTA = Time till admission

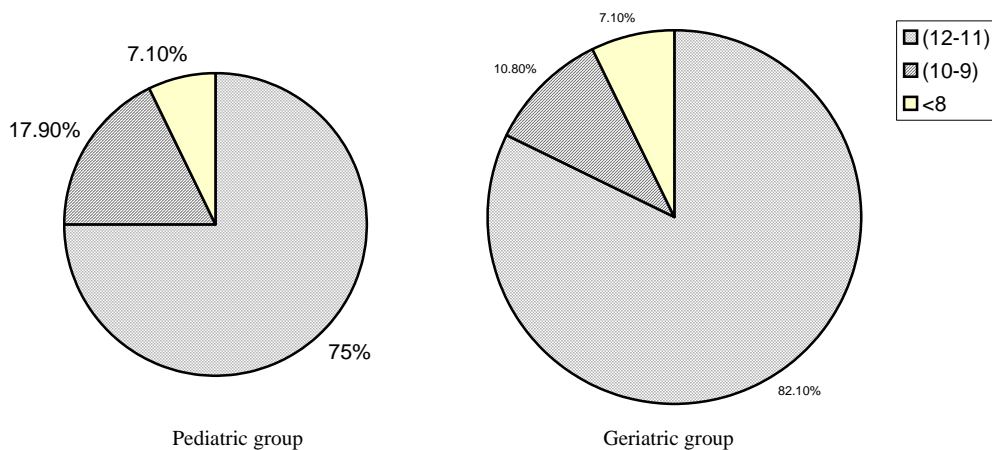
TOR = time to operating room

THS = Total hospital stay

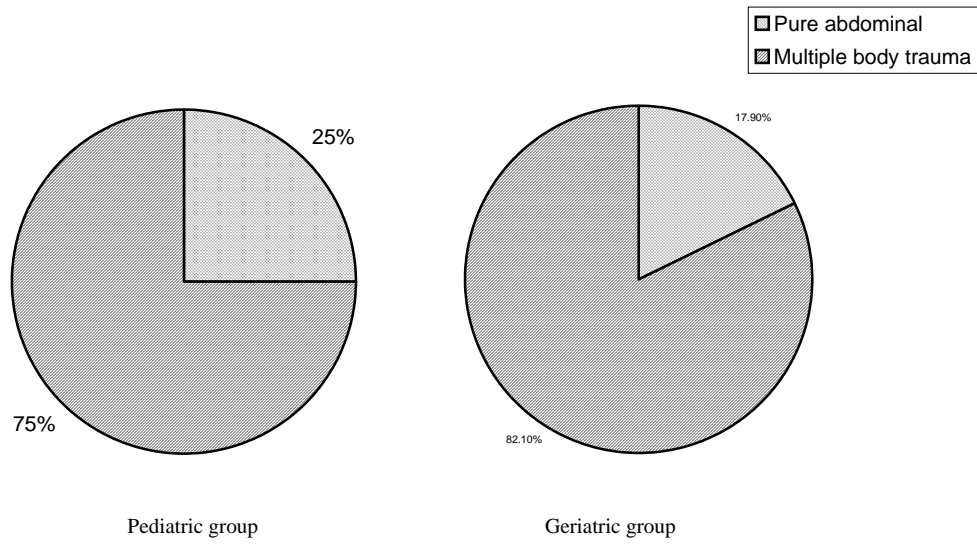
NOM = Non operative management

OM = operative management

**Fig.(3): R.T.S. of studied groups on admission**



*Fig.( 4): Region of Trauma of studied groups*



*Fig.( 5): Methods of management of studied groups*

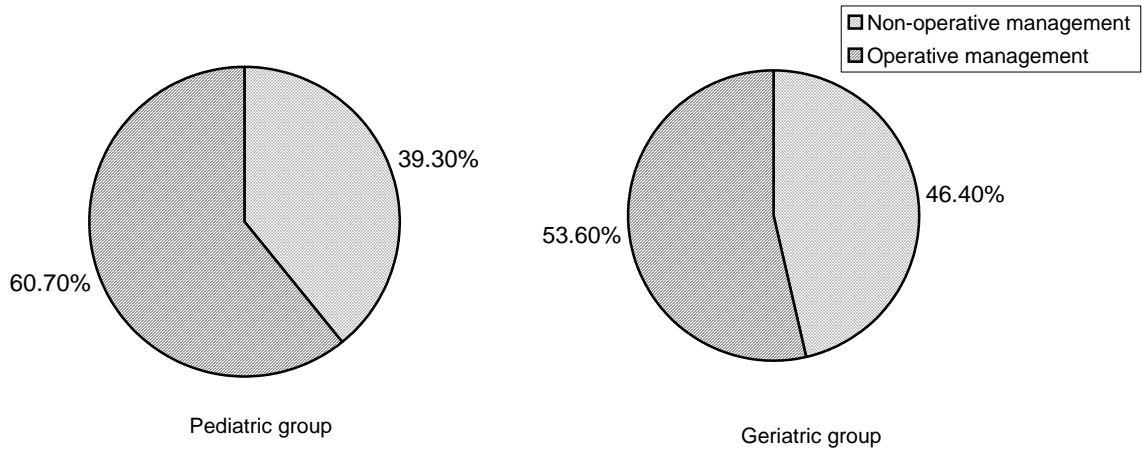
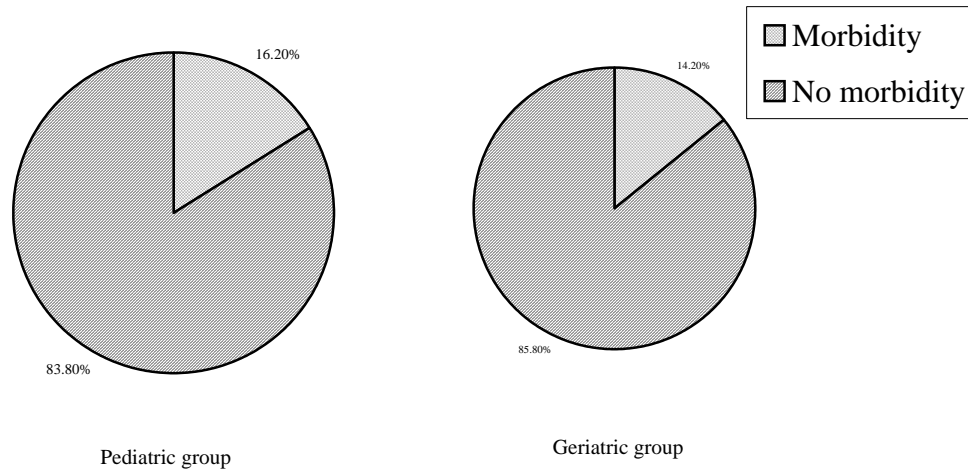


Fig.( 6): Morbidity characteristic of studied groups



## DISCUSSION

In our study the intermediate age of both groups was more susceptible to trauma. As the mean of age was 7.5 + 3.94 years and 55 + 4.36 years in pediatric and geriatric groups respectively. These findings are in agreement with those of others. The pediatric mean of age was 7 years (Ibrahim et al., 1996)<sup>(6)</sup>, 7 years (John et al., 1996)<sup>(7)</sup>. While the most of geriatric trauma occur below age of 60 years (Michael, 1995)<sup>(8)</sup>.

Results of our study as regard mechanism of trauma are in agreement with the results found in most of trauma literature, as the most common mechanism of injury causing blunt abdominal trauma in our study pediatric and geriatric group was MVA constituting 48.2% and 46.4% respectively, followed by FFH constituting 21.4% and 28.6% of both groups respectively.

The mechanism of pediatric injury in most of trauma studies varies with age. Falls are more commonly seen in toddlers while older children experienced motor vehicle accident (Tepas et al., 1997)<sup>(9)</sup>.

A review of the literature on trauma in the elderly showed that most common mechanisms of injury are falls, motor vehicle accident and thermal injuries (De Maria et al., 1987)<sup>(10)</sup>.

The MVA remains the most common injury for all patients even up to the age of 75 years, when falls become more common (Schwab and Kauder, 1992)<sup>(11)</sup>.

In our study, personal private automobile transport to emergency hospital represented the main method of transport, constituting 76.8% and 60.7% of pediatric and geriatric groups respectively with insignificant statistical analysis between both groups. This similar to one study in pediatric trauma (John et al., 1996)<sup>(7)</sup> but other studies showed that the ambulance transport were up to 83% (Burton et al., 1996)<sup>(12)</sup>, and up to 98% with helicopter ambulance 53% and ground ambulance 54% in others (Charles et al., 1996)<sup>(13)</sup>.

Accurate diagnosis of intraabdominal injuries remains one of the most challenging aspects of evaluating patients sustaining blunt abdominal trauma (Goletti et al.; 1994)<sup>(14)</sup>.

Clinical results in our study were neither sensitive nor specific so, we agree that no single physical finding was specific or reliable as was mentioned in many previous studies (Frederick et al., 1995)<sup>(15)</sup> and (Ibrahim et al., 1996)<sup>(6)</sup>.

Plain radiographs of the abdomen were rarely sufficiently reliable to diagnose bowel injuries (John et al., 1995)<sup>(16)</sup> and Jael et al., 1997)<sup>(17)</sup>.

Revised trauma score (RTS) was utilized in our study as a measure of the physiologic status of each patient in both groups on arrival at the emergency resuscitation area. The

results showed that most of the patients were good on arrival, as 75% and 82.1% of Pediatric and geriatric patient respectively were grouped in RTS (11-12), with insignificant statistical analysis between both groups. This result is in agreement with other studies (Finelli et al., 1989)<sup>(18)</sup>, (Shadbot and Johnson. 1995)<sup>(19)</sup>.

In our study, isolated pure blunt abdominal trauma was the minority in both groups, because of multiple body trauma occurred in 75% and 82.1% of pediatric and geriatric groups respectively. This similar to Other studies (Gudrun et al., 1986,<sup>(20)</sup> Mary et al., 1992<sup>(21)</sup>;Feza et al., 1997<sup>(22)</sup>, Van der sluis et al., 1997).<sup>(23)</sup>

In this study, all patients were evaluated with plain Radiographs and the results were depressive and similar to previous studies. We used US as a routine for all patient for diagnosis, monitoring and follow up. The results were highly sensitive and specific for both groups.

Peritoneal tapping was also very useful in diagnosis of intraperitoneal hemorrhage and bowel rupture, but with insignificant statistical analysis in both groups.

We used abdominal CT in 2 cases only, we propose using CT in special situations as patients in whom minimal free fluid of no definite source is detected with US, this agree with( Fez et al., 1997)<sup>(22)</sup>.

In this study, the decision for laparotomy was based on a combination of the clinical findings, US scan and results of other diagnostic tests such as peritoneal lavage (Ibrahim et al., 1996)<sup>(6)</sup>.

The management of blunt abdominal trauma has changed significantly over the past two decades. The laparotomy rate for blunt abdominal trauma has decreased (Kown et al., 1994)<sup>(24)</sup>.

The rate of laparotomy in our study was not only higher in pediatric group (60.7%) than Geriatric group (53.6%) but also was still generally high in comparison to other studies. Because of other studies in pediatric trauma showed dramatic decrease in laparotomy rats as 16-36% (Kown et al., 1994)<sup>(24)</sup>.

This discrepancies among studies may be explained by the experiences of surgeons and specialization of the trauma center.

The most commonly injured organ in both groups in patients undergone laparotomy was the spleen constituting 26.8% and 25% of pediatric and geriatric patients respectively.

These finding agreement with previous studies (Morton et al., 1987<sup>(25)</sup>; Trunky, 1992)<sup>(26)</sup>. Gastrointestinal

injuries were common in geriatric group (10.7%) than pediatric group (5.4%).

The study of the significance of time of each step in trauma care gives an idea about availability of tools and nature of any development. In our study, the majority of pediatric group (78.6%) transmitted to the hospital after one hour, while this occurred in all geriatric cases (100%)with highly significant statistical analyses between both groupe (p=0.01). this similar to previous studies (Ibrahim et al., 1996),<sup>(6)</sup> (Annika and Karin, 1997)<sup>(27)</sup>. On the other hand the time to operating room was less than one hour in the majority of both groups and this result is similar to some studies (Van der sluis et al., 1997)<sup>(23)</sup>, the total time of hospital stay is variable in all studies ranging from 2.6 days to 26 days depending on multiplicity of trauma, type of management as regard operative or non-operative comorbid diseases, and availability of hospital resources (Burton et al., 1996)<sup>(12)</sup>.

Overall mortality in this study was 8.9 % and 10.8% in pediatric and Geriatric group respectively. But it still high if compared to the highly specialized trauma centers 6 % (Eveylen et al., 1989); <sup>(28)</sup> (Kaufmann et al., 1989)<sup>(29)</sup>; (Margaret et al., 1992)<sup>(30)</sup>

Cost of trauma care system is impossible to be calculated in our country, because of not only there is no country-wide schedule for the cost of each service, but also there is tendency for exhaustion the resources because no body care or ask. So we advice to put a program to calculate the cost of management of each patients and this must be written beside name of the patient and diagnosis in the discharge card. Also this cost must be paid by some one (e.g. patient, job, assurance,...), this for not only to improve the trauma care but also to protect and keep the present level of care from decline and deterioration.

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