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TRAUMA SURGERY

Trauma in the intellectually impaired

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Background: Individuals with intellectual disability (ID) are a uniquely vulnerable subset of South Africa's trauma population, yet their injury patterns and outcomes remain poorly documented. This study aims to describe the epidemiology, mechanisms, and outcomes of trauma in this population.
Methods: A retrospective review was conducted at the Pietermaritzburg Metropolitan Trauma Service between December 2012 and December 2023. Patients with a documented diagnosis of ID were identified from the Hybrid Electronic Medical Registry. Demographic data, injury characteristics, management, and outcomes were analysed. Subgroup analysis compared intentional and unintentional injuries.
Results: Seventy-one patients with ID sustained trauma over the study period (0.4% of all admissions). The mean age was 25 years; 24% were female. Blunt trauma accounted for 90% of cases. Falls (27%) and pedestrian injuries (22%) were the most common mechanisms. Intentional trauma accounted for 21%, including gunshot (6%) and stab wounds (4%). The head was the most frequently injured region (77%). Morbidity was 51%, with neurological complications predominating. Admission to the intensive care unit (ICU) was required in 13%, and mortality was (1/71) 1.4%. Patients with intentional trauma were significantly older (mean 38 vs 21 years; $p = 0.003$).
Conclusions: Patients with ID are highly vulnerable to trauma, particularly involving the head. Although falls are the predominant mechanism in our environment, a significant proportion of patients are victims of intentional trauma.
Keywords: intellectual disability, trauma

Introduction

The massive burden of trauma in South Africa has been well documented in the literature over the last fifty years.[1-4] The reasons for this excessive burden of disease remain opaque and poorly understood.[1-4] What distinguishes this trauma burden is that a significant proportion of the disease profile is due to intentional interpersonal violence.[1-4] Although there is a large bibliography covering many aspects of this burden, there are within the overall cohort a number of vulnerable groups of trauma victims, with special needs who have tended to be overlooked, and subsequently under researched.[5-10] This is a disservice to these groups as they are all uniquely vulnerable and include diverse cohorts of patients such as female trauma patients, children, the elderly, victims of self-harm and patients with intellectual disability (ID).[5-10] This study focuses on trauma as it impacts on patients with a pre-existing ID. This is in itself a vague and poorly defined term, which includes, but is not limited to patients with developmental delay (e.g. cerebral palsy), psychiatric disease, and substance abuse issues.[11-14] The broadness of the definition is problematic but reflects the general paucity of pre-existing research on this topic in South Africa.[2-10] Studying these patients is difficult as they are not easy to identify in paper-based medical records. Even in sophisticated electronic databases like the Hybrid Electronic Medical Registry (HEMR) at Greys Hospital, the comorbidity of intellectual impairment remains hidden in text-based fields and hence is relatively inaccessible. This study is an attempt to address the relative lack of research on this topic by reviewing patients with ID who sustained trauma and were treated at our institution over the last thirteen years. Improved understanding of this group may help develop dedicated injury prevention programmes and interventions specifically targeting their special needs.[12-22]

Materials and methods

Clinical setting

This was a retrospective observational study conducted at the Pietermaritzburg Metropolitan Trauma Service (PMTS), based at Greys Hospital in Pietermaritzburg, South Africa. PMTS is the largest academic trauma centre in western KwaZulu-Natal (KZN) and the tertiary referral centre for a catchment population exceeding three million. Interpersonal violence is rife in the region, and our trauma centre manages over 5 000 admissions annually, with over 50% penetrating injuries.[3,18] PMTS maintains a formal regional trauma registry called the Hybrid Electronic Medical Registry (HEMR), in which all patients admitted to our trauma centre are recorded.

The study

The HEMR registry was interrogated from December 2012 to December 2023 and all patients with documented background of ID (of any aetiology) were reviewed. ID was determined by searching for key terms in the clinical history field in the trauma registry. In this study, we utilised the American Association on Intellectual and Developmental Disabilities (AAIDD) definition of ID. A patient with ID was defined as having significant limitations both in intellectual functioning and in adaptive behaviour as expressed in conceptual, social and practical adaptive skills, with the disability onset before the age of 18 years.[11] For the purpose of this study, those preexisting conditions include congenital conditions (e.g. Down syndrome) and neurodevelopmental conditions (e.g. cerebral palsy). ICD-11 classification was utilised and the severity of ID was further divided into mild, moderate, severe and profound. Demographic variables (age, sex, etc.), mechanism of injury, investigations, interventions, and clinical outcomes (ICU admission, length of stay, morbidity and mortality) were reviewed.

Statistical analysis

Further subgroup analysis was performed comparing those who sustained intentional injury vs unintentional injuries. Microsoft Excel Spreadsheet Version 16.92 and R (version 4.3.3, R Foundation for Statistical Computing, Vienna, Austria) were used for data analysis, and data was summarised into mean and standard deviation for numerical outcomes and frequency and percentages for various categorical outcomes and measures. Wilcoxon Rank-Sum test was used for continuous variables and Fisher's exact test was conducted for categorical variables. *P*-values of < 0.05 were considered statistically significant.

Results

Overview

During the 12-year study period, a total of 71 patients with documented ID were identified. This constitutes 0.4% (71/20 000) of all trauma admissions over the 12-year period. Twenty-four per cent were female (17/71) and the mean age was 25 years. Table I summarises the aetiology of the ID.

Clinical presentation

On admission, patients had a mean respiratory rate of 21 breaths per minute, heart rate of 103 beats per minute, systolic blood pressure of 116 mmHg, shock index of 0.92, lactate of 2.89 mmol/L, and pH of 7.39. The mean injury severity score (ISS) was 10.

Injury pattern

Of the 71 patients included in the study, 90% (64/71) sustained blunt injuries and the remaining 10% (7/71) penetrating injuries (4 gunshot wounds and 3 stab wounds). Table II summarises the mechanisms of injury for all 71 patients. Table III summarises the body regions injured.

Clinical management

Table IV summarises the radiological imaging performed in the 71 patients. In 27% (19/71) of patients one or more operative procedure was required as summarised in Table V.

Table I: Aetiology of ID

Aetiology classification	Subgroup/Diagnosis	*n*
Genetic/chromosomal	Down syndrome	2
Congenital/perinatal causes	Congenital hydrocephalus	3
Neurodevelopmental disorders	Autism	1
	Neurodevelopmental delay	5
Neurological conditions	Cerebral palsy	10
Acquired brain injuries / progressive conditions	Congenital cerebral atrophy	1
	HIV encephalopathy	1
Others	Unknown	7
	Unspecified	41

Clinical outcomes

Table II: Mechanism of injury

Mechanism *n* = 71	
Blunt (%) (*n* = 64)	***n***
Fall	17 (27)
Pedestrian struck	14 (22)
Motor vehicle crash	9 (14)
Assault	8 (13)
Building collapse	1 (1)
Others	15 (23)
Penetrating (%) (*n* = 7)	
Gunshot wounds	4 (57)
Stab wounds	3 (43)

Table III: Body region injured

Region (%)	*n*
Head	44 (77)
Face	12 (21)
Neck	5 (9)
Chest	9 (16)
Abdomen	11 (19)
Pelvis	1 (2)
Upper limb	17 (30)
Lower limb	16 (28)

Of the 71 patients included in the study, the overall morbidity was 51% (36/71) with the most common type being neurological (67%), followed by wound (24%), respiratory (5%), gastrointestinal (2%), and renal (2%) complications. No cardiac or venous thromboembolism events were recorded. Thirteen per cent (7/55) required ICU admission, three required mechanical ventilation. The overall mortality was 1.4% (1/71).

Intentional vs unintentional injuries

Of the 71 patients, 15 (21%) sustained injuries that were considered intentional (8 blunt assaults, 4 GSWs and 3 SWs). Table VI summarises the demographics and clinical outcome in these two groups.

Discussion

ID affects approximately 1% of the population, and of those afflicted, 85% are reported to have mild ID.[11] Based on studies from developed countries, approximately 2%

Table IV: Radiological imaging modalities

Modality (*n* = 71)	*n*
Plain radiographs (%) (n = 21)	
Skull	5 (24)
Neck	4 (19)
Chest	15 (71)
Abdomen	2 (10)
Pelvis	4 (19)
Limbs	10 (48)
Computed tomography (%) (*n* = 47)	
Head	44 (94)
Neck	16 (34)
Chest	10 (21)
Abdomen	15 (32)
Pelvis	7 (15)
Limbs	8 (17)
Ultrasound	1
MRI	0
Cystogram	2

Table V: Procedures performed for the 19 patients

Type of procedure	*n*
Craniotomy	5
Ventriculoperitoneal shunt insertion	3
Neck exploration	1
Laparotomy	4
Open reduction internal fixation	1
Fasciotomy	2
Debridement	4
Others	6

of the paediatric population has an ID.[5,9] ID is identified by significant limitations in both intellectual functioning and adaptive behaviours; however, the term is broad and includes a widely diverse group of aetiologies and processes that can overlap.[5,11,16] The AAIDD definition used in this study is only one taxonomy, which attempts to standardise the reporting and identification of such individual patients. Regardless of the precise underlying aetiology, ID results in a commonality of a vulnerable cohort of patients who present distinct needs and challenges from patients who do not have ID.[5,11]

It is difficult to identify these patients in most medical record systems as most do not capture comorbidities specifically related to ID. This makes it difficult to accurately identify patients with ID. This applies to paper-based records and to more sophisticated electronic systems and registries. This study relied on basic word search functions to identify keywords suggestive of ID. Ironically this modality has already been rendered obsolete by the recent roll out of artificial intelligence with functions like natural language processing (NLP). NLP can read text and identify links between words and outcomes thus allowing the machine to read human writing. Using NLP, a researcher will be able to read through text fields in electronic systems to identify patients with ID as a comorbidity. Applying this is in the future may well help identify patients with ID with a greater degree of accuracy and reliability.

Individuals with ID rely on others to assist with numerous basic functions. These include daily ablutions and self-care, preparing food and managing finances. This dependency in itself makes them susceptible to abuse and injury and financial manipulation. In addition, the ID may also result in poor sensory perception as well as poor ability to assess and minimise risk.[11-19] When intellectual impairment intersects with poverty, the risk of harm may

Table VI: Demographics and clinical outcome in patients with intentional vs unintentional injuries

Variable	Overall (*n* = 71[1])	Unintentional (*n* = 56[1])	Intentional (*n* = 15[1])	*p*-value[2]
Demographics				
Mean age (SD)	25 (19)	21 (18)	38 (17)	*p* = 0.003
Sex				*p* = 0.50
Male	54 (76%)	41 (73%)	13 (87%)	
Female	17 (24%)	15 (27%)	2 (13%)	
Mechanism of injury				
Blunt	64 (90%)	56 (100%)	8 (53%)	*p* < 0.001
Penetrating	7 (9.9%)	0 (0%)	7 (47%)	*p* < 0.001
Mean admission physiology (SD)				
Respiratory rate per minute	21 (9)	22 (9)	20 (7)	*p* = 0.59
Heart mean per minute	103 (29)	108 (28)	88 (26)	*p* = 0.030
Systolic blood pressure [mmHg]	116 (17)	115 (17)	116 (17)	*p* = 0.97
Shock index	0.92 (0.33)	0.96 (0.34)	0.78 (0.28)	*p* = 0.13
Lactate [mmol/L]	2.89 (2.61)	2.98 (2.84)	2.53 (1.50)	*p* = 0.98
pH	7.39 (0.09)	7.39 (0.10)	7.39 (0.05)	*p* = 0.92
Need for procedures	19 (29%)	15 (28%)	4 (31%)	*p* = 1.00
Clinical outcomes				
ICU admission	7 (13%)	6 (14%)	1 (7.1%)	*p* = 0.67
Mean length of stay (SD)	6 (13)	6 (14)	9 (13)	*p* = 0.38
Morbidity	36 (58%)	29 (58%)	7 (58%)	*p* = 1.00
Mortality	1 (1.6%)	1 (2.1%)	0 (0%)	*p* = 1.00

[1]*n* (%) [2]Wilcoxon rank sum test; Fisher's exact test

increase exponentially.[13-18] Meta-analyses and large-scale cohort studies suggest that injury incidence rates amongst patients with ID, are up to four times higher than the general population.[12-22] This increased vulnerability persists across all age groups and healthcare settings.[12-22] The reasons for this increased level of vulnerability are multifactorial and include deficits in cognitive function, impaired judgment, limited ability to communicate, and comorbid sensory or physical impairments.[12-22] Behavioural disturbances such as hyperactivity, impulsivity, and aggression, as well as concurrent associated medical conditions (e.g. epilepsy), further elevate the risk of injury.[12-22] ID may interact with substance abuse, which acts synergistically to further impair cognitive ability and proprioception.[20-22]

Globally, blunt injuries, especially falls, are the most commonly reported mechanism of injury in this group and are responsible for under two thirds of trauma incidents.[11,13,15] The findings from our study are consistent with those reported in the literature. However, in our environment, over 20% were intentional injuries and includes a significant proportion of SWs and GSWs. This is a direct reflection on the high level of interpersonal violence in South Africa.[3,7,13] Trauma in South Africa has been described as a "malignant epidemic" and patients with ID are not immune.[1,3,10,18] Over one third of patients in our study required surgical procedures and although not statistically significant, intentional injuries appeared to be associated with the older age group.

Strategies to address the risk of injuries in patients with ID should focus on extending healthcare services to underserved populations, and improving training for caregivers, teachers, and healthcare professionals who interact with people living with ID.[6,11,16] These programmes should help them to identify signs of trauma and abuse in individuals with ID. These initiatives must be combined with advocacy for legal protection against abuse of vulnerable populations.[22] Community awareness programmes should seek to inform the general public about intellectual impairment in an effort to combat stigma and promote inclusivity.[11,12,15-17]

This project has a number of limitations. The most important is the lack of a system to capture ID as a comorbidity in the HEMR. ID is usually incidentally captured in the free text sections of the database and hence relatively difficult to retrieve. The methodology used to identify these patients in this project is limited. The advent of AI and NLP may well enable researchers to identify trauma victims with ID with greater accuracy.

Conclusion

Patients with ID are highly vulnerable to trauma, particularly involving the head. Although falls are the predominant mechanism in our environment, a significant proportion of patients are victims of intentional trauma.

Conflict of interest

The authors declare no conflict of interest.

Funding source

No funding was required.

Ethical approval

Prior to commencement of the study, ethical approval was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee (BREC BCA221/13) Ethical approval for the maintenance and use of the trauma registry data was endorsed by the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu-Natal. Institutional review board (IRB) approval number (BREC reference: BE207/09 and BE215/17).

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