Injury Characteristics, Severity and Thirty-Day Mortality of Non-Sexual Assault Related Injuries in Uganda

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Abstract

Background: Non-sexual assault is increasingly becoming a global public health concern in the context of human rights advocacy. The objective of this study was to determine the injury characteristics, severity and factors associated with thirty-day mortality of non-sexual assault attributable injuries at two tertiary hospitals in Uganda. **Methods**: Prospective observational cohort study of 140 consecutive patients with history of non-sexual assault (Ethical clearance No.UG-REC-023/2021-17). We used the Kampala Trauma Score (KTS II) to assess injury severity, coded as mild (9-10), moderate (7-8) or severe (≤ 6). The main outcome was mortality after 30 days from time of arrival at the trauma units. We analyzed data using Stata V.17.0 (StataCorp, TX, USA) at 95% confidence interval, regarding $p<0.05$ as statistically significant. **Results**: Mean age was 29.98 years +/-12.76 SD. Males were the majority 77.4% (n=108). Mortality occurred in 5.7% (n=8) of patients. The Kampala Trauma Score was moderate in 20.7% (n=29), and severe in 35.0% (n=49) of the cases respectively. Factors significantly associated with mortality at 30 days were: a severe Kampala Trauma Score (OR = 100.79, 95% CI 4.88, 2080.57; P=0.003), pelvic injuries (OR = 112.80, 95% CI 1.02, 12434.31; p=0.049] and being accompanied by a relative [OR=0.004, 95%CI (<0.01,0.48)]. **Conclusion**: Severe injuries due to non-sexual assault occur in 35% of cases in Uganda and predominantly affect males. These injuries are associated with higher mortality of 57 per 1000 affected individuals.

Key Words: Violence, Epidemiology, Trauma, Alcohol, sub-Saharan Africa.

1 Introduction

Trauma is a leading cause of global mortality, accounting for 8% of the world's annual deaths [1]. Globally, violence contributes to 4% of trauma-related deaths annually and often results in long term morbidity in the majority cases among trauma survivors [2]. The mortality arising from such injuries disproportionately occur in low- and middle-income countries (LMICs), where in 90% of injuries occur [3]. In fact the mortality rate due to violence in LMICs is more than double that reported in high income countries [4]. The extreme socio-economic inequalities and limited opportunities for social mobility at population level derange the protective cohesive family structures in LMICs, creating an ideal environment for violence to emerge. In addition, LMICs are challenged with inadequate investment in trauma prevention, documentation and trauma care [3, 5], amidst competing interests for infectious diseases prevention and emergency obstetric care.

Uganda is one of such low-income countries with a huge trauma burden, ranking it 4th among the 16 Eastern sub-Saharan African countries with most disability adjusted years lost due to road traffic crashes [1]. On the other hand, the country concurrently experiences intentional injuries that are of medico-legal, global public health and human rights concern [6]. Thus predictably, sexual assault is one of the most extensively studied research topics in Uganda [7, 8]. Indeed, previous researchers have devoted their efforts towards improving the data quality on the epidemiology of sexual-assault related injuries in Uganda [9, 10, 11, 12, 13, 14, 15].

On the other hand, non-sexual assault related injuries which is the main focus of the present study, deserve equal attention. Recent studies revealed that 16-17% of all the injuries registered in Uganda are due to non-sexual assaults, ranking second after road traffic crash related injuries [16, 17]. In other studies, non-sexual related assaults contributed to 97.1% of all intentional traumatic brain injuries [18] and to 17% of adult acidic burns in Uganda [19]. This rate due to acid burns is much higher than 3-10% reported in Europe and Asia [20]. Experiences from Iran show that the consequences of non-sexual assault related injuries span from physical wounds, impaired mental health, disability and mortality in addition to the out-of-pocket expenditure and indirect costs to the already constrained national health care budgets [21].

There is compelling evidence to suggest that non-sexual assaulted victims sustain worse injury severity scores compared to patients with unintentional injuries [18]. Moreover, patients with injuries resulting from non-sexual assault in Uganda are more likely to be transported to hospitals by police thus less likely to receive first aid which could impact their treatment outcome [18]. However, there is paucity of published literature on injury characteristics, severity and outcome of non-sexual assault events in Uganda. Sound knowledge of the epidemiology and treatment outcomes of assault related injuries is a critical step in the design of evidence-based prevention policies. The goal of this study was to determine the injury characteristics, severity and the variables associated with 30-day mortality among patients presenting with non-sexual assault related injuries at two tertiary hospitals in Uganda.

2 Methods

This was a prospective observational cohort study of 140 consecutive patients. The data were collected for a three-month period during 8th June 2021- 8th September 2021. The study participants were followed up for 30 days from the time of first hospital visit as in-patients or through out-patient review clinics (for those who were not admitted or were admitted but discharged before 30 days). The study adhered to "strengthening the reporting of observational studies in epidemiology" (STROBE) checklist for cohort studies [22].

2.1 Ethical approvals and consent to participate

A statement to confirm that all methods were performed in accordance with the ethical standards as laid down in the Declaration of Helsinki and its later amendments or comparable ethical standards. This study was approved by the research and ethics committees of Kampala International University and Uganda National Council for Science and Technology (Ethical clearance No.UG-REC- 023/2021-17). All study participants and or their legally authorized representatives signed an informed consent document before recruitment.

2.2 Study population and settings

We recruited all patients with history of assault who presented at the accident and emergency departments of two tertiary teaching hospitals including, Kampala International University Teaching Hospital (KIU-TH) and Jinja Regional Referral Hospital (JRRH) in Uganda. At these hospitals, all assaulted patients present at emergency unit for initial assessment and emergency trauma resuscitation after which definitive care is given by the specialized units manned by Consultant Surgeons, Radiologists, Surgery Residents, Intern Doctors, and Trainee Medical Students (See Fig 1: Flow of participants).

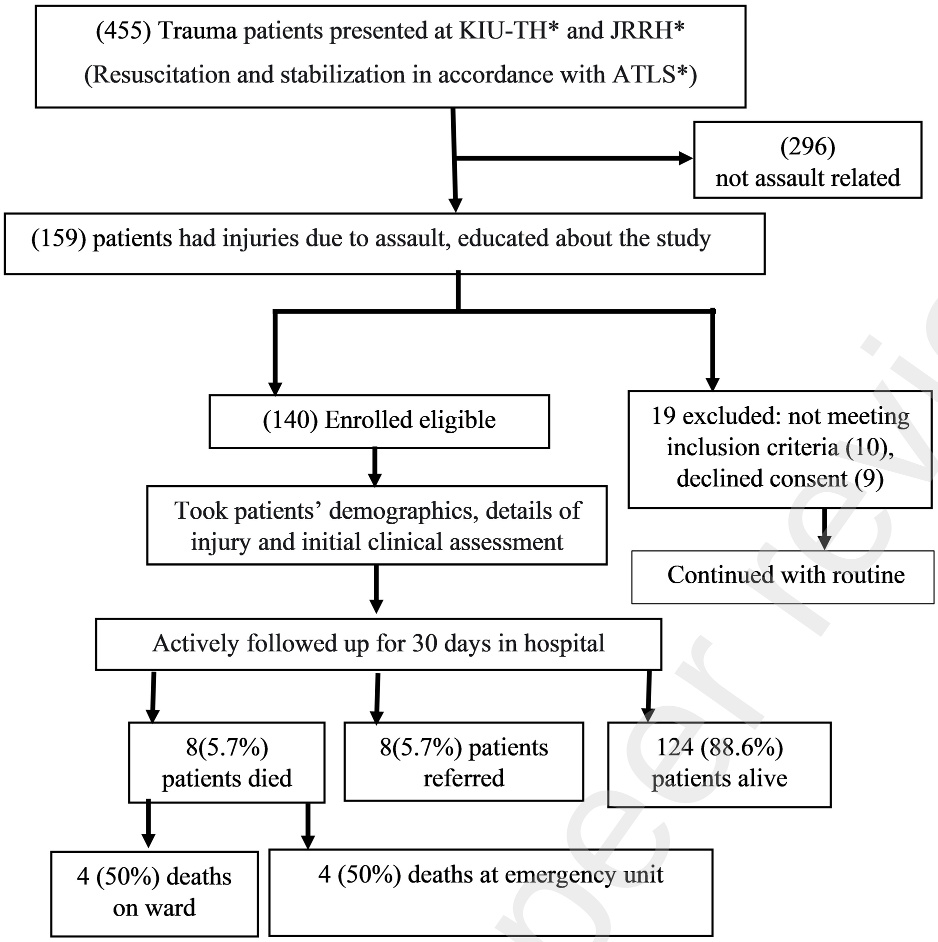

Figure 1: Flow of Participants

KIU-TH* (Kampala International University Teaching Hospital)
JRRH* (Jinja Regional Referral Hospital)
ATLS* (Advanced Trauma Life Support)

2.3 Sample size determination

Since this was a baseline prospective cohort study partly aimed at defining possible associations between study variables and thirty-day mortality, it was deemed unnecessary to compute a sample size as way of demonstrating a valid association with each single variable. We however performed sample size calculation due to foreseen differential non-response, loss to follow-up and other factors that could affect statistical reliability of our results.

We used OpenEpi version 3.0 to estimate the sample size for this cohort as described by Kelsey et al (https://www.openepi.com/SampleSize/SSCohort.htm). Assuming 16% of individuals exposed to non-sexual assault would have the outcome of interest (mortality) and 80% statistical power at two-tailed 95% confidence interval, the resulting sample size was 278 with continuity correction (Odds ratio 3.6). However, during the three months period that preceded the study, a total of 76 and 176 number of assault cases had been recorded at KIU-TH and JRRH local registries respectively, giving a total of 252. Thus, after adjusting for finite population, the final sample was 140 inclusive of 5% projected loss to follow-up. Further, We used proportionate sampling thus 42 participants were recruited from KIU-TH and 98 from JRRH respectively.

2.4 Inclusion criteria

All patients with injuries due to non-sexual assault who consented to take part in the study during the data collection period.

2.5 Exclusion criteria

We excluded patients who reported to the study sites when their principle definitive care was already executed by the referring facility for instance those received during the rehabilitation phase of their recovery journey. This is because operative surgical intervention as opposed to "watchful waiting" was one of our study variables.

2.6 Study variables

Mortality at 30 days after arrival at the hospital was the main outcome of interest and coded as dead or alive. We used the Kampala Trauma Score II, herein being referred to as KTS as the main predictor of injury severity [23]. This score is suitable in resource constrained settings to enable easy data collection process without time-consuming extensive recording [24], and has been validated and found to be comparable to other trauma scoring systems such as the revised trauma score [25], [26]. A twenty-year track evaluation of the KTS showed that it equaled or exceeded more complicated-time-consuming trauma scores in 80% of studies that assessed injury severity and clinical outcomes [27], and thus was considered suitable for the present study.

The KTS puts into context both physiological and anatomical aspects and thus relies on the patients' respiratory rate, systolic blood pressure, age, number of serious injuries and neurological status at admission. The KTS score ranges from (0-10), with lower scores indicating more severe injuries. We coded the injury severity as mild (KTS 9-10), moderate (KTS 7-8) or severe (KTS ≤ 6). Other variables of interest included socio-demographic, the specific body part injured, neck strangulation, type of injury, interval from injury to hospitalization, who accompanied the patient to the hospital, whether there was alcohol intoxication at time of incidence and if a weapon was used in the assault process. These variables had been found to influence the outcome of non-sexual assault related injuries in the literature [28][29][30].

2.7 Statistical analysis

Categorical variables were presented as percentages while numeric variables were presented as means and standard deviations. Owing to small numbers in the cross tabulation, the Fishers Exact p-values were presented. The Firth's logistic regression method was used to determine the association between mortality at 30 days and the predictor variables. In this study, Firth's logistic regression was deemed suitable because the cases with the outcome of interest (mortality) are rare or samples were few thus reducing bias by penalizing the maximum likelihood estimates [31]. We used p=0.05 to test for the penalized log likelihood of the overall model. Odds Ratios were presented with their respective 95% confidence intervals and the statistical significance at 5%. The fit of the model was tested using Firth fit test and found to have a good fit. Multicollinearity was tested using the Variance Inflation Factor (VIF). Variables in the final model were found to have VIF factor less than 5, suggesting minimal correlation. All statistical analyses were conducted using Stata 17 (StataCorp, TX, USA).

3 Results

In terms of the injury characteristics, the overall mean age of the patients was 29.98 (Standard Deviation (SD)=12.76) i.e. [36.63 (SD=16.69) for those who died and 29.58 (SD=12.45) for those who survived respectively]. Males were the majority 108 (77.14%), especially those who were unemployed 94 (67.14%). Nearly half of the patients resided in urban areas 71 (50.71%). A higher proportion of patients had been assaulted on the street/road 50 (35.71%) or at home 42 (30.00%). A weapon was used during the assault process in 80% (n=112) of the cases; out of these, the use of a sharp object was the most common at 42.86% (n=48), followed by a blunt object at 39.29% (n=44). Almost half of the patients experienced multiple injuries 68 (48.97%), while nearly a quarter had (only) head injuries 38 (27.14%). Less than half of the patients reported had consumed alcohol at the time of injury 61 (43.57%). Less than a quarter 28 (20.00%) of the patients were treated and discharged at the Emergency Department, while the majority required admission and surgery 118 (84.29%). The median duration of stay in the hospital was 2 days with an interquartile range of (1, 4.5 days).

Regarding mortality and injury severity, during the study period, out of 140 patients, 8 (5.71%) died (Table 1). Based on KTS, the injuries were moderate in 29 (20.71%) and severe in 49 (35.00%) of cases respectively. It was established that in our settings, less-fatal sharp or blunt objects such as knives or iron bars were used more often compared to gun violence.

Regarding predictors of mortality, in the unadjusted models (Table 2), patients with KTS categorized as severe were more likely to die compared to the mild cases (OR = 49.4, 95% CI 2.74, 892.73; p=0.008). Being managed by surgical operation as opposed to watchful waiting was associated with less mortality at 30 days (OR = 0.16, 95% CI 0.04, 0.65; p=0.010). Patients who had been assaulted with petrol or paraffin were 18 times more likely to die compared to those on whom a sharp object had been used (OR = 18.60, 95% 2.13, 162.28; p=0.008). Victims with neck (OR=11.10, 95% CI 2.64, 46.64; p=0.001), spinal (OR=8.92, 95% CI 1.65, 48.32; p=0.011), tendon (OR=10.44, 95% CI 1.21, 89.97; p=0.033 and burn (OR=14.23, 95% CI 2.34, 86.45 p=0.004) injuries were more likely to die within 30 days after the assault incident. On the other hand, patients with cuts and soft tissue injuries were 82% less likely to pass away during the 30-day period (OR = 0.18, 95% CI 0.04, 0.89; p=0.036).

In the multivariable model (Table 3), patients with a severe KTS were 100 times more likely to experience mortality by 30 days (aOR = 100.79, 95% CI 4.88, 2080.57; p=0.003) compared to those with mild KTS. Patients with pelvic injuries were also at an increased risk of 30-day mortality (aOR = 112.80, 95% CI 1.02, 12434.57; p=0.049). Patients who were accompanied to the hospital by the relatives had lower odds of mortality at 30 days compared to those accompanied by police or nurses (aOR= 0.004, 95% CI <0.01, 0.48, p=0.024)

4 Discussion

One of the study aims was to document the injury characteristics associated with the assault event. We established that the males in the age group of 29.98 years +/-12.76 SD were the majority. Our findings are comparable to those reported in Rwanda [28], Malawi [32] and South Africa [33] where males in economically productive age group (20-40 years) predominated, accounting for 68-80% of assault cases. In addition, our findings conform to the gender and crime statistics in some of the high income countries. In a large Romanian study at an emergence department in Europe, 80% of victims of inter-personal violence were men and the same gender were perpetrators in 99% of inter-personal violence cases [34]. Contrary to our findings, investigators in the United States of found women and children equally vulnerable to non-sexual assaults [35] and compelling evidence from Michigan illustrated no gender disparities in occurrence of assault amongst adolescents 14-18 years [2]. However, this balance arguably shifts with increasing age and changing gender roles [32]. For instance, in an Asian study of assaults amongst children using the Pakistan National Emergency Departments Surveillance data from seven major emergency departments, Khan et al[36] reported that boys were three times more likely to sustain non-sexual assault related injuries compared to girls. However, in a study that evaluated community based assault victims in South Africa [33], the odds of young males being victims were 11 times higher compared to their female counterparts. The issue of men being more exposed to intentional as well as unintentional injuries such as road traffic crash should be given prime importance in injury prevention strategies in African settings and globally. In a multi-country study that investigated the burden of such injuries in Europe[37], it was found that economically productive males aged 15-24 years disproportionately carried the largest share across the six participating countries including Denmark, Austria, Norway, Netherlands and the United Kingdom. The resulting economic losses to due pre-mature deaths and disability-adjusted life years lost from these injuries are unbearable. Moreover, evidence from five Latin American countries show that the costs limited just to health care expenditure on inter-personal violence ranged from 0.03% of the gross domestic product in Venezuela, 1.5% (Mexico), 1.9% (Brazil), 4.3 (El Salvador) to 5% in Colombia [35]. In a more recent analysis of Chile, Costa Rica, Honduras, Paraguay and Uruguay, the cost attributable to inter-personal violence crimes ranged from 2.5 to 10.5% of their GDP [38]. Further expenses on legal pursuit for justice, hiring security agencies to prevent these crimes and periods of unproductiveness due to prolonged imprisonment of perpetrators warranty cost-effective prevention measures for assaults[39].

Still in relation to gender disparities in assaults, in accordance with the social construct of masculinity [40], men are regarded the bread winners in African socio-cultural context and sustaining assault related injuries during robbery for monetary gain or securing hierarchy amongst men has been reported by researchers in Rwanda amidst increasing unemployment in their settings [28]. In our study, 67.14% of victims of assault were unemployed. Although no causal relationship has been established, unemployment is an emerging phenomenon reported amongst victims of assault in Africa [33, 41]. As such, some scholars have linked assault to low socio-economic status [42]. To the contrary however, other researchers have underpinned marginalisation and the increasing gap between extremes of poverty and richness to be the key driving factor for assaults linked to socio-economic status [35].

Like in the present study, the Rwandan [28], Malawian [32] and Pakistan's [36] experiences showed that most assaults occur on the streets and at homes mostly at night when identification of perpetrator can easily be concealed. This demonstrates a dual burden of unsafe families and communities. According to a study from the USA [35], it has been argued that insecurities associated with assaults in communities stagnates their future economic development in addition to devaluing their existing business assets. It is thus evident that assault prevention strategies should adopt an ecological model targeting individual, interpersonal and community levels. Such target-specific prevention programs should balance between urban and rural settings both of which our study show are hot spots for inter-personal injuries. In addition, assault prevention measures should consider excessive alcohol consumption control in the long-term multidisciplinary rehabilitation of these victims since alcohol use was reported in 43.6% (61) of our study participants.

The present study also aimed at determining injury severity and establishing variables associated with thirty-day mortality amongst patients involved in assault event. We were concerned to find that most assault related injuries were multiple in nature which contributes to their severity. Moreover 35% (49) of cases in our series had a severe Kampala Trauma score (≤ 6), which in addition to increasing risk of mortality, poses huge socio-economic burden during hospitalization and post survival rehabilitation. In contrast to 10.5% admission rate for assault related injuries that was documented in Malawi [32], a country that has similar characteristics with Uganda, indeed our study showed that the majority 84.3% (118) of cases required admission for surgical operations; obviating the injury severity and the cost implication of assaults to our fragile health care system.

We established that mortality occurred in 5.7% (8) patients within 30 days follow-up. This is comparable to 4.0% reported in an old local study in Uganda (Mutto et al., 2010), but much higher than 1.0% and 0.14% reported in South Africa [33] and Malawi [32] respectively. The discrepancies could be either due to a huge trauma burden in Uganda or variation in reporting periods, the later studies reporting annual death tolls. However, the mortality in the present study is slightly lower than 10% documented in the East African neighborhood in Rwanda [28], although our mortality is underrepresented since pre-hospital delays in our settings often deter patients with serious injuries from making it to the hospital. It should be noted that mortality is the last outcome for which by world health organization's definition of assault, several deleterious psychosocial and mental health consequences could have occurred before death [4]. In addition to the direct mortality, proxy reports of physical assault are known to exacerbate cardiovascular diseases and are associated with all-cause mortality from non-external causes as demonstrated in the Russian case control study [43]. Furthermore, the feeling of insecurity, stigma, and anxiety amongst families attached to assault victims are other societal consequences. In a survey of Latin American countries, 12 in 18 reported that their main fear in life were criminality associated with assaults [38, 39]

Our study demonstrated that one of the key factors significantly associated with mortality at 30 days was a severe Kampala Trauma Score [aOR=100.79, 95% CI (4.88, 2080.57); P=0.003)]. These findings reinforce our understanding that KTS is a good predictor of mortality in the assaulted population. This is in accordance with the foundation laid by Kobusingye et al [23] and Weeks et al[25] who predicted hospital admissions and mortality using KTS in the general trauma population.

In addition, we found that being accompanied by a relative [aOR=0.004, 95% CI ($<$0.010, 0.48) P=0.024] was associated with lower odds for mortality compared to being accompanied by police or nurse. Uganda is one of the disadvantaged countries with no formal pre-hospital care and where police is not trained in basic life support [44]. On the other hand, non-sexual assault patients are more likely to be transported to health facilities by police as lay responders because of limited ground ambulances and a weak legislative system that requires such cases to first report to police stations before visiting the hospitals [18]. Such patients often receive no first aid before arrival to emergence departments which worsens their injuries [44]. In addition, because of limited human resource for health in Uganda, it is mostly the very sick patients who enjoy the privilege of being transported in an ambulance with an accompanying nurse during referral from lower health facilities. Otherwise, stable patients are accompanied by relatives and reach hospitals by use of public transport. This unique practice arguably explains the higher mortality amongst those accompanied by nursing staff.

We found that sustaining pelvic, spinal or burn injuries due to paraffin, petrol and hot water were independently associated with increased mortality. Such patients and those with severe KTS should be prioritized during triage and bench-marked for admission, allowing close observation and possible follow-up surgical intervention to avert complications that could lead to mortality.

Study Limitations Our study had certain limitations which should be considered whilst interpreting the findings. Firstly, the consecutive recruitment and limited sample size in the present study attracts selection bias. Secondly the self-reported alcohol consumption prior assault event was subjective to social desirability bias. In addition, the study was conducted at tertiary hospitals thus the mortality reported is likely to be underestimated, not accounting for patients who die before arrival and those who die in lower health facilities. Lastly, due to our small sample size with the outcome of interest i.e mortality, the confidence limits in the present study are imprecise. On the other hand, this study boosts of several strengths. Firstly, we focused on a unique population that had been underrepresented in the local settings as most of previous research in Uganda concentrated on sexual assault in the context of gender-based violence. More so, we covered a wide range variables and injury characteristics associated with non-sexual assault event in both men and women. Further, the data in this prospective study was collected using pre-tested questionnaires that were specifically designed for this purpose, thus the quality of data completion could easily be controlled without loss to follow-up. Finally, to mitigate the likely bias due to limited samples with the outcome of interest, we used Firth's logistic regression suitable for rare cases [31].

5 Conclusion

Non-sexual assault predominantly affects unemployed young males in Uganda and mainly occur on streets and homes. Diverse severe injuries due to non-sexual assault manifest in 35% of the cases and are associated with higher chances of 30-day mortality. Sustaining neck, spinal, pelvic or burn injuries and who accompanies the patient to the hospital were other determinant of mortality. Future research should be larger multi-center prospective cohort studies to establish the long-term multidimensional effects of non-sexual assault related injuries on affected individuals and communities.

Author contributions

Daniel Asiimwe conceived and designed the experiments, performed the experiments, collected and analyzed the data, prepared figures and/or tables and reviewed drafts of the paper.

Anne Abio conceived and designed the experiments, performed the experiments, analyzed the data, prepared figures and/or tables and reviewed drafts of the paper.

Kevin Nelson conceived and designed the experiments, performed the experiments, analyzed the data, prepared figures and/or tables and reviewed drafts of the paper.

Sadhvi Subramanian conceived and designed the experiments, analyzed the data, prepared figures and/or tables and reviewed drafts of the paper.

Michael Lowery Wilson conceived and designed the experiments, analyzed the data, prepared figures and/or tables and reviewed drafts of the paper.

Patrick Kyamanywa conceived and designed the experiments, performed the experiments, analyzed the data, prepared figures and/or tables, reviewed drafts of the paper and co-supervised the study.

Herman Lule conceived and designed the experiments, performed the experiments, analyzed the data, prepared figures and/or tables, wrote drafts of the paper and supervised the study.

All authors read and approved the final manuscript.

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8 Conflict of interest/ Disclosure

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Data Availability Statement The data from which these results were generated is available as supplemental material

Table 1: Cross tabulations of assault injury mortality at 30 days at two hospitals

	Death by 30 days	No Death by 30 days	Fishers Exact P
All cases	8 (5.71)	132 (94.29)	-
Age - mean (SD)	36.63 (16.69)	29.58 (12.45)	0.276
Duration of hospital stay – Median (IQR)	1 (0, 3)	2 (1, 5)	0.301
Hospital			
Jinja	7 (7.14)	91 (92.86)	0.435
KIU	1 (2.38)	41 (97.62)	
Sex			0.682
Females	1 (3.13)	31 (96.88)	
Males	7 (6.48)	101 (93.52)	
Education			0.178
Not attended	2 (13.33)	13 (86.67)	
Primary school	5 (8.20)	56 (91.80)	
Secondary school	1 (1.92)	51 (98.08)	
University /Other training	0 (0.00)	12 (100.00)	
Employment status			0.053
Employed	0 (0.00)	46 (100.00)	
Unemployed	8 (8.51)	86 (91.49)	
Occupation			0.238
Student	0 (0.00)	21 (100.00)	
Civil servant	0 (0.00)	4 (100.00)	
Casual labourer	4 (7.84)	47 (92.16)	
Private employee /Small business owner	1 (2.33)	42 (97.67)	
Farmer	3 (14.29)	18 (85.71)	
Place of residence			0.490
Urban	3 (4.23)	68 (95.77)	
Rural	5 (7.25)	64 (92.75)	
Time of assault			0.881
Morning	1 (5.26)	18 (94.74)	
Afternoon	2 (4.26)	45 (95.74)	
Night	5 (6.76)	69 (93.24)	
Place of assault			0.682
Home	3 (7.14)	39 (92.86)	
Work	1 (3.85)	25 (96.15)	
Road or street	4 (8.00)	46 (92.00)	
Other	0 (0.00)	22 (100.00)	
Weapon was used			1.000
No	1 (3.57)	27 (96.43)	
Yes	7 (6.25)	105 (93.75)	
Nature of weapon used			0.032
Sharp object	2 (4.17)	46 (95.83)	
Blunt object	3 (6.82)	41 (93.18)	
Gun shot	0 (0.00)	16 (100.00)	
Paraffin or petrol or hot water	2 (50.00)	2 (50.00)	
Alcohol consumption			1.000
No	5 (6.33)	74 (93.67)	
Yes	3 (4.92)	58 (95.08)	

	Death by 30 days	No Death by 30 days	Fishers Exact P
Known perpetrator			0.290
No	2 (3.13)	62 (96.88)	
Yes	6 (7.89)	70 (92.11)	
Head or face injured			1.000
No	3 (5.17)	55 (94.83)	
Yes	5 (6.10)	77 (93.90)	
Neck			0.002
No	3 (2.52)	116 (97.48)	
Yes	5 (23.81)	16 (76.19)	
Chest			0.362
No	5 (4.50)	106 (95.50)	
Yes	3 (10.34)	26 (89.66)	
Abdominal injury			0.343
No	6 (5.04)	113 (94.96)	
Yes	2 (9.52)	19 (90.48)	
Spinal injury			0.052
No	6 (4.51)	127 (95.49)	
Yes	2 (28.57)	5 (71.43)	
Pelvic injury			0.258
No	7 (5.19)	128 (94.81)	
Yes	1 (20.00)	4 (80.00)	
Upper limbs injured			0.446
No	4 (4.35)	88 (95.65)	
Yes	4 (8.33)	44 (91.67)	
Lower limbs injured			0.412
No	5 (4.76)	100 (95.24)	
Yes	3 (8.57)	32 (91.43)	
Specific body part injured			0.488
Head	1 (2.63)	37 (97.37)	
Neck	1 (33.33)	2 (66.67)	
Chest	0 (0.00)	5 (100.00)	
Abdomen	0 (0.00)	5 (100.00)	
Spine	0 (0.00)	1 (100.00)	
Pelvis	0 (0.00)	2 (100.00)	
Upper limbs	0 (0.00)	10 (100.00)	
Lower limbs	0 (0.00)	8 (100.00)	
Multiple	6 (8.82)	62 (91.18)	
Number of parts injured*			0.157
One body part	2 (2.78)	70 (97.22)	
Multiple body parts	6 (8.82)	62 (91.18)	
Limb fracture			
No	5 (4.55)	105 (95.45)	0.368
Yes	3 (10.00)	27 (90.00)	
Joint dislocation			0.212
No	7 (5.15)	129 (94.85)	
Yes	1 (25.00)	3 (75.00)	
Tendon tear/injury			0.163
No	7 (5.11)	130 (94.89)	

	Death by 30 days	No Death by 30 days	Fishers Exact P
Yes	1 (33.33)	2 (66.67)	
Soft tissue injuries			0.102
No	2 (20.00)	8 (80.00)	
Yes	6 (4.62)	124 (95.38)	
Burns			0.026
No	6 (4.44)	129 (95.56)	
Yes	2 (40.00)	3 (60.00)	
Strangulations			0.421
No	7 (5.34)	124 (94.66)	
Yes	1 (11.11)	8 (88.89)	
Type of injury			0.035
Fracture	0 (0.00)	4 (100.00)	
Tendon tear/ injury	0 (0.00)	1 (100.00)	
Cuts and soft tissue	2 (2.08)	94 (97.92)	
Burns	1 (25.00)	3 (75.00)	
Strangulation	0 (0.00)	2 (100.00)	
Multiple	5 (15.15)	28 (84.85)	
Kampala Trauma Score			<0.001
Mild	0 (0.00)	62 (100.00)	
Moderate	0 (0.00)	49 (100.00)	
Severe	8 (27.59)	21 (72.41)	
Pre hospital transport			0.132
Relative	2 (2.70)	72 (97.30)	
Police	4 (13.33)	26 (86.67)	
Nurse	0 (0.00)	1 (100.00)	
Other	2 (5.71)	33 (94.29)	
Interval from injury to hospital			0.309
Less than 1 hour	2 (7.69)	24 (92.31)	
1 to 6 hours	4 (4.44)	86 (95.56)	
6 to 12 hours	1 (12.50)	7 (87.50)	
12 to 24 hours	0 (0.00)	5 (100.00)	
24 to 48 hours	1 (25.00)	3 (75.00)	
More than 48 hours	0 (0.00)	7 (100.00)	
Treated and discharged from ED			1.000
No	7 (6.25)	105 (93.75)	
Yes	1 (3.57)	27 (96.43)	
Surgery done			0.021
No	4 (18.18)	18 (81.82)	
Yes	4 (3.39)	114 (96.61)	
Admitted on ward			0.053
No	5 (11.90)	37 (88.10)	
Yes	3 (3.06)	95 (96.94)	
Referred for super-specialised care			1.000
No	8 (6.06)	124 (93.94)	
Yes	0 (0.00)	8 (100.00)	
Type of operation			0.164
Surgical toilet and suturing	2 (2.38)	82 (97.62)	
Orthopedic procedures	1 (4.76)	20 (95.24)	
Laparatomy	0 (0.00)	7 (100.00)	

	Death by 30 days	No Death by 30 days	Fishers Exact P
Other	1 (16.67)	5 (83.33)	

* Derived from the Specific part variable above.

Table 2: Firth's logistic regression univariate analysis - injury mortality at 30 days at two Ugandan hospitals

	Unadjusted OR	95% CI	P
Kampala Trauma Score			
Mild	1		
Moderate	1.26	0.02, 64.77	0.908
Severe	49.42	2.74, 892.73	0.008
Age	1.04	0.99, 1.08	0.103
Hospital			
KIU	1		
Jinja	2.27	0.38, 13.60	0.37
Sex			
Females	1		
Males	1.55	0.26, 9.37	0.632
Education			
Not attended	1		
Primary school	0.53	0.11, 2.63	0.433
Secondary school	0.16	0.02, 1.30	0.086
University /Other training	0.22	0.01, 4.95	0.338
Employment status			
Employed	1		
Unemployed	9.14	0.52, 161.88	0.131
Occupation			
Student	1		
Civil servant	4.78	0.08, 274.08	0.449
Casual labourer	4.07	0.21, 79.07	0.353
Private employee /Small business owner	1.52	0.06, 38.84	0.801
Farmer	8.14	0.39, 167.98	0.175
Place of residence			
Urban	1		
Rural	1.67	0.42, 6.65	0.468
Time of assault			
Morning	1		
Afternoon	0.68	0.08, 5.51	0.716
Before/Past midnight	0.98	0.15, 6.38	0.980
Place of assault			
Home	1		
Work	0.66	0.09, 4.79	0.685
Road or street	1.09	0.25, 4.70	0.906
Other	0.25	0.01, 5.08	0.367
Weapon was used	1.30	0.21, 7.90	0.773
Nature of weapon used			
Sharp object	1		
Blunt object	1.57	0.29, 8.38	0.599
Gun shot	0.56	0.03, 12.36	0.716
Paraffin or petrol or hot water	18.6	2.13, 162.28	0.008
Alcohol consumption	0.81	0.20, 3.23	0.766
Known perpetrator	2.30	0.52, 10.31	0.275

	Unadjusted OR	95% CI	P
Head or face injured	1.13	0.28, 4.49	0.867
Neck	11.10	2.64, 46.64	0.001
Chest	2.56	0.63, 10.43	0.191
Abdominal injury	2.24	0.48, 10.40	0.304
Spinal injury	8.92	1.65, 48.32	0.011
Pelvic injury	5.71	0.78, 41.74	0.086
Upper limbs injured	1.99	0.51, 7.71	0.320
Lower limbs injured	1.97	0.49, 7.96	0.342
Number of parts injured			
One body part	1		
Multiple body parts	2.93	0.66, 13.11	0.159
Limb fracture	2.44	0.60, 9.94	0.213
Joint dislocation	7.40	0.95, 57.45	0.056
Tendon tear/injury	10.44	1.21, 89.97	0.033
Soft tissue injuries	0.18	0.04, 0.89	0.036
Burns	14.23	2.34, 86.45	0.004
Strangulations	2.93	0.44, 19.31	0.264
Pre-hospital transport			
Relative	1		
Police	4.92	0.99, 24.61	0.052
Nurse	9.67	0.31, 301.47	0.196
Other	2.16	0.36, 13.10	0.401
Interval from injury to hospital			
Less than 1 hour	1		
1 to 6 hours	0.51	0.10, 2.55	0.412
6 to 12 hours	1.96	0.22, 17.40	0.546
12 to 24 hours	0.89	0.04, 21.30	0.943
24 to 48 hours	4.20	0.42, 42.46	0.224
More than 48 hours	0.65	0.03, 15.16	0.791
Treated and discharged from ED	0.77	0.13, 4.65	0.773
Surgery done	0.16	0.04, 0.65	0.010
Admitted on ward	0.25	0.06, 1.01	0.051
Referred for super-specialised care	5.00	0.07, 366.32	0.463
Duration spent in the hospital	0.90	0.70, 1.18	0.455
Type of operation			
Surgical toilet and suturing	1		
Orthopedic procedures	2.41	0.30, 19.35	0.406
Laparatomy	2.20	0.10, 50.17	0.621

	Unadjusted OR	95% CI	P
Other	9.00	1.00, 81.27	0.05

Table 3: Firth's logistic multivariable regression model - injury mortality at 30 days at two Ugandan hospitals

	Adjusted OR	**95% CI**	**P**
Kampala Trauma Score			
Mild	1		
Moderate	1.46	0.03, 73.38	0.849
Severe	100.79	4.88, 2080.57	0.003
Pelvic injury	112.80	1.02, 12434.31	0.049
Pre-hospital transport			
Nurse	1		
Relative	0.004	<0.01, 0.48	0.024
Police	0.06	0.001, 5.93	0.226
Other	0.07	0.001, 6.77	0.255

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