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Research Article

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The Prevalence of Substance Use and the Association with Injury Severity among Emergency Department Patients in Moshi, Tanzania

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Abstract

Background: Alcohol and substance use are significant risk factors for injury. To guide harm-reduction strategies, this study describes alcohol and substance use patterns and analyzes their association with injury severity among injury patients presenting to Kilimanjaro Christian Medical Centre (KCMC).

Methods: Self-reported sociodemographic, alcohol, and substance use data were collected from a prospective trauma registry of adult patients admitted to KCMC for acute injury. The Alcohol Use Disorder Identification Test (AUDIT) was also administered. Injury severity data were determined by the Kampala Trauma Score. Descriptive statistics and multivariable logistic regressions assessed the association of sociodemographic and substance use data with injury severity.

Results: of all participants (n=716), 57% self-reported alcohol use within the last year. Of those participants, 20% were determined to have an alcohol use disorder (AUDIT Score> 8). 26% of all participants reported alcohol use before the injury, while 18% of participants reported current using tobacco. 20% of participants reported use of any psychoactive substance, including 3% reporting current marijuana use, and 1% reporting current khat/mirungi use. Alcohol use in the past year was associated with an increased likelihood of also using tobacco (OR 5.2, 95% CI 3.0-9.9), while current other drug use was associated with an increased likelihood of alcohol use (OR 5.9, 95% CI 1.8-38.6). Although alcohol use alone was not associated with injury severity, other drug use was linked with a 3 times increased risk of a severe injury (OR 3.1, 95% CI 1.0-8.9).

Conclusion: Alcohol use is common among KCMC injury patients. While illicit drug use is less common, it is associated with an increased likelihood of severe injury occurrence. Further research delineating the association of alcohol and drug use on the severity of injury in similar injury populations is suggested.

Keywords

Trauma; Injury; Alcohol; Substance use

Key Message

This study aimed to describe the prevalence of substance use among injury patients admitted to the Kilimanjaro Christian Medical Centre (KCMC), Moshi, Tanzania. We found that those who used tobacco were also likely to drink alcohol and those who suffered assault injuries had high rates of alcohol use before injury. Our findings also suggest that illicit drug use may be associated with the occurrence of more severe injuries, likely due to risky behavior patterns and impaired judgment.

Introduction

Alcohol use is responsible for about 5% of the global burden of disease [1] and around 31 million people are estimated to have substance use disorders [2]. In sub-Saharan Africa (SSA), roughly 23% of Emergency Department (ED) patients test positive for alcohol upon arrival [3]. This estimate is slightly higher at 30% in Moshi, Tanzania [4]. Alcohol and substance use are significant risk factors for injury due to resulting decreased judgment and impaired neurological abilities [5-10]. Globally, injuries makeup 9% of global mortality and 11% of Disability Adjusted Life Years (DALYs) [11,12] and are a growing public health concern [13]. Previous studies have found that rates of tobacco and marijuana use in urban areas of Tanzania may reach as high as 8.7% and 0.8%, respectively [14]. Thus far, however, the prevalence of other substance use, including khat/mirungi, tambu, and kuberi in relation to injury patients, remains understudied.

EDs are uniquely positioned to address alcohol and substance use issues among injury patients [15,16]. Few substance-use screening systems are available to collect data on injury patients in sub-Saharan African EDs. Based on previously reported literature, a positive Breathalyzer Test (BAC ≥ 0.01%) within 6 hours of the injury is considered to be an alcohol-related injury [4]. This study aimed to determine the prevalence of alcohol or substance use in an injury population presenting to a regional referral hospital in Northern Tanzania, and to understand how many of those patients are categorized as having lifetime and current alcohol or substance use. We also explored the association between alcohol or substance use and injury severity experienced by this population.

Methods

Ethical statement

This study was approved by the Duke University Medical Center Institutional Review Board, Kilimanjaro Christian Medical Center (KCMC) Ethics Committee and the Tanzanian National Institute of Medical Research. At all three institutions, this registry received a waiver of informed consent based on the clinical registry nature of this data collection.

Setting

This study was conducted at KCMC in Moshi, Tanzania. KCMC is located in northern Tanzania, and serves as a referral hospital for the Kilimanjaro region and one of the four tertiary care hospitals in Tanzania. It is also the third largest hospital in the country [17,18].

Study population

This study is a secondary data analysis of a large trauma registry of data collected prospectively by trained research staff at KCMC. Inclusion criteria for the trauma registry include age (≥ 17 years), and acute injury (<24 hours) prior to admittance. People within 24 hours of injury were eligible for enrollment if they arrived directly to KCMC ED or if first seen at another hospital and transferred to KCMC. A total of 716 people met inclusion criteria and were included in this study.

Variables

Sociodemographic characteristics including age, sex, education, employment, tribe, marital status, and hospital payment method were collected as self-report. Injury characteristics, such as mechanism of injury, injury severity, and physical outcome scores were also collected. The Kampala Trauma Score (KTS) (range 0-10) was used to assess injury severity and has previously been validated to predict outcomes in injury populations in Tanzania [19]. Severe KTS is indicated by a score 0-8, while a patient with mild KTS scores 9-10. A positive alcohol status upon ED arrival was determined by either self-report, positive breathalyzer test, or by physical exam by the research nurses. Alcohol use was assessed with the Alcohol Use Disorders Identification Test (AUDIT), which is a 10-item questionnaire and cross-cultural clinically validated tool used to screen for harmful alcohol use [20-25]. Hazardous alcohol use is identified with an AUDIT score 8-40, while non-hazardous use is considered with an AUDIT score 0-7 [26]. Lifetime and current substance use for tobacco, marijuana, khat/mirungi (a psychedelic stimulant native to East Africa), and other drugs were self-reported [27].

Data collection

Data collection using surveys administered to patients in the KCMC ED or once patients were medically stable occurred between April 18, 2018 and May 22, 2019. The survey was administered by trained research nurses and assistants to collect all patient-level variables. Survey questions were developed in English and translated for administration to participants by research staff in the local Kiswahili language. Data were collected on paper, then entered and stored in an electronic database on REDCap behind a university firewall.

Data analysis

Data analysis was performed in RStudio for Statistical Computing [28]. Descriptive statistics, including means, dispersions, and frequencies, were obtained for sociodemographic characteristics. Univariate logistic regression models were constructed to estimate odds ratios (OR) with a 95% confidence interval (CI) between the following relationships; 1) sociodemographic characteristics and KTS, 2) sociodemographic characteristics and current alcohol use, 3) sociodemographic characteristics and tobacco use, 4) and alcohol and substance use and KTS. Multivariable logistic regressions were used to estimate OR with a 95% CI for the association between an AUDIT score of 8 or above, current tobacco use, and current use of other drugs with KTS score. The multivariable models were adjusted for sex, age, education, marital status, insurance, mechanism of injury, and tribe.

Results

A total of 716 participants were included in this study (Table 1). The majority of participants were assessed with mild KTS (71.0%). The majority of study participants were also male (83.8%), with a mean age of 37.9 (SD 15.9), and completed a mean of 8.5 (SD 3.31) years of education. We found that 54.2% of participants reported being married, 53.1% were from the Chagga tribe, 40.2% of participants were self-employed, while 26.3% worked as farmers. The majority of participants were admitted to KCMC due to Road Traffic Injury (RTI) and paid for hospital expenses out-of-pocket with cash (64.1% and 83.1%, respectively). Statistically significant differences were found between participants with mild and severe KTS scores in terms of mean age, sex, and years of education, marital status, tribe, and employment, mechanism of injury, insurance type, and insurance type.

Table 1: Sociodemographic characteristics.

Sociodemographic Characteristics	Participants n=716	Mild KTS n=508 (71.0%) REF	Severe KTS n=208 (29.1%)	OR (CI 95%)
Age mean (SD)	37.9 (15.9)	32.4 (9.4)	51.3 (20.2)	0.9 (0.9-0.9)
Male n (%)	600 (83.8%)	447 (88.0%)	153 (73.6%)	0.4 (0.3-0.6)
Years education mean (SD)	8.5 (3.3)	8.79 (3.2)	7.89 (3.6)	1.1 (1.0-1.2)
Marital status n (%)				
Single	256 (35.8%)	199 (39.17%)	57 (27.4%)	REF
Married	388 (54.2%)	261 (51.4%)	127 (61.1%)	1.8 (1.2-2.6)
Other	72 (10.1%)	48 (9.5%)	57 (11.5%)	2.2 (1.3-3.8)
Tribe n (%)				
Chagga	380 (53.1%)	252 (49.6%)	128 (61.5%)	REF
Sambaa	35 (4.9%)	25 (4.9%)	10 (4.8%)	0.7 (0.3-1.4)
Maasai	17 (2.4%)	12 (2.4%)	5 2.4%)	0.9 (0.3-2.5)
Pare	106 (14.8%)	80 (15.8%)	26 (12.5%)	0.6 (0.4-1.0)

Other	178 (24.9%)	139 (27.4%)	39 (18.8%)	0.5 (0.3-0.8)
Employment n (%)				
Professional	73 (10.2%)	54 (10.6%)	19 (9.1%)	REF
Skilled employment	90 (12.6%)	73 (14.4%)	17 (8.2%)	0.7 (0.4-1.5)
Self-employed	288 (40.2%)	231 (45.5%)	57 (27.4%)	0.8 (0.4-1.4)
Farmer	188 (26.3%)	101 (19.9%)	87 (41.8%)	*2.5 (1.4-4.7)*
Student	21 (2.9%)	19 (3.7%)	2 (1.0%)	*0.3 (0.1-1.2)*
Unemployed	23 (3.2%)	13 (2.6%)	10 (4.8%)	*2.3 (0.8-6.2)*
Other	33 (4.6%)	17 (3.4%)	16 (7.7%)	*3.0 (1.3-7.2)*
Mechanism of Injury n (%)				
Road Traffic Injury	459 (64.1%)	338 (66.5%)	121 (58.2%)	REF
Assault	103 (14.4%)	82 (16.1%)	21 (10.1%)	0.7 (0.4-1.2)
Fall	117 (16.3%)	62 (12.2%)	55 (26.4%)	*2.6 (1.8-4.0)*
Other	37 (5.2%)	26 (5.1%)	11 (5.3%)	1.0 (0.4-2.1)
Insurance Type n (%)				
Cash/personal payment	588 (83.1%)	436 (86.3%)	152 (74.9%)	REF
National Health Insurance	110 (15.5%)	63 (12.5%)	47 (23.2%)	*2.0 (1.3-3.1)*
None	2 (0.3%)	1 (0.2%)	1 (0.5%)	2.8 (0.1-72.2)
Other	8 (1.1%)	5 (1.0%)	3 (1.5%)	1.7 (0.4-7.0)
*Italicized Odds Ratios indicate statistically significant at α=0.05				

Over half (57.3%) of the participants reported that they are current alcohol users, while 28.6% of participants reported using a drug during their lifetime (Figure 1). We found that 19.6% of injury patients reported current use of any drug, 25.7% reported lifetime tobacco use, 17.9% reported current tobacco use, 6.0% reported lifetime marijuana use, 2.5% reported current marijuana use, 3.6% reported lifetime use of khat/mirungi, less than 1.0% reported current use of khat/mirungi, and 0.9% of injury patients report that they have used any other drugs (e.g. cocaine, heroin, tambu, kuberi) during their lifetime. The majority of study participants who reported current alcohol use (63.7%) and current tobacco use (51.5%) belonged to the Chagga tribe.

We found that for participants who reported current use of tobacco, the odds of that they also used alcohol increased by 4.7 (95% CI 2.69-8.54). Likewise, for participants who reported current use of alcohol, the odds that they used tobacco increased by 5.2 (95% CI 2.95-9.9). For participants who reported current use of cocaine, heroin, tambu, or kuberi, the odds that they also used alcohol increased by 5.9 (CI 1.80-38.61).

Participants who reported current use of cocaine, heroin, tambu, kuberi, marijuana, or khat/mirungi were more likely to have a severe KTS score (when adjusted for sociodemographic characteristics) (OR 3.1, 95% CI 0.97-8.9).

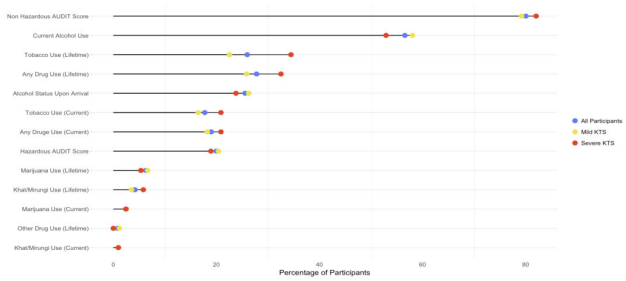

Figure 1: Prevalence of alcohol and other drug use stratified by injury severity.

Those who reported lifetime tobacco use were more likely to have a severe KTS score (OR 1.8 95% CI 1.24-2.52). We did not find a significant relationship between alcohol status upon arrival or hazardous AUDIT score and an increased likelihood of a severe KTS score.

Discussion

While previous studies have examined the relationship between alcohol use and injury in Tanzania [4,29], this study is the first to look at substance use and its association with injury characteristics in Northern Tanzania. Our study found that 57.3% of injury patients self-report having used alcohol within the past month, with 25.6% testing and self-reporting positive alcohol status upon arrival to KCMC ED with injury. We also found that 28.6% of participants reported using at least one substance (tobacco, marijuana, khat/mirungi, cocaine, tambu, kuberi, and heroin) during their lifetime while 19.6% reported currently using one or more of these substances. Participants who reported lifetime tobacco use or current drug use (cocaine, heroin, tambu, kuberi, marijuana, or khat/mirungi) were found to have increased odds of also having severe KTS score.

Socio-demographic predictors of substance use and injury severity

Our results show that men are more likely than women to currently use alcohol and/or tobacco. We found a tribal association with alcohol use, with the Chagga having higher rates of alcohol and tobacco use (Table 2). Self-employed participants had significantly higher odds of being current alcohol users, which is consistent with other work that has found a relationship between employment status and alcohol consumption [30]. Self-employed, farmer, and unemployed participants were more likely to report current tobacco use, likely due to employment stress and schedule flexibility. Those involved in assault-related injuries had 2.18 higher odds of reporting current alcohol use. These findings are similar to previous studies based in the South Africa that saw that alcohol use and the initiation of physical assault are often linked due to the substance causing cognitive and psychomotor impairment [31-33]. We also found that fall injuries were associated with increased odds of severe injury. We attribute this result to the idea that certain Mechanisms of Injury (MOI) are associated with early admittance to the ED. In the case of a fall, the injured person is much more likely to seek medical help at the ED within 24 hours of occurrence if the injury is obviously severe. On the other hand, due to the additional legal and insurance related complications of a road traffic accident, a wider range of injury severity sustained through this MOI are likely to present to the ED. This idea may also explain the low number of falls compared to road traffic injury (16.3% and 64.1%, respectively). We found that those who were male, older, and who completed fewer years of education were at increased odds of having a severe injury as classified by a KTS score (Table 1). Those who were married were linked with higher odds of having severe KTS when compared to single participants. This was also the case for participants who reported being subscribed to the National Health Insurance program. Those who subscribe to this type of insurance are likely mid-high socioeconomic status. They are more likely to own personal modes of transportation, which can significantly influence their risk of injury. Additionally, this group is more likely to reside in urban areas where the presence of paved roads greatly impact the severity of injury sustained through road traffic accidents.

Table 2: Participant characteristics by substance use indicator.

	Current Alcohol use			Current Tobacco use		
	Yes n=410 (57.3%)	**No n=306 (42.7%) REF**	**OR (CI 95%)**	**Yes n=128 (17.9%)**	**No n= 588 -82.1% REF**	**OR (CI 95%)**
Age mean (SD)	37.9 (14.6)	37.9 (17.6)	1.0 (1.0-1.0)	41.2 (15.7)	37.2 (15.9)	1.0 (1.0-1.0)
Male n (%)	363 (88.5%)	237 (77.5%)	*0.4 (0.3-0.7)*	122 (95.3%)	478 (81.3%)	*0.2 (0.1-0.4)*
Years education mean (SD)	8.4 (3.0)	8.7 (3.7)	1.0 (0.9-1.0)	7.5 (2.5)	8.74 (3.4)	*0.9 (0.8-0.9)*
Marital status n (%)						
Single	139 (33.9%)	117 (38.2%)	REF	41 (32.0%)	215 (36.6%)	REF
Married	226 (55.1%)	162 (52.9%)	1.2 (0.9-1.6)	74 (57.8%)	314 (53.4%)	1.2 (0.8-1.9)
Other	45 (11.0%)	27 (8.8%)	1.4 (0.8-2.4)	13 (10.2%)	59 (10.0%)	1.2 (0.6-2.3)
Tribe n (%)						
Chagga	261 (63.7%)	119 (38.9%)	REF	77 (60.2%)	303 (51.5%)	REF
Sambaa	14 (4.3%)	21 (6.9%)	*0.3 (0.2-0.6)*	9 (7.0%)	26 (4.4%)	1.4 (0.6-2.9)
Maasai	7 (1.7%)	10 (3.3%)	*0.3 (0.1-0.9)*	3 (2.3%)	14 (2.4%)	0.8 (0.2-2.7)
Pare	43 (10.5%)	63 (20.6%)	*0.3 (0.2-0.5)*	11 (8.6%)	95 (16.2%)	*0.5 (0.2-0.9)*
Other	85 (20.7%)	93 (30.4%)	*0.4 (0.3-0.6)*	28 (21.9%)	150 (16.2%)	0.7 (0.5-1.2)
Employment n (%)						
Professional	34 (8.3%)	39 (12.8%)	REF	8 (6.3%)	65 (11.1%)	REF

Skilled employment	47 (11.5%)	43 (14.1%)	1.2 (0.7-2.3)	11 (8.6%)	79 (13.4%)	1.5 (0.5-4.5)
Self-employed	190 (46.3%)	98 (32.0%)	*2.3 (1.3-3.8)*	50 (39.1%)	238 (40.5%)	*2.4 (1.1-6.5)*
Farmer	103 (25.1%)	85 (27.8%)	1.4 (0.8-2.4)	50 (39.1%)	138 (23.5%)	*3.9 (1.7-10.6)*
Student	10 (2.4%)	11 (3.6%)	1.18 (0.5-3.1)	0 (0.0%)	21 (3.6%)	<0.01 (<0.01-<0.01)
Unemployed	12 (2.9%)	11 (3.6%)	1.58 (0.6-4.3)	3 (2.3%)	20 (3.4%)	*1.8 (3.6-7.7)*
Other	14 (3.4%)	19 (6.2%)	0.73 (0.3-1.7)	6 (4.7%)	27 (4.6%)	2.3 (0.7-8.2)
Mechanism of Injury n (%)						
Road Traffic Injury	253 (61.7%)	206 (67.3%)	REF	79 (61.7%)	380 (64.6%)	REF
Assault	75 (18.3%)	28 (9.2%)	*2.2 (1.4-3.5)*	23 (18.0%)	80 (13.6%)	1.4 (0.8-2.3)
Fall	66 (16.1%)	51 (16.7%)	1.1 (0.7-1.6)	21 (16.4%)	96 (5.4%)	1.1 (0.6-1.8)
Other	16 (3.9%)	21 (6.9%)	0.6 (0.3-1.2)	5 (3.9%)	32 (5.4%)	0.8 (0.3-1.8)
Insurance Type n (%)						
Cash/personal payment	350 (86.0%)	238 (79.1%)	REF	120 (95.2%)	468 (80.4%)	REF
National Health Insurance	53 (13.0%)	57 (18.9%)	0.6 (0.4-1.0)	6 (4.8%)	104 (17.9%)	*0.6 (0.4-1.0)*
None	1 (0.3%)	1 (0.3%)	0.7 (0.0-17.3)	0 (0.0%)	2 (0.3%)	0.7 (0.0-17.3)
Other	3 (0.7%)	5 (1.7%)	0.4 (0.1-1.7)	0 (0.0%)	8 (1.4%)	0.4 (0.1-1.7)
*Italicized Odds Ratios indicate statistically significant at α=0.05						

Substance use in injury patients

Our study found that alcohol was the most common substance used by injury patients, with 57.3% reporting current alcohol use. Tobacco was the second most common substance (17.9%), followed by marijuana (2.5%) (Figure 1). These rates of alcohol and drug use are higher compared with general populations in other sub-Saharan African countries. In Kenya, it has been estimated that 13.4% of the population report being current alcohol users, while the rate is 15.4% in Zimbabwe [34]. Our findings also suggest that current tobacco use may be higher in this Tanzanian injury population than the rest of the country where it is reported that between 8%-12% of the population are current users [35] (Table 3).

Table 3: Alcohol and substance use and injury severity characteristics.

	OR (CI 95%)
Alcohol status upon arrival n (%)	
Negative	REF
Positive	0.9 (0.6-1.3)
Alcohol Use, current n (%)	
No	REF
Yes	0.8 (0.6-1.1)
AUDIT n (%)	
AUDIT score 0-7	REF
AUDIT score 8-40	0.9 (0.6-1.3)
Any Drug Use n (%)	
Lifetime use	*1.5 (1.1-2.2)*
Current Use	1.3 (0.9-1.9)

Tobacco use n (%)	
Lifetime use	*1.8 (1.2-2.5)*
Current use	1.3 (0.9-2.0)
Marijuana use n (%)	
Lifetime use	0.8 (0.4-1.5)
Current use	0.9 (0.3-2.5)
Khat/mirungi n (%)	
Lifetime use	1.7 (0.8-3.5)
Current use	1.0 (0.1-4.6)
Other Drugs n (%)	
Lifetime use	---
*Regression models adjusted for age, sex, education, marital status, insurance, mechanism of injury *Italicized Odds Ratios indicate statistically significant at α=0.05	

We found that other illicit substances, including khat/mirungi, cocaine, heroin, tambu, and kuberi, were uncommon in this study population-less than 4% of injury patients reported ever having used khat/mirungi, and less than 1% reported ever having used either cocaine, heroin, tambu, or kuberi (Figure 1). Our findings suggest that khat/mirungi usage in this injured Tanzanian population may be lower than that in other African populations. Previous research has found that khat/mirungi is the third most frequently used substance in East African adolescents; in North Somalia, rates of khat/mirungi usage are as high as 80% in adult males [34].

Those who reported having used any substance during their lifetime were found to have 1.5 increased odds (95% CI 1.1-2.2) of experiencing severe KTS. The use of psychoactive drugs is known to have an association with traumatic injury due to the substance's ability to alter senses and judgement. While more research is needed to confirm our findings, it is likely that substance use is associated with worsened injury severity due to such impairments and heightened risky behavior [36,37].

Combination alcohol, tobacco and substance use

Our study found that current tobacco users were more likely to also use alcohol when compared to those who abstained from smoking. Similarly, current alcohol users were more likely to also use tobacco. Our findings are consistent with previous literature that has linked the comorbidity of alcohol use with tobacco use [38,39]. Our findings suggest that current users of at least one illicit drug (cocaine, heroin, tambu, or kuberi) are also more likely to use alcohol when compared to participants who didn't report using any of these drugs (Table 4).

Table 4: Multivariable logistic regressions.

	Injury Severity		
	Mild n (%) REF	**Severe n (%)**	**OR (CI 95%)**
Hazardous AUDIT Score (≥ 8)	108 (21.26%)	36 (17.31%)	0.97 (0.56-1.65)
Current tobacco use	84 (16.54%)	44 (21.25%)	0.814 (0.45-1.45)
Current any drug use (tobacco, marijuana, khat/mirungi, cocaine, tambu, kuberi, or heroin)	93 (18.49%)	43 (22.51%)	0.82 (0.44-1.50)
Note. All models are adjusted for sex, age, education, marital status, insurance, mechanism of injury and tribe			

Limitations

This single-site study was limited to patients who sought care at the KCMC ED for a non-fatal injury within 24 hours of injury occurrence. Due to such eligibility requirements, and no prehospital emergency care system in Tanzania, it is possible that patients with more severe injuries or more attenuated substance use were less likely to reach the hospital and thus be excluded from this study cohort. Additionally, our study used self-report data to determine substance use, creating an opportunity for recall bias and suggesting that rates of substance might be higher than in our findings [40,41]. In many regions of Africa, including Tanzania, it is common to intake marijuana laced with heroin, often unbeknownst to the user [42]. This is likely to contribute to falsely low self-report rates of heroin use in this study and should be

a consideration for future studies. Additional bias is introduced as expected with observational studies. Lastly, our results come from the emergency department of a large referral hospital in Moshi, Tanzania and thus may not be generalizable to emergency departments in other types of hospitals or geographies.

Conclusion

Understanding the relationship between alcohol and substance use and injury characteristics is imperative to ultimately reduce the burden of injury, alcohol, and other substance use in Tanzania and other LMICs. This study sought to describe the prevalence of substance use among the injury population admitted to the KCMC ED. In addition, this study examined the relationship between 1) sociodemographic characteristics and KTS, 2) sociodemographic characteristics and alcohol use, 3) sociodemographic characteristics and tobacco use, and 4) alcohol and substance use and KTS. Our study found significant correlations between non-professionally employed participants and alcohol and tobacco use, as well as assault injuries and alcohol. We found evidence of comorbidity between alcohol and tobacco use, which is consistent with previous research on this topic. Finally, our study findings suggest that illicit drug use may be associated with the occurrence of more severe injuries, likely due to risky behavior patterns and impaired judgement. Given the relative unreliability of self-report substance use data, it is suggested that future studies on this subject use biological tests to determine substance use rates. Overall, this research highlights the burden of alcohol and substance use related injuries, and is necessary to guide both healthcare providers and policy-makers in the development of appropriate interventions aimed at reducing such harms

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