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Emergency care outcomes of acute chemical poisoning cases in Rawalpindi

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ABSTRACT

Objective: To assess the emergency care outcomes of acute chemical poisoning cases in tertiary care settings in Rawalpindi, Pakistan.

Methods: The data were extracted from an injury surveillance study conducted in the emergency departments (ED) of three tertiary care hospitals of Rawalpindi city from July 2007 to June 2008. The World Health Organization standard reporting questionnaire (one page) was used for recording information. Associations of patients' characteristics with ED care outcomes, *i.e.*, admitted *vs.* discharged were assessed using logistic regression models.

Results: Of 62530 injury cases reported, chemical poisoning was identified in 434 (0.7%) cases. The most frequent patient characteristics were poisoning at home (61.9%), male gender (58.6%), involving self-harm (46.0%), and youth aged 20–29 years (43.3%). Over two-thirds of acute poisoning cases (69.0%) were admitted. Acute poisoning cases were more likely to be admitted if they were youth aged 10–19 years [odds ratio (OR) = 4.41], when the poisoning occurred at home (OR = 21.84), and was related to self-harm (OR = 18.73) or assault (OR = 7.56).

Conclusions: Findings suggest that controlling access of poisonous substances in youth and at homes might reduce related ED care burden. Safety promotion agencies and emergency physicians can use these findings to develop safety messages.

1. Introduction

Acute poisoning is a global public health problem[1–6]. According to the World Health Organization, almost 346000 people die of acute unintentional poisoning and another 370000 die of self-poisoning each year globally[1,2]. About 91% of acute poisoning-related deaths occur in the low- and middle-income countries (LMICs)[1]. Unfortunately, despite the best evidence, pesticides, *e.g.*, organophosphorus, carbamates, and pyrethroids, remain major poisoning substances in the LMIC[3–5].

The burden of acute poisoning cases on the emergency departments (EDs) is not negligible as these cases account for over two million ED visits in the United States each year[6]. Similar data are not available in many LMIC however[1,2,7,8]. Majority of the LMIC studies on this topic are single center, conducted usually in the inpatient settings, and they rarely investigate about the ED burden or outcomes of acute care in poisoning cases[2,9,10]. Information about ED burden of acute poisoning can be useful in advocating related prevention, acute care, and control strategies[11]. Therefore, the aim of this study was to describe the emergency care outcomes of acute chemical poisoning cases in a low-income setting.

2. Materials and methods

2.1. Setting and design

The study setting was in Rawalpindi, Pakistan. The urban town had a population of 1.6 million residents in 2007–2008[12]. The study was conducted at the EDs of the three largest teaching

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hospitals located in the city, namely, the Holy Family Hospital, Benazir Bhutto Hospital and District Headquarter Hospital. These hospitals also provide care to the patients from three northern Punjab districts, namely, Attock, Chakwal, and Jhelum and the neighboring regions of Azad Kashmir and Khyber Pakhtunkhwa. The study duration was one year starting from July 1, 2007 to June 30, 2008. The measurement tool was the minimal data set questionnaire adapted from the injury surveillance tool by the World Health Organization[13,14]. This questionnaire captured information about age, gender, place, activity, mechanism, intent, and outcome of acute poisoning case. This one-page questionnaire was translated into the local language Urdu and was back translated to English to ensure consistency (see full version published in the research of Farooq *et al.*[14]). The questionnaire was filled during face-to-face interviews after the initial management of these patients at the ED and obtaining informed consent. Additional information was collected from the ED documents or informants (patients' attendants) where needed.

2.2. Data collection

Data collection was coordinated at the hospital level by a surgery resident. Four data collectors from the attending hospital staff were nominated in each department to ensure data collection 24 h a day. The data collection was supervised by the head of the surgery department and by a surgical registrar. Each day, all the questionnaires filled during the previous 24 h were submitted to the directors of the ED. The questionnaires were transferred to a central coordination office every third day, which were then entered in spreadsheets by two data entry operators. The coordinating officers (registrars and residents) checked 10% of the data during entry to detect errors during these steps. Ethical approval of the study protocol was obtained from Rawalpindi Medical College research ethics council before the conduct of the study.

2.3. Analysis

Frequencies of demographic, injury circumstances, and ED outcomes were computed. For each given characteristic, an ED presentation rate per 1 000 ED visits was computed and then compared with overall ED presentations due to acute poisoning per 1 000 visits. The patients' characteristics were compared with respect to ED outcomes by using *Chi*-square tests or Fisher exact test. Multivariate logistic regression analyses were performed to assess factors associated with ED outcomes *i.e.*, inpatient admission or ED death *vs*. ED discharge. Lastly, patient characteristics were compared between cases with respect to intent.

3. Results

Of the total of 62 530 injury cases, 434 cases (0.7%) were identified related to acute chemical poisoning. Of the cases where intent was reported, 135 (34.1%) were unintentional, 182 (46.0%) due to self-harm and 79 (19.9%) were related to assaults. Males accounted for 58.8% (n = 236) cases whereas young adults aged 20–29 years accounted for 43.4% of cases. Almost three out of five (n = 61.9%) poisonings occurred at home followed about 24.0% occurring on roads/markets and 11.3% at work place. Over two-thirds of poisoning cases (n = 256) were admitted whereas 31% (n = 115) were discharged from the ED. Five ED deaths (1.1%) were reported in this sample.

Overall, 6.9 cases per 1 000 ED visits were related to acute poisoning (Table 1). Compared to this overall rate, the rates of poisoning per 1 000 ED visits were higher among youth aged 20–29 years (9.5) and middle-aged adults aged 30–39 years (8.2), females (14.1), poisoning occurring at homes (11.7), at work place (34.2), those involving self-harm (521.5) and assault (25.9). Similarly, the rates of being admitted/died per 1 000 ED visits were nearly five times higher (34.6 per 1 000 ED visits) than the average rate of these cases.

Compared to those who were discharged from the ED, the proportion of being admitted or died was high for following characteristics (Table 2): adolescents aged 10–19 years (25.7% *vs*. 13.1%), middle-aged adults aged 30–39 years (17.8% *vs*. 11.2%), females (50.6% *vs*. 25.0%), poisoning occurring at home (81.9% *vs*. 37.5%), involving self-harm (66.5% *vs*. 9.5%) and assaults (21.1% *vs*. 18.1%). The multivariate logistic regression model indicted that acute poisoning cases of adolescents aged 10–19 years [odds ratio (OR) = 4.41], at home (OR = 21.84), related to self-harm (OR = 18.73) and assault (OR = 7.56) were significantly more likely to be admitted or died in the ED as compared to those who were discharged from ED.

The comparison of patient characteristics according to intent indicated adolescents aged 10–19 year more frequently had self-harm related acute poisoning (28.7% *vs*. $\leq$ 15.9%), whereas those aged 0–9 years more frequently had unintentional poisoning as compared to other cases (6.8% *vs*. $\leq$ 1.3%) (Table 3). Females were also more frequently had self-harm related poisoning (58.1% *vs*. $\leq$ 33.8%). Nearly, all self-poisoning incidents occurred at home (97.1%) whereas over half of assault involving self-poisoning occurred on roads/market place (54.9% *vs*. 44.0%). Alcohol was relatively frequent in assault involving poisoning compared to other types of poisoning (6.3% *vs*. 1.1%).

Table 1
Characteristics of acute chemical poisoning cases observed in Rawalpindi, Pakistan (2007–2008).

Parameters		Cases [n (%)]	Per 1000 ED cases
Age	0–9 years	15 (3.6)	1.4
	10–19 years	86 (20.8)	6.1
	20–29 years	179 (43.3)	9.5
	30–39 years	65 (15.7)	8.2
	40–49 years	30 (7.3)	6.1
	50–59 years	21 (5.1)	7.6
	60–90 years	17 (4.1)	6.6
Sex	Male	236 (58.6)	4.7
	Female	167 (41.4)	14.1
Place	Home	253 (61.9)	11.7
	Road/market	98 (24.0)	2.9
	Work	46 (11.3)	34.2
	Unspecified	12 (2.9)	2.8
Intent	Unintentional	135 (34.1)	2.3
	Self-harm	182 (46.0)	521.5
	Assault	79 (20.0)	25.9
Alcohol	Yes	7 (1.6)	76.1
ED outcome	Discharged	115 (31.0)	2.1
	Admitted/died	256 (69.0)	34.6
Total		434 (100.0)	6.9

Table 2
Factors associated with admission or death in acute chemical poisoning cases in Rawalpindi, Pakistan (2007–2008).

Parameters		Discharged from ED [*n* (%)]	Admitted or died [*n* (%)]	*P*	Logistic regression analysis		
					OR_{adj}	95% *CI*	
Age	0–9 years	10 (9.4)	4 (1.6)	< 0.001	0.50	0.08	3.16
	10–19 years	14 (13.1)	65 (25.7)		4.41	1.21	16.10
	20–29 years	48 (44.9)	102 (40.3)		1.96	0.63	6.10
	30–39 years	12 (11.2)	45 (17.8)		3.03	0.81	11.36
	40–49 years	14 (13.1)	16 (6.3)		1.00	(Reference)	
	50–59 years	6 (5.6)	9 (3.6)		1.44	0.29	7.22
	60–90 years	3 (2.8)	12 (4.7)		4.45	0.79	25.16
Sex	Male	81 (75.0)	123 (49.4)	< 0.001	1.00		
	Female	27 (25.0)	126 (50.6)		1.64	0.74	3.64
Place	Home	39 (37.5)	203 (81.9)	< 0.001	21.84	2.27	209.88
	Road/market	37 (35.6)	36 (14.5)		9.10	0.99	84.16
	Work	23 (22.1)	3 (1.2)		1.00	(Reference)	
	Unspecified	5 (4.8)	6 (2.4)		16.72	0.98	285.32
Intent	Unintentional	76 (72.4)	31 (12.4)	< 0.001	1.00	(Reference)	
	Self-harm	10 (9.5)	167 (66.5)		18.73	7.76	45.25
	Assault	19 (18.1)	53 (21.1)		7.56	3.12	18.28
Alcohol	Yes	2 (1.7)	4 (12.4)	0.32			

95% *CI*: 95% Confidence interval; OR_{adj}: Odds ratio adjusted.

Table 3
Description of patient characteristics with respect to intent in acute chemical poisoning cases in Rawalpindi, Pakistan (2007–2008). *n* (%).

Parameters		Unintentional	Self-harm	Assault
Age	0–9 years	9 (6.8)	3 (1.7)	1 (1.3)
	10–19 years	21 (15.9)	52 (28.7)	10 (12.7)
	30–39 years	16 (12.1)	31 (17.1)	15 (19.0)
	40–49 years	12 (9.0)	12 (6.6)	5 (6.3)
	50–59 years	11 (8.3)	4 (2.2)	6 (7.6)
	60–90 years	5 (3.8)	3 (1.7)	9 (11.4)
Sex	Male	88 (66.2)	75 (41.9)	63 (81.8)
	Female	45 (33.8)	104 (58.1)	14 (18.2)
Place	Home	49 (39.2)	175 (97.2)	27 (38.0)
	Work	17 (13.6)	0 (0.0)	3 (4.2)
	Unspecified	4 (3.2)	2 (1.1)	2 (2.8)
Alcohol	Yes	0 (0.0)	2 (1.1)	5 (6.3)

4. Discussion

This study showed that acute poisoning resulted in non-negligible ED burden, and was likely to require an advanced level of care. Almost two of three poisoning cases were admitted whereas only one of ten injury-related case was admitted. The young age, home as place of acute poisoning and intentional poisoning were significantly associated with the worst outcomes among all poisoning cases[15,16].

The study may have several limitations. Firstly, it would be difficult to say if any poisoning related cases were misclassified as food borne illnesses, which are also frequent in Pakistani settings[11]. This would mean that this study might underestimate the burden of poisoning cases. Secondly, the substances used for poisoning were difficult to determine from the brief interviews conducted at ED. Most previous studies were conducted in the inpatient departments or intensive care settings in LMIC, where detailed history and laboratory examinations are possible[3,10]. Nonetheless, this study provided an overview of the ED care features in the poisoning cases that have not been considered together in previous investigations.

Some of the study findings might have clinical implications. Firstly, a high proportion of cases being admitted suggested that poisoning cases presenting to ED were of severe nature. Of note, overall reporting of intentional cases is low[17,18]. The social and legal stigmas affect medical reporting due to Islamic faith; the major religion practiced in Pakistan, prohibits suicide and the criminal code of Pakistan also makes it illegal to attempts a suicide[17]. Therefore, it is expected that only cases that could not be adequately treated in medical offices or smaller health facilities are presented to the ED of large hospitals. The contribution of self-harm to overall poisoning cases indicates that decriminalization of deliberate self-harm may be needed to ensure that adequate emergency and long-term care can be provided to these cases[18].

These findings also suggest that youth may be over-involved in the poisoning related cases. Four out of five poisoning cases were aged between 10 and 40 years with more than two of five cases aged between 20 and 29 years. These findings were consistent with studies available from other regional settings *e.g.*, Karachi[18], Saudi Arabia[19], and Nepal[20]. This higher involvement means that the morbidity-related costs of poisoning cases including underlying mental health problems could be a significant burden on healthcare. As previous work indicated that psychiatric care of ED patients might be inadequate in resource-limited settings such as Pakistan[21], perhaps more work is needed towards improving access to psychological support in these cases.

Lastly, the study indicated that most acute poisonings occurred at homes. This would imply that many substances that would lead to serious poisoning were accessible in these cases that resulted in ED visits. As pointed out by a previous study, reducing access to these substances and identifying tendencies of misuse (*e.g.* self-harm) are preventable given that adequate awareness of this problem is being made regularly[22]. Currently, there are no permanent programs for safety awareness in Pakistan and most of the education relies on acute care professionals[10]. Clearly, more work is needed to inform public about hazards in home environment.

In conclusion, the burden of acute poisoning cases was not negligible in Pakistan. This study identified several risk factors for acute poisoning that could have implications for prevention and control for such type of injuries. For example, the findings

indicate that efforts are needed toward making public aware about home health hazards especially that the access of these substances in youth might have serious consequences. Similarly, these findings might be helpful for emergency physicians in Pakistan and similar settings to discuss with families about the access to poisonous substances at homes to prevent future incidents.

Conflict of interest statement

The authors report no conflict of interest.

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