



ORIGINAL ARTICLE

Streamlining referral decisions for childhood poisoning: a cross-sectional study from a tertiary children's hospital in Cape Town, South Africa

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ABSTRACT

Introduction: The study objectives were to report on current paediatric poisoning figures from South Africa, and to better understand this patient population to contribute suggestions for streamlining local triage and referral criteria.

Methods: A retrospective review of children presenting to Red Cross War Memorial Children's Hospital (RCWMCH) with poisoning between January 2009 and December 2019 was performed. Data were extracted from the Poisons Information Centre's Clinical Poisonings Database.

Results: There were 3699 incidents, involving 3662 patients; 3011 (81%) patients were under 5 years (median 29 months, IQR 19 to 49 months). There was a slight decline in numbers over the 11-year period.

Most patients were referred ($n = 2542$, 69%), which included a greater proportion that were symptomatic ($p < 0.001$). There were 8 deaths (case fatality rate 0.2%).

Medications were the most common single toxin group ($n = 1270$, 38%), followed by handyman and industrial (HI) products ($n = 889$, 27%), household products ($n = 451$, 14%), and pesticides ($n = 445$, 13%). There was a significant relationship between toxin type and referral patterns ($p < 0.001$) as well as clinical severity ($p < 0.001$): pesticides and HI products (paraffin, $n = 486/568$, 86%) had a greater proportion of referrals, and pesticides more moderate to fatal poisonings ($n = 132/445$, 30%), all due to cholinergic (organophosphates and carbamates) and formamidine pesticides.

The medication subgroups anticonvulsants ($n = 21/78$, 27%), anti-infectives ($n = 4/34$, 12%), multi-vitamin/mineral (MVM) supplements ($n = 17/84$, 20%), neuropsychiatric medications ($n = 50/350$, 14%) and substances of abuse ($n = 13/47$, 28%) had larger proportions of moderate to severe poisonings ($p < 0.001$), as did the small group of biological toxins ($n = 17/55$, 31%; $p < 0.001$).

Conclusion: Certain medication, pesticide, and biological toxin subgroups, should be flagged for early referral. The goal is to improve patient outcomes as well as optimize the use of limited resources.

Introduction

There is a paucity of data on paediatric poisoning in South Africa. [1] According to the Global Burden of Disease study, poisoning accounted for 0.43% of deaths for children under 5 years in South Africa in 2019, double the global figure of 0.21%. [2] Fortunately, deaths due to poisoning are less frequent in children as compared to adults, therefore figures describing poisoning morbidity allow a broader understanding of the burden of disease. Since the inception of the combined Poisons Information Helpline (PIH) of the Western Cape in 2015, which takes calls from members of the public and medical professionals throughout South Africa, over 50% of patient-calls relate to children under 13 years of age. [3]

South Africa is an upper-middle-income country, [4] therefore the use of limited resources must be adapted not only according to the burden of disease but also to clinical severity of presentation. The South African Triage Scale (SATS) [5] assigns paediatric poisoning to the orange category, meaning that patients must be seen "very urgently" within 10 minutes. Once assessed, the best level of care for each patient is determined. Previous South African studies [3,6,7] have shown that most children remain asymptomatic or have only mild symptoms. Therefore, the refinement of care for poisoned children includes optimising the use of primary and secondary health care facilities as well as emergency medical referral services.

The objectives of this study were two-fold; firstly, to report on current paediatric poisoning figures from Red Cross War Memorial Children's Hospital (RCWMCH) in Cape Town, South Africa, and secondly,

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to better understand this specific patient population, paying particular attention to toxin subgroups and clinical severity, in order to contribute suggestions for streamlining local triage and referral criteria.

Methods

A retrospective review of children presenting to RCWMCH with toxin exposure or poisoning between January 2009 and December 2019 was performed. RCWMCH is a 292-bed provincial tertiary hospital serving children mostly under the age of 13 years. The primary drainage area includes impoverished communities living in low-cost or informal housing with high rates of unemployment. RCWMCH has 24-hour trauma and emergency units, both of which have overnight inpatient beds. At times, over 50% of all patients present directly to the hospital (self-referred) and the remainder are referred from general practitioners or other health facilities within the City of Cape Town Metropolitan Municipality (paediatric population 0-14 years, 1,042,259), [8] or less commonly from regional hospitals in the Western Cape Province, and rarely beyond (South African total population, 55,653,654). [8] Prior to transfer, poisoning referrals are discussed with the medical or surgical accepting teams, who have access to AfriTox, the RCWMCH Poisons Information Centre (PIC) database, for guidance on patient management. Ideally, the PIH is only consulted where complicated cases require additional clinical toxicology expertise.

Since the 1980s, the PIC has recorded information on all children who present to RCWMCH with poisoning. Potential cases are identified on a weekly basis by examining the patient diagnoses as recorded in the attendance registers of the Outpatients Department and the admission registers of all hospital wards. Since 2016, other sources of case tracking included toxicology laboratory results, hospital data management reports (using discharge diagnosis poisons-related ICD-10 codes), and the hospital's Trauma Unit database looking specifically for chemical burns and foreign body ingestions. Once a list of potential cases is compiled, the patient records are reviewed and if confirmed as a poisoning incident (according to history of exposure, clinical presentation, or toxicological confirmation), the case is recorded in a Clinical Poisonings Database.

Data for review were extracted from this database; information included patient age and sex, residential suburb, date of presentation, use of activated charcoal, length of hospital stay, toxin, route of exposure, and clinical severity. Where a child presented for multiple unrelated incidents, each individual incident was analysed separately. Where a child presented with poisoning due to multiple (two or more) toxins within the same incident, each toxin was captured individually, and the incident analysed as one.

Clinical severity was recorded according to the Poisoning Severity Score (PSS) [9]: 0 = None, No symptoms or signs related to poisoning; 1 = Minor, Mild transient and spontaneously resolving symptoms; 2 = Moderate, Pronounced or prolonged symptoms; 3 = Severe, Severe or life-threatening symptoms; 4 = Fatal, Death. For the purposes of this study, the word "exposure" refers to those incidents with mild presentations (PSS 0-1), and "poisoning" to those with moderate to fatal presentations (PSS 2-4). The distribution of length of hospital stay (LOS) was calculated for poisonings only.

Toxins were classified according to the intended use of the product, for example:

- Medications: pharmaceuticals, traditional medicines, drugs of abuse
- Household products: cleaning products such as soaps, washing powders, bleach, polishes, specific cleaning agents (window, tile, drain), swimming pool products
- Handyman and industrial products (HI): fuels (including paraffin/kerosene), paints, varnishes, thinners, glues, batteries, solvents
- Pesticides: rodenticides, insecticides, fungicides, repellents, herbicides
- Cosmetics: hair and nail products, perfumes, make-up, lotions

- Antiseptics and disinfectants: skin and wound antiseptics, environmental disinfectants
- Biological toxins: plants, fungi, and animal venoms (snakes, spiders, scorpions, bees)

Food poisoning and adverse drug reactions were excluded.

Data were exported and analysed in Microsoft Excel (Office 365). Statistical analysis was performed using IBM SPSS 26. Summary statistics were used to describe all variables. Categorical variables were described as *n* (%) and continuous variables as medians and interquartile range (IQR). The chi-squared test was used for statistical comparison of frequencies between groups. A *p*-value ≤ 0.05 was considered statistically significant.

Permission to perform this study was granted by the University of Cape Town's Faculty of Health Sciences Human Research Ethics Committee (HREC REC 381/2014) and by the School of Child and Adolescent Health Research Committee (Ref 776/14).

Results

There were 3699 incidents over the 11-year period, which involved 3662 patients, 35 with 2 separate incidents and 1 patient with 3 incidents. Of the total incidents, 3011 (81%) were patients under 5 years (median 29 months, IQR 19-49 months), and 2061 (56%) were male. There was a slight decline in overall numbers during the study period (Fig. 1). The number of incidents peaked annually during the summer months from October to February.

The 3699 incidents involved 4084 toxins; in 3323 (90%) a single toxin was implicated, and in 281 there were multiple toxins. The most prevalent toxin groups were medications (*n* = 1997, 49%), HI products (*n* = 897, 22%), household products (*n* = 463, 11%), and pesticides (*n* = 450, 11%). Paraffin was the most common single toxin (*n* = 573, 14%). Most multiple toxin incidents were due to medications only (*n* = 255, 91%).

The route of exposure was ingestion in 3214 (87%) incidents.

Most patients (*n* = 3168, 86%) were asymptomatic or had mild symptoms (PSS 0 or 1), classified as exposures. There were 8 deaths, a case fatality rate (CFR) of 0.2%.

A greater number of patients were referred (*n* = 2542, 69%). There was a significant relationship between the severity of poisoning and referral (*p* < 0.001) (Table 1); a larger proportion of asymptomatic patients presented directly to the hospital (unreferred) and more symptomatic patients were referred.

Activated charcoal was not given in most cases (*n* = 3223, 87%). There was a significant relationship between the severity of poisoning and administration of activated charcoal (*p* = 0.02) (Table 1); a larger proportion of asymptomatic patients received charcoal compared to a smaller proportion of symptomatic children who did not.

In 95 (3%) patients, the clinical presentation was suspicious for poisoning, but no specific toxin was identified. Forty of these patients presented with extrapyramidal dystonic features responsive to anticholinergic management. As the diagnosis of poisoning was not able to be corroborated, these patients were not included in any further analysis.

The severity of poisoning between single and multiple toxin incidents was not significantly different (*p* = 0.10).

All further toxin analysis is according to single toxin incidents only (*n* = 3323).

Medications were the most common single toxin group (*n* = 1270, 38%) (Table 2). Of these, neuropsychiatric medications were the most frequent subgroup (*n* = 350, 28%) (Table 3A). There were 172 (14%) moderate to fatal poisonings (Table 2). One death was due to suspected Reyes Syndrome, one from paracetamol-induced liver failure, and one patient had suspected methamphetamine toxicity. In all three deaths, the diagnosis of poisoning was made retrospectively based on a combination of serum investigations, urine mass spectrometry for toxin analysis and/or post-mortem analysis.

Fig. 1. Paediatric poisoning incidents 2009–2019

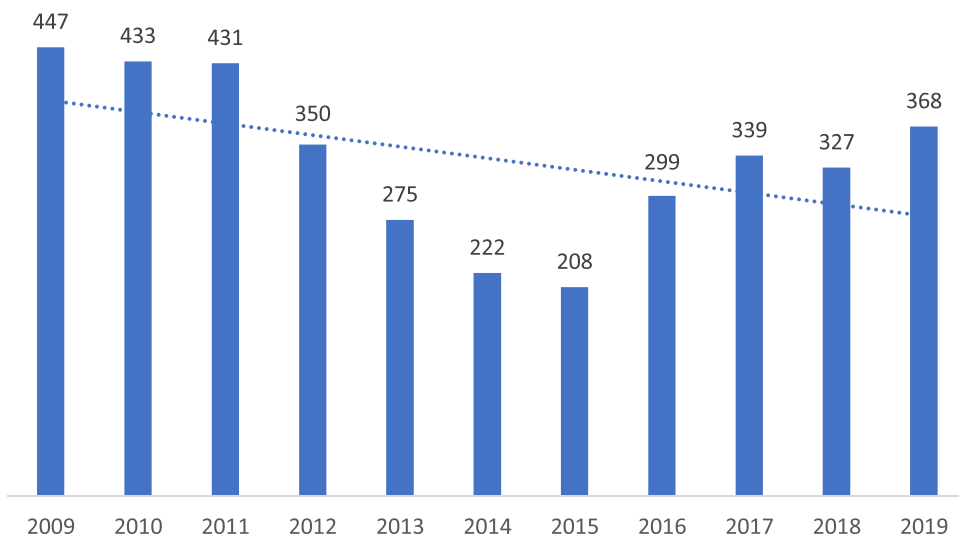


Table 1 Differences in clinical severity for all paediatric poisoning incidents, according to referral patterns and single dose activated charcoal

| | PSS 0 | PSS 1 | PSS 2 | PSS 3 | PSS 4 | Total |
|---------------------------------------|-----------|-----------|----------|----------|---------|-----------|
| Referred^a | | | | | | |
| No, n (%) | 596 (40) | 446 (26) | 74 (22) | 27 (16) | 2 (25) | 1145 (31) |
| Yes, n (%) | 883 (60) | 1242 (74) | 265 (78) | 143 (84) | 6 (75) | 2539 (69) |
| Total, n (%) ^c | 1479 | 1688 | 339 | 170 | 8 | 3684 |
| Activated charcoal^b | | | | | | |
| No, n (%) | 1257 (85) | 1499 (89) | 300 (88) | 152 (88) | 8 (100) | 3216 (87) |
| Yes, n (%) | 223 (15) | 188 (11) | 42 (12) | 21 (12) | 0 (0) | 474 (13) |
| Total, n (%) ^c | 1480 | 1687 | 342 | 173 | 8 | 3690 |

Poisons Severity Score (PSS): 0 = Asymptomatic, 1 = Mild, 2 = Moderate, 3 = Severe, 4 = Death

^a $p < 0.001$

^b $p = 0.02$

^c Cases with missing data (PSS, referred and/or activated charcoal) were excluded from statistical analysis.

Table 2 Single toxin paediatric poisoning incidents: clinical severity, referral, and length of stay in hospital according to the four main toxin groups

| TOXIN GROUP | Medications | Handyman and industrial products | Household products | Pesticides | Total incidents |
|---|-------------|----------------------------------|--------------------|------------|-----------------|
| Total, n (%) | 1270 (38) | 889 (27) | 451 (14) | 445 (13) | 3323 |
| CLINICAL SEVERITY, n (%)^a | | | | | |
| PSS 0 | 493 (39) | 313 (35) | 223 (49) | 244 (55) | 1379 (41) |
| PSS 1 | 602 (47) | 475 (53) | 185 (41) | 69 (16) | 1461 (44) |
| PSS 2 | 119 (9) | 80 (9) | 39 (9) | 57 (13) | 315 (9) |
| PSS 3 | 50 (4) | 19 (2) | 3 (<1) | 70 (16) | 153 (5) |
| PSS 4 | 3 (<1) | 0 | 0 | 5 (<1) | 8 (<1) |
| Unknown | 3 (<1) | 2 (<1) | 1 (<1) | 0 | 7 (<1) |
| Referred, n (%) ^b | 810 (64) | 672 (76) | 312 (69) | 326 (73) | 2281 (69) |
| LOS (days) for PSS 2–4 | | | | | |
| Median | 4 | 3 | 4 | 4 | 4 |
| IQR | 3–5 | 1–6 | 3–7 | 3–6.75 | 3–6 |

Poisons Severity Score (PSS): 0 = Asymptomatic, 1 = Mild, 2 = Moderate, 3 = Severe, 4 = Death

LOS = Length of stay

^a $p < 0.001$

^b $p < 0.001$

Table 3A
Main medication subgroups for single toxin incidents according to clinical severity

| Medication subgroup | Analgesics | Anticonvulsants | Flu remedies and antihistamines | Anti-infectives | Cardiac | MVM supplements | Neuropsychiatric | Substances of abuse | Topical | Total medications |
|-----------------------------------|------------|-----------------|---------------------------------|-----------------|---------|-----------------|------------------|---------------------|---------|-------------------|
| Subgroup totals, n (%) | 158 (12) | 78 (6) | 94 (7) | 34 (3) | 81 (6) | 84 (7) | 350 (28) | 47 (4) | 85 (7) | 1270 (100) |
| PSS ^a | | | | | | | | | | |
| 0 | 92 (59) | 6 (8) | 42 (45) | 21 (62) | 52 (65) | 51 (61) | 63 (18) | 12 (26) | 59 (69) | 493 (39) |
| 1 | 47 (30) | 51 (65) | 45 (48) | 9 (26) | 24 (30) | 16 (19) | 236 (67) | 22 (47) | 22 (26) | 602 (48) |
| 2 | 11 (7) | 15 (19) | 6 (6) | 1 (3) | 4 (5) | 13 (15) | 37 (11) | 5 (11) | 2 (2) | 119 (9) |
| 3 | 5 (3) | 6 (8) | 1 (1) | 3 (9) | 0 | 4 (5) | 13 (4) | 7 (15) | 2 (2) | 50 (4) |
| 4 | 2 (1) | 0 | 0 | 0 | 0 | 0 | 0 | 1 (2) | 0 | 3 (0.2) |
| Totals with PSS data ^b | 157 | 78 | 94 | 34 | 80 | 84 | 349 | 47 | 85 | 1267 |

Poisons Severity Score (PSS): 0 = Asymptomatic, 1 = Mild, 2 = Moderate, 3 = Severe, 4 = Death; Multivitamin/mineral supplements = MVM supplements; Substances of abuse found in dataset: cigarettes, methadone, methaqualone, amphetamines, methamphetamine, heroin, marijuana/THC.

^a $p < 0.001$

^b Cases with missing PSS data were excluded from statistical analysis

Table 3B
Pesticide subgroups for single toxin incidents according to clinical severity

| Pesticide subgroup | Anticoagulants | Cholinergics | Formamidine | Naphthalenes | Other pesticides | Pyrethroids | Unspecified pesticides | Total pesticides |
|------------------------|----------------|--------------|-------------|--------------|------------------|-------------|------------------------|------------------|
| PSS ^a | | | | | | | | |
| 0 | 94 (87) | 65 (30) | 1 (10) | 9 (90) | 19 (79) | 9 (75) | 47 (77) | 244 (54) |
| 1 | 14 (13) | 27 (12) | 5 (50) | 1 (10) | 5 (21) | 3 (25) | 14 (23) | 73 (16) |
| 2 | 0 | 57 (26) | 0 | 0 | 0 | 0 | 0 | 57 (13) |
| 3 | 0 | 66 (30) | 4 (40) | 0 | 0 | 0 | 0 | 70 (16) |
| 4 | 0 | 5 (2) | 0 | 0 | 0 | 0 | 0 | 5 (1) |
| Subgroup totals, n (%) | 108 (24) | 220 (49) | 10 (2) | 10 (2) | 24 (5) | 12 (3) | 61 (14) | 445 (100) |

Poisons Severity Score (PSS): 0 = Asymptomatic, 1 = Mild, 2 = Moderate, 3 = Severe, 4 = Death; Cholinergics = organophosphate and carbamate pesticides; Unspecified pesticides are those incidents where the caregiver reported exposure to a pesticide, but the active ingredient subgroup was not known.

^a $p < 0.001$

There was a significant relationship between medication subgroups and clinical severity ($p < 0.001$); anticonvulsants, anti-infectives, multivitamin/mineral (MVM) supplements, neuropsychiatric medications, and substances of abuse had larger proportions of moderate to fatal poisonings (Table 3A). All MVM supplement poisonings ($n = 17$, 20%) were due to iron compounds and all anti-infective poisonings ($n = 4$, 12%) to isoniazid.

HI products were the second most common single toxin group ($n = 889$, 27%) (Table 2), of which paraffin accounted for 568 (64%) incidents. The next most frequent subgroups were paint thinners and strippers ($n = 122$, 14%), and batteries and battery acid ($n = 51$, 6%). There were 99 (11%; paraffin 73) moderate to severe poisonings due to HI products and no deaths. Paraffin alone accounted for the largest proportion of referrals ($n = 486/568$, 86%).

Household products were the third most common single toxin group ($n = 451$, 14%) (Table 2). Of these, 213 (47%) were due to bleach and 90 (20%) due to oven or drain cleaners. There were 42 (9%) moderate to severe poisonings due to household products and no deaths.

Pesticides were the fourth most common single toxin group ($n = 445$, 13%) (Table 2). Of these, the largest subgroup was cholinergic pesticides (organophosphates and carbamates, $n = 220$, 49%), followed by anticoagulant pesticides ($n = 108$, 24%) (Table 3B). There was a significant relationship between the pesticide subgroup and clinical severity ($p < 0.001$); all moderate to fatal pesticide poisonings ($n = 132$, 30%) were due to cholinergic or formamidine pesticides (Table 3B). The five pesticide poisoning deaths were due to cholinergic pesticides; three were diagnosed based on clinical presentation and a low pseudocholinesterase level but with no history of pesticide exposure.

Analysis of single toxin incidents for the four large groups of medications, HI products, household products, and pesticides, showed a significant relationship between the group type and both clinical severity of patients ($p < 0.001$) and referral patterns ($p < 0.001$) (Table 2). Pesticides and HI products (mostly paraffin) had a greater proportion of referrals, and pesticides had a greater proportion of moderate to severe poisonings and deaths (Table 2).

Although biological toxins were a small group ($n = 55$, 2%) with fewer referrals ($n = 30$, 55%), when compared to the larger groups, there was a significant proportion of moderate to severe poisonings, ($n = 17$, 31%, $p < 0.001$). These poisonings were due to snakebite ($n = 6/16$), scorpion sting ($n = 5/6$), spider bite ($n = 2/6$), bee sting ($n = 2/3$) and scorpions ($n = 2/22$, *datura stramonium*).

Other smaller single toxin groups of interest were cosmetics ($n = 93$, 3%) with only three (3%) moderate to severe poisonings, and antiseptics and disinfectants ($n = 74$, 2%) with only two moderate to severe poisonings.

Discussion

A review of the 11-year period, in accordance with the study's first objective, shows a decrease in the annual number of paediatric exposures and poisonings presenting to RCWMCH with a large proportion of children under the age of 5 years. Both these findings are consistent with previously published PIC data. [7] The reduction in numbers from 2012 to 2015 may be due to several factors, including a change in referral patterns following the opening of two District Hospitals in the RCWMCH drainage area, patients being managed better at lower levels of care, and improved child safety in the home. Factors contributing to the increased numbers in 2016 include the additional sources of case tracking and a growing paediatric population. [8]

From 1990 to 2013, Huang et al [10] reported a similar decline in all-injury rates for children under 5 years, for both high- and low-income countries, but for poisoning and other specific injuries, there was a greater decline in high-income countries (HIC). It is therefore critical to monitor trends in low- and middle-income countries (LMICs) not only to improve treatment, but to address preventative efforts aimed at further reductions.

Apart from its impact on poisoning morbidity and mortality, socioeconomic status also plays a role in the toxin profile. [11] In this study, paraffin and pesticides were the most common toxins, in addition to medications. Furthermore, these toxins may vary in frequency within

a study area, as demonstrated in prior reports showing a greater proportion of paraffin and pesticide poisonings in communities living in informal housing. [7]

Medications causing greater frequency and severity of toxicity (anticonvulsants, iron, isoniazid, neuropsychiatric medications, substances of abuse) reflect the burden of disease within the community such as mental health disorders, tuberculosis, substance abuse and inadequate nutrition in pregnancy. Addressing underlying socioeconomic needs such as unemployment, crowded living conditions, and improved food security and family planning, to name just a few, could all contribute to reducing such medication poisonings.

The frequency of paraffin ingestions, as well as increased morbidity associated with cholinergic pesticide poisonings, have been shown previously at RCWMCH [7,12]. In the long term, basic steps to improve electrification and pest control would curb the impact of these poisonings. In the interim, measures to reduce cholinergic pesticide poisonings include strengthening the implementation of current pesticide regulations to prevent the sale of “street pesticides” (unlabelled and unlicensed products), the enhancement of packaging regulations in the retail sector to ensure childproof containers, and the distribution of safer alternatives, such as rat traps and anticoagulant pesticides, in poorer communities.

Overall, the profile of toxins described here is similar to that in other LMICs [13,14] including those on the African continent. [1,6,7,15–17] In HICs, medications (both over the counter and prescription) predominate along with household products, [18] but the additional burden of paraffin and pesticide poisonings is not as common.

The study’s second objective was to gain insights into how to streamline local triage and referral patterns for poisoned paediatric patients. The Paediatric SATS combines three elements to triage patients, namely the clinical discriminator list, the Triage Early Warning Score (TEWS), and additional investigations. [5,19] The final decision on whether a patient should be referred requires supervision by a senior health care professional. As most patients in this study and others [20] were asymptomatic or mildly symptomatic, it seems reasonable to suggest that many patients can be managed at primary or secondary healthcare levels. This requires rigorous oversight of the application of the Paediatric SATS tool, as well as adequate gatekeeping of access to referral.

Of all the study patients referred, a greater proportion were symptomatic, which is an appropriate use of limited resources. To further refine such referral decisions, the predicted clinical severity according to toxin type at triage could be used. In this study, both medications, the largest toxin group, and paraffin, the most frequent single toxin, followed the overarching pattern of mild exposures, but paraffin had the greatest proportion of referrals. Pesticides, particularly cholinergic and formamidine pesticides, had increased clinical severity and therefore referrals. The biological toxins, although a small group, had fewer referrals but more severe clinical outcomes, the interpretation of which could be two-fold; it is possible that patients with minor bites and stings were kept at the presenting hospital, or perhaps it is a true reflection of the increased clinical severity of such envenomations, particularly scorpion stings.

Overall, these data suggest that most patients with paraffin ingestion could remain at primary or secondary healthcare facilities. However, it is apparent that certain medications, pesticide subgroups, and perhaps specific biological toxins should be flagged early to receive higher levels of care, irrespective of their clinical presentation, as a more severe clinical course is anticipated.

The case fatality rate (CFR) from this study was 0.2%, whereas other studies across Africa show figures of between 0.3–7.6%. [15–17] The difference between regions depends on several local factors including socio-economic status, type of toxins, caregiver understanding of potential severity and healthcare-seeking behaviour, access to and quality of healthcare, antidote availability etc. The interpretation of CFRs relating to poisoning may also be influenced by data collection techniques and triage-transfer protocols, which in the context of this study, warrant fur-

ther appraisal. The merits and limitations of these factors are addressed by two publications from Sri Lanka on adult deliberate self-poisonings (DSP). [21,22]

Eddleston [21] reported that by including rural hospital data where many patients were managed and discharged, the CFR was slightly lower, as opposed to just looking at CFRs from secondary or tertiary hospital admissions where more severe cases are seen. Although the estimated CFR was still ten- to twenty-fold higher in Sri Lanka compared to HICs, few patients died at the rural hospital level, reflecting a good triage and referral system that identified the more severe cases early, even if a fatal outcome was anticipated.

Not only do well-organised triage and referral systems improve patient outcomes, but they also reduce costs, including those arising from unnecessary referrals. Wickramasinghe [22] reported that adult pesticide DSP patients in Sri Lanka incurred large expenses, including those for transfer, hospital staff, intensive care and antidotes. Staffing represents the highest expenditure, whether treated at peripheral or more central facilities, but the authors argue that decentralising resuscitative equipment and antidotes to peripheral hospitals may reduce costs as well as improve outcomes, as patients would be afforded quicker and more appropriate care.

These publications highlight the influence that data sources and analyses, as well as patient referral and management logistics, may have on CFRs or morbidity reports on poisoning. Emergency service managers and health policymakers should be mindful of these aspects when using poisoning data to plan or adapt healthcare systems or public health interventions.

Limitations

Tertiary hospital admission data give an accurate portrayal of outcomes for those children requiring specialist medical evaluation but miss those patients who do not seek medical care and a large number who present only to primary health care facilities. This hospital study is also not generalisable to the whole population.

The inherent limitations of retrospective study data, such as inconsistencies in the quality of clinical details captured, are acknowledged.

The PIH dataset has not been included in this study. It captures data in real-time, and analysis thereof may add useful information about clinical presentation and referral practices.

Conclusion

Poisoning, a preventable condition, is costly in terms of human and financial impacts. These data serve to give a better understanding of the burden of disease of paediatric poisoning in Cape Town, South Africa. Further work is required. Firstly, case tracking and data analysis should be expanded to include primary health care facilities, to describe overall poisoning trends more accurately. Secondly, addressing basic human rights such as access to housing, water, and sanitation, would play a major role in preventing common poisonings. Thirdly, triage staff should be trained in taking a history specific to poisoning and the type of toxin involved, to anticipate patients’ potential clinical requirements. And lastly, these data, together with a detailed analysis of the PIH dataset and improved awareness of the service, should be used to streamline referral criteria for paediatric poisoned patients in the Western Cape, throughout South Africa and perhaps across the African continent, thereby optimising the use of limited emergency medical services and ultimately improving patient outcomes.

Authors’ contribution

Authors contributed as followed to the conception or design of the work, the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: KB contributed 60% and CS 40%. All authors approved the

version to be published and agreed to be accountable for all aspects of the work.

Dissemination of results

Results from this study were presented at the University of Cape town, Department of Paediatrics and Child Health Annual research Days (2021), in the form of a narrated poster. In attendance were both clinical staff and hospital managers.

Declaration of competing interest

The authors declare no conflicts of interest.

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