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NeuroToxicology



Hospital-based surveillance for acute pesticide poisoning caused by neurotoxic and other pesticides in Tanzania

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ABSTRACT

Background and aim: Acute pesticide poisoning (APP), particularly with neurotoxic agents, is often under-reported in developing countries. This study aimed to estimate the burden of APP in Tanzania due to neurotoxic and other pesticides in order to propose a surveillance system.

Methods: The study reviewed hospital admission data for APP retrospectively (2000–2005) in 30 facilities in four regions of Tanzania. A prospective follow-up over 12 months in 2006 focused on 10 facilities with the highest reporting of APP.

Results: The majority of known poisoning agents were organophosphates or WHO class I and II pesticides. APP involving suicide was significantly more likely to be fatal in both retrospective (PRR fatal/non-fatal = 3.8; 95% CI = 1.8–8.0) and in prospective (PRR = 8.7; 95% CI = 1.1–65) studies. There was a significant association between suicide and gender (PRR female/male = 1.5; 95% CI = 1.1–2.0) in the prospective study. Occupational circumstances as a cause of APP, which was relatively small in both studies (8.5% in the retrospective and 10.2% in the prospective study) was less common amongst men compared to women (6.1% for males versus 12.0% for females) in the retrospective study but almost equal in prospective study (10.2% for males versus 10.1% for females). Contrasting retrospective to prospective studies, the annual incidence rate almost tripled (from 1.43 to 4.05 per 100,000) and mortality rate doubled (from 0.11 to 0.22 per 100,000). Case fatality declined accordingly from 7.8% to 5.6% in prospective study. The study revealed a substantial improvement in the completeness of data with prospective data collection. Missing data for circumstances and agents declined by 24.1% and 9.9%, respectively. Despite this improvement, routine reporting could only generate 33–50% of the information needed for a notification of banned or severely restricted chemicals under the Prior Informed Consent (PIC) convention.

Conclusion: The two to threefold increase in rates with prospective data collection suggests significant under-reporting of APP by neurotoxic and other pesticides. Routine reporting is likely to under-estimate the burden from pesticides, particularly for women in occupational settings. The burden of APP and the specific pesticides causing serious problems in Tanzania would continue to be missed without improved surveillance systems.

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1. Introduction

Acute pesticide poisoning (APP) is a particularly important occupational and public health problem in Tanzania (Ngowi et al., 2001a) and in other developing countries (Jeyaratnam, 1985, 1990;

WHO, 1990; He and Chen, 1999; Kishi and Ladou, 2001). Many pesticides responsible for human poisonings are neurotoxic agents, such as cholinesterase inhibitors, a category that includes some highly toxic agents. The majority of fatalities arising from pesticide exposure globally occur in less industrialized countries and small-scale farmers are the most vulnerable to pesticide exposure and poisoning. Data on injuries caused by pesticide exposure are rare in most countries (Corriols et al., 2001; Murphy et al., 2002; Calvert et al., 2008) and therefore the magnitude of the pesticide poisoning problem is not well known. Routine reporting

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systems may give false epidemiological profiles of poisoning because of flaws in the surveillance system (Litchfield, 2005).

Health care facilities in Tanzania are potentially important sources of information on APP. Hospital notification through the Health Management Information System (HMIS) is compulsory in Tanzania. The HMIS covers all levels of health care, including community health at the village level (dispensaries), health care centres serving a number of villages, and district, regional and referral hospitals (Kaija, 1995).

The HMIS in Tanzania accommodates notifications of 'notifiable' or reportable conditions such as cholera and meningitis and of poisoning cases arising from all causes. However, the system has one category for all cases of poisoning, irrespective of the type of poisoning. Important details on the causative agent, circumstances, severity, and outcome of poisoning are therefore not systematically documented in the HMIS. Consequently, routine reporting in the HMIS does not effectively capture APP or important preventable risk factors. Moreover, under-reporting of APP may result from a lack of expertise in the diagnosis of pesticide poisoning cases amongst health care providers (HCPs), a finding reported previously in a survey of Tanzanian HCPs in agricultural areas in 1991–1994 (Ngowi et al., 2001b).

As a result, the HMIS data do not reflect the actual burden caused by pesticide poisoning, nor opportunities for public health action to prevent poisoning, resulting in poorly informed resource allocation decisions in the health system in Tanzania.

The lack of cohesion in surveillance for APP in Tanzania is aggravated by the fact that the Plant Protection Act (PPA) is the legal instrument for pesticides registration and management of distribution and use but has no mandate for surveillance of APP or health injuries arising from pesticide exposure. There is thus no dedicated system for surveillance of APP in Tanzania and, as a result, the burden of injury caused by pesticides is not known.

To address this gap, this study was undertaken to estimate the burden of injuries arising from APP. The study aimed to characterize the patterns of APP reported in health care facilities in Tanzania by (i) describing the agents responsible for APP including the proportion of

neurotoxic cholinesterase inhibitors, circumstances of poisoning, demographic groups affected and the outcomes of the poisoning, as well as the relationships between these factors; (ii) estimating incidence, mortality and case fatality rates for APP by region, age and gender; and (iii) comparing the completeness of data and epidemiological patterns of poisoning obtained under conditions of retrospective to prospective data collection. The study was intended to provide data for scientists, policy makers and communities to plan and implement appropriate surveillance and intervention strategies to reduce the APP burden in Tanzania.

2. Methodology

2.1. Population and sample

In 2004/2005 Tanzania had a total of 5379 health facilities including 219 hospitals, 481 health centres and 4679 dispensaries (United Republic of Tanzania, 2006a). The regions with the highest number of facilities were Mwanza and Iringa (United Republic of Tanzania, 2006a). These two were amongst four growing coffee and vegetable-growing regions in Tanzania chosen for this study. The population included all admissions to regional, referral and district hospitals located in the regions and a subset of patients seen at health centres and dispensaries selected from the Arusha district where pesticides are extensively used (Fig. 1).

The study involved two components: (a) a retrospective (2000–2005) and (b) a prospective (2006) study. The retrospective review involved 30 health care facilities. This represented 21% of all health facilities in Northern Tanzania, but included all regional and referral hospitals in the study area ($n=4$) and 40% of district hospitals in the Arusha region ($n=2$), as well as 22 health centres and dispensaries in Arusha.

Of the 21 facilities reporting pesticide poisoning on retrospective review, 10 facilities were selected for the prospective study in 2006, based on reporting at least seven APP cases over the review period of retrospective study (with the exception of Shree Hindu

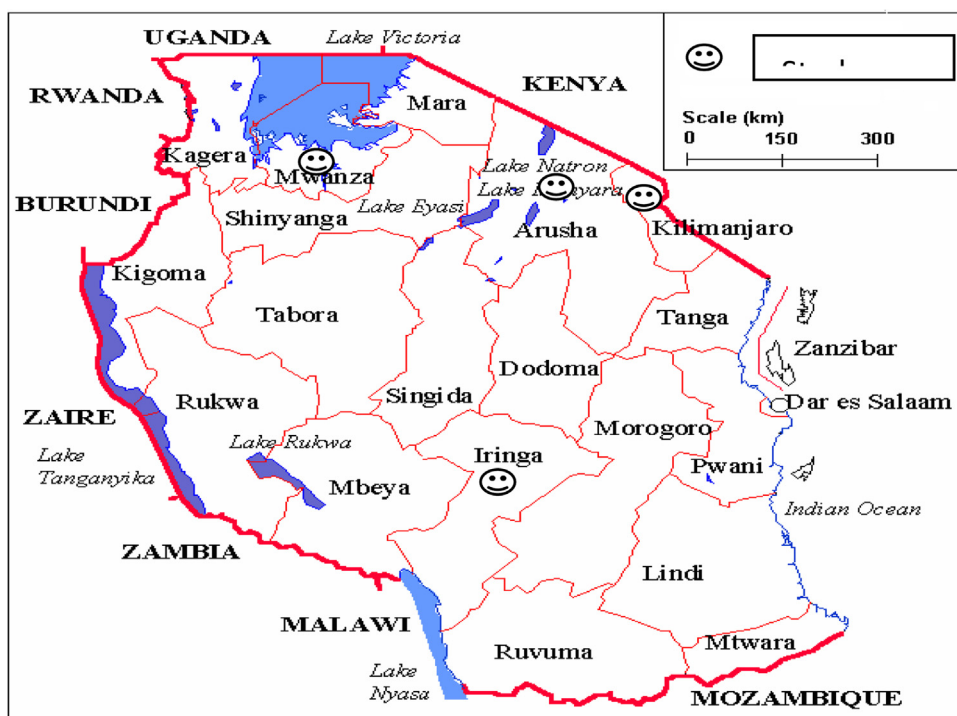


Fig. 1. A map of Tanzania showing study sites.

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