

# Acute Poisoning in the Elderly: An Increasingly Recognized But Still Overlooked Problem

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Acute poisoning remains a major public health problem worldwide, especially in developing countries. According to the 2004 World Health Report, it is estimated that 350,000 people died from unintentional poisoning worldwide in 2002; half of them in Southeast Asia and the Western Pacific region.<sup>1</sup> Furthermore, 873,000 people died from self-inflicted injuries, and two-thirds of the fatalities occurred in Asia. Among those with self-inflicted injury, many were probably related to acute poisoning as well.<sup>2,3</sup> Therefore, unintentional poisoning and self-inflicted injury accounted for a total of 2.1% of the estimated 57,029,000 deaths worldwide in 2002.

Acute poisoning primarily involves younger populations, with less than 3% of the cases being in people aged 60 years or older in most studies.<sup>4-9</sup> However, the world's population is aging rapidly. In 2004, there were approximately 600 million people in the world who were aged 60 years and over.<sup>1</sup> It is estimated that the number will double by 2025 and will reach 2 billion by 2050. Moreover, the vast majority of aged people will live in developing countries where the health care systems are less well-organized and therefore less able to adapt to the consequences of population aging.<sup>1</sup> The proportion of acute poisoning in the elderly is likely to increase as the population ages; this is because the elderly frequently suffer multiple chronic diseases and receive polypharmacy. They may also experience the death of a spouse or develop depression due to the loss of independence.<sup>4-6</sup>

The elderly are different from younger adults in many aspects. There are aged-related physiological changes. There is an increased incidence of comorbidities, and a greater use of more medications for chronic conditions,<sup>7</sup> both of which make the elderly

more susceptible to acute poisoning and its related consequences. The clinical profile of acute poisoning in the elderly is thus expected to be different from that in younger adults. Previous studies have shown that older adults are more likely to have unintentional exposure, suffer adverse drug reactions (ADRs) more frequently, and tend to develop more severe or even fatal effects following toxic exposure.<sup>4,5,7,8</sup> In a study of selected drug overdoses reported to the American Association of Poison Control Centers Toxic Exposure Surveillance System (TESS) between 1995 and 2002, Rogers and Heard found that the relative risk of death for the elderly (age,  $\geq 60$  years) was 2.7 versus young adults (age, 20–59).<sup>7</sup>

Although the significance of poisoning in the elderly is increasingly being recognized, not many studies have specifically focused on the pattern and outcome of acute poisoning in the elderly.<sup>4-8</sup> In a recent issue of the *Journal of the Chinese Medical Association*, Hu and her colleagues retrospectively analyzed the data of 250 patients aged 65 years and over who presented to the emergency department (ED) of the Taipei Veterans General Hospital because of acute poisoning from January 2006 to September 2008.<sup>10</sup> In the study, males (69.2%) outnumbered females, and the most common reason for exposure was unintentional poisoning (56%). Medications (57.6%), such as benzodiazepines (33.2%) and warfarin (9.2%), accounted for the majority of poisoning cases. Nearly two-thirds of the elderly patients required hospitalization, and 40% of them were admitted to the intensive care unit. Furthermore, patients who attempted suicide were more likely to have chronic bone pain, major depression/bipolar disorder, and emotional stress, and tended to develop more severe toxic effects than patients with



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unintentional poisoning. Twenty-four patients (9.6%, including 19 suicides) died, and most fatalities (63%) occurred after pesticide poisoning. In a multivariate logistic regression analysis, herbicide poisoning, development of hypotension and respiratory failure were independent predictors of mortality.

The interpretation of the above-noted findings should be cautious because the study conducted by Hu et al had several methodological weaknesses. For example, although all patients with intentional poisoning were included in the study, quite a few patients with an ADR (e.g. patients with hypoglycemia secondary to oral antidiabetic agents) were excluded without a clear explanation. Moreover, the case-mix of patients visiting the ED of the study hospital might be different from that of other ED patients, which would limit the generalizability of certain study findings (e.g. sex distribution and case-fatality rate). The sample size was also relatively small to allow detailed comparisons of the risk of developing major/fatal outcomes following various toxic exposures.

Despite the presence of certain limitations, the study carried out by Hu et al has nevertheless raised several important issues with regard to acute poisoning in the elderly and these merit further discussion. First, unintentional poisoning, especially therapeutic error and ADR, is prevalent in the elderly. Similar findings have previously been documented in studies that focused on the evaluation of poisonings in the elderly.<sup>4-8</sup> For example, Crouch et al found that of 298,713 exposures reported to the TESS between 1993 and 1997, 85.9% of exposures were unintentional. Moreover, therapeutic errors and ADRs accounted for 24.2% of the exposure cases, which was higher than that in patients of other ages (6.7%).<sup>5</sup> In another study involving 72,694 patients reported to the TESS between 1995 and 2002, older patients were found to be more likely to have an unintentional poisoning (63% *vs.* 15%), and to have an ADR (15% *vs.* 1%) than their younger counterparts.<sup>7</sup> Many mechanisms, including age-related alteration in pharmacokinetics and pharmacodynamics, increased incidence of multi-comorbidity, polypharmacy with increased potential for drug interactions, cognitive dysfunction, improper use or storage of medications, and mistaken identification of medications due to poor eyesight, could play a role in predisposing the elderly to unintentional poisoning.<sup>4-8</sup> Because unintentional poisonings in the elderly are often preventable,<sup>5</sup> viable strategies for poisoning prevention and/or health promotion, such as reducing the probability of polypharmacy and potential for drug-drug interactions, should be designed and exercised to minimize the magnitude of unintentional poisoning in the elderly.

Second, although the majority of poisonings in older persons are accidental, the prevalence of deliberate self-harm (DSH) and/or suicide is also substantial. Further, major and fatal outcomes are more common among patients with intentional poisoning compared to those with unintentional exposure. Previous studies have shown that the elderly are a high-risk population for suicidal poisonings,<sup>3,4,6</sup> because they are likely to suffer from physiologic deterioration, bereavement, loneliness, depression and other psychiatric disorders, as well as loss of independence due to poverty or illness.<sup>2-5,11</sup> In addition, the ratio between DSH and suicide is much lower in the elderly compared with young people, which indicates that older persons are more frequently associated with high suicidal intent.<sup>4</sup> The elderly (especially males) who experience DSH, however, frequently do not receive adequate psychiatric care, and are thus at a higher risk of subsequent suicide.<sup>2</sup> These patients also tend to manifest severe toxicities because of the high suicidal intent.<sup>5</sup>

In the study conducted by Hu et al, the distribution of problems facing the patients preceding the suicide attempt was not clearly described.<sup>10</sup> Nevertheless, the authors stated that those who attempted suicide were more likely to have suffered bone pain, major depression/bipolar disorder, or acute emotional stress than patients with unintentional exposure. The proportion of patients receiving psychosocial assessment at the time of ED presentation or during psychiatric after-care was also not reported. However, prompt psychosocial assessment might be critical in the control of repeated DSH or attempted suicide because prior DSH has been shown to be an independent risk factor for suicide.<sup>2,3</sup> Given the high incidence of suicide among the elderly in Taiwan (27.2–52.2 per 100,000 persons in 2003) and the increasing trend of suicide,<sup>11</sup> further prospective studies are required to determine whether psychosocial consultation after poisoning exposures is useful in managing patients with DSH or attempted suicide. Prevention of intentional exposure will also help reduce the severity of poisoning as major outcomes are more common following intentional exposures.<sup>5,10</sup>

Third, acute poisoning in the elderly is more likely to be associated with severe toxicities compared with young adults. The numbers reported by Hu et al did not involve a direct comparison between the elderly and their younger counterparts; nevertheless, the proportion of patients requiring medical intervention (65.2%) or intensive care unit admission (40%) is consistent with previous findings.<sup>4-7</sup> The frequent occurrence of major/fatal outcomes in elderly poisoned patients further highlights the importance of implementing

a better poison prevention program that targets the elderly.

Finally, Hu et al showed that pesticide poisoning, especially paraquat exposure, was responsible for the majority of deaths among the elderly poisoned patients. Such a finding is not unexpected given the high toxicity of many pesticides and is consistent with the results reported by Yang et al in a poison center-based study in Taiwan.<sup>9</sup> Strict control of pesticide accessibility to those with suicidal intent is important in minimizing pesticide poisoning-related deaths.

Appropriate prescription of benzodiazepines in the elderly will also help contain the problem of acute poisoning because 39 (47%) out of 83 patients with benzodiazepine poisoning in the study done by Hu et al had underlying major depression/bipolar disorder or insomnia, predisposing them to either accidental overdose or attempted suicide.<sup>10</sup> Furthermore, 25% of the 83 patients developed aspiration pneumonia and 3.6% of these people died. A much higher incidence of morbidity and mortality following benzodiazepine overdose in the elderly has been found in previous studies,<sup>5,7</sup> and is likely to be attributable to the extent of exposure and/or a lack of physiologic reserve.

In conclusion, older people are more susceptible to poisoning, and the magnitude of acute poisoning in the elderly is likely to increase as the population ages. However, the characteristics of acute poisoning in the elderly are not well defined. Further studies that employ better study designs and/or representative study populations are warranted to provide a more comprehensive picture of acute poisoning in the elderly. Effective

measures should also be taken to prevent poisoning exposure in older people.

## References

1. World Health Organization. *The World Health Report 2004—Changing History*. Geneva: WHO, 2004. Available at <http://www.who.int/whr/2004/en/> [Date accessed: January 5, 2010]
2. Doshi A, Boudreaux ED, Wang N, Pelletier AJ, Camargo Jr CA. National study of US emergency department visits for attempted suicide and self-inflicted injury, 1997–2001. *Ann Emerg Med* 2005;46:369–75.
3. Hawton K, Harriss L. Deliberate self-harm in people aged 60 years and over: characteristics and outcome of a 20-year cohort. *Int J Geriatr Psychiatry* 2006;21:572–81.
4. Dean BS, Krenzelok EP. Poisoning in the elderly: an increasing problem for health care providers. *J Toxicol Clin Toxicol* 1987; 25:411–8.
5. Crouch BI, Caravati EM, Mitchell A, Martin AC. Poisoning in older adults: a 5-year experience of US poison control centers. *Ann Pharmacother* 2004;38:2005–11.
6. Karbakhsh M, Zandi NS. Pattern of poisoning in the elderly: an experience from Tehran. *Clin Toxicol (Phila)* 2008;46: 211–7.
7. Rogers JJ, Heard K. Does age matter? Comparing case fatality rate for selected poisoning reported to US poison centers. *Clin Toxicol (Phila)* 2007;45:705–8.
8. Cassidy N, Lee SKK, Donegan CF, Tracey JA. Poisoning in older adults: the experience of the National Poisons Information Centre. *Ir Med J* 2008;10:268–70.
9. Yang CC, Wu JF, Ong HC, Hung SC, Kuo YP, Sa CH, Chen SS, et al. Taiwan National Poison Center: epidemiologic data 1985–1993. *J Toxicol Clin Toxicol* 1996;34:651–63.
10. Hu YH, Chou HL, Lu WH, Huang HH, Yang CC, Yen DHT, Kao WF, et al. Features and prognostic factors for elderly with acute poisoning in the emergency department. *J Chin Med Assoc* 2010;73:78–87.
11. Liu HL. Epidemiologic characteristics and trends of fatal suicides among the elderly in Taiwan. *Suicide Life Threat Behav* 2009;39:103–13.