

Original Research

Factors associated with outcomes of children treated at an emergency department for nonpharmaceutical poison exposure

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Received 15 February 2011; accepted 3 August 2011

Available online 15 November 2011

Abstract

Background: The aim of the study was to report detailed information on the patient characteristics, outcomes, and clinical features of pediatric nonpharmaceutical poisoning events treated at an emergency department in central Taiwan.

Methods: This retrospective study comprised 76 children aged 18 years or under who attended the emergency department for treatment of nonpharmaceutical poison exposure. We reported the regional patient characteristics and pinpointed, using receiver operating characteristic analysis, the high risk associated with older individuals in terms of intentional poisoning. The poisonous materials involved could be divided into five main categories, and detailed information on this is provided. Further, the association between different poisoning categories and outcomes are analyzed. Finally, age-related risk factors including gender and the reason for the ingestion of poison are analyzed.

Results: Cleansing products (39.5%), pesticides (28.9%), and industrial products (15.8%) were the three most common groups of items involved in non-pharmaceutical poisoning. Gaseous agents resulted in the longest hospitalization. Gastrointestinal symptoms (44.7%) were the most predominant clinical presentation. Most children (72.4%) presented with their major symptoms for less than 1 day. The incidence of exposure was highest among preschool children and adolescents. Intentional poisoning and female gender were significant factors among older children (both $p < 0.05$). Finally, children aged older than 11.5 years were found to have a high risk of intentional poisoning.

Conclusions: The type of non-pharmaceutical poison predicts the outcomes of children who are poisoned. Being female and having undergone intentional poisoning have a higher prevalence among older children.

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Keywords: Adolescent; Children; Cleaning products; Intentional poisoning; Poison; Nonpharmaceutical

1. Introduction

Poisoning is frequently encountered in emergency departments (EDs). These events pose a challenge when managing pediatric poisoning patients because of the difficulties

associated with history-taking and the fact that any physical examination is more unreliable compared with that of an adult. In addition, pediatric patients are usually more vulnerable due to physiological differences between developmental stages.

Many nonpharmaceutical agents present in the environment are potentially toxic to children.^{1,2} Previous studies in many countries have reported that preschool-age children are at high risk of poisoning, mostly unintentionally.^{1,3–5} Some risk factors that have been commonly identified include the

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packing or storage of potentially hazardous products, the socio-economic status of the parents, and the age of the child.^{1,4,6,7} However, in pediatric poisoning, the age distribution, the cause of poisoning, and the types of product involved differ between different geographical regions.^{1,3,5,6,8} To our knowledge, there are no demographic data available for central Taiwan. Moreover, patterns of and reasons for non-pharmaceutical poisoning in different age groups obviously may vary. This is especially true for adolescents, in whom there may be strong link to intentional poisoning; such information is also lacking for central Taiwan. In this study, our aim was to analyze patient characteristics, outcomes, and clinical presentations of nonpharmaceutical poisoning events that presented at an ED in central Taiwan.

2. Materials and methods

2.1. Study population and study design

Children aged 18 years or less who presented to the ED of the Changhua Christian Hospital with nonpharmaceutical poison exposure during the period January 1, 2001 to December 31, 2007 were included in this study. Patient characteristics and clinical features associated with the outcome of these nonpharmaceutical poisonings were analyzed retrospectively. The study protocol was approved by the institutional review boards of this hospital.

2.2. Data collection and definitions

Patient characteristics were obtained from the patients' medical records and were identified and abstracted by the ED physicians. The variables included sex, age at onset of poisoning, location and reason (accidental or intentional) for poison exposure, category of substance, clinical presentations, duration of major symptoms, insertion of nasogastric tube, hospital admission, and period from poison exposure to arrival at the ED. The reason for and the place of poison exposure were self-reported by family members, patients, or witnesses. The duration of the major symptoms was evaluated by physicians.

Patients were divided into four age groups: an infant group (1 month – 1 year old a preschool-age group (2–6 years), a school-age group (7–12 years), and an adolescent group (13–18 years of age). Children in whom the poisoning was due to a pharmaceutical, foreign body ingestion (coins, plastics, or toys), food overingestion or envenomation were not included in this study. The clinical presentations were categorized into seven major groups of symptoms: (1) asymptomatic (without any uncomfortable symptoms or chief complaints, and with no specific findings after a physical examination in the ED); (2) gastrointestinal symptoms (nausea, vomiting, diarrhea, constipation, abdominal pain); (3) neurological symptoms (dizziness, vertigo, convulsion, headache, change in consciousness); (4) respiratory tract symptoms (cough, dyspnea); (5) cardiovascular symptoms (brady-/tachycardia, cardiac dysrhythmia, hypo-/hypertension); (6) multiple symptoms (two or more symptoms); and (7) other symptoms.

The nonpharmaceutical substances were classified into five categories according to characteristics of usage: (1) cleaning products (bathroom detergents, glass detergents, bleach); (2) industrial products (desiccating agents, banana oil, mercury); (3) pesticides (pyrethrum, raticide, organophosphate); (4) gaseous agents (carbon monoxide, fuel gas, waste gas); and (5) cosmetics (hair glue, lotion). Detailed information on the nonpharmaceuticals that caused poisoning in these children was analyzed and is presented. Moreover, the outcomes for the children are also presented based on the different categories of substances. The different categories of poison, age, reason for exposure, and duration of hospitalization were analyzed to identify specific differences. Children who presented with very unstable vital signs were admitted to the pediatric intensive care unit (PICU); these symptoms included respiratory failure, severe hypovolemia, and persistent unconsciousness.

The severity of outcome was also classified into five levels according to the suggestions of the American Association of Poison Control Centers (AAPCC). These were: (1) no effect: the patient did not develop any signs or symptoms; (2) minor effect: the patient developed some signs or symptoms as a result of the exposure, but these were minimally bothersome and generally resolved rapidly with no residual disability or disfigurement; (3) moderate effect: the patient exhibited signs or symptoms as a result of the exposure that were more pronounced, more prolonged, or more systemic in nature than minor symptoms; usually, some form of treatment was indicated, but the symptoms were not life-threatening; (4) major effect: the patient exhibited signs or symptoms as a result of the exposure that were life-threatening or resulted in significant residual disability or disfigurement; and (5) death.⁹

In addition to the above, gender differences for the different age groups in relation to the nonpharmaceutical poisoning were also analyzed. Finally, the reasons for exposure were classified into intentional (suicidal behavior) and accidental (misuse or unavoidable exposure), and the relationship between the reasons for poison exposure and the different age groups was also analyzed.

2.3. Statistical methods

Data were analyzed by one-way analysis of variance (ANOVA), Pearson's Chi-square test, and Student t test. The results of descriptive statistics (age, sex, clinical presentation, categories of nonpharmaceutical poisoning agent, duration of symptoms, and duration of hospitalization) are reported as numbers, percentage and mean \pm standard deviation. One-way ANOVA was used to compare the mean ages of the children within the different age groups in terms of different categories of nonpharmaceutical substance. Differences in accidental and intentional poison exposure in terms of age and sex were analyzed by the Pearson's Chi-square test. The associations between demographics and AAPCC severity of outcome were also analyzed by the Pearson's Chi-square test. Overall, the high risk of intentional poisoning in terms of the age group of the children who suffered from nonpharmaceutical poisoning was analyzed by receiver operating characteristic curve (ROC)

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