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Epidemiology of a decade of Pediatric fatal burns in Colombia, South America

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ABSTRACT

Background: Burns represent a serious problem around the world especially in low- and middle-income countries. The aim was to determine the epidemiological characteristics, causes and mortality rate of burn deaths in the Colombian pediatric population as well as to guide future education and prevention programs.
Methods: We conducted an observational, analytical, retrospective population-based study. It was based upon official death certificate data using diagnosis codes for burns (scalds, thermal, electrical, intentional self-harm and not specified), that occurred between January 1, 2000 and December 31, 2009. Official death certificates of the pediatric population of up to 15 years of age were obtained from the National Administrative Department of Statistics.
Results: A total of 1197 fatal pediatric injuries related to burns were identified. The crude and adjusted mortality rate for burns in the pediatric population in Colombia during the length of the study was 0.899 and 0.912 per 100,000, respectively. The mortality rate tended to decrease (−5.17% annual) during the duration of the study. Children under 5 years of age were the most affected group (59.5%). Almost half of them died before arriving at a health facility (47.1%). Fire is the principal cause of death attributable to burns in Colombia, followed by electric burns and hot liquids.
Conclusions: This is a first step study in researching the epidemiological features of pediatric deaths after burns. The Public Health's strategies should be oriented toward community awareness about these kind of injuries, and to teach children and families about risk factors and first aid.

1. Introduction

Burns represent a serious problem around the world especially in low- and middle-income countries [1]. The World Health Organization (WHO) affirms that injuries related to burns are a global public health problem. In 2011, fire-related burns accounted for more than 300,000 deaths/year [2]. Additional burn deaths resulted from scalds, electricity, chemical injuries and other types of burns. Burns represent not only a social but an economic problem with a great impact for any community because burned patients require hospitalization at a higher rate than other traumatic injuries and usually result in higher patient care costs per individual. Fire-related burns have a high societal cost as one of the leading causes of disability adjusted life years (DALYs) lost in low and middle-income countries [3].

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Traumatic injuries worldwide are the eighth leading cause of death in the pediatric population under 5 years old excluding neonatal deaths [3]. In The United States of America (U.S.), unintentional injuries are the leading cause of death in children 1 to 19 years old, who account for nearly 37 percent of all deaths in children after infancy [4]. Furthermore, they are the eleventh cause of death in children between 1 and 9 years old and are the fifth cause of non-fatal injuries during infancy [1]. An injury in childhood is understandable, predictable and can often be prevented [5]. Prevention of pediatric injuries requires multiple tools including interventional strategies that are passive, such as changing the environment around kids to be more safe, and active, including education [6]. Risk factors are often multivariate and interrelated and may vary with different settings around the world. It is important to identify and understand risk factors in each setting before the most appropriate prevention strategies can be designed.

In burns, children are affected principally due to scalds, hot objects and fires [7]. Regardless of the causal agent, the sequela from non-fatal burns are frequently severe enough to cause permanent disability [8,9]. In a study conducted in Bangladesh, Colombia, Egypt and Pakistan, 17% of the survivors had long-term temporary disability (equal or more than 6 weeks) and 8% had permanent disability [10].

In Colombia, in 2011, an academic initiative was created with the purpose of establishing national epidemiological information about these type of injuries. This group reported that the pediatric population represents 22.1% of the total burn deaths for all ages in Colombia (Navarrete and Rodriguez, personal communication). This percentage is important as a starting point to create and measure the effectiveness of injury prevention programs.

The objective of this study is to determine the epidemiological characteristics, trends in mortality rates of burn deaths in the Colombian pediatric population, and analyze the association between causal agents and age groups. This serves as motivation, and is a vital step to create prevention strategies addressing burns.

2. Materials and methods

In Colombia, all accidental deaths are evaluated by officials working for the Institute of Legal Medicine and Forensic Science who fill out a death certificate after an autopsy. In rural dispersed areas, this assessment often has to be done by physicians working during their required year of Social Service. Data for this study came from the Section of Vital Statistics – Death Certifications– of the National Administrative Department of Statistics (DANE—for its acronym in Spanish, Departamento Administrativo Nacional de Estadística) and covered those deaths that occurred between January 1, 2000, and December 31, 2009. This is the first analysis of burn deaths to be done for Colombia.

We conducted an observational, analytical, restrospective study. There is no universally agreed age range for what constitutes childhood. In our study we present data about burn deaths up to 15 years old. The data collected includes socio-demographic standard information. Burn death was defined as any death that occurred as a result of burning as the initial trauma that triggered serial events culminating in death. All codes of the world health organization's international classification of diseases (ICD-10) that relate to burns were included. The ICD-10 codes used were: Exposure to electric current (W85 to W87), Exposure to smoke, fire and flames (X00 to X09), Contact with hot liquids (X10 to X12), Contact with hot gases (X13 to X14), Contact with hot solid (X15 to X18), Contact with other and unspecified heat and hot substances (X19), Victim of lightning (X33), and Intentional self-harm by smoke, fire and flames, steam, hot vapors and hot objects (X76 to X77). The described data has to be considered as a population-based study rather than a hospital-based study. This study did not require ethics committee review or approval because national statistics are available for the academic community's use. Additionally, this study does not reveal people identity or treat sensitive issues, therefore it meets the national resolution 8430 of 1993.

Mortality rates for burn deaths are expressed as deaths/100,000 people. Crude mortality rate and age-specific mortality rate were calculated using the estimated population per each year according to the information obtained from the DANE. The rates were standardized using 5-year age categories and were calculated using the WHO world Average Age Weights 2000-2025 [11]. We performed an Average Annual Percent Change (AAPC), which is a summary measure of the trend over a pre-specified fixed interval, to determine the tendency of the adjusted mortality rate. It allows us to use a single number to describe the average APCs over a period of multiple years.*t*-Test or its non-parametric counterpart, the Mann–Whitney *U* test were performed to compare the differences in mean ages between two groups (genders). Chi-square or Fisher's exact tests were used for the categorical variables when appropriate. All statistical calculations were done using the program STATA, 11th version, educational license (StataCorp, College station, TX) except AAPC, which was done on Microsoft Excel (2010). Differences were considered statistically significant at levels of probability <0.05.

3. Results

A total of 1,197 pediatric burn deaths were identified by the certificates of death. Children less than 5 years old account for 59.5% of all pediatric population, being the most affected group (see Fig. 1). Males were more commonly injured than females (61.4% vs 38.6%) ($p < 0.001$), for a ratio of male: female of 1.6:1. Ages ranged from 3 days of life until 14 years old (mean ± SD: 4.7 ± 4.3). Males had a mean age of 5.1 (±SD: 4.4) and females a mean age of 4.1 years (±SD: 3.9). This difference was statistically significant ($p < 0.001$).

The average crude mortality rate due during the time of this study was 0.899 per 100,000 per year and adjusted mortality rate was 0.912 per 100,000 per year (Table 1). The incidence of burn deaths in all age distributions seems to be decreasing from a maximum value of 1.127/100,000 in 2001 to a value of 0.635/100,000 in 2009 (the lowest value). The average percent mortality change for burn deaths was −5.17%. Population with higher mortality rates was that under 5 years (see Fig. 2). It is unknown why the sharp drop-off in the mortality rate for the 0–4 age range occurred between 2005 and 2007.