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Poverty, population density, and the epidemiology of burns in young children from Mexico treated at a U.S. pediatric burn facility

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ABSTRACT

Introduction: Children 5 and younger are at risk for sustaining serious burn injuries. The causes of burns vary depending on demographic, cultural and socioeconomic variables. At this pediatric burn center we provided medical care to children from Mexico with severe injuries. The purpose of this study was to understand the impact of demographic distribution and modifiable risk factors of burns in young children to help guide prevention.

Methods: A retrospective chart review was performed with children 5 and younger from Mexico who were injured from 2000-2013. The medical records of 447 acute patients were reviewed. Frequency counts and percentages were used to identify geographic distribution and calculate incidence of burns. Microsoft Powermap software was used to create a geographical map of Mexico based on types of burns. A binomial logistic regression was used to model the incidence of flame burns as opposed to scald burns in each state with relation to population density and poverty percentage. In all statistical tests, alpha=0.05 for a 95% level of confidence.

Results: Burns were primarily caused by flame and scald injuries. Admissions from flame injuries were mainly from explosions of propane tanks and gas lines and house fires. Flame injuries were predominantly from the states of Jalisco, Chihuahua, and Distrito Federal. Scalds were attributed to falling in large containers of hot water or food on the ground, and spills of hot liquids. Scald injuries were largely from the states of Oaxaca, Distrito Federal, and Hidalgo. The odds of a patient having flame burns were significantly associated with poverty percentage ($p < 0.0001$) and population density ($p = 0.0085$). Increasing levels of poverty led to decrease in odds of a flame burn, but an increase in the odds of scald burns. Similarly, we

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found that increasing population density led to a decrease in the odds of a flame burn, but an increase in the odds of a scald burn.

Conclusions: Burns in young children from Mexico who received medical care at this pediatric burn center were attributed to flame and scalds. Potential demographic associations have been identified. Different states in Mexico have diverse cultural and socioeconomic variables that may influence the etiology of burns in young children and this information may help efficiently tailor burn prevention campaigns for burn prevention efforts in each region.

Applicability of research to practice: This information will be used to develop and help modify existing prevention campaigns.

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1. Introduction

Childhood burns can cause severe physical and psychological complications [1]. Burn injuries continue to pose a serious threat to young children in both developing and developed countries [2,3]. In the United States, the Centers for Disease Control and Prevention (CDC) reports that five percent of unintentional injury deaths of children between the ages of 0–19 were attributed to burns. The CDC reported that children in the 1–4 years old age group had higher rates of death due to flame injuries than other age groups [4]. Children in developing countries tend to have more severe burns and more adverse complications from their burn injuries than children in the developed world [5].

Several studies have examined risk factors associated with burns in young children in developing countries. Studies from Peru and Brazil have identified many diverse socioeconomic variables that may lead to childhood burn injuries [6,7]. In a study conducted in Peru, researchers found that socioeconomic factors such as lack of water supply, low familial income, and crowding were factors that put young children at a higher risk for burn injuries [7]. Similarly, a study conducted in Rio de Janeiro found that the risk for childhood burns was higher in children who lived in crowded households, were not the first born child, had a pregnant mother, had recently moved to a new residence, or who had a mother recently dismissed from a job [6].

Our pediatric burn hospital treats many children with life threatening injuries from Mexico. In an effort to elucidate modifiable risk factors in our patient population from Mexico, we published a retrospective chart review on the epidemiology of burns. For our first paper, 447 patients at our pediatric burn facility met the criteria for the study. The most common causes of burn injuries were flame burns and scald burns. Flame burns were caused primarily by explosions of fuel and house fires. Scald injuries were attributed to children falling into containers of hot liquids and from spillage of hot liquids. The mean total body surface area (TBSA) burned for flame injuries was 45.5+19.0% and the mean TBSA for scald injuries was 44.5+15.4%. The mean age for sustaining flame burns was 3.0+1.5 and for scald burns was 2.6+1.2 years of age. More information on the causes of burn injuries and other epidemiological characteristics of our patient population can be found in our original paper [8].

Further research on the risk factors of childhood burn injuries is needed for many Latin American countries [6,7]. To our knowledge, very little literature exists on how socioeconomic factors and geographic location play a role in childhood burn injuries for children in Mexico. As a result, we decided to reexamine the data from our previous paper and strived to identify how factors, such as poverty and population density, were correlated with burn injuries in our young patients from Mexico [8].

2. Methods

2.1. Design

This paper builds on the work done in our previous epidemiology of burns manuscript [8]. The present study analyzes the data in that article with a focus on the impact of poverty and population density on scald and flame burns in young children from Mexico treated at this pediatric burn hospital. Documentation in the medical record for the socioeconomic situation of each patient was inconsistently available. As a result, we used measures of poverty and population density by each Mexican state, as a proxy for the socioeconomic situations of patients from that state. Poverty levels for each state were collected from the CONEVAL organization in Mexico (National Council for the Evaluation of Social Development Policy). The CONEVAL organization is run by Mexico's Ministry of Social Development. [9]. Population density data for each state was collected from the National Institute of Statistics and Geography in Mexico (INEGI) [10].

2.2. Definitions

Poverty was measured by the CONEVAL organization. The CONEVAL organization calculated the percentage of people living in poverty in each state based on the following factors: per capital income, education attainment, access to healthcare, access to Mexican social security services, quality of living spaces, access to food, food insecurity, social cohesion measurements, and access to infrastructure like paved roads. The authors of this study do not know the exact method CONEVAL used to calculate the percentage of a state's population that was living in poverty, nor do we know how much weight the factors listed above were given when poverty levels were calculated. We believe the data provided by the CONEVAL organization is the best method for calculating poverty levels for the geographic area we are studying given that the CONEVAL organization is a national

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