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Antecedents and consequences of pediatric dog-bite injuries and their developmental trends: 101 cases in rural China

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ABSTRACT

Objective: Study the contextual antecedents and consequences of pediatric dog bites in rural China.
Methods: A total of 101 caregivers from rural Anhui Province, China, whose children had suffered dog-bite injuries in the past year, participated in a structured interview about the circumstances, antecedents and consequences of their child's injury.
Results: Contextual circumstances identified frequently included outside-home environment and presence of peers but not adult supervisors. Frequent antecedents were dogs' initiation of the encounter, children walking to/from school, and dogs unleashed. Consequences to children identified frequently were rabies vaccines, restricted activity, and fear of dogs. Developmental trends emerged, with bite circumstances differing by children's ages.
Conclusions: These results offer data on common antecedents and consequences of pediatric dog bites in rural China, a necessary prerequisite for development of empirically supported prevention programs in a vulnerable population.

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1. Introduction

Pediatric dog-bite injury has received increasing attention by researchers in the past few decades (Overall and Love, 2001; Raghavan, 2008; Schwebel et al., 2012; Shen et al., 2013; Yeh et al., 2011), but most studies were carried out in developed regions such as North America (Moore et al., 2000; Raghavan, 2008), Europe (Frangakis and Petridou, 2003; Horisberger et al., 2004; Mcheik et al., 2000), and Australia (Ozanne-Smith et al., 2001). A few studies, mostly epidemiological, have been published from developing nations (Bhanganada et al., 1993; Hon et al., 2007; Yeh et al., 2011) but strikingly, almost no systematic research on pediatric dog-bite injury has been carried out in mainland China, home to 150 million children under the age of 14 who are exposed daily to large populations of stray dogs.

Available research on dog bites in China suggests the threat is immense. Work in more developed Chinese regions of Taiwan and Hong Kong report that dogs account for almost 90% of animal bites treated in emergency departments (Hon et al., 2007) and that young children are the most vulnerable age cohort for dog bites (Hon et al., 2007; Yeh et al., 2011; see also Deng et al., 2004; Guo et al., 2007). In rural mainland China, where the current study was conducted, data are less reliable due to inconsistent medical record-keeping but available data suggest the risk is higher than most other regions of the world. Animal bites are the third-leading cause of agricultural injury among rural Chinese (Yin et al., 2010). Socioculturally, risk is elevated for various reasons. First is the sheer number of dogs. In 2009, the *China Daily* newspaper estimated a population of 75 million dogs in China (*China Daily*, 2009); others offer estimates as large as 200 million dogs (Tang et al., 2005). The large dog population derives primarily from that fact that as male adults leave their villages to seek work in larger cities, women, children and the elderly raise dogs for security and protection (Duan, 2008). These dogs escape fences and wander rural areas unleashed, reproducing freely (Deng et al., 2004; Guo et al., 2007). Second, many dogs in rural China have rabies. Especially problematic in Southern China, rabies substantially increases bite risks to human health and also makes animals more likely to bite (Kienzle, 2006). From 1996 to 2007, China experienced a human rabies incidence increase of over 2000%, from 159 to over 3300 cases annually (Song et al., 2009; Si et al., 2008). The rate has stabilized and perhaps decreased slightly since (Yin et al., 2010), but the World Organization for Animal Health estimates over 95% of rabies cases in China are still transmitted via dog bites in rural areas (Tu, n.d.; see also Tang et al., 2005). Third, risks to school-aged children are heightened in rural China because almost all children walk to

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and from school on public roadways, sometimes a mile or more each way. Stray and loose dogs are prevalent along those routes (Shen et al., 2013).

What remains unknown, and critical to develop pediatric dog bite prevention programs, is the contextual circumstances under which children are bit by dogs in rural China. With a significantly different socio-cultural environment than found in developed countries or even in urban China, children in rural China likely experience different behavioral and contextual risk factors for dog-bite injury. Process analysis has proven useful to understand pediatric injuries in Western homes (Peterson et al., 1987) and holds promise to gather data on the circumstances of pediatric dog bite injury incidents in rural China.

Based on behavior learning theory, process analysis examines the behavioral antecedents before an injury and the intrapersonal and interpersonal consequences after an injury occurs (Peterson et al., 1987), thus enabling researchers to examine and notate patterns in injury events so that appropriate intervention programs might be developed. For example, in the domain of antecedents, process analysis might discover that many children are bitten by dogs after provoking the dogs while they were sleeping, indicating the need to educate and train children about basic behavioral rules such as, "Never pet a dog while it is asleep". Process analysis might also discover that dogs attack children as a means of protecting or obtaining new territory, perhaps because fences are damaged or gates left open, permitting dogs to enter previously inaccessible territory. Such a discovery may lead to interventions designed to keep dogs within designated enclosures.

Process analysis also elucidates consequences of injuries, which include not only physical injuries (e.g., extent and types of injuries) but also behavioral and psychological consequences. The methodology might reveal, for example, that well-meaning parents unintentionally encourage children's interactions with potentially dangerous dogs by comforting children with candy and sweets after fearful or painful interchanges with dogs. Such a discovery could lead to interventions educating parents about how to console their children following encounters with stray dogs.

In summary, epidemiological data indicate dog-bite injuries pose a significant threat to children in rural China (Deng et al., 2004; Guo et al., 2007; Hon et al., 2007), but the circumstances and consequences of these injuries are poorly understood. This study implemented process analysis strategies to examine antecedents and consequences of pediatric dog-bite injuries in rural China with the goal to accumulate descriptive data that might lead to development of effective intervention programs. The study was conducted via structured interviews with the primary caregiver of 101 children in rural Anhui Province, China who had suffered a medically treated dog bite within the past 12 months.

2. Methods

2.1. Procedure

101 families were recruited from 10 rural villages in the towns of Baishan and Nihe, Anhui Province, China (a 'town' is the second smallest governmental unit in China and is typically composed of one central urban area and multiple surrounding rural villages). All families included a child aged under 18 years old who had suffered a dog-bite injury treated at the local health clinic or town hospital in the past 12 months. Identification of families was accomplished by reviewing health clinic records and selecting all families from the target geographic area who met inclusion criteria. Study procedures were reviewed and approved by IRBs at both University of Alabama at Birmingham in the United States and Anhui Medical University in China.

Accompanied by physicians familiar with the local culture and language dialect, native Chinese researchers traveled to eligible participants' homes to conduct interviews. Informed consent was obtained from the self-identified primary caregiver of the victim child, with written documents read aloud in cases where potential participants were illiterate. Refusal to participate was rare (<5%).

Following consent procedures, researchers conducted a structured interview of about 30 min with the participating caregiver regarding the child's most recent medically treated dog-bite injury. Oral responses for forced-choice questions (the majority of items) were recorded on-site. Oral responses for open-ended questions were audio-recorded and then transcribed and coded according to a pre-determined coding scheme (see below). Participating families received a package of groceries worth about $5 USD to compensate for their time.

2.2. Participants

Typical of familial caregiving of children in rural China, participating caregivers were 54.0% parents ($n = 54$), 42.0% grandparents/great-grandparents ($n = 42$), and 4.0% other relatives (e.g., aunts, uncles, $n = 4$). There was 1 case with data missing on this variable. Among the 101 child victims, 65.3% ($n = 66$) were boys. The children had a mean age of 8.27 years (SD = 3.68; range = 2–17). Fathers had an average of 7.71 (SD = 2.50) years of formal education, and mothers an average of 5.60 (SD = 3.88) years of formal education. None of the 42 participating grandparents or great-grandparents had any formal school education. The average household annual income was 26,000 RMB (~$4100 USD). Thus, the sample represented a highly impoverished and disadvantaged population with little formal education. Detailed data on the sample's demographic characteristics appear in Table 1.

Table 1
Characteristics of sample in this study.

	Percent or *M* (SD)
Characteristics of child	
Gender	65.3% male
Age (years)	8.27 (3.68)
Only child	41.6%
Number of dog-bites	1.18 (.41)
Characteristics of family	
Adults in home	2.30 (0.98)
Children in home	1.65 (0.75)
Parental marriage	92.0% married
Annual household income	85.6% less than $36,000RMB/$5714USD
Education (years)	
Father	7.17 (2.50)
Mother	5.60 (3.88)
Occupation	
Father	84.9% farmer or migrant worker, 0% jobless
Mother	67.8% farmer or migrant worker, 16.7% jobless
Annual length of time with child	
Father	68.7% less than six months; 30.3% everyday
Mother	35.4% less than six months; 62.5% everyday
Dog ownership	
Number	1.21 (1.05)
Current	45.5%
Previously	28.7%
Perceived dog prevalence	
Street (five point scale)	3.73 (0.93) [3 "Sometimes", 4 "Often"]
Farm (five point scale)	2.79 (1.17) [2 "Occasionally", 3 "Sometimes"]
Medical care	
Number of vaccine shots post-bite	4.88 (.64)
Cost of medical care	366.15 RMB/58.12 USD (94.7 RMB/15.0 USD)

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