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A survey of the dog population in rural Bangladesh

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ABSTRACT

Globally, Bangladesh ranks third in the number of human deaths from rabies. Although dogs are the principal known transmitters of rabies and knowledge of dog populations is essential for effective national control and proper planning, dog control programs are scarce in Bangladesh. Our objective was to count dogs in a rural area to understand the dog population of the country. For this purpose we selected six unions of Raipura upazila in Narsingdi district. Dog counting was done by direct observation following accepted guidelines. We determined the mean density of the dog population in Bangladesh to be 14 dog/km^2 (95% CI 3.7, 24) and the human:dog ratio to be 120 (95% CI 55, 184). Our paper contribute to the literature which shows great variation in the human:dog ratio across regions of the developing world. The human:dog ratio depends on the area's human (as well as dog) population, whereas dog density per unit area indicates the true number of dogs. We propose that extrapolating from the human:dog ratios of other regions not be relied upon for estimating dog populations, unless the ratios can be supplemented by actual counts of dogs within the target area.

1. Introduction

Every year an estimated 2100 people die of rabies in Bangladesh (Hossain et al., 2012). Dogs are the primary source and transmitters of rabies to humans and domestic animals in Bangladesh (Hossain et al., 2011, 2012). Our previous study showed that 54.2% of animal bite was caused by ownerless dogs and 43.0% by owned dogs (Hossain et al., 2012). The relationship between human rabies cases and the ownership status of biting dogs is, however, unknown.

Rabies epidemiology is highly responsive to human- and dog-population densities as well as to the cultural and socioeconomic environment in which the two populations interact (De Mattos et al., 1999). Although Bangladesh is ranked third highest in rabies-endemic countries for human deaths from rabies (Hossain et al., 2011), studies of dog populations in Bangladesh are scarce. This scarcity is an obstacle for the implementation of a national rabies control program. Estimation of the Bangladeshi dog population (Hossain et al., 2011) has been based on the human:dog ratio estimates for urban and rural Asia: 7.5 (95%CI 4.8, 10.1) and 14.3 (95%CI 0, 45.0), respectively

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(Knobel et al., 2005). Those estimates were from studies in the Philippines, Vietnam, Sri Lanka, India, China and Thailand. However, because those countries differ importantly by lifestyle, physical environment, culture, and population density from Bangladesh, it is possible that extrapolating a dog density for Bangladesh from the human:dog ratios of those countries is not appropriate. With an area of 147,470 km^2, Bangladesh is one of the densely populated on earth; the predominantly flat land of Bangladesh is crisscrossed by hundreds of rivers. At present, 76.5% of its population lives in rural areas. Dogs in the rural community are accepted as guards for poultry and as "garbage cleaners."

Dog ecology is a product of the cultural and socioeconomic conditions of the humans with whom these animals share their environment; the epidemiology of rabies is greatly influenced by those complex relationships (De Mattos et al., 1999). A little more than half of all dog bites of humans in Bangladesh are attributed to ownerless dogs, however the relationship between human rabies cases and the ownership status of biting dogs remains unknown (Hossain et al., 2012). A count of dogs will fill an important logistical gap in rabies control in Bangladesh. Because the greatest burden of rabies in Bangladesh is in rural areas (Hossain et al., 2012), we determined the number of dogs in a rural area of Bangladesh to measure both the dog density per unit area and the human:dog ratio. The study might be applicable to developing dog-control measures for effective rabies control, and for predicting the needs of dog-vaccination programs to prevent canine rabies. Also, comparing our counted dog population to the estimates based on human:dog ratios from other regions provides an evaluation of the appropriateness of that practice.

2. Materials and methods

2.1. Area

Our study was conducted in six unions of Raipura upazila in the Narsingdi district (Fig. 1) (Anon., 2006). In Bangladesh, districts are divided into subdistricts (upazilas) and each upazila is divided into unions. Several villages constitute a union. For the present study, we selected a location that is totally isolated from the land mass by a large river. The unions in our study are located on an island in the Meghna River, one of the largest rivers in Bangladesh. Thus, they are completely isolated from mainland Raipura, with boat the only means of transport to the mainland.

According to the 2001 national census, the total human population of Raipura was 454,546 (Anon., 2001). Between 2000 and 2009, the annual population growth rate in Bangladesh was 1.8% (Anon., 2003). Based on this growth rate, we estimated the population of Raipura in 2011 to be 536,356. The total area of Raipura upazila is 291.26 km^2 and consists of 24 unions that include 231 villages (Anon., 2009).

2.2. Study design

From October to December 2010, we conducted a pilot study on the prevention and control of rabies by animal birth control (ABC). The study was undertaken by the Government of Bangladesh, the Institute of Allergy and Clinical Immunology of Bangladesh, and Bangladesh Anti Rabies Alliance. ABC activities commenced on the 29th October, 2010 and were carried out 2 days per week over the following 5 weeks. Determining the size of the dog population was part of the project.

The three distinct seasons in Bangladesh are summer, rainy, and cool-dry. We believe that doing this study during the cool-dry season (as we did) was appropriate for several reasons.

i. During the rainy season flood is common in the rural areas of Bangladesh (particularly in places surrounded by a big river like the Meghna). Even in the absence of flood, there is heavy rain which often causes breakdown of road links. Therefore, movements become difficult in the rainy season.
ii. In the summer, the temperature is often high and uncomfortable for field workers. Moreover, occasional cyclones during this season add further difficulties for field studies.
iii. During rainy or hot days, dogs take shelter in areas other than their dwelling places (and such areas are difficult to locate properly). Our study was done instead at the beginning of the cool-dry season. During this season, the temperature is comfortable and dogs pass their time in open places and are found in predictable locations.
iv. A field study like ours needs good support from the local people. However, during rainy and hot seasons people are extremely disturbed by the weather conditions, busy with their own problems, and do not have the attitude to cooperate for a field study.
v. The general consensus is that more puppies are seen during the cool-dry season than during other periods; however, because no study of litter "seasons" in dogs has been done for regions such as ours, we do not know whether the dog population is at the annual peak during this season.
vi. Finally, we also argue that during the rainy or hot seasons, canine rabies-vaccination campaigns are unlikely to be mounted.

Dog counting was done by direct observation following guidelines of the World Society for the Protection of Animals (Anon., 2008). These guidelines focus on estimating or monitoring simply the total number of roaming dogs in public areas. Counts made in selected regions are combined to estimate the total number of dogs roaming on public property at any one time. This number allows calculating statistics such as the density of roaming dogs per unit area. A successful rabies control project in Jaipur, India used this method to count the dog number (Reece and Chawla, 2006). This method is not the best way to count dogs but is suitable for resource-poor settings.

Dog surveyors were recruited and given a half-day's training in the counting-method and data recording. They were equipped with either digital cameras or mobile phones with in-built cameras and asked to photograph each dog during the survey to avoid double counting. Volunteers were also recruited from respective areas to assist