



Rabies: ignorance is not all the time bliss

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ABSTRACT

There is absence of a nationally representative epidemiological data on rabies in India when it is re-emerging as a major global public health problem. This deadly disease, mainly transmitted by terrestrial animals, has been entirely eliminated in few developed countries. Rabies infected dogs is the major risk factor in human rabies deaths in most of the developing countries of Asia amounting to more than 90 percent cases. Everyone by nature on earth is in persistent, frequent or increased danger of exposure to rabies though this disease is unique in pathogenesis to prevent clinical disease by judicious vaccination even after exposure to agent virus. Only the vaccination of domestic and peri-domestic animals can prevent the disease for citizen at large living in or visiting high risk regions. In India people most at risk live in rural areas, where human vaccines and immunoglobulin are not readily available or accessible. Rabies should be declared as a notifiable disease in India along with launching of a programme embedded with an organized surveillance system forthwith for updated data.

Keywords :

Prologue:

Recent increases in human rabies deaths in parts of Africa, Asia and Latin America suggest that rabies is re-emerging as a major global public health issue. Rabies is a neglected zoonosis that affects poor and vulnerable populations whose deaths are rarely reported as once symptoms develop, rabies is virtually fatal. India has more deaths from rabies than any other country and remains an avoidable cause of death. It occurs mainly in remote rural communities where measures to prevent dog to human transmission is yet to be put into operation leading and gross under-reporting prevents mobilization of resources for post-exposure vaccination (PEV) from the national as well as international communities. [1]

Global scenario

Rabies is widely distributed in more than 150 countries and territories. In the United States, animal control and vaccination programs have effectively eliminated domestic dogs as reservoirs; so also in Australia, Japan and England. In spite of being a vaccine-preventable disease it causes more than half lac of global annual human deaths; 95 percent of these occur in Asia and Africa potentially threatening over 3 billion people. Bites by rabid domestic dogs are the risk factor for 99 percent spells though numerous animal species are implicated even in natural state of affairs; a number of bat species has been noted to transmit rabies or rabies-related virus in south-east Asia. Rabies mostly affects children and adoles-

cents less than 15 years; PEV is provided to 40 percent of Asian kids in the 5–14 years age group, and the majority of them are male. Every year, more than 15 million people worldwide receive a post-exposure vaccination (PEV) to save hundreds of thousands human life after being exposed to animals suspected of rabies. [1, 2, 3, 4]

Price and value

In the United States human rabies deaths are rare, yet the estimated public health costs associated with detection, prevention, and control exceed \$300 million annually. These costs include advocacy, animal vaccination and control programs, maintenance of research laboratories, and implied medical expenses, such as those incurred for PEV that is projected to be for 40,000; escalating with rabies regional epizootic or enzootic. A course of rabies immune globulin and five doses of vaccine over a 4-week period on average cost \$1,000; the cost per human life saved ranges from \$10,000 to \$100 million, depending on the nature of the exposure and the probability of rabies in a region. [5]

Even poor people have to bear an average cost of PEV after contact with a suspected rabid animal as US\$ 40 in Africa and US\$ 49 in Asia compared to the average daily income of around US\$ 1–2 per person. Rabies deaths in Africa and Asia amounts to 1.74 million disability-adjusted life years (DALYs) loss per year with the estimated annual cost of US\$ 583.5 mil-

lion. Aborigines with their children living in or visitors of rabies-affected areas with extensive outdoor exposure in rural and remote areas are at accepted as high-risk. Children are considered at higher risk because they tend to play with animals, may receive more severe bites, or may not report bites. The most cost-effective strategy for preventing rabies is through vaccination in dogs proven in several countries like Latin America and has to be religiously practiced as a realistic goal in Africa and Asia. This is also warranted economically by the future savings of discontinuing PEV for people and to be replaced by the pre-exposure immunization in population group with a significant risk of exposure to rabid animals and persons engaged in high-risk occupations dealing with live rabies virus, and in any related activities with probability of direct contact with bats, carnivores, and other mammals in rabies-affected areas. [1]

In the United States, since the widespread vaccination of domestic dogs and cats and the development of effective human vaccines and immunoglobulin treatments, the number of recorded human deaths from rabies has dropped from 100 or more annually in the early 20th century to one to two per year, mostly caused by bat bites, which may go unnoticed by the victim and hence untreated. Over the last 100 years, rabies in the United States has changed dramatically. More than 90 percent of all animal cases reported annually to Center for disease control (CDC, Atlanta, USA) now occur in wildlife; before 1960 the majority was in domestic animals. The principal rabies hosts today are wild carnivores and bats. Modern day prophylaxis has proven nearly cent percent successful. In the United States, human fatalities associated with rabies occur in people who fail to seek medical assistance, usually because they were unaware of their exposure. [5]

Indian scenario

Rabies had been acknowledged by Indian physicians since time immemorial, earlier than Aristotle documented it in the Greco-Roman period. The ancient Vedic text 'Sushruta Samhita' described rabies in men and animals: "If the patient becomes exceedingly frightened at the sight or mention of the very name of water, he should be understood to have been afflicted with Jala-trsisa (hydrophobia) and be deemed to have been doomed". World Health Organization estimated in 2002 that rabies caused nearly 60 percent (30,000) of the estimated global human deaths per year in India. The first in-depth study based upon a nationally representative sample of deaths rather than modeling or from extrapolation from selected focal surveillance in the ongoing Million Death Study estimated rabies mortality in India. By using verbal autopsy an estimate on the age-specific mortality rates of symptomatically identifiable furious cases in geographic and demographic distributions was done. In 2005 there were 12,700 symptomatically identifiable furious rabies deaths in India; taken as a whole 1.1 deaths per lac population; mostly in males (62%), in rural areas (91%), and in children below the age of 15 years (50%); one third in Uttar Pradesh, three quarters in seven central and south-eastern states: Chhattisgarh, Uttar Pradesh, Odisha, Andhra Pradesh, Bihar, Assam, and Madhya Pradesh. Central Bureau of Health Intelligence, Ministry of Health and family Welfare, Government of India reported the total number of rabies deaths as 181 in 2010 and 253 in 2011. The concentrated geographic distribution of rabies in India of the dreaded disease leads us to think that a considerable decline in mortality or regional elimination is achievable by effective dog rabies control with increased community participation and a dedicated active surveillance. Future directions of research have to provide regional and demographic mapping of human deaths to formulate a national rabies control programmes and can be used in the futuristic models will be used for evaluation regional elimination though abolition of the canine reservoir is even a far cry. [6, 7, 8]

Other studies also established that the disease is endemic mainly caused by the bite of stray infected dogs with estimated annual incidence 2 per lac of population; leading to one-thirds of global mortality putting India as highest in Asia

and the second highest in the world; affecting male, adults and children, rural group, poor socio-economic groups; bites mainly in the extremities; incubation period up to six months with Hydrophobia as the prime feature; half of affected sought health care, one tenth had incomplete treatment. A person is bitten every 2 seconds, and two persons die from rabies every hour; annual person-days lost due to animal bites are 38 million, and PEV costs \$25 million per annum. Most of this cost being borne by patients who least can afford to pay for PEV. Urban areas including metros annually contributed to one-thirds of the total rabies deaths exposed to animal bites. One of the main reasons for the high fatality rate are lack of awareness and optimum education on a large domestic and peri-domestic dog population. Most animal bites in India (91.5%) are by dogs, of which 60 percent are strays; PEV dogs are not appropriately immunized. The incidence of animal bites is 17.4 per 1000 population. [1, 9, 10, 11, 12, 13]

Global collaboration:

For at least three decades WHO has fought to break the "cycle of neglect" affecting rabies prevention and control particularly in low- and middle-income countries through advocacy, surveys, studies, and research; elimination of animal rabies; ensuring pre-hospital care with instant meticulous local wound management; promotes wider access to appropriate PEV using modern vaccines through multi-site intradermal regimen reducing the cost of cell-cultured vaccine up to 80 percent, domestic production of biological to cover up global critical short supply of rabies immunoglobulin (RIG), continuing education of all professionals in prevention and control. WHO supports targets for elimination of human and dog rabies in all Latin American countries by 2015 and by 2020 of human rabies transmitted by dogs in South-East Asia where a five-year plan (2012–2016) aims to halve the currently estimated number of human rabies deaths. [1, 13]

Colossal influence of local injury management:

Wound cleansing and early PEV after contact with a suspect rabid animal can abort rabies. In developing countries, the vaccination status of the suspected animal alone should not be considered to initiate PEV. Presently concentrated and purified cell-culture and embryonated egg-based rabies vaccines are safe and effective. Further, elimination of virus at the site of the infection by chemical or physical means by local treatment is recommended as one of the helpful protective means in all types of exposures. Optimum pre-hospital care include instant and meticulous wash for a minimum of 15 minutes with soap and water, detergent, povidone iodine; even thorough and extensive wash with water may suffice. The wound needs treatment with passive rabies immunization and delayed for quite a few hours if suturing is unavoidable; with additional antibiotics and tetanus prophylaxis if needed. In special situations of exposure in infants or mentally disabled persons and with a reliable history in rabies enzootic areas, the cases may be treated as higher category. WHO-recently published [position paper on rabies vaccines](#) recommending thoroughly evaluated intradermal post-exposure regimen. [1, 13]

World Rabies Day: 28 September

The 74-country World Rabies Day (WRD) was first was organized by the two founding partners Alliance for Rabies Control (ARC) and Centre for Disease Control and Prevention, Atlanta (CDC), on 8 September 2007 with the co-sponsorship of the World Health Organization (WHO), the World Organization for Animal Health (OIE) and the Pan American Health Organization (PAHO/AMRO). Activities organized by WHO Headquarters (HQ), Regional Offices and its many rabies Collaborating Centres were contributing to the overall aim of the WRD: raising awareness about the impact of human and animal rabies, its easy prevention, and how to control and to eliminate the disease in animals and humans. September 28, 2011 marked the five year anniversary of the World Rabies Day Campaign; the single largest concerted effort to raise global awareness about rabies and its prevention to educate by easily translated materials using electronic media, em-

powered people in 85 countries. Since WRD inaugural campaign in 2007, rabies vaccination clinics protected 7.7 million animals and educated 182 million people. These remarkable feats would not be possible without the support of global community including followers, advocates, sponsors and outreach partners since 2007 to explore creative ways of raising even more awareness to ensure that governments, policy makers and key opinion leaders can no longer neglect rabies. [14, 15]

'Open secret'

In developed countries the control has been achieved by adapting rabies as a legally notifiable disease, mass pet vaccination and licensing, routine PEV, tight border control for traveling dogs with a proof of regularly vaccination with a certificate of sufficient rabies antibody titer in the blood; wild rabies from foxes and raccoon dogs is controlled by distributing oral vaccine baits in the forests, and the clean community management where garbage is not let in the open to support the stray dog population. In Mexico, nil human cases were reported within a decade since mass vaccination of dogs was introduced. The keys to success in rabies intervention in India lies in a holistic multipronged approach to control is by involving stakeholders from all levels: political leaders, health care providers, experts in clinical epidemiology, veterinarians, public health experts, legal authorities, social activists. Mass intensified behaviour change communication programmes are needed to augment public awareness at the primary health care level in concurrence with freely availability of vaccines for both men and animals; implement compulsory licensing and vaccination with animal welfare programs; dangers of inadequately managed animal bites; optimum mix of wound care, vaccine and RIG; popularize contemporary vaccines in the intradermal route (requiring one-tenth of the intramuscular dose), made cheaper, extensively and reachable. WHO-commissioned study of Tunisia, Sri Lanka and Ecuador concluded that "dogs which are not catchable by at least one person are rare and represent generally less than 15 percent of the dog population"; this is likely to be much higher in India. In Nepal up to 97 percent of dogs were accessible to vaccination. In India ownerless and stray dogs are mainly responsible for the maintenance of reservoir and transmission of rabies to humans. The city of Jaipur is an example of rabies control through mass vaccination and sterilizing of the dogs resulting in elimination of human rabies. WHO is collecting data on rabies on a yearly basis through an interactive 'Rabnet' information system to generate interactive maps and graphs using human and animal rabies data allowing online data entry/update at country level and on Administrative level 1 (e.g. Province, State or District depending on country politi-

cal/administrative organization). Rabnet offers basic information resources containing ready-made maps, rabies related documents and details of collaborating centres that can be displayed in interactive maps and linked to a broad range of country-specific indicators (population, education and health services) for comprehensive picture. [10, 12, 16]

Think globally, Act locally

Government of India, in collaboration with key partners noted that the main constraint is the lack of a comprehensive national programme and regionally coordinated control efforts with six bordering countries, as done by Sri Lanka and Thailand. National Centre for Disease Control (NCDC) (formerly National Institute of Communicable Disease) launched a pilot project in 2008 in five Indian cities. The effort included training of health professionals in animal-bite management and raising public awareness about PEV through mass media. In collaboration with WHO anti-rabies vaccines and anti-rabies serum are available and capacity building was ensured in the health care outlets to in close cooperation with the national animal husbandry department and partners organizations augmenting anti-rabies interventions with RIG as the high mortality in human cases is due to severe shortage to non-existence of RIG that is recommended with the initial dose of vaccine. The effort roped in effectively other organizations like Rabies in Asia Foundation, Association for Prevention and Control of Rabies in India and Animal Welfare Board of India that is promoting Animal Birth Control Programme in major metropolitan cities. Schering-Plough Corporation – a global health-care company – sponsored two projects in 10 villages surrounding Bangalore and Pune, focused on educational awareness and the mass vaccination of dogs. The Centre for rabies-free India by 2020 is contemplating a national programme to control rabies and started dialogue at all levels. [11, 15]

Take home message

Rabies is a nuisance both in developed countries with scattered cases causing fright and in developing countries where control dog rabies is hard to pin down. We can prevent rabies after known exposure, still our knowledge on the pathogenesis or the mechanism of protection is incomplete. The epidemiology of human rabies is a replica of the epizootiology of the disease. From the public health approach, the dog or other canine species are important vector for most human cases in Asia, Africa, and Latin America in contrast to the developed world. So, the interruption of transmission lies in the vaccination of animal reservoirs among domestic and peridomestic animals. [17]

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