Marching towards Rabies free India: Challenges and way forward

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Abstract

Rabies presents a significant challenge as a zoonotic disease that transfers from animals to humans. In India, the country faces a heavy burden of human deaths resulting from rabies, with dog bites being responsible for more than 99% of fatalities. The region, particularly India, experiences a high number of deaths related to rabies and incurs a considerable economic toll. Numerous obstacles hinder effective rabies control in India, including limited availability of vaccines and immunoglobulin, insufficient epidemiological and laboratory surveillance, low community awareness, inadequate capacity building for healthcare professionals, and a lack of coordination across sectors.

To address these challenges and prevent human deaths caused by rabies, the National Rabies Control Programme (NRCP) was established. Initially piloted in five cities between 2008 and 2012, the programme demonstrated success, leading to its nationwide implementation. The programme's objectives encompass providing human rabies vaccines and immunoglobulins, enhancing surveillance of animal bites and human rabies cases, improving laboratory diagnosis, establishing model anti-rabies clinics, conducting awareness campaigns, and fostering intersectoral coordination. Adhering to a One Health approach, the NRCP aligns with the National Action Plan for Rabies Elimination (NAPRE), launched in September 2021.

The NAPRE encourages states to develop comprehensive action plans encompassing both human and animal health aspects. Funding for interventions related to human health is obtained through the National Health Mission, while animal health components explore various funding options. Implementation of the NAPRE aims to reduce the risk of rabies through mass dog vaccinations, pre and post-exposure prophylaxis, and public education, with the ultimate goal of achieving "Rabies-Zero by 2030." Effective execution of the NRCP and NAPRE is crucial to successfully combat rabies and safeguard public health in India.

Keywords: National Rabies Control Programme (NRCP), National Action Plan for Rabies Elimination (NAPRE), World Health Organization (WHO)

Background

Rabies, a zoonotic disease transmitted from animals to humans, has been recognized for centuries and presents a significant challenge in the context of One Health. The majority of human deaths caused by rabies are attributed to dog bites, accounting for over 99% of fatalities [(1)]. Annually, approximately 59,000 human deaths and a loss of 3.7 million DALYs (disability-adjusted life years) are associated with dog-mediated rabies, with Asia and Africa bearing the highest burden [(1)]. In Asia, India alone accounts for 59.9% of rabies deaths and 35% of global deaths, resulting in a substantial economic cost estimated at $8.6 billion. [(1)]

Rabies is endemic throughout India, except for the Andaman & Nicobar and Lakshadweep Islands, and human cases are reported nationwide throughout the year. According to WHO estimates, India contributes to 36% of global rabies deaths and 65% of human rabies deaths in the South East Asia region [(1)]. Dog bites are responsible for about 96% of the mortality and morbidity associated with rabies in India, with children being the most vulnerable group, constituting 40% of individuals exposed to dog bites in rabies-endemic areas.[(1)] Studies provide varying figures on the incidence of animal bites and deaths due to rabies in humans. The WHO-APCRI 2004 study estimated 17.4 million animal bites and 20,000 deaths per year in India [(2)], while the Million Deaths Study in 2012 reported an estimated 12,700 deaths due to furious rabies. [(3)]

Current Scenario

Incidence of Human Rabies Cases in India

Various reports and studies [(2)(3)(4)(5)] provide estimates of human rabies deaths in India. (Figure 1)

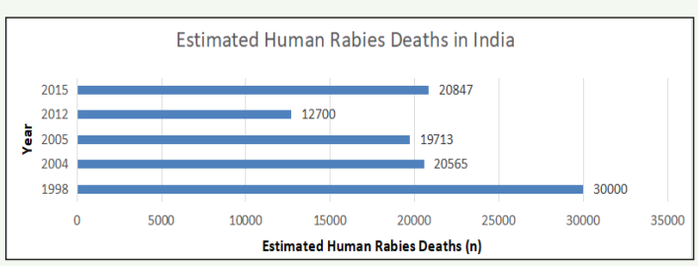

Figure 1: Trend of Estimated Human Rabies cases in India

The Central Bureau of Health Intelligence [(6)] has been monitoring human rabies cases, and the trend of reported deaths is illustrated in Figure 2 [(6)]

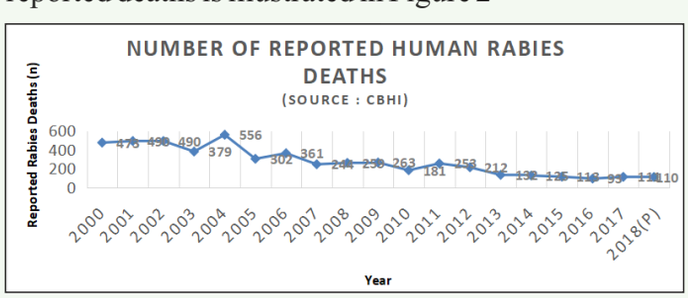

Figure 2: Human Rabies Deaths reported in India (Source: CBHI)

Mortality due to Human Rabies (Information from the National Rabies Control Programme)

The number of human deaths caused by rabies in India is tracked under the National Rabies Control Programme. Figure 3 shows the reported suspected human rabies cases for period 2018 to 2022.

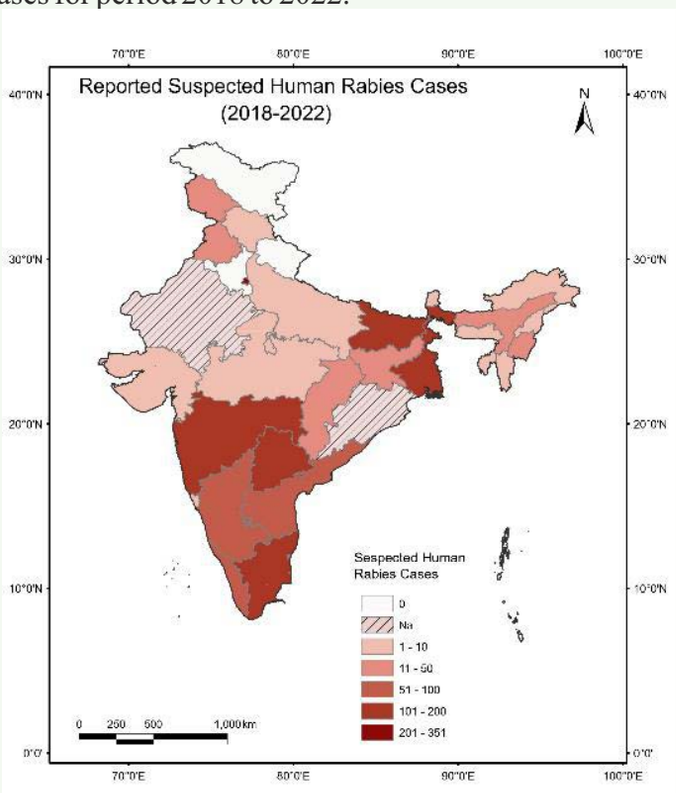

Figure 3 : Human Rabies Cases Reported under NRCP (Source: Programme Data)

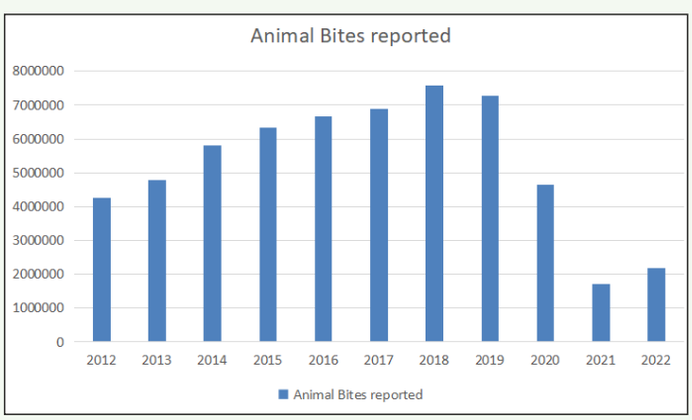

Figure 4 : Reported Animal Bite Incidents in India (Source: IDSP)

Under the Integrated Disease Surveillance Programme (IDSP), the number of reported animal bites has increased from 4.2 million in 2012 to 7.2 million in 2019 (Fig 4). These include bites from dogs, cats, monkeys, and other animals that require rabies post-exposure prophylaxis.

In 2023, a nationwide population-based assessment of burden of human rabies and animal bites was undertaken by National Institute of Epidemiology (NIE), Indian Council of Medical Research, Chennai. It estimated annual human rabies deaths using a decision-tree probability model with parameters from the community survey and laboratory data on rabies positivity among suspected rabid dogs.

1. Challenges in Rabies Control in India: Availability of Rabies Vaccine & Rabies Immunoglobulin: Ensuring the timely availability of rabies vaccine and immunoglobulin is crucial in preventing human rabies cases. However, the procurement, distribution, and availability of these biologicals vary significantly between states, as it is the responsibility of individual states. [8] Studies have indicated inadequate facilities for wound washing and a preference for the more expensive intramuscular route of vaccination instead of the cost-effective intradermal route. Stock-outs of vaccines and immunoglobulin have also been reported. Recently two rabies monoclonal antibodies have been produced in the private sector and available in the country and are under post-marketing surveillance (PMS).

2. Epidemiological Surveillance: There is a considerable gap between the actual number of human rabies cases and the estimated and reported cases in India. Due to the lack of effective medical treatment for clinical rabies and the severity of the disease, most rabies victims die at home rather than receiving hospital treatment. This underestimation of the health and economic impact of rabies hinders effective public health policymaking. Strengthening surveillance systems would provide a better understanding of the scale of the problem and the distribution of animal and human cases across different states in the country [9].

3. Laboratory Surveillance: Timely and accurate laboratory diagnosis of human and canine rabies is essential for reliable surveillance data and decision-making regarding post-exposure prophylaxis (PEP). However, the infrastructure and utilization of laboratory services for rabies diagnosis are grossly inadequate [9].

4. Awareness: Awareness Generation Rabies is a disease that affects both rural and urban areas. However, many rabies patients do not seek proper PEP from healthcare facilities and may instead visit traditional healers. Community participation plays a vital role in any disease control programme for rabies [9].

5. Capacity Building: Continuous education and training of medical and health professionals regarding PEP are necessary to ensure the provision of quality medical services to individuals bitten by dogs.

6. Intersectoral Coordination: In many countries, including India, the responsibility for rabies control falls under multiple ministries. However, there is often a lack of coordination and collaboration among these line agencies, leading to inadequate technical and financial resources for effective rabies control measures.

Evolution of the National Rabies Control Programme

The National Centre for Disease Control (NCDC) in Delhi has played a crucial role in the implementation of Rabies Control activities in India. In 2002, NCDC organized a consultation to establish national guidelines for rabies prophylaxis, aiming to standardize post-exposure prophylaxis practices [10]. These guidelines were revised in 2007 and 2013, recommending the use of modern cell culture vaccines (CCVs) for post-exposure prophylaxis after the discontinuation of Nervous Tissue Vaccine production in 2004. However, the high cost associated with the intramuscular administration of CCVs limited its widespread use. To address this, the Drugs Controller General of India (DCGI) approved the safe, effective, and cost-effective intra-dermal (ID) route of CCV inoculation in February 2006, following WHO recommendations and a feasibility study conducted by National Institute of Epidemiology, Chennai, in 2005. The national guidelines for rabies prophylaxis have been further revised and updated in 2019[10].

In the 11th Five-Year Plan (2007-2012), the Ministry of Health and Family Welfare initiated efforts to control human rabies through pilot projects, allocating funds for this purpose. For the first time, the plan also included animal welfare components such as rabies control in animals, animal birth control, and vaccination of stray dogs, to be managed by the Animal Welfare Board of India (AWBI).

The pilot project, known as the "National Rabies Control Programme: Initiative," was implemented by NCDC in five cities from 2008 to 2012. Its objectives included preventing human deaths from rabies, raising community awareness, training healthcare professionals, strengthening diagnostic facilities, and improving surveillance. The successful implementation of the pilot project demonstrated the feasibility and reproducibility of the strategy, leading to the approval of the National Rabies Control Programme (NRCP) for nationwide implementation during the 12th Five-Year Plan. The NRCP was fully funded by the central government, and funds were disbursed to states and stakeholders through the Ministry of Health & Family Welfare [11].

Currently, the Ministry of Health and Family Welfare is responsible for implementing the human health component of the NRCP programme in all states and union territories. State-level activities are carried out through the National Health Mission, following approval from the 8th Empowered Programme Committee (EPC) meeting[11]. Funds are allocated for various activities related to the NRCP at different administrative levels, following the National Health Missions Programme Implementation Plan mechanism. The objective of the programme is to prevent and control deaths due to rabies in humans, with the ultimate aim of achieving the global target of "Rabies-Zero by 2030," starting from the fiscal year 2021-22.

Institutional Mechanism for programme implementation

At Centre: The nodal ministry for the programme is the Ministry of Health and Family Welfare. It is proposed to use the current NHM's mechanism of Mission Steering Group (MSG) & Empowered Programme Committee (EPC) for policy decisions. National Technical Advisory Committee chaired by DGHS to advise on all technical aspects of the programme.

At State & district: The programme is implemented through the State Health Society At state level and District Health Society at district level.

To achieve these objectives, the programme has adopted key Strategies as under:

(A) Provision of Human Rabies Vaccine & Human Rabies Immunoglobulins (ARV & ARS): Rabies is preventable if timely and appropriate administration of post-exposure prophylaxis is given. The programme division has revised National Guidelines for rabies prophylaxis based on WHO Expert Consultation on Rabies[12]. The direct cost of PEP including ARV & RIG ranges Rs. 3,104 (1,180-3,662). The objective of this component is to facilitate and ensure the regular availability of Anti Rabies Vaccines and RIG for prompt and appropriate management of human-animal bite victims free of cost in all districts. As envisaged under the programme the objective is to promote ID use of Anti Rabies Vaccine (ARV) and Rabies immunoglobulin (RIG) to the animal bite victims as per national guidelines. ARV & RIG are already included in the National Essential Drug List. The procurement to be done by states/UTs out of funds allocated under National Free Drug Initiatives or State Revenue.

To ensure availability of ARV & RIG as per NHM's Essential Drug list Rabies vaccine should be available at all PHC & above health facilities while RIG should be available at CHC & above health facilities. The programme division recommends use of cost-effective intradermal route of Rabies vaccination to animal bite victims.

(B) Capacity Building by Training of Health care Professionals: Training and capacity buildings of health care professionals at all levels on, appropriate animal Bite management, ID route of rabies vaccine administration, RIG infiltration and other technical

aspects will be held periodically. The training may be conducted for Medical & Paramedical personnel including students, private practitioners and others.

(C)Strengthening Surveillance of Animal Bites and Rabies Cases in Human: Rabies surveillance is the key index for the success of any intervention programme. It involves the collection of essential data to determine the rabies situation, to monitor and evaluate the progress and impact of the intervention, to manage potential human exposures adequately, to calculate the cost-effectiveness of control efforts and to demonstrate absence and freedom of disease in a given area. The Standard case definitions for rabies surveillance through IDSP have been formulated. Animal bites are reported in the P form on the IDSP portal. Standardized recording and reporting formats finalized for streamlining reporting. As a part to strengthen Human Rabies surveillance, Secretary (Health), MoHFW has advocated the states to declare Human Rabies as a notifiable Disease. So far, 20 states have declared Human Rabies as a Notifiable Disease (Fig 5).

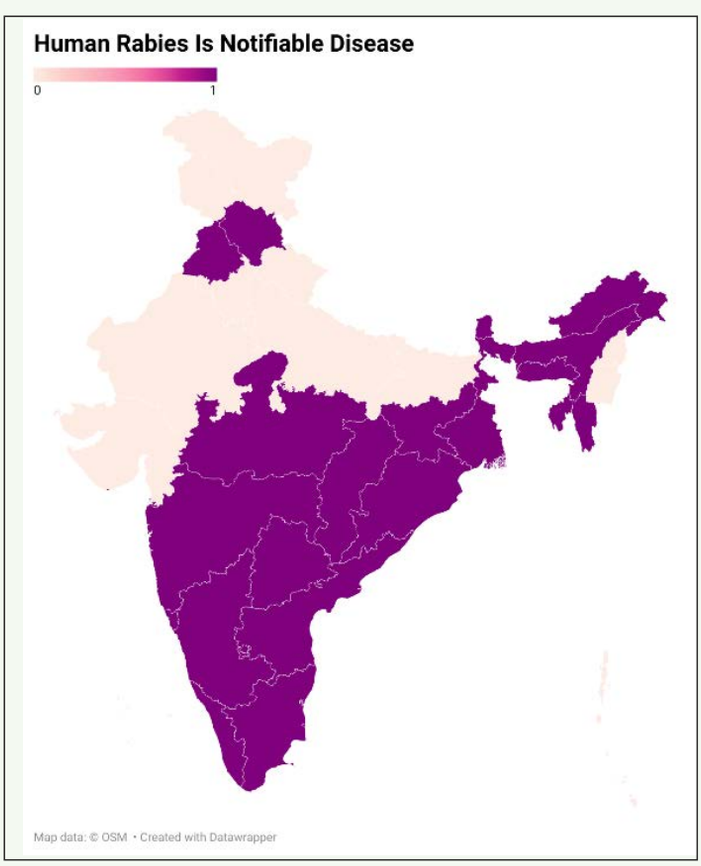

Figure 5 : Status of Declaration of Human Rabies Notification

(D) Strengthening Laboratory Diagnosis of Human Rabies: The vision of programme is to Elimination of Dog Mediated Human Rabies. For this each and every case of Human Rabies needs laboratory confirmation. Laboratories have the following role in Rabies Elimination:

(I) Confirmation of clinical diagnosis-especially in paralytic/atypical cases
(II) Patient Management/Barrier Nursing/Disinfection of ICU facilities
(III) Prophylactic vaccination to relatives, clinical & nursing staff
(IV) Characterization of causative agent/molecular epidemiology
(V) Surveillance and estimation of disease burden
(VI) Confirmation/Monitoring of disease-free status

In view of this, the programme division has envisaged to develop a network of Rabies Diagnostic Laboratories. Programme division is strengthening identified institutes as Rabies Diagnostic Facility. NCDC, Delhi and Virology laboratory of NIMHANS, Bangalore have been identified and have been working as National Reference Laboratories. So far, nine institutes all over the country are being strengthened as Rabies Diagnostic facilities.

(E) Model Anti-Rabies Clinic: The existing resources of district hospitals will be strengthened as Model Animal Anti Rabies Clinics as per proposed IPHS standards. These centres will provide comprehensive Animal Bite Management facilities which include animal bite wound washing facility, Availability of Rabies post-exposure prophylaxis- Anti-rabies vaccine and RIG, counseling of Animal Bite victims, and referral services for suspected Rabies patients, Surveillance activities and Intersectoral Coordination with other stakeholders. These sites will act as sentinel sites for animal bite surveillance in the initial period. A trained staff nurse, under the guidance of the Medical officer in charge, will manage these centres. Their objective is to deliver quality animal bite management services over time. Till the NRCP surveillance mechanism gets streamlined, these centres will act as sentinel surveillance site for PEP coverage.

(F) IEC Activities: Rabies is a practically hundred per cent fatal disease. Once bitten by a rabid dog, the deaths of the victim are sure if treatment is not instituted timely. Misconceptions about managing animal bite wounds are prevalent in the community. Raising awareness among at-risk populations is crucial for rabies prevention [12]. It is essential to educate the general public about the appropriate actions to take in the event of an animal or dog bite to prevent rabies-related deaths. Therefore, the

programme aims to conduct Information, Education, and Communication (IEC) activities to increase awareness of the disease and emphasize the importance of seeking timely and suitable treatment for animal bites. These IEC activities include developing materials for dissemination to states, creating audio and video content for professionals and the community, conducting mass media campaigns through electronic channels, organizing public lectures, scientific symposiums, and communication workshops on rabies.

(G) Intersectoral Coordination: Rabies represents a prime example of the One Health approach, requiring collaboration among various sectors such as animal welfare, public health, veterinary medicine, and civil administration. Dogs, as primary source of rabies transmission, play a crucial role in its prevention and control. The active involvement of veterinary sectors, municipal corporations, and community engagement is necessary for effective rabies control. Strengthening inter-sectoral coordination and adopting a One Health approach at the national, state, district, and block levels are key strategies for the programme. Advocacy workshops, joint training, and Information, Education, and Communication (IEC) activities will be conducted to support these efforts. Establishing state and district-level joint steering committees will facilitate programme monitoring and review of rabies elimination activities.

In September 2021, the Ministry of Health and Family Welfare (MoHFW) and the Ministry of Fisheries, Animal Husbandry, and Dairying (MoFAHD) jointly launched the National Action Plan for Rabies Elimination (NAPRE). This action plan was developed with the involvement of various ministries, stakeholders, and experts to systematically reduce rabies risk through mass dog vaccinations, pre- and post-exposure prophylaxis for humans, and public education until the country becomes free of dog-mediated human rabies. The NAPRE identifies key stakeholders, supporting stakeholders, and partner institutes based on their mandates and responsibilities.

(H) Plan of Implementation of the National Action Plan for Rabies Elimination: Based on the strategic components, it is envisaged that States will prepare a comprehensive action plan for both human and animal health components. The implementation of the NAPRE will involve comprehensive action plans prepared by each state, covering both human and animal health components. Funding for the human health component will continue to be sourced from the National Health Mission (NHM), while animal health components will explore funding options through existing schemes or revenue available with municipal corporations or state veterinary departments. Delivery of animal health services will utilize existing veterinary infrastructure, including the Animal Husbandry Department, urban/rural governing bodies, NGOs, and municipal cooperation. However, implementation of NAPRE is a resource intensive activity. Hence, in January, 2023 Government of India as an initiative of "Rabies Free Cities" has recommended to the states to prioritize densely populated Tier 1 & Tier 2 cities and then gradually progress to cover the remaining areas of the states. A list of Tier 1(Number of Cities7) and Tier 2 (Number of Cities :103) cities have been provided to the states.

Since the human health component under the National Rabies Control Programme is already in progress, designated state and district nodal officers will continue implementing its activities. For the animal health component, states will identify and nominate state and district nodal officers who will coordinate with their counterparts in the human health component to implement the activities effectively.

Acknowledgment
We acknowledge NCDC for constant support .

Financial support & sponsorship
None.

Conflicts of Interest
None.

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