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Is There Hidden Wastage of Anti-Rabies Vaccine and Rabies Immunoglobulins in India Due to Excess Vaccination?

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Abstract

Rabies is a major public health challenge in India with the highest burden globally. Anti rabies vaccine (ARV) and anti rabies serum (ARS) provide safe and effective post exposure prophylaxis (PEP) in animal bite cases. However, providing universal PEP to incident animal bite cases is a major challenge in resource constrained settings especially due to the high cost of vaccine and serum. Hence, prevention of vaccine wastage is indispensable for rabies control in the developing world. Guidelines for rabies prophylaxis in incident animal bite cases with previous history of exposure and associated PEP recommend a two dose booster regimen on day 0 and 3. Nevertheless, evidence from some socio-epidemiological studies on rabies reported from India suggest that there exist several patient and provider related factors which promote an unwarranted universal repetition of complete course of rabies PEP in re-exposure to animal bite cases. This potentially results in an avoidable wastage of 2 doses of ARV and/or ARS per animal bite case who have previously received full course of rabies PEP. Animal bite victims with low socioeconomic and educational status have greater likelihood of being subject to excess rabies PEP vaccination. This is often due to their inability to produce related medical records and lack of awareness of the treatment received during past animal bite exposure. Lack of knowledge relating to postexposure schedule in previous vaccinated cases among residents and medical graduates may also contribute to rabies vaccine wastage.

Keywords: Rabies; India; PEP; Vaccine Wastage; Vaccination.

Rabies is a major public health challenge due to its 100% fatal character. Although, modern anti rabies vaccines and anti-rabies serum during post exposure prophylaxis (PEP) provide complete protection against rabies, the costs associated with vaccination are a major barrier in controlling rabies in developing nations [1]. India has the highest burden of rabies mortality in the world with almost 20,000 rabies cases reported annually [2] which is disconcerting since PEP for rabies after animal bite is available free of cost in most government hospitals and community health centers. Patient related factors which impede adoption of PEP against rabies in animal bite victims have been identified as ignorance of rabies especially among those of a low socioeconomic status, fear of multiple painful injections and the long duration of the treatment involved [3]. Healthcare system related factors which hinder universal PEP in animal bite victims are the inconsistent supply and lack of availability of either anti rabies vaccine (ARV) or rabies immunoglobulins (RIG). The long term goal for reduction of cost of burden on the healthcare system includes immunization of stray dogs, pre exposure prophylaxis of vulnerable populations like children in slums where human animal interaction is common and ultimately reduction in the incidence of dogbites [4,5]. However, there is a question of feasibility in attainment of these objectives in the short term. The reduction in the costs involved in universal PEP coverage with ARV and ARS in all animal bite cases with potential for rabies transmission is hence necessitated through improved, cost effective approaches like the promotion of the use of intradermal anti rabies vaccines in urban areas. We suggest that there may be an additional but

overlooked modality for reduction in vaccine wastage by adherence to rabies vaccination guidelines and preventing excess vaccination among previously vaccinated persons.

Globally, Rabies prophylaxis guidelines state that among incident animal bite cases with a positive history of a previous animal bite exposure those having previously received full post-exposure treatment with a potent cell-culture vaccine should be given only two booster doses, intramuscularly / intra-dermally on days 0 and 3, but rabies immunoglobulin is not necessary [6-8]. The only exception to this guideline are patients who are immunocompromised due to HIV/AIDS or other causes which may cause loss of immunological memory and who consequently should be administered full PEP inclusive of four doses of ARV.

This implies that providing rabies PEP with a complete course containing four doses of the ARV (0,3,7,28) in a non-immunocompromised incident animal bite case with a previous history of animal bite exposure and complete PEP causes excess vaccination and consequent wastage of two doses of the vaccine. Similarly, a repeat RIG dose in an animal bite case who has previously received RIG prophylaxis may also be unwarranted. The reasons for such potentially excess vaccination may be attributed to both patient and provider related factors. Patient related factors are associated with the low socioeconomic status of almost three fourths of India's animal bite victims [9] who often lack awareness of the disease, are unable to differentiate specific rabies prophylaxis treatment from supportive care involving multiple injection treatment and may be unable to preserve medical records relating to rabies prophylaxis due to carelessness, frequent migration, frequent water logging of their homes. A community based study in rural and urban slums of Delhi by Sharma et al (2016) found most dog bite victims lacking any records for past immunization and few were aware that ARV was specifically given for protection against rabies [10]. Healthcare providers may also lack adequate knowledge for management of animal bite patients. Some studies have found significant proportion of medical interns and residents having inadequate levels of knowledge of appropriate animal bite management with rabies PEP [11-12]. In the study by Garg et al (2013) in Delhi, only 40.4% of allopathic doctors knew the correct postexposure schedule in previously vaccinated animal bite cases [14]. Moreover, in our observation, healthcare providers usually do not restrict rabies PEP in animal bite cases with a history of previous animal bite exposure probably associated with

rabies PEP without production of relevant medical records. This is particularly due to the lethality of the disease and providers lacking confidence in accepting verbal histories from patients affirming reception of rabies PEP treatment especially when advanced by those who are illiterate or lack functional literacy skills. Moreover, the immune status of the animal bite cases is often not known to the healthcare provider.

Unfortunately, an accurate estimation of the magnitude of such excess vaccination in animal bite re-exposure cases is hampered by the lack of epidemiological data since previous history of animal bite exposure and treatment availed among new incident animal bite cases has been sparsely reported in studies from India. However, a study by Jain et al (2014) among incident cases of dog bite reporting for treatment at the OPD of the community health center at Muradnagar, Ghaziabad found 28% of the patients reporting history of previous dog bite exposure [15]. Most epidemiological studies among animal bite cases conducted in India have reported class II and class III patterns of bites among majority of the animal bite victims which mandates provision of anti-rabies serum to them [10, 11, 16]. Extrapolating this evidence would tentatively mean that for every 100 dog bite patients reporting to government health centers for rabies PEP, up to 28 cases could probably have history of previous animal bite exposure with associated PEP. Assuming the lack of availability of rabies PEP based medical records during the previous episode of animal bite exposure in such cases could potentially result in excess vaccination with 56 doses of ARV and 28 doses of RIG in defiance of national guidelines for rabies PEP in animal bite victims.

In terms of costs based on prevalent market rates of ARV and RIG, a tentative estimate would amount to INR 18,872 and INR 12,600 on ARS and ARV respectively per 100 animal bite cases. Moreover, the uncalculated opportunity costs involved in terms of the time invested by the healthcare system staff in the excess vaccination process are likely to be quiet significant. The wages lost by the patient for two excess visits is 1.2 wage days each [9], which equates to a loss of 33.6 wage days per 100 animal bite cases. Considering animal bite incidence of 1.7% in India and only 47% receiving ARV [9], the enormous costs incurred due to such excess vaccination will be enormous and seriously undermine the goal of attaining universal PEP for all animal bite cases in India.

Future epidemiological studies among incident animal bite cases should record history of previous animal bite exposure, doses of ARV and ARS received

in the past, availability of past medical records related to the event, adherence of healthcare providers to national rabies PEP guidelines and their prescribing patterns when medical records of previous rabies PEP are unavailable in order to accurately estimate the levels of excess vaccination in animal bite victims.

Measures to contain the wastage through excess vaccination in previously vaccinated animal bite patients should include healthcare providers explaining the animal bite victims being vaccinated the necessity of preserving their medical record containing details of rabies PEP vaccination, training of healthcare providers with regard to proper management of animal bite patients with PEP especially among previously vaccinated persons and finally the meticulous maintenance of records of animal bite cases within healthcare systems rendering it possible to verify history of previous vaccination in new incident cases in case of non-availability of medical records with the patients. Furthermore, national guidelines for rabies prophylaxis should include a decision making algorithmic mechanism when the healthcare provider is confronted with a situation with potential for excess rabies PEP vaccination.

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