

Financial Benefit to Government and ensuring Vaccine Availability to Patients by replacing the Intramuscular Route of Antirabies Vaccine with Intradermal Route: An Operational Research

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ABSTRACT

Introduction: Rabies, a disease of antiquity, is a major public health problem in India. Most of the cost for rabies is being borne by poor patients. Immunogenicity and efficacy of the intradermal (ID) route for rabies postexposure prophylaxis (PEP) over intramuscular (IM) route is confirmed. The use of ID route leads to considerable savings in terms of total amount of vaccine needed for full pre- or postexposure vaccination, thereby reducing the cost of active immunization.

Objective: To calculate net financial benefit to Government Medical College (GMC), Latur, Maharashtra, India, per year if IM doses of antirabies vaccine (ARV) are replaced with ID doses in casualty.

Materials and methods: We collected the data of 4 months, from September 2015 to December 2015, from casualty of GMC. The number of patients receiving 1st dose of ARV intramuscularly from GMC casualty was noted. Their records as regards further vaccination in ARV OPD were studied and then data were analyzed.

Results: During a period of 4 months, 342 patients had received 1st dose of ARV intramuscularly in GMC casualty. If, in all these 342 patients, the dog is vaccinated, observable, and alive after 10 days of bite then, net benefit will be of 410 vials. In other situation, if in all these 342 patients, the dog is either unvaccinated, nonobservable, or dead, then the net benefit will be of 957 vials. So for 1 year, nearly 1,200 and 2,871 vials will be saved in 1st and 2nd situation respectively. So, the net benefit per year will be from Rs 360,000 to 861,000.

Conclusion: Considering the stronger immune response, net financial benefit, and ensuring regular availability of vaccine at all peripheral government institutes, it is strongly recommended to follow ID schedule of ARV.

Keywords: Antirabies vaccine, Financial benefit, Operational research.

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INTRODUCTION

Rabies, a disease of antiquity, continues to be a major public health problem in India. Rabies is present on all continents, and it is endemic in most African and Asian countries. It is a fatal zoonotic viral disease, transmitted to humans through contact (mainly bites and scratches) with infected animals, both domestic and wild.¹ The estimated mortality due to rabies is at least 5,500 per year worldwide, about 56% of which occur in Asia, particularly in rural areas. Most of the cost for rabies is being borne by Asian countries where large amounts of postexposure prophylaxis (PEP) are administered. Most PEP needs are borne by patients who are poor and can least afford to pay.¹ The antirabies vaccine can be given intradermally or intramuscularly. Results published from various clinical trials have confirmed the immunogenicity and efficacy of the intradermal (ID) route for rabies PEP, which is currently being used effectively in many Asian countries including India, the Philippines, Sri Lanka, and Thailand.²⁻⁴

The use of ID route leads to considerable savings in terms of total amount of vaccine needed for full pre- or postexposure vaccination, thereby reducing the cost of active immunisation.⁵ In antirabies vaccination (ARV) clinic ID route is routinely used at Government Medical College (GMC), Latur, Maharashtra, India. The present study was conducted to estimate the net financial benefit per year to GMC if intramuscular (IM) doses of ARV are replaced with ID doses in casualty.

OBJECTIVE

To calculate net financial benefit to GMC per year if IM doses of ARV are replaced with ID doses in casualty.

MATERIALS AND METHODS

For all patients coming in ARV OPD of GMC, only ID schedule is followed. But few patients come in OPD directly for

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2nd dose, i.e., they have taken 1st dose either from private hospitals or primary health centers or rural hospitals or GMC casualty. This 1st dose given in most of these government institutes and private hospitals is usually IM. Hence, as per the guidelines, next doses for these patients need to be given IM to maintain the effectiveness of the vaccine. We collected data of 4 months, from September 2015 to December 2015, from casualty of GMC. The number of patients receiving 1st dose intramuscularly from GMC casualty was noted. Their records as regards further vaccination in ARV OPD were studied and then data were analyzed.

RESULTS

Table 1 shows data of 4 months from casualty of GMC. During a period of 4 months, 342 patients had received 1st dose of ARV intramuscularly in GMC casualty. In 1 vial of ARV, 1 IM dose can be given. Thus, the consumption of vials in casualty was also 342. One vial of ARV after reconstitution is of minimum 0.5 mL. It can be 1 mL depending on the type and brand of vaccine. If Thai's regimen is followed then, the dose required is 0.2 mL per dose. Thus, in two vials of ARV, 5 ID doses can be given if reconstituted vaccine is of 0.5 mL.

As per World Health Organization and national guidelines, if the vaccinated dog is observable and alive after 10 days of bite, only 3 doses of ARV (0, 3, 7 days) are given; otherwise, 5 doses (0, 3, 7, 14, 28 days) are given in IM schedule. For ID schedule, it is 3 doses of ARV (0, 3, 7 days) or 4 doses (0, 3, 7, 28 days), respectively.

Let us consider two situations. First, in all patients, dog is vaccinated, observable, and alive after 10 days of bite. Second, in all patients, the dog is either unvaccinated, nonobservable, or dead (Table 2).

Situation 1

Let's assume the best situation, i.e., in all these 342 patients, the dog is vaccinated, observable, and alive after 10 days of bite.

Table 1: Number of ARV given IM in casualty of GMC

Month	Number of ARV given IM in GMC casualty
September 2015	79
October 2015	88
November 2015	107
December 2015	68
Total	342

Thus, the 342 patients will require 2 more IM doses each, i.e., total 684 IM doses. It will consume 684 vials. If these patients are given ID ARV injection in casualty, then, instead of 684 vials for 684 IM doses, 274 vials for 684 ID doses will be required. Thus, net benefit will be of 410 vials, i.e., $410 \times 2.5 = 1,030$ ID doses.

Situation 2

Let's assume that in all these 342 patients the dog is either unvaccinated, nonobservable, or dead. Thus 342 patients will require 4 subsequent IM doses each, i.e., total 1,368 IM doses. It will consume 1,368 vials. If these patients are given ID ARV injection in casualty then, each patient will require 3 more ID doses. Thus, instead of 1,368 vials for 1,368 IM doses, 411 vials for 1,026 ID doses will be required. Thus, the net benefit will be of 957 vials.

These data are for 4 months. So for 1 year, nearly 1,200 vials will be saved in 1st situation and 2,871 vials will be saved in 2nd situation. Now, the cost of one ARV is at least Rs 300 per vial. So, the net benefit per year will be from Rs 360,000 to 861,000.

DISCUSSION

As observed, the net financial benefit per year to GMC if IM doses of ARV are replaced with ID doses in GMC casualty only is Rs 360,000 to 861,000. We have considered data for only one government institute. There are 49 medical colleges,⁶ 23 district hospitals, 362 functional rural hospitals, and 1,811 primary health centers in Maharashtra,⁷ and in many of these institutes, IM schedule is followed. So, there will be huge total financial benefit for the government if the IM doses of ARV are replaced with ID doses.

The immune response is also stronger if vaccine is given intradermally. While using ID route, small amount (0.1 mL) of rabies vaccines/antigen is deposited in the layers of the skin at multiple sites. The antigen is directly presented to the antigen presenting cells (without circulation/dilution in blood) at multiple sites triggering a stronger immune response.⁵

As the dose required for ID route is less, the vaccine stock lasts for longer duration, and the situation of non-availability of vaccine will be avoided to a large extent. If the stock is available regularly, most of the needy and poor patients will be benefited.

Table 2: Subsequent doses of ARV required in the two possible situations in patients

	No. of patients	Subsequent doses required for		Net benefit
		IM schedule	ID schedule	
Situation 1	342	684 doses (684 vials)	684 doses (274 vials)	410 vials
Situation 2	342	1,368 doses (1,368 vials)	1,026 doses (411 vials)	957 vials

CONCLUSION AND RECOMMENDATIONS

Thus considering the stronger immune response, net financial benefit, and ensuring regular availability of vaccine at all peripheral government institutes, it is strongly recommended to follow ID schedule of antirabies vaccine in casualty of GMC and other government hospitals where still IM route is used.

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