

Evaluation of the performance of the Intradermal (ID) route versus the Intramuscular (IM) route at a tertiary care centre - A cross sectional study

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Abstract

Background: Rabies is a virtually 100% fatal acute viral encephalitis caused by an RNA virus belonging to family Rhabdoviridae and genus Lyssavirus. The virus can infect all warm blooded animals. The disease is transmitted to humans by the bite, lick or scratch of an infected animal. More than 99% of all human rabies deaths occur in

the developing world. It is preventable with timely and proper usage of modern immunobiologicals (vaccines and immunoglobulins). Once exposure occurs, modern prophylaxis entails immediate wound care, local infiltration of rabies immune globulin and parenteral administration of modern cell culture vaccines in multiple doses. The annual medicinal (vaccines and other drugs) cost for animal bite treatment is Rs. 2 billion approximately (2004). **Objectives:** The objective of the present study is to evaluate the performance of the Intradermal (Updated Thai Regimen) (ID) route vis a vis the Intramuscular (IM) route in our clinical setting the Antirabies Vaccination (ARV) OPD, of DR.S.C.G.M.C.Nanded in terms of compliance and cost benefits.

Study design: Hospital record based Cross sectional descriptive study.

Methodology: Patients who attended anti rabies vaccination OPD of DR.S.C.G.M.C.Nanded from 1 December, 2015 to 31 May, 2016 for IM regimen (Essen Regimen) and from 1 December, 2016 to 31 May, 2017 for ID regimen (Updated Thai Regimen) were compared & included in study. Data was tabulated & analyzed later.

Result: Compliance of treatment was more in Update Thai regimen (ID) as compared to Essen regimen, which is statistically significant. Also intradermal regimen found to be cost beneficial over intramuscular regimen.

Conclusion: Use of Intradermal regimen should be promoted over Intramuscular regimen as study shows Intradermal is more compliant and cost benefit.

Key words: Intradermal, Anti rabies prophylaxis, Dog-bite, Anti rabies vaccine (ARV), Compliance

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I. Introduction

Rabies is a disease entrenched in history, dating back to ancient Egypt. Caused by an RNA virus belonging to the *Lyssavirus* genus, rabies is capable of infecting all mammals. Rabies is primarily a disease of terrestrial and airborne mammals, including dogs, wolves, foxes, coyotes, jackals, cats, bobcats, lions, mongooses, skunks, badgers, bats, monkeys and humans [1]. The dog has been, and still is, the main reservoir of rabies in India. Other animals, such as monkeys, jackals, horses, cattle and rodents, seem to bite incidentally on provocation, and the fear of rabies leads the victim to seek post-exposure prophylaxis. The number of cases involving monkey bites has been increasing in the last few years. Monkeys are susceptible to rabies, and their bites necessitate post exposure prophylaxis [2].

Rabies occurs in more than 150 countries and territories [3]. With the expectation of some areas in the South Pacific, rabies persists as a major Public Health hazard in many countries across the world [4]. It is estimated that the South East Asia Region accounts for approximately 60% of human deaths due to rabies in the world [5]. Data available from 14 developing countries of Africa, Asia, South and Central America report a dog/inhabitant ratio of between 150/1,00,000 to 200/1,00,000 [6]. Stray dogs are mainly responsible for 99% of human infection [7]. In India, Some studies have estimated that there are as high as 17 million animal bites per annum and 20,000 human deaths occur due to rabies each year. Based on vaccine utilization, approximately 3 million people receive post-exposure treatment in our country.

An estimated 55,000 persons die of rabies globally every year of which 31,000 are from the Asian continent. In India, the Annual Incidence of Human Rabies is 20,000 Cases. The frequency of human rabies deaths is 1 case every 30 minutes (1/2 hour) approximately. The principal animal reservoir is dog (96.3%). The Animal bite incidence rate (per 1000 population) is 17.4 and this translates to a whopping 17.4 million bites every year. The frequency of animal bites in India is 1 every 2 seconds and the annual man-days lost due to

animal bite is 38 million. It is preventable with timely and proper usage of modern immunobiologicals (vaccines and immunoglobulins).⁸ Once exposure occurs, modern prophylaxis entails immediate wound care, local infiltration of rabies immune globulin and parenteral administration of modern cell culture vaccines in multiple doses. Pre-exposure vaccination should occur in selected population groups at risk of occupational exposure.⁹ Government of India has banned the production and use of Nervous Tissue Vaccine (NTV) in December, 2004 which was the vaccine widely used in the public sector. With the stoppage of NTV, the availability and affordability of modern Cell Culture Vaccine became a major issue with many States.¹⁰ The annual medicinal (vaccines and other drugs) cost for animal bite treatment is Rs. 2 billion approximately.⁸

Rabies is 100% fatal, at the same time 100% preventable if managed appropriately and timely. Anti-Rabies treatment is based on local wound care and administration of appropriate Rabies biological as Rabies Immunoglobulin and Vaccines.

Previously in India, nervous tissue vaccines (NTV) were used mostly. But with the advent of modern cell culture vaccines, which are highly potent and safe, the post-exposure vaccination for rabies underwent a dramatic change with almost painless injections, much reduced doses over the deltoid region and negligible side effects. But higher cost of intra-muscular administration of Cell culture vaccine (CCV) is a limiting factor for its wider use [7].

To overcome this problem, WHO has recommended use of efficacious, safe and feasible intra-dermal (ID) route of inoculation of CCVs. Clinical trials conducted in India have proved intra-dermal route to be safe, efficacious and feasible for use in the country [7]. Our study was conducted to highlights the economic advantages and compliance of using ID regimen (Updated Thai Regimen) over IM regimen (Essen Regimen).

II. Materials & Methods

This was hospital record based descriptive study, conducted on patients having animal bite and attended anti rabies vaccination clinic DR.S.C.G.M.C.Nanded. All patients who attended anti rabies vaccination OPD from 1 December , 2015 to 31 May, 2016 for IM regimen (Essen Regimen) and from 1 December, 2016 to 31 May, 2017 for ID regimen (Updated Thai Regimen) [7] were included in study. Before start of study permission from the ethical committee was taken.

This hospital had implemented ID regimen for Anti-rabies vaccination from June 2016, before that hospital were using IM regimen. So to compare cost effectiveness and compliance of ID regimen with IM regimen, data was collected for 1 year duration, 6 months before and 6 months after starting ID regimen from patients. Some time period of 5-6 months have excluded after strating of ID regimen to avoid mixing of cases of both regimens. Data was compiled ,tabulated & then analyzed.

III. Results:

Table 1: Distribution of animal bite patients taking ARV as per route

Route	No. of patients
Intramuscular	2217
Intradermal	3719

Total animal bite victims who received Inj.by intramuscular route were **2217** (1 December , 2015 to 31 May, 2016 for IM regimen (Essen Regimen)) while total animal bite victims who received Inj.by Intradermal route were **3719** from (1 December, 2016 to 31 May, 2017 for ID regimen (Updated Thai Regimen))

Table 2: Comparison of compliance ID Vs IM vaccination schedule.

Route	Completed	Not completed	Total
Intramuscular	1379(62.2%)	838(37.8%)	2217 (100%)
Intradermal	2939(79%)	780(21%)	3719(100%)

$X^2=6.948$ d.f =1, p=0.0084

Table 2 showing comparison of compliance ID Vs IM vaccination schedule, amongst total 2217 patients who received by intramuscular route 1379(62.2%)have completed the schedule & 838 (37.8%) not completed the schedule.

Amongst total 3719 patients who received by Intradermal route 2939(79%) have completed the schedule & 780(21%) not completed the schedule.

It was observed that compliance was observed more in intradermal (79%) vaccination schedule as compared to intramuscular (62.2%) vaccination schedule with very significant statistical difference.

Table 3: Number of vaccine vials used and its cost.

Route	Vials	Cost (Rs.)
Intramuscular	5099*	1427720 /-
Intradermal	3515*	984200 /-
Difference in cost		443520 /-

*Estimated number of vials

It was observed that, intra dermal regimen accounted for a saving of approximately Rs.4,43,520/- for the period of 6 months & approximately Rs.8,87,040 /- for Hospital authorities & administration.

IV. Discussion

Compliance to post-exposure vaccination is crucial to achieve optimum level of antibody titers. Present study was planned to assess the compliance and cost effectiveness of 4 dose intradermal regimen over 5 dose intramuscular regimen.

The compliance to the ID regimen was found to be 79%, this is in stark contrast to previous evidence from our centre in which a compliance of 62.2% to the intramuscular regimen was evident ($p < 0.05$). Increased compliance to post-exposure vaccination may be due to the fewer number of visits to Anti-Rabies Clinic in case of ID regimen as compared to IM regimen. Intra dermal regimen accounted for a saving of approximately Rs.8,87,040 /- for the Hospital authorities in a year . Enhanced compliance along with cost effectiveness to the ID regimen is also evident.

Aggarwal S et al (2015)¹² showed that for IM regimen, Out of 7528 subjects, 3673 (48.79%) completed treatment and remaining 3855 (51.21%) not received complete treatment while for ID regimen, Compliance of treatment was more in Update Thai regimen (ID) as compared to Essen regimen (IM); this difference is found to be statistically highly significant. ($X^2 = 297.2$, $df=1$, $p < 0.0000001$, $CI=95\%$ highly significant) Out of 7071 subjects, 4453 (48.79%) received completed treatment and remaining 2618 (37.03%) not received complete treatment. In year 2010-11 total 7528 patients needed ARV doses. According to intra muscular regimen (Essen regimen) required 5 full doses to complete post exposure prophylaxis schedule per patient. Total cost of all doses was 1,12,92,000 INR (considering one ARV vial for 300 INR). In year 2011-12 total 7071 patients needed ARV doses. According to intra dermal regimen (update Thai regimen). Each patient need 0.2 cc X 4 doses and total dose required 0.8 ml for complete vaccination of one patient needs. So total cost of treatment of all patients was 16,97,040 INR. Thus for whole year total cost of treatment is reduce by 91,70,700 INR

Kiran R. Rohi¹³ reviewed that (2017) that the compliance to the ID regimen was found to be 65.3%, this is in stark contrast to previous evidence from our centre in which a compliance of 40.2% to the intramuscular regimen was evident ($p < 0.0001$). Increased compliance to post-exposure vaccination may be due to the fewer number of visits to Anti-Rabies Clinic in case of ID regimen as compared to IM regimen. Intra dermal regimen accounted for a saving of Rs.14,50,146.78/- for the Hospital authorities in the year 2010.

Asma Rahim (2010)¹¹ et al highlighted that, the economic advantages of using ID regimen. In case of PVRV, they could be saved, about Rs 10 lakhs for 2006, 2007 and Rs. 20 lakhs for 2008 per year if ID route of administration had been followed.

Mankeshwar R. et al (2014) The compliance to the ID regimen was found to be 84%, this is in stark contrast to previous evidence from our centre in which a compliance of 40% to the intramuscular regimen. The vaccine cost for the intramuscular (i.m.) assuming 84% compliance was estimated as Rs. 15, 64, 000. Assuming 40% compliance the cost was estimated as Rs. 7, 82, 230. Thus a saving of Rs. 5, 01, 630 to Rs. 12, 83, 400 was effected. Findings of these studies are similar with present study.

V. Conclusion

With the availability of safe and potent tissue culture vaccines, prophylaxis of rabies is possible by immediate and appropriate post exposure treatment. Use of Intradermal regimen should be promoted over Intramuscular regimen as study shows Intradermal is more compliant and cost benefit. Proper counseling and follow up system should be developed to increase compliance and to avoid drop out. Increased compliance to post-exposure vaccination in case of ID regimen as compared to IM regimen. Intradermal regimen also reduces the number of vaccine vials used. Hence intradermal regimen is more cost beneficial than intramuscular (Essen) regimen.

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