

Adopt a village, rural rabies prevention project: A 'one health' experiment in India

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ABSTRACT

Aim: To assess the feasibility of implementing "one health" to prevent human rabies and control animal rabies in a rural community in India. *why not also prevent animal rabies?*

Study design: Health services research in a rural setting.

Place and duration of study: A medical college and a veterinary college along with an animal welfare organization delivered a wide array of "integrated services" in three villages viz. Kumbalagodu, Thagachikuppe and Gerupalya near Bangalore, India comprising of *a population of 10,220 persons* for a period of two years from December, 2009 to November, 2011. The nearby three villages of Ramohally, Vinayakanagara and Bhimanakuppe with a population of 6,023 formed the control group, with no intervention. *persons*

Methodology: This consisted of *make entire sentences* baseline and end line surveys; rabies awareness campaigns; clinical and laboratory surveillance; rabies post-exposure prophylaxis (PEP) in humans; pre-exposure rabies prophylaxis (PrEP) by intradermal route in school children and others; mass dog vaccination and deworming; and sero-surveillance. *surveys at the beginning and end of the two years? specify humans or animals or both?*

Results: The veterinary : medical manpower was 1: 11; dog : man ratio was 1: 23. The information, education and communication materials developed and used were outdoor wall

describe in more detail, not understandable like this

specify
paintings (11), indoor annual wall calendar (2000), school book labels (1000); game charts (16); wall posters (65); training aid (15); rabies educational DVD (1). Twenty four volunteers and 370 school children were educated about rabies and its prevention. There were 102 local cable television transmissions on rabies prevention. The incidence of animal bite was 19 per 1000 persons per year and 69 people received rabies PEP. PrEP was given to 368 school children and others. Sixty one human serum samples were analyzed by rapid fluorescent focus inhibition test. Sixteen veterinarians and others were trained to use direct rapid immunohistochemical test for rabies diagnosis and the same ^{test} was used to confirm 6 animal ^{which died} deaths in the field. There was no case of human rabies during the project period. The total economic cost of the project was 2.7 times more than financial cost. ^{rabies in}

^{for antibody detection?}
Conclusion: A blend of integrated medical and veterinary services including animal welfare could be delivered through a "one health" approach. Based on this success a "system model" is evolved to propagate its replication in other rural communities across ^{India} the country. ^{not under-standable}

Key words: rabies, prophylaxis, dog vaccination, surveillance, one health, health services research, system model

^{Include some references}
1. INTRODUCTION

^{why exactly these species are mentioned? I suggest to say: all mammals are susceptible and some serve as reservoirs (as dogs, foxes, bats, ...)}
Rabies is a zoonotic disease caused by a RNA virus and usually transmitted to man following the bite of a rabid animal. The disease is almost always fatal both in man and animals as there is ^{almost} no cure once the signs and symptoms appear. The animals involved in the transmission of rabies include dogs, cats, mongoose, foxes, ferrets, raccoons, skunks, wolves, bats and other mammals. In India, the most common vectors are the dogs (96%), cats (2%) and ^{and} others (2%) like mongoose, foxes, etc (1). India has the highest burden of human rabies deaths of 20,000 ^{which correspond to 34% of the estimated incidence globally} (36%) annually, of the global incidence of about 55,000 (2) and about 17 million animal bites each year (3). In Asia, Thailand, Philippines and Sri Lanka have successfully reduced the burden of human rabies and controlled dog rabies by effectively integrating medical and veterinary services ^{by a} popularly known as "one health approach" (4). But in India there is very little "cooperation and coordination" between medical and veterinary services. Besides there is no system or mechanism for integrating the two ^{services?} sectors for prevention and control of this disease. ^{also for other diseases}
There are two separate ministries, one for preventing rabies in humans viz. public health and the other for controlling rabies in animals viz. agriculture and animal husbandry. Also rabies is a neglected disease, i.e. a disease of low priority both in public health and veterinary sectors. The

75 other impeding factors include vastness of the country and the three tier system of governance
76 i.e. Central or Federal Government, State or Provincial Government and local self government
77 i.e. in urban areas Municipalities or Civic Corporations and in rural areas known as
78 ZillaParishats (ZP). Besides mythology, historically and socio- culturally dog is a much loved
79 animal and also revered in some communities. Hence, attempts to control the ever growing dog
80 population have not been successful. However, recently from 2007 to 2011 a "National Pilot
81 Project on Human Rabies Prevention" was implemented by Government of India in five cities
82 which attempted to bring together both medical and veterinary sectors for preventing the
83 disease in humans(5). In this background, it was considered necessary to do a "health services
84 research"(6) and demonstrate "a model" in a rural area of India to prevent rabies in humans
85 and control it in dogs through integration of medical and veterinary services including animal
86 welfare. Hence, this "one health" experiment was conducted in three villages, near Bangalore,
87 Karnataka, a southern state of India.

88 2. MATERIAL AND METHODS

89 A medical college, a veterinary college including an animal welfare organization came together
90 for this purpose. The Department of Community Medicine, Kempegowda Institute of Medical
91 Sciences and Department of Pathology of Veterinary College, Bangalore along with "Karuna" an
92 animal welfare organization (AWO) integrated for this project work. The project was
93 implemented in three villages viz Kumbalagodu, Thagachikuppe and Gerupalya comprising of
94 10,220 population for the duration of two years from December, 2009 to November, 2011. The
95 nearby three villages viz. Ramohally, Vinayakanagara and Bhimanakuppe having a population
96 of 6,023 formed the control group, with no intervention.
97 The activities were conducted over a two years period from December, 2009 to November,
98 2011. The core project team comprised of two faculty members from medical college, a medical
99 officer and field staff; from veterinary college, a faculty member and a veterinarian and from the
100 AWO, a veterinarian and field staff.

101 The various community level activities conducted include live stock census, base line & end line
102 door to door household surveys; training and orientation of formal and informal village leaders,
103 women self help groups, medical and veterinary personnel, school teachers and others;
104 development of socio-culturally acceptable rabies information, education and communication
105 (IEC) materials like posters on rabies post-exposure prophylaxis (PEP), responsible pet
106 ownership, training aid for village level volunteers, chart on snake and ladder game, indoor
107 annual wall calendar, school book label, outdoor wall painting, rabies video and its transmission

should be described in whole sentences
and more exactly. I suggest to take the
information from the results part.

108 through cable television net work, use of folk dance, public rallies, drawing competitions in
109 schools; providing rabies pre-exposure prophylaxis (PrEP) by intradermal route and its sero-
110 surveillance ; PEP through both intradermal(ID) and intramuscular(IM) routes as feasible;
111 clinical and laboratory surveillance for rabies in animals and humans, training of veterinarians in
112 rabies diagnosis using direct rapid immunohistochemical test(dRIT) ; animal welfare work
113 consisting of mass dog vaccination, collaring, deworming and sero-surveillance. The project
114 was periodically monitored by both national and international observers.

115 3. RESULTS AND DISCUSSION

116 An overview of activities done under the project is shown in table-1. ~~It was found that the~~
117 veterinary manpower ^{was} as compared to medical manpower, in the ratio of 1:11 was grossly
118 inadequate. ~~The live stock of cow, buffalo, sheep and goat in the community are known hosts of~~
119 ~~rabies in the region and dogs & cats the common vectors of the disease.~~ The dog: man ratio of
120 1:23 was more as compared to national figures of 1: 36 (3) . This made the people more prone
121 to dog bites and consequently an higher incidence of animal bite in the project villages.

122 The rabies IEC materials were developed based on the results of baseline survey and socio-
123 cultural acceptance. The outdoor wall paintings depicting the message of rabies and its
124 prevention were done with the consent of the head of the household on the walls of those
125 houses that are strategically located giving a clear view to the community for easy readability.
126 The indoor domestic annual wall calendars having 12 pages one for each month are popular in
127 the villages. These calendars generally display the day, date, list of important local festivals,
128 events, etc for every month. Such calendars were specially printed having twelve rabies
129 education messages one for each month. One calendar was provided to each household. The
130 rabies prevention messages were effectively communicated through these calendars to
131 household members.

132 The school children have a set of books to use for one year and each book on the front cover
133 has a self adhesive label which provides for writing the name, class and other details of the
134 pupil. Such labels were printed with an additional message of rabies prophylaxis and given to
135 school children through their teachers in the class rooms. Similarly, the snake and ladder chart
136 is a popular indoor game which is played with dice; the snakes represent the "bad practices in
137 rabies prevention" and the ladder "good practices in rabies prevention". The school children
138 learnt about rabies prevention while playing snake & ladder game.

at least give a reference for this education aid. better word? they would be to describe it.

139 The thick paper board wall posters having rabies prophylaxis messages were fixed at strategic
140 places in the community halls, schools, health centres, grocery shops, etc and were a good
141 source of rabies information to the community. After training village level volunteers in rabies
142 prophylaxis a well designed and tested rabies education aid was provided to them for educating
143 the community. The educational sessions on rabies conducted in the schools not only benefitted
144 the students but also the teachers. The drawing competition held in the schools at the start
145 end of the project on the theme of "Rabies prevention" was successful in improving the
146 awareness. A documentary video film (DVD) on rabies in local dialect (Kannada) prepared by
147 Rabies in Asia Foundation was shown in the schools and also through local cable television
148 network for community education. The folk dance was another popular medium used for
149 improving community awareness about rabies and its prevention. The two world rabies days
150 (WRDs), 28th September, of 2010 and 2011 were successfully used to hold public rallies and
151 other rabies awareness activities in the villages.

how was this success? measurable?

152 The training of veterinarians, village level volunteers and others on rabies prophylaxis held in
153 separate batches was quite successful. This subsequently ensured timely and appropriate
154 rabies PEP in the community which was confidence building and reassuring. The PrEP was
155 provided to school children using Injection Rabipur (purified chick embryo cell vaccine) by ID
156 route .This was found to be safe and immunogenic (7).

157 The animal welfare campaign for responsible pet ownership, dog collaring, mass dog
158 vaccination and deworming were well received. Mass vaccination of dogs in the community was
159 done using Injection Nobivac R(Inactivated rabies vaccine). Mass deworming was done by
160 using Tablet Plozin (Praziquintel 50mg,Pyrantelpamoate 144mg &Fenbendazole 500mg) orally
161 for owned dogs and injection Ivermectin (0.5ml for puppies & 1 ml for adults) subcutaneously
162 for stray dogs. To assess the immunogenicity of this vaccination the sera samples of the dogs
163 were tested for antirabies antibody using RFFIT. This was found to be immunogenic following
164 annual booster dose.

165 The animal welfare campaign for responsible pet ownership, dog collaring, mass dog
166 vaccination and deworming were well received. Presently, many veterinary institutions in India
167 for laboratory diagnosis of rabies still routinely use "seller's stain" and demonstrate "Negri
168 bodies" in the brain of the suspect animal. In this project, for the first time the local veterinarians
169 were trained to use dRIT, a simple field based test developed by CDC, Atlanta, USA, for
170 diagnosis of rabies in animals (8). Later the test was successfully used for diagnosing rabies in

mind species? results of the tests?

171 six large animals in the field. Incidentally, there was no case of human rabies during the project
172 period. — in all 3 or 6 villages? How was surveillance done?

173 Following implementation of various public health and veterinary activities there was a
174 significant improvement in the knowledge, attitude and practices (KAP) of people on rabies
175 prevention in the study villages as compared to the control villages ($P=0.001$)(7). *test, sample size*
176 *this is the core of the results, but nothing was said how this was calculated!*

177 The financial cost of the project was US \$ 31,604 and the economic cost was US \$ 85,958. The
178 economic cost was 2.7 times more than the financial cost. This was due to resource
179 mobilization in terms of personnel, supplies and expertise at the local and community level. The
180 distribution of the cost of the activities was awareness and education (25%); veterinary ((22%),
181 training and capacity building (19%), monitoring and evaluation (19%) and medical component
182 (15%).

183 Lastly, ^{al)} though population and area of coverage of the project was small, still was
184 suitable for this experiment to test the implementation of an array of public health and veterinary
185 activities. The activities could be blended well and made acceptable to the community.

187 4. LESSONS LEARNT

188 The intersectoral coordination between the departments of public health, veterinary health,
189 school education, local self government, women and social welfare was key to success.

190 *to? never mentioned before*
191 2/ The laboratory diagnosis of rabies in dogs was not possible as dog deaths were not reported
192 by the community despite educating them about the importance of rabies surveillance in the
193 dogs. This is because dogs are not of economic value to the community.

194 . The rabies education materials must be cost-effective, long lasting based on local traditions,
195 conditions and interesting especially to school children. 4. The laboratory diagnosis of rabies in
196 dogs was difficult, *never described before! why?*

197 Lastly, it is sincerely hoped that the lessons learnt from this project would be of some help in
198 formulating rabies prevention and control strategies in India as now a "National Rabies Control
199 Programme" is under way by Government of India during the twelfth five year plan (2012-17).

*give a
reference
for this
programme*

5. CONCLUSION AND RECOMMENDATION

Based on the activities done, results shown and experience gained a "system model"(9) was evolved. (Figure -1). This in conclusion is the message of the project for other medical and veterinarians in the country and for the attention of all those involved in prevention and control of rabies.

DEFINITIONS.

Health services research. The systematic study of the means by which biomedical and other relevant knowledge is brought to bear on the health of individuals and communities under a given set of conditions.

One health. Is a concept that promotes partnership between human and veterinary medicine. The development of strategies for implementing "one health" involves important steps toward our understanding of how to control, and ultimately, prevent zoonotic disease transmission, which would improve the health and lives of both animals and humans. Schools of medicine, veterinary medicine, and public health should embrace the "One Health" concept and prepare their students to meet the challenges of the future.

at least mention one the onehealthinitiative.com because it is not a definition

Financial cost. Money spent on goods and services.

Economic cost. Financial cost plus estimated monetary value of donated goods and services.

COMPETING INTERESTS. Authors have declared that no competing interests exist.

APPROVALS AND CONSENT

The project was approved by the institutional ethics committee of Kempegowda Institute of Medical Sciences. The approval of State Government of Karnataka was obtained for the different activities done in the community. The consent of the formal leaders of the village, school teachers, heads of the households, parents / guardians of the school children was taken.

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AUTHORS CONTRIBUTIONS

This project was a collaborative work of all the authors. MKS put forth the idea, mentored, monitored the project work and prepared the manuscript. DHAN did the coordination and liaison work and prepared the project report. NRRM planned and supervised the field work. MLS was responsible for the veterinary component of the study. PK was the medical officer and postgraduate trainee who organized the field work. SNM conducted the laboratory training and responsible for sero-surveillance. BCRK was responsible for mass dog vaccination, deworming and animal welfare work. GB performed data and statistical analysis. All authors have read and approved the final manuscript.

quite short for a full research paper

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300 **Table 1: Adopt a village, rural rabies prevention project: An overview and activities done**

301

302 **Socio-demography**

303 Number of Villages *included in the study* 3

304 Number of households *visited? were mentioned in the manuscript* 2043

305 Total human population *- in all 3 (or 6) villages?* 10,220

306 Medical manpower (medical-4; paramedics-5; traditional - 2) 11

307 Veterinary manpower (live stock inspector) 1

308 Live stock census (dogs-446; cats-56, cows-348, buffalo-45, sheep-165 & goat-275) 1335

309 Dog: man ratio 1:23

310 **Rabies awareness and education materials developed and used/ displayed/distributed** *number* 311 (In local dialect, Kannada)

312 ~~Number of outdoor wall paintings (on the prominently located houses)~~ 11

313 ~~Number of annual wall calendars (in local dialect) distributed to households~~ 2000

314 ~~Number of book labels distributed through school teachers amongst school children~~ 1000

315 ~~Number of snake and ladder game thick charts given to schools (for children to play in schools)~~ 16

316 ~~Number of thick Posters displayed/fixed on the walls (in schools and community centres)~~ 65

317 Rabies training aid (for village level volunteers) 15

318 Rabies DVD (in local dialect, Kannada; 15 minutes duration) 1

319 **Rabies awareness and education activities**

320 Number of veterinarians and other health staff trained in rabies prophylaxis 40

321 ~~Number of village level (rabies) volunteers attended training programme on rabies~~ 24

322 ~~and~~ its prophylaxis

323 ~~Number of rabies education sessions conducted in the village per month~~ 14

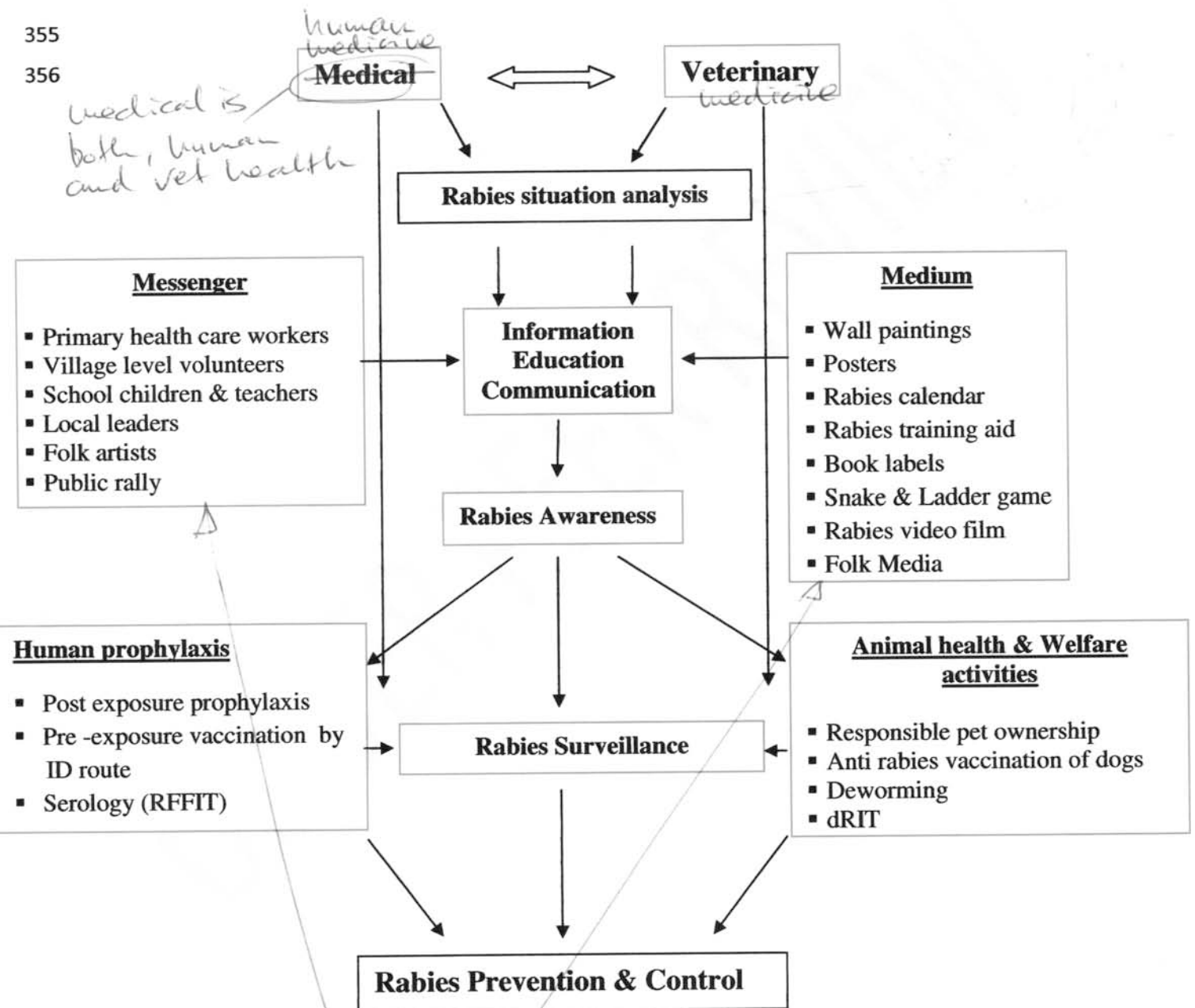
324	Number of rabies education sessions conducted in the schools per month	5
325	Number of school children attended rabies education sessions	370
326	Number of Drawing competitions (start& end of the project) for school children	6
327	Rabies DVD shown (in local dialect, Kannada) (number of times shown in schools-6;	102
328	local cable television network -96)	
329	Use of folk dance	1
330	Use of public rally	2
331		
332	Rabies prophylaxis in humans	
333	Incidence of animal bite/exposure per 1000 persons per year	19
334	Number of rabies PEP given	69
335	Number of rabies PrEP given (school children-323, vets& pet owners-45)	368
336	Number of rapid fluorescent focus inhibition test (RFFFIT, antirabies antibody test) done	61
337	Rabies prophylaxis in animals	
338	Mass vaccination of dogs (primary - 262; one month booster - 183; annual booster-243)	688
339	Number of RFFIT (antirabies antibody test) done	148
340	Rabies surveillance	
341	Number of veterinarians (15) and others (1) trained in dRIT (sessions held - 2)	16
342	Number of dRIT done	06
343	~~Incidence of animal rabies~~ Number of positive rabies	06
344	Incidence of human rabies	Nil
345	Costing of the project (2 years duration)	
346	Total financial cost	USD 31,604
347	Total economic cost	USD 85,958
348		
349		

this is completely unclear how this was calculated

this is not mentioned in the text

Fig.1: Adopt a village project: “One Health” Experiment

A model for rabies prevention and control in a rural community in India



put these boxes somewhere into the middle of the graph, it is valuable for both, human & vet medicine