

1 | -Rural rabies prevention project: - A 'one health' experiment in India: An overview

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## 17 | ABSTRACT

18 |  
19 |  
20 | **Aim:** To assess the feasibility of implementing "one health approach" to prevent human rabies  
21 | and control animal rabies in a rural community.

22 |  
23 |  
24 | **Study design:** Health services research in a rural setting.

25 |  
26 | **Place and duration of study:** A medical college and a veterinary college along with an animal  
27 | welfare organization delivered a wide array of "integrated services" in three villages' vizi.e.  
28 | Kumbalagodu, Thagachikuppe and Gerupalya near Bangalore, India comprising-comprising a  
29 | population of 10,220 persons population for a period of two years from December, 2009 to  
30 | November, 2011. The nearby three villages of-Ramohallyof Ramohally, Vinayakanagara and  
31 | Bhimanakuppe with a population of 6,023 persons formed the control group, with no  
32 | interventionproject inputs.

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34 | **Methodology:** This consisted of baselinehousehold surveys at the beginning and end line of  
35 | two years surveys; rabies awareness campaigns; clinical and laboratory surveillance of rabies  
36 | in dogs; rabies post-exposure prophylaxis (PEP) in humans; pre-exposure rabies prophylaxis

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(PrEP) by intradermal route in school children, pet dog owners and veterinarians and others;  
mass; mass dog vaccination and deworming; and sero-surveillance in both dogs and humans.

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**Results:** The ratio of veterinary and medical manpower in study villages was 1: 11 and dog to  
man ratio was; dog : man ratio was 1: 23. The information, education and communication  
materials developed and used were rudomestic outdoor wall paintings-writings (11), domestic  
indoor annual wall calendar (2000), school book labels (1000); game charts (16); wall  
posters(posters (65); flip chart (15) ); rabies educational DVD(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 3.319 per  
1000 persons per year and 69 people persons received rabies PEP. PrEP was given to 368  
school children and others, pet dog owners and veterinarians. Sixty one human serum  
samples were analyzed for rabies virus neutralizing antibodies by rapid fluorescent focus  
inhibition test for rabies antibody detection. Sixteen veterinarians and others were trained to use  
direct rapid immunohistochemical test (dRIT) for rabies diagnosis. and the same test was used  
to Six large animals were confirmed rabiesd by dRIT in 6 animals which died deaths in the field.  
There was were no cases of human rabies during the project period. The total economic cost  
of the project was 2.7 times more than the financial cost.

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**Conclusion:** A blend of integrated medical and veterinary services including and animal  
welfare activities services could were as be successfully delivered through a "one health"  
approach. Based on this success a "system model conceptual model" is was evolved to  
propagate its replication in other rural communities across the country India.

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

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## 1. INTRODUCTION

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 no cure once the signs and symptoms appear. Though all mammals are susceptible to rabies  
some serve as hosts and vectors which The animals involved in the transmission of rabies  
include dogs, cats, mongoose, foxes, ferrets, raccoons, skunks, wolves and bats, and other

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mammals. In India, the most common vectors are the dogs (96%) and cats (2%), besides and others other (mammals (2%)) like mongoose, foxes, etc (1). India has the highest burden incidence of human rabies deaths of at 20,000 (36%) annually which corresponds to 36% of the estimated global incidence of burden of about 55,000 (2) and about 17 million animal bites each year (3). One health is a concept that promotes partnership among multiple disciplines including 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.

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 popularly known as by a "one health approach" (4,5). The "one health approach" is a concept that promotes partnership among multiple disciplines including 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" approach. But in India there is very little "cooperation and coordination" collaboration between medical and veterinary services. Besides there is no system or mechanism integrating the two sectors for prevention and control of this disease. There are two separate ministries, one for preventing rabies in humans' viz. e. public health and the other for controlling rabies in animals' viz. i. e. 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 other impeding factors include vastness of the country and the three tier system of governance i. e. Central or Federal Government, State or Provincial Government and local self government i. e. in urban areas Municipalities or Civic Corporations and in rural areas known as Zilla Parishats (ZP). The dog is mythologically mythologically, historically and socio- culturally a much loved animal and also revered in some communities. Besides historically and socio- culturally dog is a much loved animal and due to mythology in some communities it is also revered. Hence, attempts to control the ever growing dog population have not been successful. However, recently from 2007 to 2011 a "National Pilot Project on Human Rabies Prevention" was implemented by Government of India in five cities which attempted to bring together both medical and veterinary

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sectors for preventing ~~the disease~~rabies in humans(6). In this background, it was considered necessary to do a "health services research" (6) and demonstrate "a model project" a model in a rural area of India to prevent rabies in humans and control it in dogs through integration of medical and veterinary services including animal welfare services. Hence, this "Consequently this "one healthhealth services research" experiment (7) was conducted in three villages, near Bangalore, Bangalore, Karnataka, a southern state of India.

## 2. MATERIAL AND METHODS

A medical college, a veterinary college including an animal welfare organization came together for this purpose. The Department of Community Medicine, Kempegowda Institute of Medical Sciences, Bangalore ([www.kimscommunitymedicine.org](http://www.kimscommunitymedicine.org)) and Department of Pathology of Veterinary College, Bangalore ([www.kvafsu.kar.nic.in](http://www.kvafsu.kar.nic.in)) along with "Karuna" an animal welfare organization, (AWO), Bangalore ([www.karunaananimalwelfare.org](http://www.karunaananimalwelfare.org)) had combined expertise integrated for this project work. The project was implemented in three study villages viz i.e. Kumbalagodu, Thagachikuppe and Gerupalya comprising with a 10,220 population of humans. The nearby three villages viz i.e. Ramohally, Vinayakanagara and Bhimanakuppe having a population of 6,023 humans formed the control group, with no inputs from the project.

The activities were conducted over a two years period from December, 2009 to November, 2011. The core project team comprised of two faculty members from medical college, a medical officer and field staff from medical college; from veterinary college, a faculty member and a veterinarian from veterinary college and from the AWO, a veterinarian and field staff from the AWO.

The various community level activities conducted include live-stock census, base line & end line door to door household surveys; training and orientation of formal and informal village leaders, women self help groups, medical and veterinary personnel, school teachers and others; development of socio-culturally acceptable rabies information, education and communication (IEC) materials like posters on rabies post-exposure prophylaxis (PEP), responsible pet ownership, training aid flip chart for village level volunteers including volunteers from dDepartment of wWomen & sSocial welfare, chart on snake and ladder game, indoor annual wall calendar, school book label, outdoor wall paintingwritings, rabies video-DVD and its transmission through cable television net work, use of folk dance, public rallies, drawing competitions in schools; providing rabies pre-exposure prophylaxis (PrEP) by intradermal route

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138 | ~~and measuring its effectiveness through sero-surveillance of vaccinees and~~ PEP ~~through by~~  
 139 | both intradermal (ID) and intramuscular (IM) routes as feasible; clinical and laboratory  
 140 | surveillance for rabies in animals and humans, training of veterinarians in rabies diagnosis using  
 141 | direct rapid ~~immunohistochemical-immunohistochemical~~ test (dRIT) ; animal welfare ~~activities~~  
 142 | ~~work~~ consisting of mass dog vaccination, collaring, deworming and sero-surveillance. The  
 143 | project was periodically monitored by both national and international observers.

### 144 | 3. RESULTS AND DISCUSSION

145 | An overview of activities ~~done under~~ ~~conducted under~~ the project is shown in table-1. ~~It was~~  
 146 | ~~found that the veterinary manpower as~~ compared to medical manpower, ~~in the~~  
 147 | ~~ratio of at~~ 1:11 was grossly inadequate. ~~The live stock of cow, buffalo, sheep and goat are~~  
 148 | ~~known hosts of rabies in the region and dogs & cats the common vectors of the disease.~~ The  
 149 | dog: man ratio of 1:23 ~~was was more as compared to~~ ~~higher than~~ national ~~the national~~ figures of  
 150 | 1: 36 ~~(3)-~~. This made the people more prone to dog bites and consequently ~~there was~~ a higher  
 151 | incidence of animal bite ~~in~~ in the project villages.

152 | The rabies IEC materials were developed based on the results of ~~baseline survey~~ ~~household~~  
 153 | ~~survey on knowledge, attitude and practice of people on rabies prevention and socio~~ ~~their socio-~~  
 154 | cultural acceptance. The outdoor wall ~~paintings-writings~~ depicting the message of rabies and its  
 155 | prevention were done with the consent of the head of the household. ~~on the Wall~~  
 156 | ~~painting writings~~ ~~were on walls of those~~ houses that are strategically located ~~giving a~~ clear  
 157 | view to the community. ~~for easy readability.~~ The indoor domestic annual wall calendars having  
 158 | 12 pages ~~one for page~~ for each month are ~~are very~~ popular in the villages. These calendars  
 159 | generally display ~~as the~~ ~~day, and date, list~~ of important local festivals, events, ~~etc~~ for every  
 160 | month. ~~and for one year having 12 such sheets with a hook to be hung on the wall for easy~~  
 161 | ~~reference.~~ Such calendars were specially printed ~~was got printed with having twelve with~~  
 162 | ~~rabies different rabies~~ education messages ~~for one for~~ each month. One calendar was provided  
 163 | to each household. ~~and~~. ~~The calendar was very popular and The rabies Rabies~~  
 164 | ~~message prevention messages were~~ effectively communicated ~~amongst through these~~  
 165 | calendars to ~~the~~ household members.

166 | The school children have a set of books to use for one year and ~~each book on the front cover of~~  
 167 | ~~each~~ ~~has book has~~ a self adhesive label, which provides for writing the name, class and other  
 168 | details of the pupil. Such labels were printed with an additional message of rabies prophylaxis  
 169 | and given to school children through their teachers ~~in the class rooms.~~ ~~Similarly, the~~ ~~The~~ snake

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170 and ladder chart is a popular indoor game which ~~are-is used for to-play~~ed with dice; the snakes  
171 represent the "-bad practices in rabies prevention" and the ladder "good practices in rabies  
172 prevention".~~and the same was got printed with rabies messages and given to schools for use~~  
173 ~~by older children during play time. This was again popular amongst the children in the schools.~~

174 The thick paper board ~~thick~~ wall posters ~~having rabies depicting rabies~~ prophylaxis messages  
175 were fixed at strategic places in the community halls, schools, health centres, grocery shops,  
176 ~~etc~~ and other places were served as a good source of rabies information to the community.

177 After training volunteers from the villages ~~village level volunteers in on~~ rabies prophylaxis a well  
178 designed and ~~tested simple~~tested simple rabies education aid flip waschart was provided to  
179 ~~them to them to~~ for educating e the peoplecommunity. about the disease and its prevention. A  
180 documentary video film (DVD) on rabies in local dialect (Kannada) prepared by Rabies in Asia  
181 Foundation was used in ~~shown in the schools and through local cable television network for~~  
182 community education. ~~The folk dance was another popular medium used for improving~~  
183 community awareness about rabies and its prevention.~~The e~~Educational sessions on rabies

184 conducted in the schools ~~not only benefitted the students both students but also the~~  
185 ~~teachers and teachers.~~ The drawing competition held in the schools at the start ~~& end and end of~~  
186 the project on the theme of "Rabies prevention" ~~had was successful in improving the rabies~~

187 awareness. A documentary video film (DVD) on rabies in local dialect (Kannada) prepared by  
188 Rabies in Asia Foundation ([www.rabiesinasia.org](http://www.rabiesinasia.org)) was shown in the schools and also through  
189 local cable television network for community education. The folk dance was another popular

190 medium used for improving community awareness about rabies and its prevention. ~~The two~~  
191 World rabies days (WRDs), 28th September, of 2010 and 2011 were successfully used to  
192 hold public rallies and other to create rabies awareness activities in the villages.

193 The training of veterinarians, medical doctors, health workers and village level volunteers and  
194 others on rabies prophylaxis held in separate batches was quite successful. This subsequently  
195 ensuredensured timely and appropriate provision of rabies PEP in the community for the animal  
196 bite victims, which was confidence building and reassuring. The PrEP was provided to 323  
197 school children using Injection Rabipur (purified chick embryo cell vaccine) by intradermal~~id~~  
198 route.~~This route. The vaccine was found to be safe and immunogenic by serology. (8)~~

199 ~~The animal welfare campaign for responsible~~emphasized responsible pet ownership, dog  
200 collaring, mass dog vaccination and deworming ~~were~~was well received. Mass vaccination of  
201 dogs in the community was ~~done using~~accomplished using Injection Nobivac R

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202 (Inactivated rabies vaccine) three times i.e. at the start of the project, one month later  
 203 and again after one year. Mass deworming was ~~done~~ done by using Tablet Plozin  
 204 (Praziquintel 50mg, Pyrantel pamoate 144mg & Fenbendazole 500mg) orally for owned dogs  
 205 and injection Ivermectin (0.5ml for puppies & and 1 ml for adults) subcutaneously for stray  
 206 dogs. To assess the immunogenicity of Inj. Nobivac-R, ~~of this vaccination the sera sera~~  
 207 ~~samples from sub sample of dogs of the dogs~~ were tested for antirabies antibody using RFFIT  
 208 on day 0 i.e. before first dose of vaccination, ~~at day -365 days and~~ day 379 i.e. 14 days after  
 209 one year booster dose ~~for antirabies antibody using RFFIT. This~~ The vaccine was found  
 210 to be immunogenic on day 379 as adequate titers ( $\geq 0.5$  IU/mL) were found following an annual  
 211 booster dose.

212 ~~The educational sessions on rabies conducted in the schools not only benefitted the students~~  
 213 ~~but also the teachers. The drawing competition held in the schools at the start & end of the~~  
 214 ~~project on the theme of "Rabies and its prevention" was successful in improving the awareness.~~  
 215 ~~The two world rabies days (WRDs), 28th September, of 2010 and 2011 were successfully used~~  
 216 ~~to hold public rallies and other rabies awareness activities in the villages.~~

217 ~~The animal welfare campaign for responsible pet ownership, dog collaring, mass dog~~  
 218 ~~vaccination and deworming were well received. Presently, many veterinary institutions in India~~  
 219 ~~that conduct laboratory diagnosis for rabies still~~ routinely use ~~the outdated~~ "seller's stain" ~~and~~  
 220 ~~demonstrate to demonstrate~~ "Negri bodies" in the brain of the suspect animal ~~for laboratory~~  
 221 ~~diagnosis of rabies. In this project, for the first time~~ Through this project the local veterinarians  
 222 were trained to use dRIT, a simple field ~~based test~~ diagnostic test developed by CDC, Atlanta,  
 223 USA, ~~for diagnosis of rabies in animals (97).~~ Surveillance for rabies was conducted using both  
 224 medical and veterinary manpower in project villages. ~~Later the test was successfully used for~~  
 225 ~~diagnosing rabies in s~~ Six large animals i.e. three cows, one calf and two goats were diagnosed  
 226 of rabies by dRIT in the ~~field study~~ villages. The laboratory diagnosis of rabies in dogs was not  
 227 possible as dog deaths were not reported by the community despite educating them about the  
 228 importance of rabies surveillance in the dogs. This was because dogs are not of economic  
 229 value to the community.

230 ~~Incidentally, there~~ There were no cases of ~~of~~ human rabies reported during the  
 231 project period in both study and control villages during the project period.

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232 Following implementation of various public health and veterinary activities there was a  
233 significant improvement in the knowledge, attitude and practices (KAP) of people on rabies  
234 prevention in the study villages as compared to the control villages (P=0.001) (8).

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235  
236 The financial cost of the project was US \$ 31,604 US and the economic cost was US \$  
237 85,958 US \$. The economic cost was 2.7 times more than the financial cost because, This was  
238 due to the local and community level resource mobilization in terms of personnel, supplies and  
239 expertise at the local and community level were not included as part of financial cost. The  
240 distribution of the cost of the activities was: awareness and education (25%); veterinary  
241 component (22%), training and capacity building, (19%), monitoring and evaluation (19%) and  
242 medical component (15%).

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243 A total of 688 dogs were vaccinated with. — Lastly, though While the human Inj. Nobivac-R on  
244 days 0, 1<sup>st</sup>, booster at the end of 3 months & another booster at the end of one year. A total of  
245 148 sera samples were tested for rabies virus neutralizing antibody titers by RFFIT. There was  
246 good immuneresponse on day 379 after annual booster vaccination. Lastly, following  
247 implementation of various public health and veterinary activities there was a significant  
248 improvement in the knowledge, attitude and practices (KAP) of people on rabies prevention in  
249 the study villages as compared to the control villages (P=0.001)(8).

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250 population and area of coverage of for the project this project was small, still it was suitable for  
251 this experiment to test the implementation of an array of public health and veterinary activities.  
252 The activities could be blended well and made acceptable to the community. This supports and  
253 strengthens the conclusion of another recent study from India that it is possible to implement a  
254 successful—"one health—" approach for rabies prevention and control programme, in an  
255 environment of strong political will, evidence-based policy innovations, clearly defined  
256 roles and responsibilities of agencies, co-ordination mechanisms at all levels, and a  
257 culture of open information exchange (10).

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#### 258 4. LESSONS LEARNED

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259 1. The intersectoral collaboration among the departments of public health, veterinary health,  
260 school education, local self government, women and social welfare was key to success.

261 2. The rabies education materials must be cost-effective, long lasting based on local traditions,  
262 conditions and interesting especially to school children.

263 **Based on the activities, results and experience from this study a "conceptual model"(11) is**  
264 **provided for medical personnel and veterinarians in the country to enhance rabies prevention**  
265 **and control work in rural community. (Figure 1).**

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267 **The PrEP by ID route for school children was found to be safe, feasible and**  
268 **immunogenic. (8).**

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270 **Cost analysis of the project. The financial cost of the project was US \$ 31604 and the**  
271 **economic cost was US \$ 85958. The economic cost was 2.7 times more than the financial**  
272 **cost. This was due to resource mobilization in terms of personnel, supplies and expertise**  
273 **at the local and community level. The distribution of the cost of the activities was**  
274 **awareness and education (25%); veterinary ((22%), training and capacity building, (19%),**  
275 **monitoring and evaluation (19%) and medical component (15%).**

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#### 279 **4. LESSONS LEARNT LEARNED**

280 **1. The intersectoral coordination collaboration between among the departments of public**  
281 **health, veterinary health, school education, local self government, women and social**  
282 **welfare was key to success. The intersectoral coordination and cooperation between**  
283 **public health and veterinary services at community level was not easy. The difficulty was**  
284 **more managerial (man management) and less technical in nature.**

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285 **2. The laboratory diagnosis of rabies in dogs was not possible as dog deaths were not**  
286 **reported by the community despite educating them about the importance of rabies**  
287 **surveillance in the dogs. This is because dogs are not of economic value to the**  
288 **community. The intersectoral coordination between the departments of public health,**  
289 **veterinary, school education, local self government, women and social welfare was key**  
290 **to success.**

291 ~~2. 33. The rabies education materials must be cost effective, long lasting based on local~~  
292 ~~traditions, conditions and interesting especially to school children.~~

293 ~~4. The laboratory diagnosis of rabies in dogs was difficult not possible as none reported~~  
294 ~~these events.~~

295 ~~Lastly, it It is sincerely hoped that the lessons learnt learned from this project would~~  
296 ~~will be of some helpused in formulating rabies prevention and control strategies in~~  
297 ~~India as now aunder the " National Rabies Control Programme" is under way byof~~  
298 ~~Government of India during the twelfth five year plan ((2012-17).(6)~~

## 299 ~~455. CONCLUSION AND RECOMMENDATION~~

300 ~~Based on the activities, results and experience from this study a "conceptual model"(11) is~~  
301 ~~provided for medical personnel and veterinarians in the country to implement "one health~~  
302 ~~approach "for rabies prevention and control work in rural community. (Figure -1).~~

303 ~~It is hoped that the results of this project will be useful in formulating rabies prevention and~~  
304 ~~control strategies under the " National Rabies Control Programme" of Government of India~~  
305 ~~during the twelfth five year plan (2012-17)~~

307 ~~1. The intersectoral collaboration among the departments of public health, veterinary health,~~  
308 ~~school education, local self government, women and social welfare was key to success.~~

309 ~~2. The rabies education materials must be cost-effective, long lasting based on local traditions,~~  
310 ~~conditions and interesting especially to school children.~~

312 ~~It is hoped that the results of this project will be useful in formulating rabies prevention and~~  
313 ~~control strategies under the " National Rabies Control Programme" of Government of India~~  
314 ~~during the twelfth five year plan (2012-17)~~

315 ~~Based on the activities activitiesdone, results shown and experience gained from this astudy a~~  
316 ~~"system conceptual model"(1011) is provided was evolved. (Figure -1). This in conclusion is~~  
317 ~~the message of the project for other medical, andpersonnel and veterinarians in the country and~~

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318 | for the attention of all those involved in to enhance rabies prevention and control work in rural  
319 | community of rabies. (Figure 1).

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## 321 | DEFINITIONS.

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

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

331

332 | **Financial cost.** Money spent on goods materials goods and services.

333

334 | **Economic cost.** Financial cost plus estimated monetary value of donated donated honorary  
335 | goods materials goods and services.

336

337 | **COMPETING INTERESTS.** Authors have declared that no competing interests exist.

338

339

## 340 | APPROVALS AND CONSENT

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

345

## 346 | ACKNOWLEDGEMENTS

347 | This project was implemented following a financial grant from Global Alliance for Rabies  
348 | Control-, Kansas, United States of America. The formal permission given by the Departments of

Public Health and School Education, Government of Karnataka, [Bangalore, –India for the conduct of this study](#) is gratefully acknowledged. The authors thank Drs. Deborah Briggs, Executive Director, Global Alliance for Rabies Control and S. Abdul Rahman, President, Commonwealth Veterinary Association, for their constant support and guidance. The technical and logistical support extended by Dr. S Yathiraj, Dean, Veterinary College, Bangalore is duly placed on record. [The help & support of Dr. D. Nagabushana, Veterinary officer is gratefully acknowledged.](#) The technical expertise and help of Dr. Sudha Chandrasekhar, Associate Professor of St.John's Research Institute, Bangalore for conducting the cost analysis of the project is ~~gratefully~~ duly acknowledged. The overall coordination and help of the trustees of Rabies in Asia Foundation is sincerely acknowledged. Lastly, field work of this project was possible due to the cooperation and participation of the community, school teachers, government veterinary staff and public health staff and from the field staff of the Department of Community Medicine of Kempegowda Institute of Medical Sciences, Bangalore.

#### **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 ~~the~~ mass dog vaccination, deworming and animal welfare work. GB performed ~~the~~ data and statistical analysis. All authors have read and approved the final manuscript.

#### **REFERENCES**

1. M.K. Sudarshan, S.N. Madhusudana, B.J. Mahendra, N.S.N. Rao, D.H. Ashwath Narayana, S. Abdul Rahman, et al. Assessing the burden of human rabies in India: results of a national multi-center epidemiological survey, International Journal of Infectious Diseases, 2007, 11, 29-35.
2. World Health Organization .Rabies vaccines, WHO position paper. Weekly Epidemiological Record, 6 Aug 2010; 32(85): 309-20.

382

383 3. M.K. Sudarshan, B.J. Mahendra, S.N.Madhusudana, N.S.N. Rao, D.H. Ashwath Narayana,  
384 S. Abdul Rahman et al. An epidemiological survey of animal bites in India: Results of a WHO  
385 sponsored national multicentric rabies survey, Journal of Communicable Diseases, 2006, 38(1),  
386 32-39.

387

388 4. Kahn.LH, Kaplan.B, Monath.TP, Steele.JH. Teaching "One medicine, One health" The  
389 American Journal of Medicine, 2008, 121(3), 169-70.

390

391 5. J. Zinsstag, E. Schelling, D. Waltner-Toews, M. Tanner. From "one medicine" to "one  
392 health" and systemic approaches to health and well-being. Preventive Veterinary  
393 Medicine, 2011, 101, 148– 156

394

395 6. National Centre for Disease Control. Human Rabies in India: moving towards elimination,  
396 Newsletter, October, 2012, 1(1), New Delhi.

397

398 7. K.Park. Park's textbook of Preventive and Social Medicine. 21st edition. M/S Banarasidas  
399 Bhanot, Jabalpur, India. 2011.

400

401 8. Adopt a village Project, Report. <http://www.rabiesinasia.org/AVVP.pdf> [accessed on 29th  
402 October, 2012]

403

404 9. Tiziana Lembo, Michael Niezgoda, Andrés Velasco-Villa, Sarah Cleaveland, Eblate Ernest,  
405 and Charles E. Rupprecht. Evaluation of a Direct, Rapid Immunohistochemical Test for Rabies  
406 Diagnosis, 2006, Emerging Infectious Diseases • www.cdc.gov/eid 12,(2), 310-313.

407

408 8. Adopt a village Project, Report. <http://www.rabiesinasia.org/AVVP.pdf> [accessed on 29th  
409 October, 2012]

410

411 10. Syed Shahid Abbas, Vidya Venkataramanan, Garima Pathak, Manish Kakkar. Rabies control  
412 initiative in Tamil Nadu, India; a test case for the 'one health' approach, International health,  
2011, 3, 231-239.

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413 1011. Conceptual model. [http://en.wikipedia.org/wiki/Conceptual\\_model](http://en.wikipedia.org/wiki/Conceptual_model) [accessed on 15th  
414 December, 2012] System model. [http://en.wikipedia.org/wiki/System#/System\\_concepts](http://en.wikipedia.org/wiki/System#/System_concepts)  
415 [accessed on 29th October, 2012]

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431 **Table 1: Adopt a village, rural rabies prevention project: An overview ~~and activities done of~~**  
432 **~~activities conducted, in study villages~~**

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435 **Socio-demography**

436 ~~Number of Villages~~  
437 ~~3~~

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438 ~~Number of households~~ ~~2043~~

|     |                                                                                   |        |
|-----|-----------------------------------------------------------------------------------|--------|
| 439 | Total human population                                                            | 10,220 |
| 440 | Medical manpower (medical-4; paramedics-5; traditional - 2)                       | 11     |
| 441 | Veterinary manpower (live stock inspector)                                        | 1      |
| 442 | Live stock census (dogs-446; cats-56, cows-348, buffalo-45, sheep-165 & goat-275) | 1335   |
| 443 | Dog: man ratio                                                                    | 1:23   |

444 **Rabies awareness and education materials developed and used/ displayed/distributed**

445 (In local dialect, Kannada)

446 ~~Number of O~~ Outdoor wall ~~paintings writings~~ (on the prominently located houses)

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447 \_\_\_\_\_ 11

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448 ~~Number of a~~ Annual wall calendars (in local dialect) distributed to households

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449 \_\_\_\_\_ 2000

450 ~~Number of b~~ Book labels distributed through school teachers amongst school children

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451 \_\_\_\_\_ 1000

452 ~~Number of s~~ Snake and ladder game thick charts given to schools (for children to play in schools)

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453 16

454 ~~Number of t~~ Thick Posters displayed/fixed on the walls (in schools and community centres)

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455 65

456 Rabies training aid (for village level volunteers)

15

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

1

458 **Rabies awareness and education activities**

459 ~~Number of v~~ Veterinarians and other health staff trained in rabies prophylaxis

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460 40

461 ~~Number of v~~ Village level (rabies) volunteers attended training programme on rabies and its prophylaxis

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462 \_\_\_\_\_ 24 \_\_\_\_\_ -24

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463 ~~& and its prophylaxis~~

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464 ~~Number of r~~ Rabies education sessions conducted in the village per month

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465 14

466 ~~Number of r~~ Rabies education sessions conducted in the schools per month

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467 5

468 ~~Number of s~~ School children attended rabies education sessions

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469 370

470 ~~Number of~~ Drawing competitions (start& end of the project) for school children

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471 6

472 Rabies DVD shown (in local dialect, Kannada) \_\_\_\_\_ 102

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473 (number of times shown in schools-6; local cable television network -96)

474 \_\_\_\_\_ 102

475 local cable television network -96)

|     |                                                                                                                |            |
|-----|----------------------------------------------------------------------------------------------------------------|------------|
| 476 | Use of folk dance                                                                                              | 1          |
| 477 | Use of public rally                                                                                            | 2          |
| 478 |                                                                                                                |            |
| 479 | <b>Rabies prophylaxis in humans</b>                                                                            |            |
| 480 | <del>Incidence of animal bite/exposure per 1000 persons per year</del>                                         |            |
| 481 | <del>49</del>                                                                                                  |            |
| 482 | Number of rabies PEP given                                                                                     | 69         |
| 483 | Number of rabies PrEP given (school children-323, vets& pet owners-45)                                         | 368        |
| 484 | Number of rapid fluorescent focus inhibition test (RFFFIT) <u>for</u> antirabies antibody <del>test</del> done |            |
| 485 | 61                                                                                                             |            |
| 486 | <u>Number of vaccinees protected (RFFIT titers ≥0.5 IU/mL)</u>                                                 | <u>61</u>  |
| 487 | <b>Rabies prophylaxis in animals</b>                                                                           |            |
| 488 | <u>Total number of vaccine doses administered</u> <del>Mass vaccination of dog_s</del>                         |            |
| 489 | <u>688</u>                                                                                                     |            |
| 490 | (primary - 262; one month booster - 183; annual booster-243)                                                   |            |
| 491 | <del>688</del>                                                                                                 |            |
| 492 | Number of RFFIT (antirabies antibody test) done                                                                | 148        |
| 493 | <b>Rabies surveillance</b>                                                                                     |            |
| 494 | Number of veterinarians (15) and others (1) trained in dRIT (sessions held - 2)                                | 16         |
| 495 | Number of dRIT done                                                                                            |            |
| 496 | <del>96</del>                                                                                                  |            |
| 497 | <del>Incidence</del> <u>Number</u> of animals <u>positive for</u> rabies                                       |            |
| 498 | <del>96</del>                                                                                                  |            |
| 499 | <del>Incidence of h</del> <u>Human rabies cases</u>                                                            |            |
| 500 | <del>Nil</del>                                                                                                 |            |
| 501 | <b>Costing of the project (2 years duration)</b>                                                               |            |
| 502 | Total financial cost                                                                                           | USD 31,604 |
| 503 | Total economic cost                                                                                            | USD 85,958 |
| 504 |                                                                                                                |            |
| 505 |                                                                                                                |            |

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



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