

Original Research Article

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## Risk Assessment and Recommendation of Post Exposure Prophylaxis after a Sentinel Case of Rabies in a Tertiary Care Hospital, South India

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### ABSTRACT

Rabies is the oldest zoonotic disease known to mankind. Most of the human cases reported worldwide are due to dog bite, although few cases may be transmitted by non-bite exposures. Theoretically high-risk exposures include direct contact of broken skin or mucosa with saliva, tears, oropharyngeal secretions and CSF. Hereby we narrate our risk assessment and post-exposure prophylaxis (PEP) for HCWs at our hospital after a case of rabies was detected. We incorporated our assessment program in the following form: (1) identification of potentially exposed HCWs and laboratory staff, (2) risk analysis by the Hospital infection control committee by using a questionnaire (3) Based on the type of exposure, PEP was recommended to few HCW's and lab staff. 63 persons in total came in contact with the rabies patient, of which 36 were HCW's and 27 were Laboratory staff. All 63 underwent risk assessment, but PEP was recommended for 28/63, who were considered as high risk exposures. After confirming that it is a case of rabies, an integrated attempt was put up by our infection control staff, which culminated in a prompt risk analysis of all those who were potentially exposed. The HCW's were counselled regarding the use of standard precautions while handling the patients and their samples and also to use adequate PPE during performing all the procedures.

#### Keywords

Rhabdoviridae,  
zoonotic disease,  
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#### Article Info

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### Introduction

Rabies is the oldest zoonotic disease known to mankind. It is an acute, progressive, and fatal encephalomyelitis caused by the Rabies virus (RABV) and other Lyssavirus species of the

family Rhabdoviridae. (1). Rabies sustains to pose a major public health challenge in India. Although the exact magnitude of the disease is not known reliably, some studies estimate that 174 lakh persons are bitten and approximately 20000 persons succumb to the disease

annually. (2) Most of the human cases reported worldwide are due to dog-transmitted rabies. Annually, 61,000 human deaths have been estimated globally, mostly in Asia and Africa. India accounts for one third of the global disease burden.

In India dogs are responsible for about 97% of human rabies. Human infections from rabies due to non-bite transmission routes include mucous membrane contamination, aerosols released due to laboratory activities, organ transplantation, and improper inactivation of vaccines. (3)

A category 3 dog bite case was received in our hospital, who had a history of dog bite 1 month prior to admission. Initially on admission he was suspected of acute febrile encephalopathy and was treated for the same. But rabies workup was done for the patient and the serum and CSF antibodies were suspicious for rabies. So there was a fear among the healthcare workers (HCWs) regarding the communication of disease from the infected patient.

Although there has never been a documented evidence of transmission of rabies to HCWs, theoretically high-risk exposures include direct contact of broken skin or mucosa with saliva, tears, oropharyngeal secretions and cerebrospinal fluid. Urine and feces are considered as non-infectious. (4)

Hereby we narrate our risk analysis and post-exposure prophylaxis (PEP) for HCWs at our hospital after a case of rabies was detected.

### **Materials and Methods**

We planned our risk analysis after the affirmation of rabies by RFFIT (Rapid Fluorescent Focus Inhibition Test) in Serum & CSF (>1024 in Serum & 256 in CSF).

The present study incorporated the assessment program in the following form: (1) identification of potentially exposed HCWs and laboratory staff; (2) instantaneous alert of these HCWs and staff; (3) risk analysis by the Hospital infection control committee staff by using a questionnaire (4) Based on the type of exposure, PEP was recommended to few HCW's and lab staff who were suspected of having high-risk exposure.

The duration of potential transmission was from the date of admission in our hospital till the time of his death. The patient was on standard precautions, during his hospitalization.

Immediately after the patient was confirmed of having rabies, the Pediatric and Microbiology department chiefs were advised to notify their employees to report for risk assessment. We prepared a questionnaire for the HCW's who documented care for the patient and the laboratory staff who processed the specimens received from that patient. This risk assessment was carried out by the Infection Control Team of JIPMER, to interview and counsel the exposed HCW'S and laboratory staff. The risk assessment form for HCW's and lab staff is as following (Table 1a and 1b).

In our study, we concluded those as specific high-risk rabies exposures, who had a direct contact with the patient's respiratory secretions, saliva, tears, cerebrospinal fluid, or any laboratory specimens without wearing adequate personal protective equipment. (4). The HCW's who were present around the patient during procedures like ET tube intubation or during suctioning of ET secretions, those were also considered as high-risk rabies exposed, if adequate PPE was not worn.

Persons identified as having high-risk exposure, Post-Exposure Prophylaxis was recommended to them by the HICC team. The PEP recommended was to receive Rabies cell culture vaccine, IM, 5 doses at 0, 3,7,14 and 28 days. (5) Those who were not at high risk, PEP was not recommended. Supplementary comprehensive counseling was provided to HCWs who had a suspicion of rabies transmission.

## **Results and Discussion**

Our medical center is a tertiary care teaching hospital. It is an institution of National Importance.

Our patient had interaction with many HCWs, during his 16-day stay in the pediatric intensive care unit.

As shown in Table 2, 63 persons in total came in contact with the rabies patient, of which 36 were HCW's, who provided care to the patient and 27 were Laboratory staff, who were exposed to the patient's specimens. All 63 underwent risk assessment in the form of a questionnaire provided by the HICC team, who addressed all the questions about intimate procurement of rabies from fearful HCWs.

Recommendations for PEP: Those HCW's who had a direct contact with the patient's saliva, respiratory secretions, tears, CSF, laboratory specimens, without adequate PPE i.e not worn at least one of the following like gown, mask, gloves, were considered as potentially high-risk exposures.

In addition, those HCW's who were around the patient during procedures like NG tube insertion, Tracheal tube maintenance, LP, ET tube intubation and suctioning, and were not wearing adequate PPE i.e not worn at least one of the following like gown, mask, gloves,

were considered as potentially high-risk exposures.

All the HCW's and the laboratory staff, who were considered as high-risk exposures and who had a potential need for PEP was discussed by the Hospital Infection Control Officer, Senior Virologist and the Pediatrician, before the final decision regarding the PEP recommendation was given.

As shown in Table 2, of the total 63 persons who came in contact with the rabies patient either directly or indirectly, PEP was recommended for 28, who were considered high risk. For 35, PEP was not recommended. No HCWs sustained any bites from our patient. None of the HCW's and lab staff were previously vaccinated for rabies.

Immediately after the confirmation of rabies in the patient, our hospital infection control team screened 63 HCWs at potential risk, of whom 28 persons were recommended to take PEP.

Because non-intact skin or mucosal contact with the patient's secretions, body fluids *etc* are considered as specific high risk exposures, some of these would have been avertible if the HCWs would have practiced standard precautions during patient care or contaminated medical equipment. (6). Also would have been avoidable, if they had used adequate personal protective equipment when assisting few procedures which can cause aerosolization.

The CDC reported that during 1980–1996, that PEP was given to a mean of 64.6 persons per case (SD, 40.8 persons per case) after potential exposure to rabies. (7). For HCWs, PEP is not simply given after routine healthcare delivery and is warranted after specific risk exposures only.

**Table.1A Rabies Exposure Risk Assessment Form, JIPMER**

Name:

Date:

Profession:

Department:

Q1. Did you have any direct physical contact with this patient?

Yes/No

Q2. Were you bitten by this patient?

Yes/No

Q3. Did you have direct contact with this patient’s saliva, respiratory secretions, tears, CSF or laboratory specimens, which are considered infectious for rabies?

Yes/No

(\*Note that blood, feces and urine are not considered infectious for rabies)

Q4. Which of the following PPE were you wearing when you had contact with this patient or the patient’s body fluids? Gloves  Goggles  Face

mask Gown

Q5. Did any of the above mentioned infectious materials enter into your eyes, nose, mouth or fresh open wound?

Yes/No

Q6. Did you perform or were you in the patient’s room when following procedures were performed?

Procedures	Performed	Not performed, Present nearby	PPE used during procedure			
			Gloves	Gown	Mask	Goggles
NG tube insertion						
Tracheal tube maintenance						
Lumbar puncture						
Intubation						
ET suctioning						

Q8. Did you sustain a needle stick injury after it was or may have been in contact with the patients saliva, respiratory secretions, or CSF ?

Yes/No

Q9. Have you been previously immunized against rabies?

Yes/No

ADVICE by HICC team about PEP: PEP Recommended  PEP Not Recommended

Signature of HICC team  
healthcare worker

Signature of the

**Table.1B** Rabies risk assessment form for laboratory staff, JIPMER

Name:

Date:

profession:

Department:

Q1. What sample did you handle? (tick the answer)

A1. Blood/ Serum/ CSF/ Urine/ Tracheal aspirate/ Sputum/ Any other (mention here-)

Q2. What process of sample did you perform in relation to the above sample?

A2. 1. Received in reception

2. aliquoted

3. performed test (if yes, give details of the test-)

4. handled discarded sample

Q3. Specify which procedures were performed in the test performed?

A3. 1. Centrifugation

2. vortex

3. pipetting

4. culture inoculation

5. smear preparation

6. loading in automated instrument

Q4. What PPE did you use while performing the above procedures?

A4. 1. Gloves

2. Mask

3. N95 mask

4. Gown

5. goggles

Q5. How did you discard the specimen after the test?

PEP Advice by HICC: PEP Recommended

PEP not recommended

Signature of HICC staff

Signature of Healthcare worker

**Table.2**

<b>Number</b>	<b>Profession</b>	<b>Department</b>	<b>Type of exposure</b>	<b>PEP</b>
1.	Doctor	Paediatrics	ET suctioning, adequate PPE not worn	Recommended
2.	Junior Resident	Paediatrics	ET suctioning, NG tube insertion, LP, Intubation, PPE-only gloves worn, adequate PPE not worn	Recommended
3.	Junior Resident	PICU-Paediatrics	ET suctioning, NG tube insertion, LP, Intubation, PPE-only gown worn, adequate PPE not worn	Recommended
4.	Junior Resident	Paediatrics	ET suctioning, NG tube insertion, LP, Intubation, PPE-only gown worn, adequate PPE not worn	Recommended
5.	Junior Resident	Paediatrics	Tracheal tube maintenance & ET suctioning, adequate PPE not worn	Recommended
6	Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning, adequate PPE not worn	Recommended
7	Junior Resident	Paediatrics	Tracheal tube maintenance & ET suctioning, adequate PPE not worn	Recommended
8	Nursing Officer	PICU-Nursing Section	Tracheal tube maintenance & ET suctioning, adequate PPE not worn	Recommended
9	Junior Resident	Paediatrics	ET suctioning, PPE not worn	Recommended
10	Junior Resident	Paediatrics	Tracheal tube maintenance & ET suctioning, adequate PPE not worn	Recommended
11	Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning, adequate PPE not worn	Recommended
12	Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning & intubation , adequate PPE not worn	Recommended
13	Nursing Officer	PICU-Nursing Section	Tracheal tube maintenance-adequate PPE worn & ET suctioning- adequate PPE not worn	Recommended
14	Nursing Officer	Paediatrics-Nursing Section	Present nearby during ET suctioning & intubation, adequate PPE worn	Not Recommended
15	Nursing Officer	PICU-Nursing Section	ET suctioning, NG tube insertion, Intubation, adequate PPE worn	Not Recommended

16	Senior Resident	PICU-Paediatrics	Present nearby during ET suctioning, adequate PPE not worn	Recommended
17	Senior Resident	PICU-Paediatrics	Present nearby during ET suctioning, adequate PPE not worn	Recommended
18	Professor	Paediatrics	Present nearby during ET suctioning, adequate PPE not worn	Recommended
19	Intern	PICU-Paediatrics	ET suctioning performed, adequate PPE worn	Not Recommended
20	Senior Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning & tracheal tube maintenance, adequate PPE not worn	Recommended
21	Senior Nursing Officer	PICU-Nursing Section	Not performed any procedures, not handled any specimen	Not Recommended
22	Junior Resident	Paediatrics	ET suctioning performed, adequate PPE worn	Not Recommended
23	DRL	Paediatrics	Present nearby during all the procedures, adequate PPE not worn	Recommended
24	Senior Resident	PICU-Paediatrics	ET suctioning performed, adequate PPE not worn	Recommended
25	Senior Resident	PICU-Paediatrics	Present nearby during all the procedures, adequate PPE not worn	Recommended
26	Nursing Officer	PICU-Nursing Section	Tracheal tube maintenance & ET suctioning, adequate PPE worn	Not Recommended
27	Nursing Officer	PICU-Nursing Section	Tracheal tube maintenance & ET suctioning, adequate PPE worn	Not Recommended
28	Junior Resident	Paediatrics	ET suctioning performed, adequate PPE not worn	Recommended
29	DRL	PICU-Paediatrics	Not performed any procedures, not handled any specimen	Not Recommended
30	DRL	PICU-Paediatrics	Not performed any procedures, not handled any specimen	Not Recommended
31	DRL	PICU-Paediatrics	Not performed any procedures, not handled any specimen	Not Recommended
32	DRL	PICU-Paediatrics	Not performed any procedures, not handled any specimen	Not Recommended
33	Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning, adequate PPE not worn	Recommended
34	Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning & tracheal tube maintenance, adequate PPE not	Recommended

			worn	
35	Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning, adequate PPE not worn	Recommended
36	Nursing Officer	PICU-Nursing Section	Present nearby during ET suctioning, adequate PPE not worn	Recommended
37	SRF	Microbiology	Handled blood (non infectious)	Not Recommended
38	Lab Technician	Microbiology	Handled blood (non infectious)- centrifugation ,pipetting & loading	Not Recommended
39	Lab Technician	Microbiology	Handled samples after DNA extraction (non-infectious)	Not Recommended
40	Lab Technician	Microbiology	Handled blood & urine (non infectious) & CSF / centrifugation,pipetting& loading	Recommended
41	Medical Lab Technologist	Microbiology	Handled blood (non infectious) / centrifugation,pipetting & loading	Not Recommended
42	Lab Technician	Microbiology	Received CSF specimen, worn gloves	Not Recommended
43	Lab Technician	Microbiology	Handled CSF/Tracheal aspirate & sputum / pipetting & loading, worn adequate PPE, adquate PPE worn	Not Recommended
44	Medical Lab Technologist	Microbiology	Handled CSF,Tracheal aspirate & urine (non infectious) / centrifugation,pipetting& loading , adquate PPE worn	Not Recommended
45	Technical Officer	Microbiology	Handled blood (non infectious) & CSF / centrifugation ,pipetting & loading, adquate PPE worn	Not Recommended
46	Medical Lab Technologist	Microbiology	Handled blood (non infectious) & CSF / centrifugation & loading, adequate PPE not worn	Recommended
47	Lab Technician	Microbiology	Handled blood (non infectious) / centrifugation & loading	Not Recommended
48	Lab Technician	Microbiology	Handled blood (non infectious) / centrifugation & loading	Not Recommended
49	Technical Officer	Microbiology	Handled Tracheal aspirate & sputum / Culture & smear preparation, worn gloves and mask	Not Recommended
50	Medical Lab Technologist	Microbiology	Handled blood (non infectious), Tracheal aspirate &	Not Recommended



			sputum, worn only gloves, adequate PPE not worn	
51	B.Sc(MLT) Intern	Microbiology	Handled blood (non infectious) & CSF / Culture & smear preparation	Not Recommended
52	M.Sc Student	Microbiology	Handled CSF (infectious) & urine (non infectious) / centrifugation, pipetting & loading, worn adequate PPE	Not Recommended
53	B.Sc(MLT) Intern	Microbiology	Handled CSF, Tracheal aspirate (infectious) & urine (non infectious) / centrifugation, pipetting & loading, -worn adequate PPE	Not Recommended
54	DRL	Microbiology	Received samples in reception, worn adequate PPE	Not Recommended
55	Research Assistant	Microbiology	Handled blood (non infectious) & CSF / centrifugation, pipetting & loading, adequate PPE not worn	Recommended
56	Lab Technician	Microbiology	Handled blood (non infectious)	Not Recommended
57	Junior Resident	Microbiology	Not handled any samples directly, handled the culture plates of the sample	Not Recommended
58	Junior Resident	Microbiology	Not handled any samples directly, handled the culture plates of the sample	Not Recommended
59	Junior Resident	Microbiology	Not handled any samples directly, handled the culture plates of the sample	Not Recommended
60	Junior Resident	Microbiology	Not handled any samples directly, handled the culture plates of the sample	Not Recommended
61	Faculty	Microbiology	Not handled any samples directly, handled the culture plates of the sample	Not Recommended
62	Faculty	Microbiology	Not handled any samples directly, handled the culture plates of the sample	Not Recommended
63	Faculty	Microbiology	Not handled any samples	Not Recommended

(\*ET-endotracheal Tube, \*\*NG- Nasogastric, \*\*\*LP-Lumbar Puncture)

Considering rabies as a differential diagnosis in the early stages of the disease, following adequate personal protective barriers while

handling the patient as well as the patient samples, and thorough risk analysis of the exposed persons can help to avoid

recommending unnecessary PEP.

In our hospital, 44.4% of the HCW's who were screened, were recommended to take PEP. Our PEP recommendation rate was comparable to the previous studies done in similar settings after a transplant exposure to rabies, whose PEP coverage in HCW's was reported as 44-50%. (8-15). In few cases of transplanted corneas, where there were only a few HCW's who were exposed, PEP was given to all of them after the confirmation of rabies. Contrary to this, in a case of non-transplant patient, HCW's with even low and no risk received PEP, even though it was recommended only for high risk exposures. (16). There were 2 other reports from California which occurred in the same year. One case was diagnosed postmortem, after which 72 HCW's received PEP. Another was an antemortem case, in which only 1 HCW received the PEP. (17).

Only 1 report of pre exposure prophylaxis was available for a patient whose rabies was diagnosed ante mortem, in which 3 pathologists received the prophylaxis after performing autopsy. (18). As rabies usually causes severe neurological complications and fatal infection, the use of excessive PEP may be considered among HCW's, as they may have a fear of transmission of disease during the care of the patient. This may also lead to disproportionate deviation from the PEP guidelines. (19, 20). The staff from the Hospital Infection Control clarified all the queries raised by HCW's in an objective and timely manner. In addition to this, they also provided comprehensive education regarding the risks of rabies transmission and the use of PEP for all those HCW's and the laboratory staff who were considered as high risk exposures.

In summary, after confirming that it is a case of rabies, an integrated attempt was put up by

our infection control staff, which culminated in a prompt risk analysis of all those who were potentially exposed i.e high HCW's and the laboratory staff. Our team figured out and counseled 63 HCW's who were potentially exposed, to alleviate their fear regarding the nosocomial spread of rabies to them. A total of 28 (44.4%) HCW's were recommended to receive PEP. We also counselled the HCW's regarding the use of standard precautions while handling the patients and their samples and also to use adequate PPE during performing all the procedures. As suggested in the literatures and also from our own experience, human-to-human transmission of rabies is very rare. Therefore a reactionary approach should be applicable for determining which HCW's should receive PEP after caring for a patient with rabies.

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