Assessment of knowledge of health professionals regarding post exposure prophylaxis of rabies; a pilot study

Short title: Knowledge regarding PEP of Rabies among health care providers

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Abstract

Rabies is a fatal zoonotic disease presented by viral encephalitis by Lassa viridae known as Rabies virus. It is a global health and financial burden with no improvement in its epidemiology. Purpose of present study was to study the knowledge level of different health care professionals regarding rabies. Cross-sectional study approved vide letter HCM&D/CHS/15/2019 was conducted among on job or on training health care professionals at different public/ private hospitals in four cities of Pakistan. Knowledge level was assessed by scoring the questions. Sample size was calculated to be 384. SPSS-26 was used for statistical analysis. Out of 455 participants with average age of 31.9 ± 8.7 years, 53% participants were found to have average knowledge level and only 19% were found to have good knowledge about rabies. Major lack of knowledge was about duration of wound washing (29.2%), selection of WHO recommended protocol of ARV injection on 0^{th}, 3^{rd} and 7^{th} day post bite (37%) and RIG injection (56%). Results were dependent upon education level but not gender. Information regarding rabies is not sufficient even in health care professionals. The cases of rabies related deaths are on a rise. To overcome this problem persistent information dissemination is required. Combined initiatives of government, civil society and health department along with general public are required to raise awareness, education and for policies to achieve the target of "Rabies – zero by 30"

Key Words

Rabies, Post exposure prophylaxis, PEP, Health professionals

Introduction:

Rabies is a fatal viral encephalitis which was considered to be transmitted only by rabid dog bite but it is now confirmed that can be spread by casual contact with bats as well (Hankins and Rosekrans, 2004). Probable pathogenesis is viral spread along peripheral nerves to the CNS causing encephalomyelitis

(Hankins and Rosekrans, 2004). Number of cases ranges between 7 – 9.8 cases/million per year (Parviz, Chotani et al., 2004). 60,000 deaths were reported in Asia & Africa in year 2019 (Khan, Ayaz et al., 2019). Every 4th out of 10 victims is < 15 years of age (Factsheet, 2021). Treatment and prophylaxis is a very big financial burden globally in the year 2015 only, human rabies vaccine has cost $490 million and dog vaccine has cost $9 million in a year (Hampson, Coudeville et al., 2015).

It is therefore important to put major emphasis on prevention of rabies to save lives and to reduce the cost of treatment (Gangal, 2019). If the person gets exposed to a rabid animal, that animal should be observed for 10 days (Mitmoonpitak, Tepsumethanon et al., 1998) as it is observed that the rabid feline is not found alive more than 10 days (Tepsumethanon, Lumlertdacha et al., 2004).

Efficient post exposure prophylaxis is the mainstay for preventing death from rabies which includes extensive wound washing, intradermal vaccine and intra-wound immunoglobulin (Kessels, Tarantola et al., 2019). To reach this optimal goal awareness regarding rabies should be disseminated thoroughly (Salahuddin, Jamali et al., 2011).

Present study is designed to assess the knowledge level of health profession related individuals regarding rabies and its management. To the best of knowledge this is the first report on assessment of knowledge of health professionals in Pakistan.

Methodology

Study design

A cross-sectional observational study was conducted from Nov 2019 – Nov '20. The study protocol was approved by the ethical committee of medical college with the letter number HCM&D/CHS/15/2019.

Study population

The target population was paramedical staff, doctors, pharmacist and nurses (graduate and post graduate) who were serving in public and private sector hospitals in Karachi, Sindh.

Study tool

Tool was a questionnaire which was designed keeping in view the earlier surveys conducted elsewhere. It was a pre-tested questionnaire with both open ended and closed ended questions. It included questions related to rabies, its treatment and prevention and control. It contained two portions one consisted of demographic information (4 questions) and the other consisted of knowledge level about PEP of rabies (17 questions). The correct options were numbered 01 and wrong answer was numbered 00.

Sample size

Sample size was calculated using sample size formula for proportions or descriptive study. The formula is $n = [DEFF \times Np (1 - p)]/[(d^2/z^2_{1-a/2} \times (n - 1) + p \times (1-p)]$. At the population size of 1 million and anticipated % frequency of 50% (Rezaeinasab, Rad et al., 2007) of population to dog bite exposure, the sample size was calculated to be 384 (AG, KM et al., 2013). .

Protocol

The study participants were contacted and were briefed about the study and after obtaining verbal consent they were asked to fill the questionnaire with the promise of confidentiality.

Statistical analysis

Data was analyzed using descriptive stats for demographic details on Statistical Package for social sciences (IBM SPSS – 26). "Kolmogorov – Sminorov test" was applied for distribution. For "Inferential statistics" Kruskal Wallis test was applied to assess difference and "Spearman's rank correlation

coefficient" test to study correlation between variables. "Pearson's χ^2 test of correlation" was applied to observe correlation between knowledge of different variables on the basis of education field between different health professional groups. Results were considered significant when $p<0.01$ in "Spearman's test of correlation" and $p< 0.05$ for other tests.

Results

Demographic characters

Total eight hundred people were contacted for interview. Many responses were not found proper therefore after complete scrutiny 455 responses were included in the study, thus giving us the response rate of 56.9%. Shapiro-Wilk and Kolmogorov-Sminorov tests showed non-normal distribution of the data.

The gender distribution of the respondents was equal with 235 male participants (51.6%), average age of participants was 31.9 ± 8.7 years. As the participants were health professionals their basic degrees were intermediate (*n* = 80; 17.5%), graduation (*n* = 293; 64%) and post-graduation (*n* = 82; 18%). Hundred percent participants of the study were employed (Table 1).

Table 1: Demographic details

S. No.	**Demographic details**		**χ^2 (*p* value)**
	Age	31.93 ± 8.7	-
	Age strata		**68.062 (*p* < 0.001)**
	<25 years	69 (15.2%)	
	25 – 30 years	187 (41.1%)	
	>30 years	199 (43.7%)	
	Gender		0.495 (*p* > 0.05)
	Male	235 (51.6%)	
	Female	220 (48.4%)	

	Education		**301.63 ($p < 0.001$)**
	Undergraduate		
	Paramedical staff	80 (17.6%)	
	Graduate		
	MBBS	185 (40.7%)	
	BSN	58 (12.7%)	
	Pharmacist	50 (11%)	
	Post Graduate		
	FCPS	36 (8%)	
	Post BSN	36 (8%)	
	Masters Pharmacy	10 (2.2%)	

Assessment of knowledge towards Rabies

The knowledge level of participants was assessed by focused queries regarding etiology, sign symptoms, post exposure prophylaxis and treatment option. All the responses were scored; the correct replies were marked as one (1) while wrong answers were taken as zero (0). The scoring depended upon the number of correct replies ranged between 17 as maximum and zero as minimum. Cut off level of ≤ 9 was considered poor, points scored from 10-13 were taken as average and ≥ 14 was considered as good knowledge about rabies.

Out of 455 participants 242 (53%) were found to have average knowledge, 127 (28%) had poor knowledge and 86 (19%) showed good knowledge ($\chi^2 = 86.25$, $p < 0.001$). There were four important questions regarding transmission of disease where 47% ($n = 214$) participants fall in average / good knowledge but in case of questions regarding management of the disease 54 % ($n = 247$) were found to have good / average knowledge.

When the respondents were asked about the most common vector for disease transmissions 83 % (*n* = 378) responded correctly. The correct response by the respondents for possibility of human to human transmission of rabies was found to be 54 % (*n* = 246). 419 respondents (92 %) were having knowledge about the disease transmissions by the bite of any rabid animal to the humans. In majority i.e. 86% (*n* = 389) participants had a false impression that the disease can be spread by the lick of rabid animal on the intact skin of any human.

Although the traditional therapy of any kind is extremely harmful and non-valid for the prevention of rabies; still 152 (33.4%) professional were of the view that traditional therapies can prevent Rabies (χ^2 = 28.81, $p < 0.05$) while 303 (66.6 %) were having correct information in this regards.

387 (85%) respondents had the knowledge for wound washing of dog bite site with soap and water, but only 29.2% (*n* = 133) had the right information for the duration of washing, i.e. 15-20-minute duration.

317 (70%) professional had knowledge about the anti-Rabies vaccination being done at their institutions, only 287 (37%) had the WHO recommended protocol information about the intra dermal injections of 0.1 ml in both arms for 0^{th}, 3^{rd} & 7^{th} day post bite.

254 (56%) of the professionals had the knowledge about the injection of rabies immunoglobulins into the wound caused by the bite and the correct volume to be injected, according to the weight of the patient (Table 2 & 3).

Assessment of knowledge based on education qualification

Spearman's ρ test of correlation between variables showed significant association with respect to educational qualification of the respondents in three questions. First question was about safe administration of RIG post bite (ρ = -0.106; *p* = 0.024) with highest response from para medical staff (*n* = 54/80; 67.5%). Regarding the question about survival of rabies virus is water the correct answer was

strongly dependent on education (ρ = - 0.133; p = 0.004) with highest response in post graduate participants (n = 47/82, 57.3%) followed by graduates. Sign of rabid animal was the question with multiple options. The correct answer was associated with education (ρ = - 0.25, p < 0.001) with highest correct response from paramedical (n = 66/80; 82.5%)

Discussion

Rabies, a fatal zoonotic disease, costs for on average 160 lives globally per day (Fenelon, Dely et al., 2017) the major vector of disease is dog in Pakistan, but cats and bat may also contribute (Organization, 2018). Post dog bite, the virus ascends 12-100 mm/day in the nerves towards CNS (Kucera, Dolivo et al., 1985). There have been several attempts to control & eradicate Rabies but it distinctively retains its highest case fatality ratio among all infectious diseases (Rupprecht, Hanlon et al., 2002). The at risk population 5 - 14 years of age (Singh, Jain et al., 2001) and old age people (Rupprecht, Hanlon et al., 2002).

Despite a very severe and continuous risk to human life, knowledge regarding rabies has not been transferred to professionals and trainee staff. On extensive scrutiny of the literature, knowledge level of participants of different studies showed major differences and deficiencies. 72.3 % health care workers in Addis Ababa, Ethiopia expressed moderate knowledge levels (Ali, Ahmed et al., 2013) where as low knowledge reached 43 % in Chad (Mbaipago, Mindekem et al., 2020). Among 162 health care professionals 59.9 % demonstrated average knowledge in Dehradun, India (Kishore, Singh et al., 2015) 56 % health care participants had average knowledge about the disease & treatment Jaipur, India (Kapoor, Baig et al., 2019). Present study showed 53% professionals with average knowledge & only 19 % has good knowledge (χ^2 =

86.25, $p < 0.001$) which strongly depends upon educational qualification ($\chi^2 = 28.47$, $p = 0.005$). This result is in consistence with studies of Ethiopia (Ali, Ahmed et al., 2013, Yalemebrat, Bekele et al., 2016).

In Sri Lanka (Matibag, Kamigaki et al., 2007), 79 % population knows that rabies is fatal, 90 % has the knowledge that dog is a common vector, but still 58 % of the study population had the ownership of animal, living alongside the household with variable veterinary preventive health care. In Tanzania (Sambo, Lembo et al., 2014), 17% of the study population owns unvaccinated dogs. In a survey done in Pakistan, it was noted that the 74 % animal owners were never vaccinated for the disease and only 26 % of the household animals had ever been vaccinated for rabies, which too was improperly given any booster dose (Ahmed, Hussain et al., 2020).

According to WHO, in case of category 3 exposure (Organization, 2018) only Post exposure prophylaxis (PEP) can prevent from rabies that includes wound washing with soup water, rabies immunoglobulin (RIG) according to the weight of the victim & anti rabies vaccination (Kessels, Tarantola et al., 2019). Around 15 million people receive PEP (Dietzschold, Faber et al., 2003, Singh, Singh et al., 2017). Yet awareness wound washing remains only 5 % in Tanzania (Sambo, Lembo et al., 2014) even the knowledge of significance of wound washing is low in healthcare providers as in Haiti only 34 % professionals emphasized on wound washing as a major workout of PEP. Present study showed that 85 % of healthcare providers in Pakistan knew that wound should be washed, out of which only 29 % of the study population had the information about the proper method of washing and for at least 15-20-minute duration (Singh, Bhardwaj et al., 2013).

Few studies showed knowledge level strongly associated with gender as in studies by Ali et al (Ali, Ahmed et al., 2013) and Yalemebrat (Yalemebrat, Bekele et al., 2016) i.e. female participants did not show knowledge at par with their male counterparts. This effect was not found in present study as responses and knowledge levels of both gender suggested that knowledge is bases upon inquisitiveness of the individual.

PEP includes injection of anti-rabies virus which is cell culture based: administered 0^{th}, 3^{rd} & 7^{th} day post bite intra dermally (Organization, 2018). Along with either human rabies immunoglobulin (HRIG) with dose of 20 IU/ kg of body weight (Christian, Blanton et al., 2009, Organization, 2018) at the exposure site or Equine rabies immunoglobulin (ERIG) with the dose of 40 IU/ kg of body weight (Organization, 2018). In USA (Hennenfent, Iyengar et al., 2018), 39.4 % practicing doctors and veterinary practitioners selected correct PEP schedule and 49 % responders correctly identified the WHO recommended site of administration. It is very necessary to ensure that victim of animal assault is positively & timely exposed to effective & complete PEP to avoid fatality which is inevitable if not treatment is not provided (Mbaipago, Mindekem et al., 2020).

Current study as well as previous studies showed that despite the fact that Rabies is a fatal disease; people do not take thing seriously. It is very common that random pet as well as stray dogs are handled affectionately by people of all ages without knowing the vaccination status of the animal handled (Matibag, Kamigaki et al., 2007). Awareness regarding safety, prevention & PEP is very necessary to be disseminated through print & electronic media for all age groups along with hands-on first aid training for wound irrigation for adolescents in their schools as

part of first aid in physical training. Under the present circumstances of hundreds of Dog bite victims across Pakistan on daily basis, it is highly needed to develop anti-Rabies vaccination centers alongside every district basic health units (BHUs), with proper trained doctors / staff and a consistent supply of immunoglobulins & vaccines to eliminate the deaths due to rabies. WHO has recommended that the national policies & institutions, public & private hospitals and the victims and their families must work synchronously in an attempt to effectively eliminate rabies globally by year 2030 (Organization, 2018).

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CONTRIBUTION OF AUTHORS

Humera Ishaq – data analysis, result compilation and final write up; Kiran Khan – Basic conceptualization and initial research design; Ata-ur-Rehman, Concept, data entry and final write up; Farzana Sadaf - Data collection; Muhammad Furqan – Ethical contribution and final approval of manuscript; Humayun Siddiqui, Fatima Zulfiqar, Fiza Iqbal, Abbas Mehdi – field worker and data collection; Hira Rashid – data collection.

CONFLICT OF INTEREST

Authors declare no conflict of interest

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Table 2: Chi squared test of correlation between groups

S. No.	Variable		Total		Education Level							
	Questions	Scoring Answer	Total	Chi Square (df)	BSN	Post BSN	MBBS	FCPS	Para medics	Pharm D	Pharm PG	Chi Square
1	Have you Heard about Rabies	Yes	432 (94.9%)	**777 (2)**	54	34	175	35	76	48	10	15.59(NS)
2	Main Vector	dog	378 (83%)	**823 (3)**	54	24	147	32	66	45	10	29.42(0.043)
3	Human to human spread	No	246 (54%)	**189 (2)**	29	24	106	11	46	22	8	26.83(0.008)
4	Spread by dog bite	Yes	421 (92.5%)	**718 (2)**	54	32	167	35	73	50	10	14.52(0.269)
5	Spread by licking	No	65 (14%)	**460 (2)**	10	5	25	4	9	11	1	9.96(0.619)
6	Inevitable death after Dog bite	Yes	371 (81.5%)	**480 (2)**	45	32	157	33	55	40	9	18.63(0.098)
7	Traditional treatment beneficial?	No	304 (66.8)	**251 (2)**	40	22	136	20	57	25	4	28.81(0.004)
8	Wound washing	Yes	385 (84.6%)	**542.7 (2)**	52	31	159	25	72	37	9	44.07(0.000)
9	Duration of washing	15/20	133 (29%)	**12.36 (2) p<0.05**	13	20	70	9	7	11	3	70.24(0.000)
10	Observation of dog after biting	Yes	361 (79.3%)	**439.2 (2)**	45	30	147	27	67	35	10	12.16(0.433)
11	Days of observation	10Day	246 (54%)	105.8 (2)	35	19	96	17	57	16	6	23.77(0.022)
12	Awareness about ARV	yes	317 (69.7%)	286.5 (2)	27	22	147	24	58	30	9	51.86(0.000)

13	Safe RIG administration after Dog bite	7 Days	254 (55.8)	138.6 (2)	31	14	98	20	54	28	9	16.93(0.152)
14	Prevention & Control	All	274 (60.2)	314.5 (3)	32	19	120	20	61	21	1	47.97(0.000)
15	Viral survival in water	No	246 (54%)	92.04 (2)	34	23	112	20	33	20	4	33.67(0.001)
16	Signs of rabid dog	All	341 (74.9%)	609.8 (3)	45	28	157	24	66	20	1	157.03(0.000)
17	Schedule for Vaccination	I/D 0^{th}, 3^{rd}, 7^{th} day post bite	287 (63.1%)	191.5 (2)	29	20	120	26	64	23	5	25.73(0.012)

Table 3: Level of Knowledge on whole and education level basis

Variable		Total		Education Level							
		Total	Chi Square (df)	BSN	Post BSN	MBBS	FCPS	Para medics	Pharm D	Pharm PG	Chi Square
Level of Knowledge	Poor	127 (28%)	86.25 (2) P < 0.05	20	8	39	12	20	26	2	28.47(0.005)
	Average	242 (53%)		29	22	100	19	43	22	7	
	Good	86 (19%)		9	6	46	5	17	2	1	