

Epidemiology of rabies in Pakistan: A review of literature.

Farida Bibi Mughal^{1*}, Bibi Hajira Irshad Ali²

¹Aga Khan University School of Nursing and Midwifery, Karachi, Pakistan

²School of Nursing, Shifa Tameer-e-Millat University, Islamabad, Pakistan

Abstract

Objective: This literature review aims to explore the risk factors, preventive measures and treatment options for people with rabies especially in Pakistan.

Introduction: It is suggested that nearly 2,000 to 5,000 deaths been reported annually due to rabies, in Pakistan. It is estimated that above 30,000 people die each year because of rabies in Asia. One Asian expires every 15 minutes where 15% are probable to be the children under 15 years.

Methods: Comprehensive and systematic literature search was undertaken by using various electronic research databases. Studies were eligible for this review if they were published in last twenty years in english language and focused on epidemiology, risk factors, consequences, prevention and treatment of rabies especially in Pakistan.

Results: Rabies is a prevalent disease and there are so many barriers especially in Pakistan which led this issue to persist. Lack of awareness and improper vaccination of dogs are the major leading issues which are increasing the number of patients affected by rabies day by day.

Conclusion: Results suggest that rabies is one of the common diseases in Asia and the root cause of which is lack of awareness and stray dogs especially in developing countries like Pakistan. Since this overlooked illness can lead to serious complications, the issue should be addressed to promote public health.

Keywords: Epidemiology, Rabies, Pandemic, Vaccinations, Socioeconomic status, Rabies immune globulin

Accepted on March 26, 2018

Introduction

Men's best friend, best security guard and the best threat detector, dogs have become a menace for human race causing a fatal disease of rabies. Over the centuries, the trend of having mammals as pets have increased, neglecting the fact they are the reason behind this deadly rabies. According to WHO, rabies is a serious zoonotic virus-related disease, conveyed to humans through contact (mainly bites and scratches) with diseased animals, both domestic and wild [1]. This virus attacks the brain, causing severe inflammation and death.

Rabies known as the oldest and deadliest diseases to mankind has been taking away precious lives since 4000 years. Brightman highlighted the devastation rabies has been causing over the time [2]. It's clear picture was presented in 500 BC. Further in 16th century its spread was investigated. Researchers proved that rabies can be transmitted from one dog to another and its virus is present in its saliva. Bench mark was when Pierre Galtier, Professor of Veterinary Medicine at Lyons proved that rabbits can also pass disease from one another. Moreover, its first case was reported in Chile, Latin America in March 1996 in a patient bitten from an infected bat and after that it reached out in whole world [3].

The burden of this disease is increasing day by day causing to lose many costly lives and building economic burden. Gongal and Wright estimates more than 563 million US

dollars being used for rabies in Asia, where the redouble lies [4]. According to Yousaf et al. above 30,000 people die each year because of rabies in Asia [5]. One Asian expires every 15 minutes where 15% are probable to be the children under 15 years. Over 3 billion people in emerging countries in Asia are prone to dog rabies. Moreover, statistics prepared by National Institute of Health, suggests nearly 2,000 to 5,000 deaths been reported annually due to rabies, in Pakistan [6]. Surprisingly in 2010, more than 97,000 cases of dog bites were reported by primary health care. Those managed by secondary and tertiary care facilities, private physicians and faith healers are not documented [7]. In addition, 99% of rabies in human occurs due to domestic dogs which are in large numbers in Pakistan [8]. Hence, the significance of this issue cannot be overlooked and comprehensive efforts are required to overcome this issue in Pakistan.

Besides, the threat of rabies is global. It is present in 150 countries and it is estimated to be highest in Asia [9]. This deadly disease has no boundaries; more than 55,000 people die of rabies each year all over the world signifying its pandemic spread by affecting almost 150 countries [10]. Whereas, dog rabies potentially threatens over 3 billion people in Asia and Africa [11]. Considering overwhelming effects of rabies in many countries especially Pakistan, this paper attempts to discuss prevalence, causes, prevention, management and recommendations with regards to rabies.

Materials and Methods

Comprehensive review of literature was done from various articles using SAGE, PubMed, Cochrane, CINAHL, Medline, PsycINFO, using search terms such as rabies, dog bite, Pakistan, Asia, public health, epidemiology, culture, barriers etcetera. Moreover, links to “related articles” were accessed in electronic databases. Inclusion criteria included articles in English as funds were not available to translate articles published in non-English languages. Articles published since the last ten years were preferred; however, few older articles were also included as some key studies conducted many years ago have not been conducted in recent years. Research studies were selected that included occurrence, prevalence, risk factors of rabies especially in Pakistan. Moreover, prevention and treatment options for rabies were also examined.

Results

To mention, the barriers Pakistan is facing in eliminating rabies is mismanagement of vaccinations, unavailability of awareness sessions at mass level. India has launched a pilot project in 2008 for health professionals, which includes training of animal-bite management and for general public about the need to pursue post-exposure treatment, particularly through placing messages on automobiles and in other areas, which is readable and understandable by mass population because of it being pictorial in nature [12]. Hence such strategies should be replicated in order to decrease the burden of the disease.

Levels of prevention

At primary level, most important step is teaching those at jeopardy, about avoiding themselves and their pets from rabies and being responsible pet owners. People who have pets should vaccinate their pets especially dogs once a year followed by a booster dose in the same year and this dose should be repeated after every three years. High risk strategy can also contribute to decrease new incidences. In this strategy people at high risk such as veterinarians, animal handlers, rabies laboratory workers, and rabies biologics production workers should be offered rabies vaccine. Moreover, WISE approach should be emphasized that include wound washing (W), injecting immunogenic vaccines and immune globulins (I), and stray dog euthanization (SE) to prevent painful deaths from rabies. Successful elimination of rabies from animals will ultimately decrease its incidence in humans.

Many infected individuals remain asymptomatic causing rabies to be endemic. Therefore, early detection and treatment are very important which constitute secondary prevention. The standard test for diagnosis is direct immunofluorescent antibody (DFA) test [13]. Secondary prevention includes actions after exposure of agent that is if a rabid animal bites a person then also it is possible to control rabies by giving prompt treatment. This treatment is known as rabies post exposure prophylaxis (PEP) and consists of washing bite wounds, getting rabies immune globulin and then a series of vaccinations. If received shortly after exposure, PEP seems to be most effective in putting a stop to rabies. Unfortunately, PEP has been a failure in Pakistan due to lack of resources and mismanagement [14].

As a public health nurse, the prior duty of a nurse is to ensure proper awareness of this deadly disease and its outcomes. Furthermore, as concluded by Parviz et al. the major reason for treatment failure in Pakistan is useless vaccinations because of destroyed cold chain. The nurses should ensure availability of ice boxes because of the electricity problems and absence for refrigerators. Therefore, nurses must work with government and public health care centers to ensure proper maintenance of vaccines. Animal vaccination clinics are critical to deal with this disease and recover human and animal health around the world. In addition, establishment of rabies treatment centers are also important. As collaborator, public health nurses should ensure the strict policy implementation of vaccinated pets and stray dogs and cats should be removed from society and sent to dog houses [15]. Surveillance of rabies is the foundation for any program of rabies control. Surveillance helps adopt suitable actions towards animals in contact with an assumed animal case [7]. As well, community health nurses while working with the non-governmental organizations can make sure birth control among stray dogs and cats of the community. Also, follow-ups of the awareness and treatment facilities developed in community are essential.

Discussion

Epidemiological triad is the best way to explain all the infectious diseases including rabies. The triad is completed in the presence of a host, agent and environment. In relation to the triad for rabies the agent here is rabies virus which is the only necessary cause for this illness. Banyard and Fooks explain that rabies virus belongs to the Lyssavirus genus of Rhabdoviridae family [16]. If this necessary cause is removed the disease will never develop fulfilling the cessation of exposure component of Hill’s criteria. Since rabies is an infectious disease its virus can be isolated and transmitted from one animal to another. Pasteur proved the Koch postulates correct by transmitting the rabies virus in a rabbit and evidenced it by observing its spread from one rabbit to another [17]. Rabies is a disease of animals but can be transmitted to humans. Specifically, only mammals can carry rabies, predominantly bats [18]. Opposite to the fact that rabies is a dog disease, many wild animals carry rabies, especially raccoons, bats, and foxes in developed countries [19]. Conversely, in developing countries, dogs continue to be the main cause of rabies, with monkeys being the second most sources [20]. Virus and its habitat complete the environmental component of the triad. In addition, humans and animals both are considered to be preferred host of rabies virus since both are mammals. There are certain host factors that predispose a person to infection. According to Mayo Clinic, one risk factor is traveling to the countries like Africa and south East Asia where rabies is most common [21]. Secondly, campers or jungle explorers are more prone to rabies because of their contact with wild animals like bats, dogs and cats. Thirdly, workers at laboratory who work with the virus might get exposed to the virus. Moreover, if a person is bitten or has wound near the head or neck then the chances of developing rabies doubles because of the entry of virus near to the brain. Lastly, people with low socioeconomic status or people who live in villages are vulnerable to rabies because of the exposure to stray animals especially mammals. Poor hygienic conditions and garbage around attract such

animals and make humans especially children prone to come across the virus [22].

This agent-host-environment triad plays a key role in rabies transmission. Every kind of mammals is liable to develop rabies viral infection, but very few specific types are central as reservoirs. Rabies transmission occurs when infected saliva of host is passed into an uninfected person by a bite from a rabid animal. Minimal chances of rabies transmission through non bite exposures like cuts, abrasions, open injuries, or contaminated mucous membrane with saliva are there. Furthermore, rabies virus is present in the saliva of even a dead rabid animal. But once the animal dies the virus does not survive for long in the environmental conditions [23]. Besides, babying a rabid mammal, or dealings with their blood, urine, or feces, does not establish an exposure with the virus and is not a hint for rabies spread. So cause precedes the disease which fulfills the temporality criteria of Bradford Hill. Ironically, human to human transmission has also been reported by implanting the rabies infected organs of the donor to the recipients [24].

Once the virus is transmitted, it follows few stages termed as natural history of disease. It starts with susceptibility stage including certain risk factors which predispose people to rabies as discussed earlier. Next is subclinical stage. The incubation period varies from few days to several years; most apparently it appears in less than 6 months in humans. Pathogenesis of rabies in this stage is associated with the host immune response activated by rabies virus. When the virus arrives in the body of human, it initially attacks and starts to spread in the central nervous system and just after that symptoms begin to appear and it usually becomes untreatable and fatal within few days.

The third stage is clinical disease comprising of prodromal form, furious form and paralytic form. The initial clinical symptom is severe pain at the site of contamination or injury due to viral replication [5]. Prodromal stage lasts for 2-3 days and is characterized by anxiousness, nervousness and change in personality. Next is furious form which lasts for 1-7 days and it is characterized by aggression, hyperactivity, hydrophobia, hypersensitivity, and grand mal seizures. Third, is paralytic form which lasts for 1-10 days and it is characterized by paralysis of one or more limb and then progressively to entire nervous system. Coma gradually develops, and sooner or later death occurs [11]. The last stage is recovery, disability or death. If prompt treatment is given to the client that is washing the affected area more than 5 times and administration of immunoglobulin soon after exposure so it can decrease mortality rates in humans. Otherwise, once the symptoms starts to appear it is almost impossible to treat the client and the save the life [25].

The only way to prevent and treat rabies is vaccination. Louis Pasteur was the first person to produce a successful vaccine against rabies in the 1880s. Imovax and Rabavert are the vaccines used. Person who receives vaccine prophylactically are administered of 3 injections given on day 0, 7 and 21. After the exposure from rabid animal a series of 5 injections are given and the persons previously immunized with a completed rabies vaccine schedule need to receive 2 additional doses, post-exposure [26].

According to Yousaf et al. following are the preventive measures for rabies [5]. At primordial level, awareness regarding vaccination against rabies virus should be given at individual and mass level through electronic media especially television and radio channels and newspaper advertisement by health care authorities to reduce emergence of risk factor associated with rabies. Travelling to the areas or places where rabies is common or contact with mammals that can cause rabies should be avoided so people are not exposed to the risk factor.

Conclusion

In conclusion, rabies is a global threat affecting Asian countries in particular. It is an infectious disease caused by a virus. Its fatal prognosis and ineffective and inaccessible health care in Pakistan makes it imperative to solve this issue. Removal of stray dogs, mass awareness and vaccinated pets with effective post exposure treatment can lessen the burden of disease. In a nutshell, controlling this epidemic disease would only be possible by forming policies and partnerships at global, regional and national levels.

References

1. World Health Organization. WHO Expert Consultation on Rabies. WHO, Geneva. 2005.
2. Brightman C. Rabies: an acute viral infection. *Trends in Urology & Men's Health*. 2012;3(5):31-33.
3. Favi M, de Mattos, Yung CA, et al. First case of human rabies in Chile caused by an insectivorous bat virus variant. *Emerging Infectious diseases*. 2002;8(1):79-81.
4. Gongal G, Wright AE. Human rabies in the WHO Southeast Asia Region: forward steps for elimination. *Adv Prev Med*. 2011;2011:383870.
5. Yousaf MZ, Qasim M, Zia S, et al. Rabies molecular virology, diagnosis, prevention and treatment. *Virology*. 2012;9.
6. Askari J. WHO, Indus hospital to conduct survey on rabies. *The nation*. 2008.
7. World Health Organization. Rabies control program. WHO, Geneva. 2017.
8. Dzikwi AA, Umoh JU, Kwaga JKP, et al. Rabies vaccination and immune status of owned dogs in Zaria, Nigeria. *Nigerian Veterinary Journal*. 2011;32(3):204-207.
9. World Health Organization. Rabies epidemiology and burden of disease. WHO, Geneva. 2018.
10. Song M, Tang Q, Wang D, et al. Epidemiological investigations of human rabies in China. *BMC Infect Dis*. 2009;9.
11. World Health Organization. Rabies. WHO, Geneva. 2013.
12. Chatterjee P. India's ongoing war against rabies. *Bull World Health Organ*. 2009;87(12):891-92.
13. Durr S, Mindekem R, Diguimbye C, et al. Rabies diagnosis for developing countries. *PLOS Negl Trop Dis*. 2008;2(3):e206

14. Parviz S, Chotani R, McCormick J, et al. Rabies deaths in Pakistan: Results of ineffective post-exposure treatment. *Int J Infect Dis.* 2004;8(6):346-52.
15. Florida Department of Health. Rabies control and prevention in Florida. 2012:1-122.
16. Palmar SR, Soulsby L, Torgerson PR, et al. *Oxford Textbook of Zoonoses.* 2011.
17. Najera RF. Discovery of rabies virus. 2013.
18. Livermore DM. Multiple mechanisms of antimicrobial resistance in *Pseudomonas aeruginosa*: Our worst nightmare? *Clin Infect Dis.* 2002;34(5):634-40.
19. Centers for Disease Control and Prevention. Rabies Infection and Animals. CDC, US. 2007.
20. Quinzio M, McCarthy A. Rabies risk among travellers. *CMAJ.* 2008;178(5):567.
21. <https://www.mayoclinic.org/diseases-conditions/rabies/symptoms-causes/syc-20351821>
22. Costa P, Briggs DJ, Tumpey A, et al. World Rabies Day outreach to Asia: Empowering people through education. *Asian Biomed.* 2009;3(4):451-57.
23. Zinsstag J, Durr S, Penny MA, et al. Transmission dynamics and economics of rabies control in dogs and humans in an African city. *Proc Natl Acad Sci.* 2009;106(35):14996-15001.
24. Bronnert J, Wilde H, Tepsumethanon V, et al. Organ transplantations and rabies transmission. *J Travel Med.* 2007;14(3):177-80.
25. <https://www.cdc.gov/>
26. Salahuddin N. Rabies Prevention in Pakistan. 2009.

***Correspondence to:**

Farida Bibi Mughal
Aga Khan University School of Nursing and Midwifery
Karachi
Pakistan
Tel: +923322479266
E-mail: faridaqurban@yahoo.com