# 1 INTRODUCTION

Dog bite injuries represent a neglected public health problem that has increased over time in many countries of the world. The consequences of a dog bite injury may include trauma, transmission of zoonotic diseases, infection at wound site and even death due to rabies. In addition; such injuries have a negative economic impact on affected individuals and health services. In developing countries, most bites are caused by stray dogs ([Munibullah et al., 2020](#_ENREF_5)). It is estimated that each year, over 10 million people get post-exposure prophylaxis of rabies which indicates the gravity of the problem ([Ghosh et al., 2020](#_ENREF_2); [Janatolmakan et al., 2020](#_ENREF_3)). The situation is even more alarming in developing countries where morbidity and mortality due to dog mediated rabies remains higher and unabated. Pakistan ranks fifth among most rabies affected countries in the world with 2000 to 5000 deaths each year ([Mughal & Ali, 2018](#_ENREF_4)). Various hospitals in the country have reported 25 to 30 cases of dog bites per day ([Wright, Subedi, Pantha, Acharya, & Nel, 2021](#_ENREF_7)). Globally , different approaches such as culling, sheltering, fertility control , combination of fertility control and sheltering have been implemented to manage population ([Smith et al., 2019](#_ENREF_6)). Recently, the country has introduced a capture neuter-vaccinate-and-release program in Punjab province to control dog population and reduce transmission of rabies. With limited resources, it is important to prioritize districts for this program and support other programs to control dog population and eliminate rabies ([Ahmad, Naeem, Akram, Ahmad, & Younus, 2021](#_ENREF_1)).

* 1. **Problem statement**

Earlier studies about dog bites in Pakistan are limited by spatial scale i.e., restricted to a few districts or mega cities ([Zaidi et al., 2013](#_ENREF_8)). Moreover, the routinely collected data by the health department has not been investigated to map disparity in distribution of incidence of dog bites. Also, there is a little empirical evidence about determinants of dog bites at district level which is the usual scale for planning control programs. It remains unclear which district level socio-economic, demographic and importantly remote sensing variables are associated with incidence of dog bites. Mapping the distribution and risk of dog bites is important to prioritize districts for dog population management, rabies control programs /interventions as well for further research on this issue.

**1.2 Objective(s)**

The objective(s) of this research were to map the incidence of dog bites and explore its association with selected socio-economic and demographic variables.

# 2 REVIEW OF LITERATURE

**2.1 Subheading**

**2.1.1 sub-subheading**

**2.1.2 sub-subheading**

**Instructions:**

* Literature review is a summary of the existing knowledge about the research topic.
* Usually, a literature review is written from ‘general to very specific’ and must be relevant
* A literature review may be structured thematically and have subheadings to identify themes.
* It is also essential to include a review of the local literature (work already done in the country)
* There is no need to ‘pad out’ the literature review with peripheral information, make it relevant, concise and informative.

# 3 MATERIALS AND METHODS

**3.1 Subheading**

**3.1.1 sub-subheading**

**3.1.2 sub-subheading**

**Instructions:**

* Methodology is a detailed description of how you actually did the study. It should enable its replication and to provide enough contextual detail to enable readers to understand and interpret the results.
* The methodology should include details of the study i.e., settings, time frame, sampling technique, sample size, sample selection, inclusion and exclusion criteria, study design, data collection procedure and data analysis. Also explain any methodological problems and how they were addressed.
* The hallmark of an exemplary methods section is the justification of why each method was used.

# 4 RESULTS

**4.1 Subheading**

**4.1.1 sub-subheading**

**4.1.2 sub-subheading**

**Instructions:**

* Results are presented as narrative, tables, graphs and figures.
* The narrative should highlight the main results and orientate the reader to the tables, graphs and figures.
* Give “results” for all outcome measures that are described under “Materials and Methods.”
* Judicious use of tables and/or ﬁgures, save editorial space and make it easier for the reader. Data in tables or figures should not be repeated in the text where only important observations should be summarized.
* Each table or ﬁgure should stand on its own and be self-explanatory. Tables and figures should communicate all salient details necessary for a reader to understand the findings without consulting the text.
* Results should be presented in terms of confidence intervals wherever possible. The important ﬁndings should be highlighted that may or may not be statistically signiﬁcant.
* Note that there should not be citations in the results section and you should not interpret results here.
* incidence of dog bites per 100000 of population at risk in Punjab, Pakistan (2016-2019)

****

**Figure 1** Crude incidence of dog bites per 100000 of population at risk in Punjab, Pakistan (2016-2019)

**Table 1** Output of simple linear (univariate) regression analysis

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | PD | RP | NTL | MPI | LIT |
| *Predictors* | *Estimates* | *Estimates* | *Estimates* | *Estimates* | *Estimates* |
| Intercept | 7.0954 \*\*\* | 5.2872 \*\*\* | 7.3064 \*\*\* | 3.4277 \*\*\* | 5.8101 \*\*\* |
| PD  | -0.0004 \*\*\* |  |  |  |  |
| RP |  | 0.0214 \*\*\* |  |  |  |
| NTL |  |  | -0.5670 \*\*\* |  |  |
| MPI |  |  |  | 0.0386 \*\*\* |  |
| LIT |  |  |  |  | 0.0263 \*\*\* |
| Observations | 36 | 36 | 36 | 36 | 36 |
| R2 / R2 adjusted | 0.427 / 0.410 | 0.397 / 0.379 | 0.328 / 0.309 | 0.318 / 0.298 | 0.288 / 0.267 |
| AIC | 44.988 | 46.827 | 50.697 | 51.238 | 52.794 |
| *\* p<0.05   \*\* p<0.01   \*\*\* p<0.001* |

# 5 DISCUSSION

**5.1 Subheading**

**5.1.1 sub-subheading**

**5.1.2 sub-subheading**

**Instructions:**

* Discussion is an interpretation of the results, what they mean and their importance
* This section should include: i) main results of the study, primary followed by secondary outcomes, ii) strengths and weakness of study, iii) unexpected results if any, iv) comparison (agreement or disagreement) of study with previous studies or pre exiting knowledge, v) reasons for differences and similarities with other studies, and possible explanation of significant findings, vi) conclusion, implications and direction for future research based on evidence generated. Avoid speculation and overstatements.
* Be honest to mention if there are any systematic biases or confounding in study that could not be avoided.
* Note that differences among studies could arise because context of studies e.g., study populations may vary.

# Literature Cited

Ahmad, W., Naeem, M. A., Akram, Q., Ahmad, S., & Younus, M. (2021). Exploring rabies endemicity in Pakistan: Major constraints & possible solutions. *Acta Tropica, 221*, 106011. doi: 10.1016/j.actatropica.2021.106011

Ghosh, S., Rana, M. S., Islam, M. K., Chowdhury, S., Haider, N., Kafi, M. A. H., . . . Jhora, S. T. (2020). Trends and clinico-epidemiological features of human rabies cases in Bangladesh 2006-2018. *Sci Rep, 10*(1), 2410. doi: 10.1038/s41598-020-59109-w

Janatolmakan, M., Delpak, M., Abdi, A., Mohamadi, S., Andayeshgar, B., & Khatony, A. (2020). Epidemiological study on animal bite cases referred to Haji Daii health Center in Kermanshah province, Iran during 2013-2017. [Evaluation Study]. *BMC Public Health, 20*(1), 412. doi: 10.1186/s12889-020-08556-1

Mughal, F. B., & Ali, B. H. I. (2018). Epidemiology of rabies in Pakistan: A review of literature. *J Infectious Disease Med Microbiol. 2018; 2 (1): 18-21. J Infectious Disease Med Microbiol 2018 Volume 2 Issue, 1*.

Munibullah, Habibullah, Rashid, H. B., Mushtaq, M. H., Sadiq, S., Hasan, S., & Chaudhry, M. (2020). Incidence of Animal-Bite Injuries Registered in Public Hospitals of Post-Conflict Swat District, Pakistan in 2014. *Am J Trop Med Hyg, 104*(1), 329-337. doi: 10.4269/ajtmh.20-0208

Smith, L. M., Hartmann, S., Munteanu, A. M., Dalla Villa, P., Quinnell, R. J., & Collins, L. M. (2019). The Effectiveness of Dog Population Management: A Systematic Review. [Review]. *Animals (Basel), 9*(12). doi: 10.3390/ani9121020

Wright, N., Subedi, D., Pantha, S., Acharya, K. P., & Nel, L. H. (2021). The Role of Waste Management in Control of Rabies: A Neglected Issue. *Viruses, 13*(2). doi: 10.3390/v13020225

Zaidi, S. M., Labrique, A. B., Khowaja, S., Lotia-Farrukh, I., Irani, J., Salahuddin, N., & Khan, A. J. (2013). Geographic variation in access to dog-bite care in Pakistan and risk of dog-bite exposure in Karachi: prospective surveillance using a low-cost mobile phone system. [Research Support, Non-U.S. Gov't]. *PLoS Negl Trop Dis, 7*(12), e2574. doi: 10.1371/journal.pntd.0002574