**Determinants of Compliance with Rabies Post-Exposure Prophylaxis Among Animal Bite Victims in Bangladesh**

**Evaluating Determinants of Rabies Post-Exposure Prophylaxis Compliance to Inform Policy Toward Elimination by 2030 in Bangladesh**

**Introduction**

Rabies is a preventable yet deadly zoonotic disease and remains a significant public health concern in Bangladesh, which aims to eliminate dog-mediated human rabies by 2030. Post-exposure prophylaxis (PEP) is provided free-of-charge nationwide, but adherence to the full PEP regimen among animal bite victims is suboptimal. This study aimed to assess the rate of PEP compliance and identify key factors associated with adherence among animal bite victims.

**Methods**

We conducted a hospital-based study using immunization records from the National Rabies Prevention and Control Centre (NRPCC) at the Infectious Diseases Hospital, Dhaka. Data from 457 animal bite patients who initiated post-exposure prophylaxis (PEP) between February and July 2022 were analyzed. Sociodemographic, clinical, and exposure-related factors were assessed using multivariable logistic regression.

**Results**

Of the 457 patients, 78 (17.1%) completed the full WHO‑recommended PEP schedule. Median age was 32 years (IQR 24–45); 54% were male. Most exposures were dog bites. Factors independently associated with higher adherence included being female (AOR = 0.63; 95% CI: 0.28–0.91), monthly household income below BDT 30,000 (AOR = 4.18; 95% CI: 2.07–8.47), residence within 10 km of the hospital (AOR = 3.82; 95% CI: 1.64–8.93), no prior knowledge of the treatment center (AOR = 0.33; 95% CI: 0.17–0.65), dog bite exposure (AOR = 0.59; 95% CI: 0.25–0.94), and wound washing with water only (AOR = 0.29; 95% CI: 0.14–0.91). The final model demonstrated excellent performance (AUC = 0.852; accuracy = 87.5%).

**Conclusion:**  
Despite the availability of free PEP, compliance among bite victims remains low in Bangladesh. This highlights the need for targeted interventions such as community education, improved follow-up, and enhanced accessibility to improve PEP adherence and support Bangladesh’s goal of eliminating rabies by 2030.

**Introduction:**

Rabies is a fatal but preventable zoonotic viral disease that can cause approximately 59,000 human deaths worldwide annually, predominantly in Asia and Africa where canine rabies remains endemic1. Dogs account for approximately 99% of human rabies cases, making control of dog-mediated transmission a crucial public health priority2,3. Despite the existence of safe and effective vaccines for over a century, rabies continues to cause preventable deaths, particularly in low- and middle-income countries where gaps in awareness, healthcare access, and program implementation persist4. Post-exposure prophylaxis (PEP), consisting of thorough wound cleansing, administration of a rabies vaccine, and, for severe exposures, rabies immunoglobulin (RIG)5, is the only proven intervention to prevent disease onset following potential rabies exposure6.

​In Bangladesh, rabies constitutes a significant public health threat, with an estimated 2,100 human deaths annually, placing the country among those with the highest rabies mortality rates globally7-9. Bangladesh has committed to eliminating dog-mediated human rabies by 2030, aligned with the WHO-led “Zero by 30” initiative through sustained mass dog vaccination, multi-sectoral public education, and expanded access to free PEP3. Nevertheless, achieving this goal requires ensuring high compliance with PEP among individuals exposed to potentially rabid animals10. Earlier reports from Bangladesh have documented encouraging levels of PEP uptake, yet substantial proportions of patients fail to complete the recommended anti-rabies vaccine (ARV) regimen11,12. Factors contributing to non-compliance include poor awareness of rabies and PEP schedules, financial hardship, long travel distances, difficulty accessing clinics due to work commitments, and the inconvenience of multiple follow-up visits13. Identifying and addressing these barriers is critical for ensuring the effectiveness of national rabies elimination efforts. Bangladesh provides free PEP at designated centers, following WHO guidelines for intradermal vaccine administration on Days 0, 3, and 7, with RIG given for Category III exposures14,15. However, evidence remains limited on the true rate of compliance with the full ARV schedule and the factors associated with incomplete PEP in the Bangladeshi context. Therefore, this study aimed to determine the rate of compliance with the WHO-recommended rabies vaccination schedule among animal-bite victims in Bangladesh and to identify key sociodemographic, clinical, and contextual factors associated with non-compliance. Insights from this study could guide targeted interventions to improve adherence and support Bangladesh’s progress toward rabies elimination.

**Methods:**

We obtained patient data from immunization records at the National Rabies Prevention and Control Centre (NRPCC), located within the Infectious Diseases Hospital (IDH) in Dhaka. IDH serves as Bangladesh’s primary referral center for animal-bite and rabies cases, offering free WHO‑recommended post‑exposure vaccination and treatment to patients nationwide4. Data was collected from patients of all age groups presenting to the IDH emergency department who initiated rabies post-exposure treatment between February and July 2022. We examined a comprehensive set of socioeconomic and clinical variables as independent predictors to identify potential risk factors for failure to complete the recommended vaccination schedule. These included age, sex, occupation, income level, highest educational attainment, residential location and distance to IDH, prior awareness of the rabies treatment center, details of the animal exposure (species, nature of exposure, number of bites or scratches, wound category, biting animal status, location, and reason for the bite), wound-care measures taken, and reported reasons for delayed attendance.

Dependent and independent variables need to be explained and explain their categories in short.

## Statistical analysis

We summarized categorical variables using contingency tables (counts and percentages), and applied Pearson’s chi‑square test when expected cell counts were adequate, resorting to Fisher’s exact test for tables with small, expected frequencies (i.e., when >20% of cells had expected counts <5 or any cell <1), ensuring accurate statistical inference16. We then employed logistic regression to identify factors associated with non‑compliance to the ARV regimen. Initially, univariable (crude) logistic regressions were carried out for individual predictors, with variables showing p < 0.20 considered for multivariable modeling—a common strategy in epidemiology to avoid premature exclusion of important predictors17. The multivariable model included all selected variables simultaneously, and results are reported as adjusted odds ratios (AOR) with 95% confidence intervals, using a two‑sided significance threshold of p < 0.0518. Multicollinearity was assessed via variance inflation factors (VIF), with values below 4 retained in the model19. All analyses were performed in IBM SPSS version 25.0 and map produced by R version 4.5.0.

**Model performance**

We evaluated the predictive performance of the final logistic regression model using several complementary measures. Discrimination was assessed via the area under the receiver operating characteristic curve (AUROC), which quantifies how well the model distinguishes between compliant and non‑compliant patients: values closer to 1 indicate stronger discrimination, with ≥0.70 considered acceptable20. Sensitivity and specificity were also derived at the optimal threshold to further characterize model accuracy. Overall goodness-of-fit were tested using the Hosmer–Lemeshow statistic: a non-significant p-value (>0.05) implies that predicted probabilities align well with observed outcomes21.

# **Results**

Between February and July 2022, 457 patients who had received the rabies vaccine at the NRPCC were interviewed to collect detailed information on their demographics, exposure circumstances, and vaccination adherence. The majority of animal-bite cases reported to the NRPCC were clustered in Dhaka city and its immediate surroundings, with several patients coming from peripheral districts outside the metropolitan area (Figure 1). The mean age of animal-bite patients was 25.9 years (SD = 15.6) (Table 1). The average monthly household income was BDT 34,105 (USD ≈ 273), with notable variability (SD = 45,119). Participants resided an average distance of 10.4 km (SD = 9.4) from the IDH, incurring mean travel costs of BDT 148 (SD = 113). The interval between exposure and presentation at the hospital averaged 3.2 days (SD = 14.8), although delays varied widely among patients. Medication expenses showed relatively little variation, averaging BDT 345 (SD = 46).

Figure 1: Map showing the geographic distribution of animal-bite cases reported to the National Rabies Prevention and Control Centre at the IDH, Dhaka, Bangladesh, February–July 2022.

A map of different countries/regions

AI-generated content may be incorrect.

**Figure 2:** Bar chart illustrating mean delays (in days) for delayed attendance to rabies post‑exposure prophylaxis at the National Rabies Prevention and Control Centre, IDH, Dhaka, Bangladesh (February–July 2022).

The leading cause of delayed rabies PEP initiation and completion was distance to the healthcare facility (mean delay = 8.36 days), followed by lack of awareness of the vaccine schedule (4.09 days) (Figure 2). Other contributing factors included illness (3.33 days), bite-related complications (3.11 days), work obligations (2.14 days), difficulty locating the hospital (1.90 days), and miscellaneous reasons (1.80 days).

Of the 457 patients included in the study, 78 (17.1 %) completed the entire WHO-recommended rabies vaccination course. Individuals aged ≥15 years had higher adherence than those under 15 (19.1% vs. 11.5%, p = 0.055), and females were more compliant than males (22.5% vs. 14.6%, p = 0.037) (Table 2). Profession was also linked to compliance (p = 0.027), with housewives (23.2%) and the “other” occupation group (30.0%) outperforming students and business workers. Lower-income participants (< BDT 30,000) demonstrated markedly better adherence than their higher-income counterparts (28.4% vs. 7.6%, p < 0.001). Although not statistically significant (p = 0.114), compliance was slightly higher among those with no formal or primary education.

Residing within 10 km of the hospital increased adherence (22.1% vs. 11.1%, p = 0.002). Notably, unfamiliar with the hospital before their visit had higher compliance (28.1% vs. 13.4%, p < 0.001), and those informed about the facility by relatives or others were more compliant than those informed by doctors or neighbors (p < 0.001). In terms of exposure, dog bites (21.9%) were associated with higher compliance than cat or other animal bites (p = 0.020), and bite wounds elicited better adherence than scratches (21.1% vs. 11.5%, p = 0.008). Multiple exposures (23.0%) improved compliance relative to single exposures (14.8%, p = 0.037), and exposure to stray animals showed a trend toward higher adherence (p = 0.055). Unprovoked bites (22.5%, p = 0.004) and Category III wounds (17.4%, p = 0.007) correlated with increased compliance. Prompt wound care, particularly washing with soap and water (15.1%), was strongly associated with better adherence compared to water-only, no treatment, or other methods (p < 0.001).

After multivariable adjustment, several factors remained independently associated with completion of the WHO‑recommended rabies vaccination schedule. Notably, individuals from low‑income households (< BDT 30,000) had more than four times higher odds of completing the regimen compared to those with higher income (AOR 4.18; 95% CI 2.07–8.47; p < 0.001) (Table 3). Female patients were significantly more adherent than males, with a 37% reduction in the odds of non-compliance (AOR 0.63; 95% CI 0.28–0.91; p = 0.025). Similarly, residing within 10 km of the hospital nearly quadrupled the odds of adherence (AOR 3.82; 95% CI 1.64–8.93; p = 0.002), while prior knowledge of the IDH reduced the odds of non-compliance by two-thirds (AOR 0.33; 95% CI 0.17–0.65; p < 0.001). In exposure-related factors, those experiencing scratches alone were more likely to adhere (AOR 1.77; 95% CI 1.16–3.66; p = 0.012), whereas patients with a single exposure had significantly lower odds of non-compliance compared to those with multiple exposures (AOR 0.41; 95% CI 0.20–0.81; p = 0.010). Exposure to stray animals (versus wild) also improved adherence (AOR 0.36; 95% CI 0.13–0.95; p = 0.039). Dog bites were associated with higher PEP compliance (AOR = 0.59; 95% CI: 0.25–0.94; p = 0.022). Among wound-care behaviors, those who washed the wound with only water (AOR 0.29; 95 % CI 0.14–0.91; p = 0.024) or used other protective measures (AOR 0.22; 95 % CI 0.12–0.84; p = 0.022) were more likely to complete the vaccine series than those who did nothing.

The final logistic regression model demonstrated excellent performance: the Hosmer–Lemeshow test showed strong calibration (χ² = 5.97, df = 8, p = 0.651), indicating no significant difference between observed and predicted outcomes (Table 4 and Figure 3). Discrimination was likewise high, with an area under the ROC curve (AUC) of 0.852 (95% CI: 0.840–0.875), reflecting excellent ability to distinguish between compliant and non-compliant patients (AUC > 0.80 is considered clinically useful). The model correctly classified 87.5% of cases, demonstrating strong predictive accuracy.

Table 1: Summary Statistics of Key Variables Among Rabies Patients

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Minimum | Maximum | Mean | SD |
| Age | 1.00 | 70.00 | 25.88 | 15.60 |
| Family income | 10000 | 450000 | 34105.03 | 40661.61 |
| Residence to IDH | 1.00 | 110.00 | 10.42 | 9.40 |
| Travel costs to the IDH | 10.00 | 1000.00 | 147.98 | 113.14 |
| Time gap between animal exposure to IDH visit | 0.00 | 180.00 | 3.22 | 14.78 |
| Medicine cost | 150.00 | 800.00 | 344.73 | 45.97 |

Table 2: Determinants of Compliance with the WHO‑Recommended Rabies Post‑Exposure Vaccine Schedule Among Animal‑Bite Victims at the Infectious Diseases Hospital, Dhaka, Bangladesh (January–August 2022)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Adhered to the WHO-recommended vaccine schedule** | | | |
|  | **Yes**  **n (%)** | **No**  **n (%)** | **Total**  **n (%)** | **P-value** |
| **Demographic characteristics** | | | | |
| **Age category** |  |  |  |  |
| <15 | 14 (11.5) | 108 (88.5) | 122 (26.7) | 0.055 |
| >=15 | 64 (19.1) | 271 (80.9) | 335 (73.3) |  |
| **Gender** |  |  |  |  |
| Female | 32 (22.5) | 110 (77.5) | 142 (31.1) | 0.037 |
| Male | 46 (14.6) | 269 (85.4) | 315 (68.9) |  |
| **Profession** |  |  |  |  |
| Student | 23 (14.1) | 140 (85.9) | 163 (35.7) | 0.027 |
| Job/Business | 17 (12.9) | 115 (87.1) | 132 (28.9) |  |
| Housewife | 19 (23.2) | 63 (76.8) | 82 (17.9) |  |
| Children | 4 (13.3) | 26 (86.7) | 30 (6.6) |  |
| Others | 15 (30.0) | 35 (70.0) | 50 (10.9) |  |
| **Income Category** |  |  |  |  |
| <30000 | 59 (28.4) | 149 (71.6) | 208 (45.5) | <0.001 |
| >= 30000 | 19 (7.6) | 230 (92.4) | 249 (54.5) |  |
| **Education** |  |  |  |  |
| No education or below the primary | 16 (29.6) | 38 (70.4) | 54 (11.8) | 0.114 |
| Primary | 14 (13.7) | 88 (86.3) | 102 (22.3) |  |
| Secondary | 25 (16.1) | 130 (83.9) | 155 (33.9) |  |
| Higher Secondary | 10 (13.9) | 62 (86.1) | 72 (15.8) |  |
| Above higher secondary | 13 (17.6) | 61 (82.4) | 74 (16.2) |  |
| **Residence** |  |  |  |  |
| Dhaka North | 42 (15.1) | 178 (84.9) | 279 (61.1) | 0.303 |
| Dhaka South | 25 (19.2) | 111 (80.8) | 130 (28.4) |  |
| Outside Dhaka | 11 (22.9) | 37 (77.1) | 48 (10.5) |  |
| **Distance: Patient residence to IDH** |  |  |  |  |
| <10 (below avg) | 55 (22.1) | 194 (77.9) | 249 (54.5) | 0.002 |
| >=10 (above avg) | 23 (11.1) | 185 (88.9) | 208 (45.5) |  |
| **Know about IDH before** |  |  |  |  |
| Yes | 46 (13.4) | 297 (86.6) | 343 (75.1) | <0.001 |
| No | 32 (28.1) | 82 (71.9) | 114 (24.9) |  |
| **Heard about IDH** |  |  |  |  |
| Doctor | 9 (15.5) | 49 (84.5) | 58 (12.7) | <0.001 |
| Neighbor | 32 (12.2) | 231 (87.8) | 263 (57.5) |  |
| Relative | 25 (25.0) | 75 (75.0) | 100 (21.9) |  |
| Others | 12 (33.3) | 24 (66.7) | 36 (7.9) |  |
| **Characteristics of animals’ exposure** |  |  |  |  |
| **Type of Animal** |  |  |  |  |
| Dog | 51 (21.9) | 182 (78.1) | 233 (51.0) | 0.020 |
| Cat | 26 (12.1) | 189 (87.9) | 215 (47.0) |  |
| Others | 1 (11.1) | 8 (88.9) | 9 (2.0) |  |
| **Exposure type** |  |  |  |  |
| Bite | 56 (21.1) | 209 (78.9) | 265 (58.0) | 0.008 |
| Scratch | 22 (11.5) | 170 (88.5) | 192 (42.0) |  |
| **Number of bites/scratches** |  |  |  |  |
| Single | 49 (14.8) | 282 (85.2) | 331 (72.4) | 0.037 |
| Multiple | 29 (23.0) | 97 (77.0) | 126 (27.6) |  |
| **Type of animal** |  |  |  |  |
| Stray | 51 (20.8) | 194 (79.2) | 245 (53.6) | 0.055 |
| Community own | 8 (8.5) | 86 (91.5) | 94 (20.6) |  |
| Own pet | 18 (15.8) | 96 (84.2) | 114 (24.9) |  |
| Wild | 1 (25.0) | 3 (75.0) | 4 (0.9) |  |
| **Reason of bite** |  |  |  |  |
| Provoked by patient | 27 (14.2) | 163 (85.8) | 190 (41.6) | 0.004 |
| Provoked by animals | 4 (6.2) | 61 (93.8) | 65 (14.2) |  |
| Unprovoked | 45 (22.5) | 155 (77.5) | 200 (43.8) |  |
| **Category of wound** |  |  |  |  |
| Cat-I | 3 (75.0) | 1 (25.0) | 4 (0.9) | 0.007 |
| Cat-II | 24 (15.0) | 136 (85.0) | 160 (35.0) |  |
| Cat-III | 51 (17.4) | 242 (82.6) | 293 (64.1) |  |
| **Measures taken following animal exposure** |  |  |  |  |
| Wash with water only | 12 (18.5) | 53 (81.5) | 65 (14.2) | <0.001 |
| Wash with water and soap | 48 (15.1) | 270 (84.9) | 318 (69.6) |  |
| Did nothing | 8 (13.6) | 51 (86.4) | 59 (12.9) |  |
| Others | 10 (66.7) | 5 (33.3) | 15 (3.3) |  |
| **Total** | 78 (17.07) | 379 (82.93) | 457 (100) |  |

Table 3: Multivariate Analysis of Sociodemographic and Exposure‑Related Factors Influencing Compliance with WHO‑Recommended Rabies Vaccination Schedule Among Animal‑Bite Patients at IDH, Dhaka, 2022

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Adhered to the WHO-recommended vaccine schedule** | | |  |
|  | **COR (95% CI)** | **P-value** | **AOR (95% CI)** | **P-value** |
| **Demographic characteristics** |  |  |  |  |
| **Age category** |  |  |  |  |
| <15 | 1.82 (0.98 – 3.39) | 0.058 | 1.46 (0.51 – 4.15) | 0.481 |
| >=15 | Reference |  | Reference |  |
| **Gender** |  |  |  |  |
| Female | 0.59 (0.36 – 0.97) | 0.038 | 0.63 (0.28 – 0.91) | 0.025 |
| Male | Reference |  | Reference |  |
| **Profession** |  |  |  |  |
| Student | 0.90 (0.46 – 1.77) | 0.759 | 0.73 (0.30 – 1.83) | 0.506 |
| Job/Business | 1.84 (0.93 – 3.61) | 0.078 | 0.85 (0.26 – 2.77) | 0.788 |
| Housewife | 0.94 (0.30 – 2.93) | 0.910 | 0.48 (0.08 – 2.95) | 0.431 |
| Children | 2.61 (1.23 – 5.52) | 0.012 | 1.12 (0.36 – 3.47) | 0.847 |
| Others | Reference |  | Reference |  |
| **Income Category** |  |  |  |  |
| <30000 | 4.79 (2.75 – 8.36) | <0.001 | 4.18 (2.07 – 8.47) | <0.001 |
| >= 30000 | Reference |  | Reference |  |
| **Education** |  |  |  |  |
| No education or below the primary | 2.61 (1.08 – 6.34) | 0.034 | 2.01 (0.47 – 8.58) | 0.348 |
| Primary | 0.99 (0.41 – 2.36) | 0.980 | 0.90 (0.26 – 3.15) | 0.870 |
| Secondary | 1.19 (0.54 – 2.64) | 0.664 | 1.12 (0.41 – 3.06) | 0.818 |
| Higher Secondary | 1.32 (0.54 – 3.24) | 0.543 | 1.95 (0.62 – 6.11) | 0.250 |
| Above higher secondary | Reference |  | Reference |  |
| **Residence** |  |  |  |  |
| Dhaka North | 1.34 (0.78 – 2.32) | 0.289 | 2.25 (1.06 – 4.75) | 0.034 |
| Dhaka South | 1.68 (0.79 – 3.55) | 0.176 | 3.39 (1.01 – 5.38) | 0.048 |
| Outside Dhaka | Reference |  | Reference |  |
| **Distance: Patient residence to IDH** |  |  |  |  |
| <10 | 2.28 (1.35 – 3.86) | 0.002 | 3.82 (1.64 – 8.93) | 0.002 |
| >=10 | Reference |  | Reference |  |
| **Heard about IDH** |  |  |  |  |
| Doctor | 0.37 (0.14 – 0.99) | 0.048 | 0.53 (0.14 – 2.03) | 0.356 |
| Neighbor | 0.28 (0.13 – 0.61) | <0.001 | 0.64 (0.22 – 1.84) | 0.408 |
| Relative | 0.67 (0.29 – 1.53) | 0.337 | 1.17 (0.39 – 3.50) | 0.784 |
| Others | Reference |  | Reference |  |
| **Know about IDH before** |  |  |  |  |
| Yes | 0.40 (0.24 – 0.66) | <0.001 | 0.33 (0.17 – 0.65) | <0.001 |
| No | Reference |  | Reference |  |
| **Characteristics of animals’ exposure** |  |  |  |  |
| Animal Bite |  |  |  |  |
| Dog | 0.49 (0.29 – 0.82) | 0.007 | 0.59 (0.25 – 0.94) | 0.022 |
| Cat | 0.45 (0.16 – 3.65) | 0.452 | 0.19 (0.15 – 3.66) | 0.274 |
| Others | Reference |  | Reference |  |
| **Exposure type** |  |  |  |  |
| Scratch | 2.07 (1.22 – 3.53) | 0.007 | 1.77 (1.16 – 3.66) | 0.012 |
| Bite | Reference |  | Reference |  |
| Number of bites/scratches |  |  |  |  |
| Single | 0.58 (0.35 – 0.97) | 0.038 | 0.41 (0.20 – 0.81) | 0.010 |
| Multiple | Reference |  | Reference |  |
| **Type of animal** |  |  |  |  |
| Stray | 0.35 (0.16 – 0.78) | 0.010 | 0.36 (0.13 – 0.95) | 0.039 |
| Community own | 0.71 (0.40 – 1.29) | 0.262 | 0.48 (0.20 – 1.18) | 0.112 |
| Own pet | 1.27 (0.13 – 2.45) | 0.839 | 1.90 (0.13 – 2.94) | 0.754 |
| Wild | Reference |  | Reference |  |
| **Reason of bite** |  |  |  |  |
| Provoked by patient | 0.40 (0.13 – 1.18) | 0.096 | 0.46 (0.13 – 1.67) | 0.236 |
| Provoked by animals | 1.75 (1.04 – 2.96) | 0.036 | 1.49 (0.74 – 2.98) | 0.265 |
| Unprovoked | Reference |  | Reference |  |
| **Category of wound** |  |  |  |  |
| Cat-I | 4.24 (1.45 – 13.62) | 0.023 | 8.48 (0.75 – 14.28) | 0.074 |
| Cat-II | 0.84 (0.49 – 1.42) | 0.511 | 0.81 (0.40 – 1.66) | 0.573 |
| Cat-III | Reference |  | Reference |  |
| **Measures taken following animal exposure** |  |  |  |  |
| Wash with water and soap | 0.21 (0.13 – 0.49) | 0.001 | 0.48 (0.17 – 1.98) | 0.248 |
| Wash with water only | 0.19 (0.13 – 0.37) | <0.001 | 0.29 (0.14 – 0.91) | 0.024 |
| Others | 0.18 (0.12 – 0.39) | <0.001 | 0.22 (0.12 – 0.84) | 0.022 |
| Did nothing | Reference |  | Reference |  |

Table 4: Model Performance Metrics Including Hosmer-Lemeshow Test, AUC, and Classification Accuracy

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Hosmer and Lemeshow Test** | | | **Area Under the Curve** | | **Classification Accuracy** |
| Chi-square | df | P-value | Area | 95% CI |
| 5.97 | 8 | 0.651 | 85.20% | 83.96%-87.51% | 87.50% |

Figure 3: ROC Curve of final multivariable logistic regression model

A graph with a red line

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**Discussion**

This study provides important insights into rabies PEP compliance among animal-bite victims in Bangladesh, revealing both encouraging and concerning trends. Overall, the rate of adherence to the WHO-recommended vaccine schedule remains suboptimal, despite the availability of free PEP services nationwide. Our findings highlight several demographics, socioeconomic, and exposure-related factors that significantly influence patients’ likelihood of completing the full ARV regimen. These findings align with broader evidence from South Asia and Africa that highlights the multifactorial nature of PEP compliance, influenced by both accessibility and individual perceptions of risk. Addressing these barriers is essential not only for optimizing individual patient outcomes but also for supporting Bangladesh’s national “Zero by 30” rabies elimination goals.

The observed overall compliance aligns with previous reports from Bangladesh and other endemic countries, where although PEP uptake is generally high after initial visits, a substantial proportion of patients fail to complete the prescribed schedule15,22,23. Notably, our analysis identified that individuals from lower-income households were more likely to adhere to the vaccine schedule compared to those with higher incomes. While this may appear counterintuitive, it could reflect differences in perceived disease risk, health-seeking behavior, and prioritization of free public health services among lower-income populations. Individuals from lower-income groups may have fewer alternative healthcare options or a greater perceived value of free public health services, prioritize completing the free vaccination course once they access the facility. Conversely, higher-income individuals might face different barriers, such as work obligations, which our study also identified as a contributing factor to delays. This contrasts with some literature suggesting that higher socioeconomic status can positively correlate with better health-seeking behaviors and access to care24,25. The finding that lower-income individuals are more compliant when PEP is free suggests that continued public funding for rabies prophylaxis is a vital strategy for achieving the national goal of eliminating dog-mediated human rabies by 203026. It underscores the importance of equitable access to essential health services, particularly for diseases that disproportionately affect vulnerable populations in low- and middle-income countries25.

Gender differences in compliance were significant, with female patients demonstrating higher adherence than males—findings consistent with previous research indicating that, in South Asia, women often exhibit greater attention to health-related guidelines and are more actively involved in household health decisions15,25,27. However, this contrasts with broader gender norms in the region, where women may face reduced mobility or reliance on family decision-making for healthcare access. These conflicting influences—women’s heightened health vigilance versus cultural restrictions on their autonomy—underscore the need for further qualitative research to clarify how gender roles specifically impact PEP compliance in Bangladesh.

Geographic proximity to the treatment center emerged as a critical determinant of adherence. Patients residing within 10 km of the hospital were significantly more likely to complete PEP, underscoring the challenge posed by travel distance and associated costs, even in settings where treatment itself is free. Similar barriers related to geographical access have been documented in rabies-endemic regions worldwide28,29. Innovative solutions, including decentralizing PEP services and integrating rabies management into primary healthcare facilities, may help mitigate these challenges. Moreover, targeted awareness campaigns that emphasize the importance of completing the full vaccination schedule, particularly for those living far from health facilities or those with higher incomes who might perceive fewer personal risks, are crucial. Educational initiatives should specifically address the common reasons for non-compliance, such as forgetting vaccine dates and work obligations, potentially through reminder systems like telephone calls or SMS messages, which have shown positive impacts on adherence9.

Additionally, being unfamiliar with the hospital prior to the visit and being informed about the facility by relatives or others were associated with higher compliance, suggesting that informal networks and the initial perceived novelty or criticality of the situation might enhance adherence23. Further qualitative research is warranted to explore these behavioral dynamics.

Exposure characteristics significantly influenced PEP compliance: patients with dog bites, multiple wounds, and unprovoked attacks demonstrated higher adherence to the vaccine schedule, likely due to heightened awareness of rabies risk—findings that resonate with studies from both Asia and Africa linking more severe exposures to better compliance23,30. Conversely, individuals presenting with scratches were less likely to complete the regimen, suggesting that minor injuries may be underestimated as a risk factor—an observation supported by research identifying inadequate perception of seriousness as a key driver of non-compliance. These results underscore the importance of targeted educational campaigns emphasizing that even seemingly minor exposures necessitate full PEP, in alignment with global public health recommendations31. Category III wounds, which are severe, also correlated with increased compliance, reinforcing the idea that higher perceived risk drives better adherence13,32. Prompt wound care, specifically washing with soap and water, was strongly associated with better adherence, indicating that proactive initial self-care aligns with greater overall compliance to the full treatment protocol33,34.

For clinical practice, the study reinforces the need for clinicians to provide comprehensive counseling at the initial visit, detailing the importance of full adherence, the specific schedule, and potential consequences of non-compliance, especially for those with less severe perceived exposures or single bites26. Enhanced communication strategies, perhaps leveraging community health workers or digital reminders, are necessary to bridge the gap in awareness and counteract the effect of vaccine fatigue, particularly for later doses9.

While this study provides valuable insights, it has several limitations that warrant consideration. Being hospital-based, the findings may not represent individuals who are never present for treatment, potentially underestimating noncompliance in the broader population. While IDH serves as a national referral center, it might attract a specific demographic that is already more motivated or able to travel for specialized care. Self-reported data on reasons for delay and adherence are susceptible to recall and social desirability biases. Additionally, while several associations were statistically significant, causal inferences cannot be definitively established due to the observational study design.

This study highlights ongoing challenges in achieving full compliance with the WHO-recommended rabies post-exposure prophylaxis (PEP) regimen among animal-bite victims in Bangladesh, despite the provision of free services. Key determinants of adherence included socioeconomic status, gender, geographic accessibility, exposure severity, and initial wound-care practices. Consistent with evidence from other endemic settings, these findings underscore the need for targeted interventions to improve PEP completion. Recommended strategies include decentralizing PEP delivery to reduce travel-related barriers, implementing reminder systems (e.g., SMS or phone calls) to minimize missed appointments, and developing tailored health education campaigns that emphasize the necessity of completing the full vaccine course—even following minor exposures. Such efforts are essential to improving PEP uptake, reducing rabies mortality, and advancing Bangladesh’s goal of eliminating dog-mediated human rabies by 2030. Future initiatives should prioritize ongoing monitoring, impact evaluation, and qualitative research to better understand and address the behavioral and structural barriers contributing to non-compliance.

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