MODELING THE IMPACT OF RAT POISONING INTAKES IN HUMANS: AN EPIDEMIOLOGICAL FRAMEWORK AND NEURAL NETWORK APPROACH

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Abstract. Rat poisoning in humans, whether deliberate, accidental, or occupa-

tional, represents a serious global public health risk concern due to the high toxicity and widespread availability of rodenticides. With clinical effects ranging from clotting disorder and bleeding to multi-organ failure, neurotoxicity, and death, these chemicals which are often divided into anticoagulants and non-anticoagulants present serious health concerns. The dynamics of human populations exposed to rodenticides are examined in this study using a compartmental epidemiological model that includes the Susceptible (S), Exposed (E), Infected (I), Hospitalized (H), and Recovered (R) classes. The key epidemiological processes such as exposure to toxins, start of symptoms, hospitalization, recovery, and mortality are taken into consideration in the model, along with the possible impact of intervention and prevention strategies. The basic reproduction number R_0, stability analysis of rat poisoning free and endemic equilibria, and sensitivity analysis of important factors like exposure rate, hospitalization efficiency, and recovery probability are among the analytical outcomes. Numerical simulations that show the chronological change of each compartment and the effect of control measures on reducing rodenticide poisoning outbreaks are carried out using the non-standard finite difference (NSFD) scheme in MATLAB. The results show that the burden of poisoning episodes is significantly decreased by early hospitalization, quick diagnosis, and successful public awareness programs. This framework provides insightful information for creating successful public health initiatives. The techniques and analysis offered help strengthen prevention strategies against rodenticide poisoning and increase readiness for possible poisoning crises.