



Original Article

Health System Preparedness, Response, and Incidence of Dengue in District Mianwali

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ABSTRACT

Dengue is a mosquito-borne viral infection caused by the dengue virus. It has 4 different serotypes and is mainly spread by *Aedes* mosquitoes. The disease is a significant public health problem worldwide. **Objective:** Assess district health system preparedness for Dengue outbreaks, identify gaps, strengthen surveillance, and determine incidence post-preventive measures. **Methods:** The study was a mixed-method design, using both qualitative and quantitative approaches. A cross-sectional design was used to assess the incidence of dengue. **Results:** A total of 118 participants were selected for questionnaire-based interviews out of which 47.9% were male and 51.3% were females. The average age of the participants was 38.58 ± 9.63 with a minimum age of 24 years and maximum age of 55 years was observed. Overall 8.4% of the participants belonged to the Supervisor cadre, 5.9% were entomologists, 32.8% were CDC supervisors and 52.1% were clinical doctors. Most healthcare professionals find it easy to diagnose and report a case of dengue fever. Only 0.85% of the participants felt it very difficult to diagnose and report a dengue case, 45.76% felt somewhat easy and 44.07% felt very easy in reporting a dengue case. Some of the participants 9.32% neither felt it easy nor difficult to report dengue cases. **Conclusions:** Punjab, Pakistan's dengue surveillance system has improved but needs further enhancements in case detection, reporting, communication, and stakeholder collaboration. The province has established dengue monitoring units and implemented a comprehensive reporting system.

INTRODUCTION

Dengue fever is a significant global health problem caused by four types of dengue viruses. It is spread through mosquito bites and belongs to the Flavivirus group. This virus is similar to other mosquito-borne viruses such as Zika, yellow fever, and West Nile. The disease is most commonly transmitted by *Aedes* mosquitoes, including *Ae aegypti* and others [1]. These insects, known for eating indoors and outdoors, help the disease to quickly spread. They impact lots of people all over the world [2]. Dengue cases have jumped to 390 million every year, which is four times higher than estimated by the World Health

Organization. Latin America and the Caribbean alone account for 54 million cases. Environmental changes and weather conditions are contributing factors to its spread [3]. Global health systems face challenges fighting infectious diseases like dengue fever. Despite some progress, the issue of new and old diseases continues to be a concern [4]. Dengue outbreaks in Pakistan, particularly in Punjab province, have been significant. The outbreaks in Lahore in 2011 and Sawat District in 2013 contributed to the illnesses and deaths related to this disease nationwide. The events highlight the importance of studying the readiness

and response of health systems, especially in flood-prone areas such as Mianwali where the disease can spread rapidly [5]. Since there is not much writing about how Pakistan gets ready for dengue and the system's readiness, this study observes and analyzes whether District Mianwali Dengue Surveillance System is prepared [6]. It aims to find mistakes in how well the system can quickly deal with sickness outbreaks. This is especially important when it comes to environmental issues like floods [7]. Dengue is spreading all around the world and causing big health problems [8]. Dengue fever is becoming increasingly dangerous due to factors such as fast population growth, changes to nature, and weak healthcare systems in rapidly growing urban areas. Most cases occur in Southeast Asia and Latin America, with yearly outbreaks in Pakistan since 2010, particularly after the rainy season [9]. Dengue and other global health issues, like the COVID-19 pandemic, have put more pressure on Pakistan's medical system. The similar signs of dengue and COVID-19 make diagnosing them hard. Also, giving resources to fight the disease might cause fewer cases of dengue to be reported. A big problem with the healthcare system is its ability to handle many health problems at once, especially when there are not enough beds and medical places get too full [10]. Pakistan is taking steps to combat dengue, including government pest control measures, public education campaigns, and collaboration with organizations like the Pakistan Red Crescent Society. However, the increasing number of dengue cases during rainy seasons suggests that more effective measures are needed [11]. A complete way to stop dengue needs finding and getting rid of places where mosquitoes can breed, analyzing them more closely, and improving health measures like using nets against bugs or putting on repellents. Also, solving bigger problems such as city cleanliness and wastewater control is very important for stopping dengue in the future [12].

Considering these problems, the current study will check out how well-prepared the Dengue Surveillance System in Mianwali City is. It's a place located in the Punjab region. The study uses a mixed way and wants to see how ready the system is for dealing with dengue outbreaks. The CDC's new rules require checking the response to environmental issues like floods. Talking with those involved and analyzing the system can help improve managing dengue outbreaks. The goal of this study is not only to identify the degree of patient satisfaction with quality nursing service but also to determine the relationship of demographic variables in public sector tertiary care hospitals.

METHODS

This study used mixed methods (qualitative and quantitative) to understand the Dengue Surveillance System in Mianwali, Punjab. It was a cross-sectional study.

The research was conducted for six months in Mianwali district, Punjab province, covering an area of 5840 km² with a population of approximately 1.546 million, divided into three tehsils: Issa Khel, Piplan, and Mianwali. The data collection took place from October to December 2022, and the analysis was carried out from January to March 2023. Inclusion criteria encompassed all staff members related to dengue surveillance and response within the District Health Authority. Exclusion criteria applied to those not involved in dengue surveillance activities. The study's data were obtained from the dengue control cell of the District Health Authority in Mianwali, including primary data from dengue surveillance staff and secondary data from patient records of those tested positive for dengue via ELISA NS. I or ELISA IgM tests. The study population comprised staff members engaged in dengue surveillance activities, including indoor and outdoor surveillance teams and supervisory staff. A convenience sampling method was employed. The sample size for this study was determined by using a single population proportion formula [$n = [(Z\alpha/2)^2 \cdot P(1-P)]/d^2$] by assuming a 95% confidence level ($Z\alpha/2 = 1.96$), a margin of error of 5%, $P =$ proportion 50 %, and the final sample size was 118. Data collection involved an official request to the CEO of the District Health Authority for access to the password-protected dengue control cell data. The data included demographic details, clinical conditions, and test results of patients. A structured questionnaire, developed by the Standard Operational Procedure for Prevention and Control of Dengue Fever 2020 by the Punjab Health Department, was utilized for primary data collection from the surveillance staff. Data analysis was conducted using SPSS version 22.0. Descriptive statistics were used to calculate frequencies, percentages, means, and standard deviations. Ethical approval for the study was obtained from the Ethical Approval Committee of the Health Services Academy, Islamabad. IRB number was F. No. 000178/HSA/MSPH-2021. The CEO office of District Health Authority Mianwali also issued an ethical approval letter for data collection. Its number was CEO/DHA/MWI/10576/Est. It was issued on 23rd June 2023. Participant rights were protected through informed consent, ensuring confidentiality, anonymity, and privacy. Data were securely stored on a personal computer in a password-protected folder, and individual privacy was maintained by assigning unique identifiers to each participant.

RESULTS

A total of 118 participants were interviewed, comprising 57 males (47.9%) and 61 females (51.3%). The average age of the participants was 38.58 years, with a standard deviation of 9.63 years. The age range of participants was from 24 to 55 years. The professional cadre distribution among

participants included 10 Supervisors (8.4%), 7 Entomologists (5.9%), 39 CDC Supervisors (32.8%), and 62 Clinical Doctors or LHS (52.1%). Only 1 (0.85%) of the participants felt it very difficult to diagnose and report a dengue case, 54 (45.76%) felt somewhat easy, and 52 (44.07%) felt very easy in reporting a dengue case. Some of the participants 11(9.32%) neither felt it easy nor difficult to report dengue cases (figure 1).

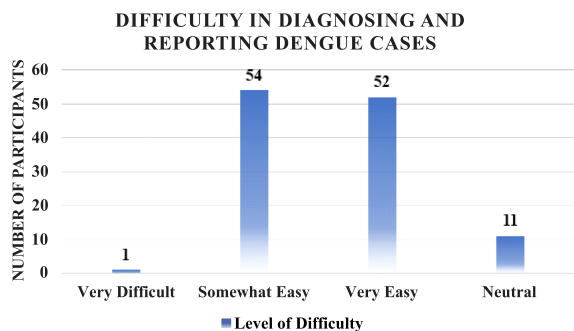


Figure 1: Difficulty in case detection and reporting.

In terms of the availability of trained healthcare professionals in the district, 4 participants (3.39%) believed there were not enough trained professionals, 35 (29.66%) felt there were just enough, 53 (44.92%) thought there were enough, and 26 (22.03%) believed there were more than enough professionals for dengue diagnosis and reporting (figure 2).

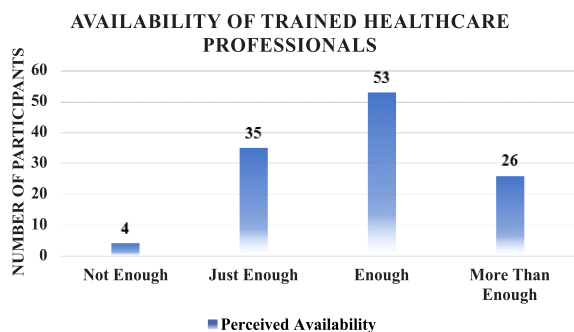


Figure 2: Availability of trained healthcare professionals.

The quality of data collected on dengue cases showed a mixed trend, with 19 cases (16.10%) reported as extremely poor quality, 25 cases (21.19%) of poor quality, 26 cases (22.03%) of fair quality, 27 cases (22.88%) of good quality, and 21 cases (17.80%) of excellent quality (figure 3).

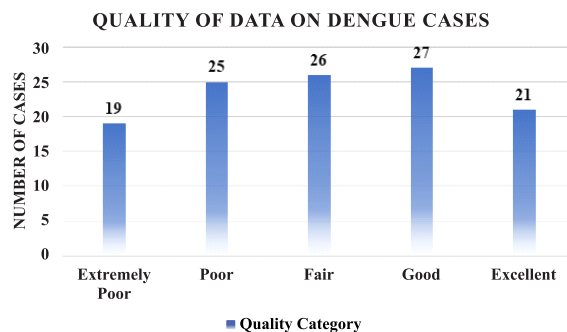


Figure 3: Quality of data.

The analysis of response capacity revealed that 18 union councils (15.25%) had very weak response capacity, 23 (19.49%) had somewhat weak capacity, 28 (23.73%) had moderate capacity, 30 (24.42%) somewhat strong capacity, and 19(16.10%) very strong capacity (figure 4).

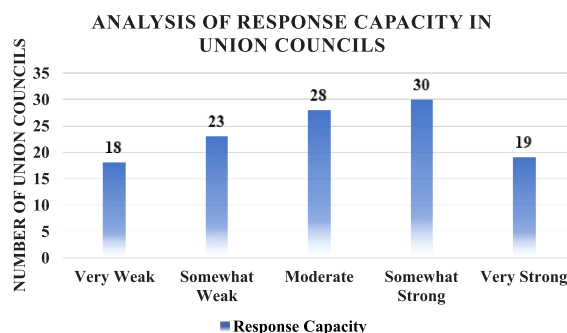


Figure 4: Response capacity for Dengue outbreaks.

In terms of identifying and addressing improvements, 33 participants (27.97%) reported that improvements were never identified or addressed, 23(19.49%) rarely, 19(16.10%) sometimes, 21 (17.80%) usually, and 22 (18.64%) always addressed improvements (figure 5).

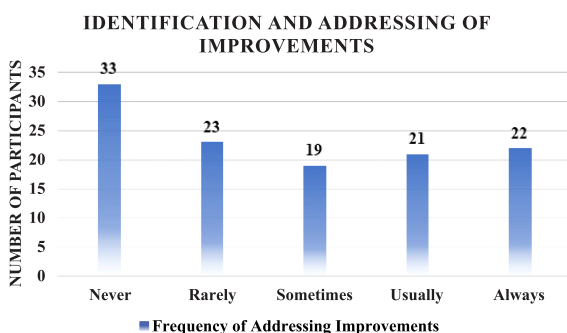


Figure 5: Improvement identified and addressed.

The evaluation of the surveillance system indicated that 18 participants (15.25%) reported their work was never evaluated, 17 (14.41%) rarely, and 34 (28.81%) occasionally evaluated (figure 6).

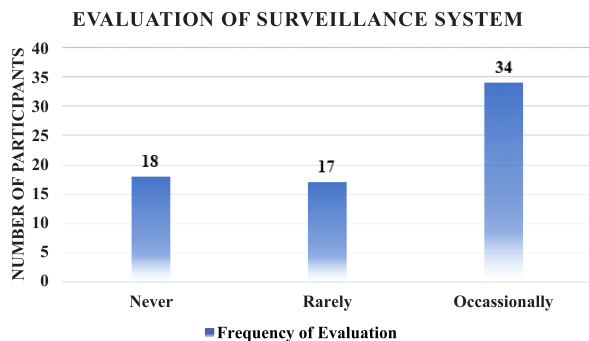


Figure 6: Evaluation of surveillance system.

These results provide a comprehensive assessment of the Dengue Surveillance System in District Mianwali, indicating its strengths and areas requiring improvement, particularly in communication, data quality, and technological advancement.

DISCUSSION

This discussion evaluates the readiness of the dengue analyzing system in Punjab, Pakistan. It compares it with international and nearby standards, and focuses on four key aspects: case detection and communication, response effectiveness, collaboration, and disease control analysis. The WHO supports the worldwide use of complete monitoring systems to quickly spot, correctly diagnose, and fast-report dengue cases. These tools are very important for handling and stopping diseases well [13]. Sri Lanka, Thailand, and Malaysia use active surveillance to find dengue cases early, making it easier to take action quickly [14]. Punjab has improved dengue analysis by setting up special groups and using full reports. However, issues like underreporting, lack of test places, and time-wasting still persist [15]. The World Health Organization (WHO) developed the Global Vector Control Response (GVCR) 2017-2030 to offer guidance to countries and development partners in strengthening vector control as a fundamental strategy to prevent and respond to vector-borne diseases and outbreaks [16]. The ability to respond varies throughout the South Asian area. Sri Lanka's strong system has special groups and involvement by the community. On the other hand, Thailand combines control of the environment with insecticide use to fully manage pests [17]. Punjab has gotten better at responding quickly, as shown in teaching healthcare workers and forming teams to control the spread of disease. However, it required more money to improve laboratory tests and analyze disease carriers while also working together with different groups [18]. Good talking and working together are very important around the world for dengue analysis systems to be successful. Sharing details, working together on tasks, and getting involved in the community are very important. Groups like GOARN are very important in helping teams around the world work together during

outbreaks [19]. In South Asia, the value of talking and working together is understood. In Sri Lanka, the health sector works together with many government departments and involves neighborhoods. SAARC also supports sharing information across regions and leads joint projects [20].

CONCLUSIONS

Finding how Punjab analyzed dengue shows a situation with some advances and difficulties. Important improvements have been made in creating special checking groups and full reporting systems. But problems like not telling soon or late reports still exist because people don't know much about it and can't diagnose it well enough. The system needs improvements in lab tests, keeping an eye on disease carriers, and working together with different groups to better respond quickly.

Authors Contribution

Conceptualization: FN

Methodology: FN, MIK, SN, JM

Formal analysis: FR

Writing-review and editing: MKW

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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