

An Experience from Public Sector tertiary care Hospital: Secondary data analysis of Dengue patients from 2013-2022



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Abstract

Background: This study aims to identify patient number trends in three tertiary care hospitals affiliated with Rawalpindi Medical University by conducting a secondary data analysis of past hospital records.

Methods: A retrospective study, spanning from 2013 to 2022, was undertaken in three tertiary care hospitals (Holy Family Hospital, District Head Quarters Hospital, and Benazir Bhutto Hospital) affiliated with Rawalpindi Medical University. The analysis included data on outpatient department (OPD) visits, admission rates, confirmed cases, morbidity and mortality variables related to Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS), fatalities, expiries %, and the predominant Dengue virus genotype. Statistical analysis utilized SPSS version 25.0.

Results: The records encompassed 299,101 OPD patients in the three allied hospitals. Over the past decade, an epidemic occurred in 2019, witnessing a surge—87,680 OPD cases, 14,879 admissions, and 11,942 confirmed cases. A second peak in the current year saw 32,940 cases. Maximum fatalities occurred in 2021 (0.68%), followed by 2013 (0.57%). Dominant Dengue serotype was DEN-2, except in 2022, which showed both DEN-1 (40%) and DEN-2 (60%).

Conclusion: Trend analysis of dengue cases from 2013 to 2022 revealed a peak in 2019, followed by the current year (2022), indicating a significant increase. The rise during the current epidemic, coupled with a new serotype (DEN-1), may be linked to human migration due to recent floods, population displacement, and virus evolution, evident in increased cases with different serotypes.

Keywords: Dengue, epidemic, retrospective data, trend analysis.

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Introduction

Dengue fever is vector borne disease caused by four serotypes (DENV-1, DENV-2, DENV-3 & DENV-4). Disease transmission occur primarily by bite of *Aedes aegypti* mosquito and to some extent by *Ae. Albopictus*. Over past few years, the global incidence of dengue has increased dramatically with estimated 100-400 million infections occurring yearly, 80% of them are generally mild or asymptomatic. According to WHO report, dengue cases are increased up to 8 fold over past two decades ranging from 2.4 million in 2010 to 5.2 million in 2019 (1). The modelling study on global distribution and burden of dengue reported 390 million dengue virus infections per year out of which 96 million are with clinical manifestation of severe disease (2).

Dengue virus persists in 129 countries globally, out of which Asia shared the highest burden, which represents 70% of total disease burden². In particular, South East Asian region has highest burden and affected badly with estimated 1.3 billion at risk population thus accounting for total 52% of the world population at risk of contracting viurus (3).

An alarming increase in dengue cases is being observed during current year. Moreover, dengue cases are constantly increasing as compared to previous years along with resurgence in areas where it has been previously (4). Health authorities have declared the areas with rapid growth of larva as “sensitive” as it can pose additional threat if well-coordinated efforts are not establish timely dengue could wreck health system of country (5), which is already struggling hard to mitigate impacts of unprecedented flood disaster.

According to data shared by NIH, 25, 932 dengue cases were reported between 1st January to 27th September, 2022 with 62 deaths making case fatality rate CFR 0.25%. Out of these 74% of the cases reported in month of September alone. This rapid upsurge occur because of unanticipated flooding that started in mid-June 2022 (6). This toll is significantly high as compared to same period in previous four years (7). The insubstantial health system of the country already struggling with COVID-19 pandemic crisis along with unprecedented challenges posed by flood crisis can root serious implication on national health system of the country (7). Moreover, growing humanitarian crisis can be additional threat for

aggravating risk of serious health issues from dengue other concurrent infectious disease outbreaks (8). Risk of cross border spread of virus due to high population displacement within country and neighbour countries like Afghanistan and Iran, cannot be rule out (9).

Current study aims to determine frequency of various parameters related to patients reporting to dengue OPD from past records of hospital data of 3 tertiary care hospitals affiliated with Rawalpindi Medical University. Being only Public Sector University located in Rawalpindi district, the allied hospitals affiliated with university cater for significant population. Therefore, this data can provide baseline data to policy makers to devise effective targeted strategies for stronger epidemiological surveillance and implementation of public health measures to mitigate the long-term implication.

Methodology

A retrospective hospital data based research was carried out by secondary data analysis in three tertiary care hospitals affiliated with Rawalpindi Medical University (RMU). The data of dengue patients who visited and received consultation in tertiary healthcare settings from year 2013 to 2022 retrieved from hospital records. Variables retrieved from hospital records include the total number of dengue cases reporting to OPD, number of admissions, confirmed cases, frequency of dengue haemorrhagic fever, dengue shock syndrome, death rate and predominant genotype. Data was analyzed by using SPSS version 25.0.

Results

Records of all patients admitting in our 3 teaching hospitals during year 2013 to 2022 were retrieved. Current study intends to determine the total number of dengue cases reporting to OPD, number of admissions, number of confirmed cases, patients reported with Dengue haemorrhagic fever, dengue shock syndrome, mortality rate and predominant genotype from data extracted from hospital record of 3 allied hospitals of Rawalpindi district from year 2013 -2022. Record of data of total 299,101 patients reporting to 3 allied hospitals affiliated with Rawalpindi Medical University was retrieved. There were 43,547 admitted patients and 31,019 confirmed cases. Table 1 shows that there was dengue epidemic during 2019 with maximum cases since 2013 then second surge during current year. During first peak in 2019, maximum cases 87680 reported to OPD , 14879 hospital admissions and 11942 confirmed cases were reported . Second peak was reported during current year (2022) with 32940 confirmed cases. Maximum rate of expires were recorded in year 2021 (0.68%) followed by 2013 (0.57%). Maximum cases of DHF (n=4566) reported during year 2019, followed by 1714 cases during 2021. Predominant serotype recorded almost every year was DEN-2 except year 2022 that has both DEN-1 (40%) and DEN-2 (60%). Fig 1 is showing number of health professionals received dengue management training during period of year 2013 – 202

Table 1: Descriptive Analysis of Dengue data from year 2013-2022

Variables	Year of study									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Patients reported to OPD	25914	22126	44337	20449	9131	4516	87680	5648	32940	46360
Admitted patients	-	2422	6139	5258	2116	1561	14879	350	5050	5772
Confirmed dengue cases	1223	1571	3917	3306	651	717	11942	38	3526	4128
DHF	339	570	1384	992	217	120	4566	18	1714	1586
DSS	-	32	84	55	13	1	265	1	92	78
Expires	7	2	8	3	3	2	41	0	24	17
Expires%	0.57%	0.12%	0.20%	0.20%	0.46%	0.27%	0.345	-	0.68%	0.41%
Predominant Genotype	DEN-2	DEN-3	DEN-2	DEN-2	DEN-2		DEN-1&2	-	DEN-2	DEN-1 (40%) DEN-2 (60%)

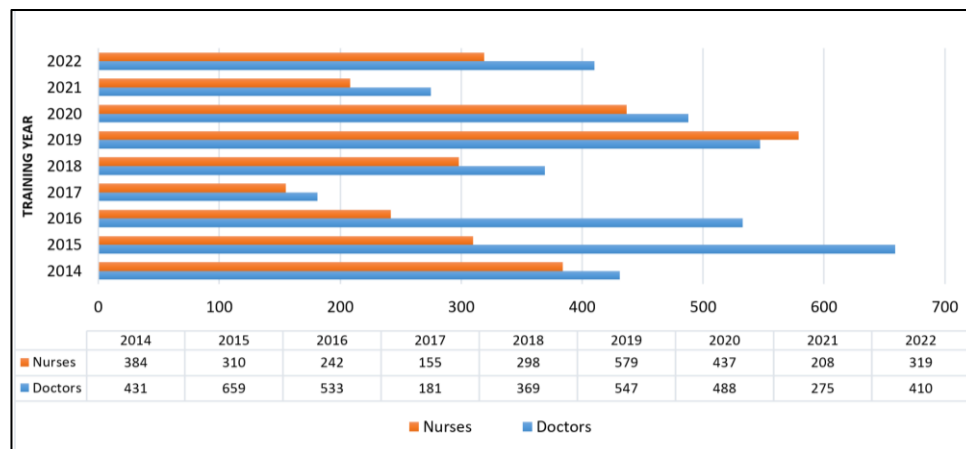


Figure 1: Training received by Health Professionals (2013-2022)

Discussion

According to WHO, the first documented case of dengue fever was reported in 1994, though yearly epidemic pattern started in 2005 (1). Since 2010, Dengue Fever is endemic in Pakistan with seasonal peaks. The first largest dengue outbreak was reported in Lahore in 2011 with 22,562 dengue cases and 363 fatalities (9). Pakistan is still having an epidemic this year. It is worth mentioning that 2019 cast a daunting picture by reporting rapid upsurge with total 54,386 cases reported across country (6). Data from 3 allied hospitals during the year 2019, reported 14879 admissions and 11942 confirmed cases. The recent dengue epidemic has imposed considerable disease and economic burden on the already friable health system of the country, which has not yet recovered from after maths of pandemic crisis (8). During the current (2022) year reported statistics are worse as compared to previous two years due to hard strike by worst flooding (10). However, fortunately this year has a low mortality rate (0.41%) as compared to previous year (0.68%). Moreover, the rate of complication including DHF (1586) and DSS (78) was also comparatively less as compared to preceding year (4). The number of cases reported between January and September is significantly high as compared to previous years. According to statistics shared by National Institute of health, Islamabad, total 25,932 confirmed cases and 62 deaths are reported in Pakistan till month of September 2022. There was variation in case distribution at provincial level with highest cases reported at Sindh $n=6888$ cases, followed by $n=6255$ from Punjab (including Islamabad), then from Khyber Pakhtunkhwa $n=5506$ and finally $n=3128$ cases from Baluchistan (6).

As per data reported from 3 allied hospitals reported till 25th October 2022 cases reported to OPD were 46360, out of which 5772 were admissions and number of confirmed cases after serological testing were 4128. Predominant genotypes reported were DEN-2 (60%) and DEN-1 was (40%). Case fatality rate was 0.41%, which contrasts with national data reported by NIH, which has case fatality rate of 0.25%. The case fatality rate (CFR) varies considerably between countries, it is as high as 10-15% in some countries and less than 1% in other countries (11,12). Case fatality rate reported by Simmons et al (13) was 0.53%, Gubler (14) stated that effective management can reduce case fatality rate to less than 1%. Our data of current year 2022, from three allied hospitals reported 1586 patients of DHF, 78 of DSS with relatively low mortality rate of 17 and case fatality rate of 0.41%. The low case fatality rate at allied hospitals is due to the provision of high-quality healthcare facilities. In addition to that, there is formulation of Dengue Expert Advisory Group by Government of Punjab, responsible for training of doctors, nurses, paramedics from both Public and Private sector. During the year 2022, a total of 729 health care professionals received training on dengue management. The rest of the details are shown in Fig. 1.

There are four serotypes of Dengue Virus are DEN-1, DEN-2, DEN-3 & DEN-4. Different types of Dengue virus are present in diversified manner in different regions globally. India mainly reported presence of DEN-2 (15); Indonesia has mainly DEN-2 and DEN-4 (16), Serotype 2 is the major circulating serotype reported in Lahore, Karachi, Rawalpindi and Faisalabad since 1994 (17). With

progression of time, new variants appear, and DEN-2 is replaced by emergence of DEN-3 in the country (18). This strain has also genetic resemblance with Chinese and Saudi Arabian strains. DEN-3 reported in outbreak at Karachi in 2005, which had close resemblance with Indian and Sri Lankan strain (19).

In Pakistan during 2013, all four serotypes were reported, during 2014 DEN-1, 2 & 3 was present; year 2015 and 2016 also reported presence of all four serotypes. In year 2017, KPK Pakistan revealed the presence of DEN-2 followed by DEN-3 and DEN-4 with mixed serotypes (20). In our study data from four allied hospitals mostly showed the presence of DEN-2, almost every year, except for year 2014 that showed presence of DEN-3, and year 2022 that has DEN-1 and DEN-2 both.

Conclusion

Trend analysis of hospital record of dengue cases from 2013 to 2022 showed that maximum cases were reported during year 2019, followed by current year 2022, that showed striking increase in cases. The current condition is worsened further due to recent flood owing to human migration, virus evolution as depicted by increase cases with DEN-1 (40%) as compared to previous years. Since transmission of dengue infection is strongly associated with human migration, recent public health challenges imposed human displacement is hypothesized to be strong factor associated with striking rise in cases this year. Hence, there is dire need to use this data as baseline to devise effective targeted strategies to halt future epidemics. Establishment of effective surveillance system in form of integrated disease integrated response is need of an hour to mitigate long-term implication.

Strengths and Limitations:

Our study has limitation that results rely on secondary data analysis of already collected data as a result data records for few years was missing. In contrast our study has strengths that it was a huge data from one of biggest healthcare setting with affiliated 3 allied hospitals which cater for huge population of twin cities. Trend analysis from such big data set can be valuable source for future strategic planning specially in resource limiting country like Pakistan.

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