Research Article

Diabetes Mellitus Prognosis Due to Dengue Fever

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Abstract:

Introduction: Dengue, an acute viral illness, poses a concern to public health globally. This observational research is with the aim to examine the prevalence of DM among patients who have been diagnosed dengue fever. Since there have been an increasing number of dengue cases over the years, and it is expected that this trend will continue, diabetes is a non-communicable diseases that is increasing in prevalence.

Methodology: Study was conducted on the 200 patients from DHQ, hospital Kasur from July 2020 to August 2020. Every patient who participated in this trial had dengue fever, 1gm antibody, and a platelet count of fewer than 100.

Results: Patients with negative 1gm antibodies or platelet counts more than 100 were not included in the study moreover all patients had their fasting blood glucose levels examined, and it was confirmed that diabetes mellitus diagnosis in the patients. Apply Chi square test, and a significant result was regarded with p value less than 0.05.

Conclusion: The study involved 200 patients in all with age range from 20 to 80 years. PCV ranged from 14.5 to 54, with a mean of 40.1±4.7 and a haemoglobin range of 5 to 21, respectively. There were 9 to 239 platelets, with a mean of 40±3.3. Only 34% of patients had diabetes mellitus, while 66% of patients had normal glucose. Dengue fever and diabetes mellitus have a strong correlation. Dengue, fever, kasur

Key words: diabetes, mellitus, dengue, fever, relation

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Introduction:

Since 2005, dengue has become Pakistan's most serious public health issues, endangering the lives of millions of people. Southern regions are most disturbing. It was first identified in Karachi in 1994, where one out of 145 cases of dengue died due to severity (Qureshi*et al.,* 1997*)*. In Hub, southern Baluchistan, October 1995, 57 from 76 patients were positive. The first dengue outbreaks was discovered in sub-mountainous of KPK's district Haripur and Punjab's district Khushab in October 2003, 717 cases and 6 fatalities were recorded. After a ten-year gap, dengue returned to Karachi in October 2005, with 103 confirmed cases and 21 fatalities (Ali N *et al.,* 2006) and (Riaz MM *et al.,* 2006). The condition has spread

rapidly and been acknowledged as one of Pakistan's biggest public health issues. 26270 cases and 156 fatalities have been documented up until 2010 (Mukhtar *et al.,* 2006).

The most prevalent viral disease transmitted by mosquitoes in the world is dengue fever. It is a sickness brought on by a virus that the Aedes mosquito spreads. This virus has four different serotypes that can infect people: Den1, Den 2, Den 3, and Den 4. Den 3 is the principal serotype causing infection. (Volk *et al.,* 2007; Rodenhuis*et al.,* 2010; Guzman *et al.,* 2010).It belongs to the family of single-stranded RNA, positive sense, flavivirus (Vasilakis *et al.,* 2017). The WHO's 2009 classification of dengue cases divides dengue fever into three distinct types. These are Dengue with warning signs (DWWS), Dengue without warning signs (DWOS), and Signs Dengue (WHO, 2009).Dengue is the fastest-growing zoonotic disease which linked with geographic enlargement, (Wilder-Smith *et al.,* 2017) most significantly affects the travellers (Ferguson *et al.,* 2000).One type infection enable immune system for the type of infection causing serotype, second infection with different type of serotype can creates complications(Rodenhuis*et al.,* 2010; Guzman *et al.,* 2010). The first response of immune system to infection is the production of interferon, which is a cytokine that improves the attempts of defenses in response to viral infection (Rodenhuis*et al.,* 2010).

The main objective of this study was to ascertain the connection between diabetes mellitus in dengue fever patients (Kouri*et al.,* 1997) and (Cunha*et al.,* 2009).Typically, three to fourteen days after infection, symptoms will appear. These symptoms can include a headache, high temperature 40°C/104°F,pain behind the eyes, discomfort in the muscles and joints, nausea, as well as the typical rash and itching of the skin. It takes 2-7 days to recover. In Rare case, the illness goes worse form of dengue hemorrhagic fever that causes low blood platelet counts, bleeding, and plasma leakage, or to dengue shock syndrome, which causes dangerously low blood pressure (Kularatne*et al.,* 2015) and (WHO, 2016) .

Figure: Symptoms of Dengue fever and its effects on human body (WHO,2009 pp. 25–27).

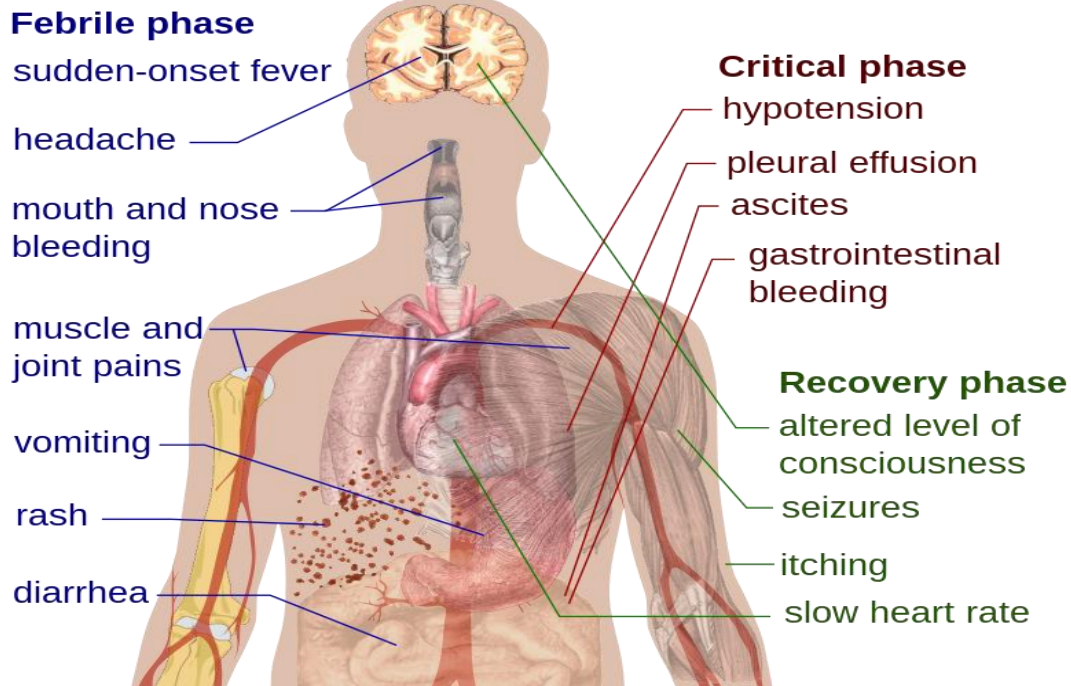Often dengue fever transmissions were at peak during the rainy seasons (Saleem*et al.,*2014).

Effect of Dengue On metabolism

Dengue Viruses depend on host cellular metabolism for the energy and biochemical building blocks for their reproduction. Research shows that DENV infection in primary human cells produces intracellular metabolic changes. According to the results human metabolic profiling, the

Central carbon metabolism, especially glycolysis, changed during DENV infection. Increased glucose consumption occurs during DENV

hereditary or acquired, or by the inefficiency of the insulin that is produced. Millions of individuals throughout the world are affected

Symptoms of
Dengue fever

Febrile phase
sudden-onset fever
headache
mouth and nose bleeding
muscle and joint pains
vomiting
rash
diarrhea

Critical phase
hypotension
pleural effusion
ascites
gastrointestinal bleeding

Recovery phase
altered level of consciousness
seizures
itching
slow heart rate

infection, leave viral multiplication in DENV-infected cells.(Fontaine K.A*et al.,* 2015). Some reports note that DM can be an aggravating factor in the development of dengue shock (figueiredo*et al.,* 2010) and (Lee *et al.,* 2006). There is an interesting report stating that patients suffering from dengue fever should be cautioned for development of diabetes in future (Hasnat*et al.,* 2006).

Diabetes Mellitus

Diabetes is a chronic illness characterized by high blood sugar levels. In the entire world, it is the second most common cause of kidney disease and blindness. Diabetes mellitus is a chronic condition brought on by an inability of the pancreas to make enough insulin, whether

by this silent killer illness (SamreenRiaz, 2009). A person's genetic make-up, family history, ethnicity, health, and environmental variables are the main contributors to T2DM predisposing factors. Diabetes ketoacidosis, heart attacks, strokes, blindness, kidney failure, diabetic neuropathy, pregnancy issues, mental difficulties, and insulin shock are all brought on by the usual metabolic dysfunction associated with T2DM (SamreenRiaz, 2015).

The higher risk association

The higher risk associated with diabetes is also consistent with the inflammatory concept. Due to a chronic inflammation created by T-lymphocyte

activation due to type 2 diabetes which limits the body's utilization of glucose, alters the morphological and physiological integrity of the endothelium.

Two pro-inflammatory cytokines gamma interferon (IFN) and TNF are released in result.

It is confirmed that these cytokines play a crucial part in severe dengue fever.

The endothelial failure and causes shock, hypotension, and hemoconcentration.

Since diabetes enhances the intrinsic permeability of the endothelium surface of the host who has already been infected by another serotype, allowing the occurrence of fluid shift, it would suggest that this is the biological process by which diabetes worsens dengue fever (Masood*et al.,* 2012).

Method

The chi-square test is known as the goodness of fit tests. A chi-square test used to examine the relationship between two variables in a contingency table. Chi Square test was applied to the data of 200 patients and P – value <0.05 was find which is considered significant.

$$X^2 = \sum \frac{(Observed\ Value - Expected\ Value)^2}{Expected\ Value}$$

$$X^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where,
X^2 = **Chi Square**
O_i = **Observed Value**
E_i = **Expected Value**

Result

200 individuals in total, ranging in age group from 20 to 80, participated in this study. Hemoglobin ranged from 5 to 21, while PCV range from 14.5 to 54, with mean 40.1±4.7.

The range of platelets was 9 to 239, of mean 40±3.3. While 66% of patients had normal blood glucose levels, only 34% of patients had diabetes mellitus. Among those aged 20 to 35, 2.0% had high blood sugar, while 97% had normal blood sugar (normoglycemia).

From ages 36 to 50, 25 (46.3%) had high blood sugar (hyperglycemia), compared to 29 (53.7%) who had normal blood sugar (normoglycemia), from ages 51 to 65, 33 (78.6%) had high blood sugar , as compared to 9 (21.4%) who had normal blood sugar, and 6 (85.7%) had high blood sugar from ages over 65 and 1(14.28%) had normal blood sugar..

There was a statistically significant P-value of 0.00 for age groups. In terms of gender, 44 (31.4%) of the males had hyperglycemia, 96 (68.6%) had normal glucose, and 22 (36.7%) of the females had high glucose (hyperglycemia), compared to 32 (53.3%) who had normal glucose (normoglycemia). It is not statistically significant that the P value was 319.

Table1: Status of **Glucose elevation** according to gender and age.

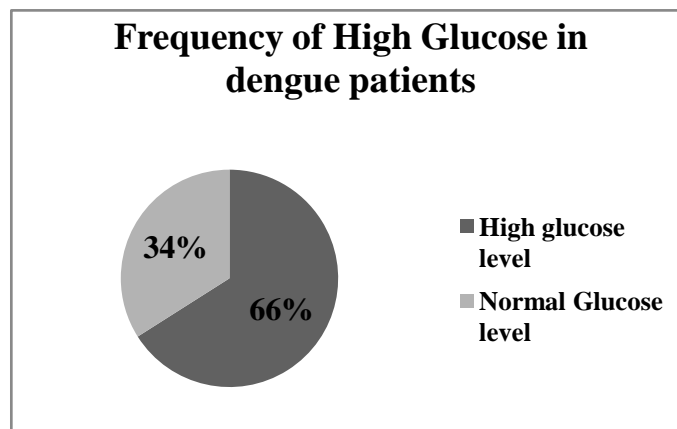| Variables		High Glucose Level	Normal Glucose
Age group (P=0.00)			
20-35	99	2(2.0%)	97(97.9%)
36-50	54	25(46.3%)	29(53.7%)
51-65	42	33(78.6%)	9(21.4%)
> 65	7	6(85.7%)	1(14.28%)
Gender (P= 319)			
Male	140	44(31.4%)	96(68.6%)
Female	60	22(36.7%)	32(53.3%)

Fig.1: Frequency of high glucose among dengue patients.

DISCUSSION

Dengue was present in Pakistan from last 20 years. In Pakistan, the first significant outbreak was noted between 1994 and 1995. According to a study, southern areas of Pakistan saw a pandemic of dengue illness for two Consecutive years.(Paul *et al.,*1998). The first dengue outbreak was recorded in Karachi in 1994, and following years saw occasional occurrences. In 2004 the virus was first time introduced to Lahore as a result of economic and security-related migration (Masood *et al.,*2012).

Pakistan has experienced several dengue outbreaks since the first outbreak in 1994. The country reported 22,938 dengue fever cases in 2017, more than 3,200 in 2018, 24,547 cases in 2019 and 3,442 cases in 2020, according to the data shared by the National Institute of Health (NIH) Islamabad.

Predictions from the past have not proved accurate regarding the Diabetes pandemic. Number of people with diabetes are increasing dramatically that they can be placed as nation and it would be the third largest in the world, and about one percent of its citizens would perish every year. In 2009, 463 million adults with diabetes are natives of developing nations which is 79%, and this percentage is expected to rise to 84% by 2045 which will be 700 million. (Smokovski*et al.,* 2005).Diabetes and dengue are two diseases that can coexist. When glycemic management is insufficient, the glycosylation process slows the spread of dengue infection (Stephen JR *et al.,*2005).Some new risk factors observed which proved dengue as fatal in 1981 Cuba.An additional risk factor which is cause of dengue

hemorrhagic fever was the presence of chronic diseases such diabetes mellitus (JR Bracosa*et al.,*2008). 28 out of the 133 dengue patients evaluated as diabetic. (Hasanat*et al.,*2010). Diabetes and dengue infection, were found in 60% of perished cases, revealing the causes of the disease's severe consequences and high mortality rate. (Saqibt*et al.,*2014). A study in Singapore was conducted in which it was found that 21 of every 27 dengue-related deaths had a co-morbid condition. (Leo*et al.,*2011). According to a different study, when diabetic patients caught by dengue it is 2.5 times more likely to develop dengue hemorrhagic fever (Figueirredo*et al.,* 2011). In 2014 a study showed that mortality due to dengue was higher in those patients with multiple chronic condition such as diabetes (Karunakaran*et al.,* 2014).

Conclusion

All research work; create a link between diabetes and dengue fever while other disclosed that prognosis become worsen when dengue patients have diabetes. This study showed an association between diabetes and dengue, the major reason is that diabetes is prevailing among elderly and middle age patients with dengue. A strong co-relation was established between diabetes and dengue fever. So, an immunological and pathophysiological study required which would examine the complex mechanism governing the most severe kinds of dengue.

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