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HEMATOLOGICAL PARAMETERS IN DENGUE POSITVE PATIENTS AT NORTHWEST GENERAL HOSPITAL AND RESEARCH CENTER PESHAWAR PAKISTAN

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Abstract:

Dengue virus, a mosquito-borne human viral pathogen, which cause dengue fever and sometime cause severe condition like dengue hemorrhagic fever, dengue shock syndrome and has recently become a major health problem especially in equatorial and sub equatorial region. Importance of study was to interpret hematological parameters with sero-positivity of dengue thus management of dengue will be easy. This is a cross- sectional study carried out in the department of general medicine at Northwest General Hospital and Research center Peshawar Pakistan. This study includes 111 patients admitted in hospital and identified positive for dengue virus.Out of 111 cases 74 (66.66 %) were male and 37(33.33%) were female, majority of cases belongs to age groups 21 – 30 years. Thrombocytopenia was found in 50(44.35%) cases, raised hematocrit value >45 in 28(25.22%) cases, leucopenia (<4000) in 16(14.41%) cases and hemoglobin >18 in 2(1.80%) cases. Male and young adult are more commonly affected by dengue. Most of the cases were NS1 antigen positive. The most common laboratory abnormality is low platelet count (thrombocytopenia), low leukocyte count (leucopenia), raised hemoglobin and raised hematocrit.

Key words: *Dengue, hematological parameters, thrombocytopenia, leucopenia, HCT.*

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INTRODUCTION:

The word dengue is believed to have originated from Swahili language "ki denga pepo", which describes abrupt cramp like seizure. The clinical symptoms indicative of dengue virus infection can be traced back to Chinese Chin Dynasty (265-420 AD) where disease was considered as water poison and was known to be associated with water and insects(1).

Global scenario:

The first epidemic occurred in Manila, Philippines in 1953–54, followed by Bangkok in 1958, and Singapore, Malaysia, and Vietnam in the early 1960s(2).

According to estimation, 2.5 billion people are in danger of dengue illness, about 975 million of those live in built-up areas (towns) in different countries located tropically and sub-tropically in Southeast Asia, the Americas and the Pacific globally(3).

National scenario:

In Pakistan The first confirmed outbreak of dengue infection with symptoms of dengue hemorrhagic fever was observed in Karachi in 1994.(4) The second outbreak (2005–2006) in Karachi confirmed the circulation of DENV-3 for the first time(5).

Third Outbreak (2007-2011) In Pakistan the worst years regarding dengue viral infection were 2007 and 2011 (6).

Fatima et al. Conducted a detailed study of major outbreaks in Lahore for a period of three years from 2007-2009 (7). Fourth Outbreak (2012-2013),Since 1994, dengue outbreaks have been reported in cyclic manner in Pakistan, but in 2013 a new trend have been observed regarding dengue prevalence in Pakistan , when cases reported from areas other than endemic region such as Balochistan Khyber Pakthunkhwa provinces(8).

Classification:

There are four serotypes of the dengue virus (DEN-1, DEN-2, DEN-3, DEN-4) that can cause the disease. It is a type of arbovirus (arthropod-borne viruses) that belongs to the genus flavivirus of the family flaviviridae (9, 10).

As far as the year wise prevalence of dominant serotypes of DENV infection in Pakistan is concerned DEN-2 was the ascendant serotype from 1994 to 1995 (11,12). In 1998 both DEN-1 DEN-2 were dominant (13). All three serotypes DEN-1, DEN-2, DEN-3 in circulation dominated in 2005 (14). Dominant serotypes of the year 2006 were DEN-2, DEN-3(15).A high prevalence of DEN-2, DEN-3,DEN the year 2008. (16) DEN-2,DEN-3 dominant serotypes in 2009(17). Next year in 2010 DEN-1, DEN-2 again co-circulated in high ratios(15).

Transmission, Pathogenesis and Symptoms:

This disease is transmitted by mosquitoes of the genus Aedes aegypti. Dengue has a variety of clinical presentations, where the patients can be completely asymptomatic to mild clinical features to high grade fever with viral syndrome or in the severest forms as dengue hemorrhagic fever (DHF) which can even be fatal (18).

Dengue fever is an acute febrile disease characterized by sudden onset of fever of 3-5 days, intense headache, myalgia, retro-orbital pain, anorexia, gastrointestinal disturbances and rashes(19). Dengue hemorrhagic fever (DHF) is characterized by four major clinical manifestations: high grade fever, hemorrhagic phenomena, often with hepatomegaly and, in severe cases, signs of circulatory failure. Severe plasma leakage in these patients can lead to hypovolemic shock and circulatory failure. This is called dengue shock syndrome (DSS) and can lead to death(20).

Laboratory diagnosis:

The diagnosis of dengue fever is carried out based on clinical, epidemiological and laboratory data. Among laboratory tests, both non-specific (blood count, platelet count, tourniquet test, prothrombin time (PT), activated partial thromboplastin time (APTT), liver function tests and serum albumin concentration) and specific tests (viral isolation tests and serology for antibody examination) are used (21, 22).

Effect on hematological parameters:

Most commonly dengue virus cases leukopenia, sometimes with counts of less than 2 x 103/μL. However, there are reports of mild leukocytosis at the onset of the disease, with neutrophilia. Lymphocytosis is a common finding, with the presence of atypical lymphocytes. The hematocrit concentration should be monitored according to the days of illness, remembering that, with the progression to DHF, there will be a 20% increase in hematocrit from the patient's baseline, associated with thrombocytopenia (< 100 x 109/L)(23,24).

A recent study conducted in a tertiary care hospital in India reported that out of 60 patients, 40 (66.6%) were male and 20 (33.3%) were female patients. Out of 60 patients, 30 (50%) were in age group of 20 to 30 years. out of 60 cases of dengue fever, raised hematocrit (>47%) was noted in 10 (16.6%) of patients at presentation and 50 (83.3 %) cases had thrombocytopenia. Leucopenia (leukocyte count of

less than 4,000 cell/mm^3) was present in 12 (20 %) cases (25).
Dr. Chetal Suva et al. Out of 200 patients, 132 males and 68 females with M:F=1.94:1. The mean age of these patients was 28.3 years and the highest proportion was seen in the age group of 20-29 years (53%). thrombocytopenia was present in 158 patients out of total 200 patients followed by leucopenia in 112 patients, HCT (≥45%) in 28 patients(26).
According to the study conducted in LRH Peshawar the total TLC count ranged from 1600 to 9000/mm^3 with mean TLC 4283/mm^3+1919 and the platelets ranged from 15000 to 271000 with mean of 69290/mm^3+50820.5 and HCT ranged from 33 to 49.1% with mean of 42%+_4.1(27).

Importance of this study:
In this context, the present study aimed to collect fresh data about the recent outbreak in Peshawar so that clinician can interpret the hematological parameters with sero-positivity of dengue thus management of dengue will be convenient.

LITERATURE REVIWE:

A recent study conducted in a tertiary care hospital in India reported Out of 100 cases of dengue, 63 cases (63%) were males and 37 (37%) were females. According to age, maximum cases (29%) were in 21-30 years. Thrombocytopenia was found in 90% patients, Leucopenia in 51% patients and hematocrit value >45% in 13% patients (28).

Deshwal, et al. studied a total of 515 patients of Dengue. In their study too maximum patients were in 21-40 year age group (62.91%) and observed a male predominance in their studies with 72.8%. leucopenia was noticed in around 20.19% of cases, platelet count of 50,000/cumm at presentation in 69.5% of cases and raised hematocrit of >47% in 20.7% of patients(29).

Conducted a study in a tertiary care hospital in India reported that out of 60 patients, 40 (66.6%) were male and 20 (33.3%) were female patients. Out of 60 patients, 30 (50%) were in age group of 20 to 30 years. out of 60 cases of dengue fever, raised hematocrit (>47%) was noted in 10 (16.6%) of patients at presentation and 50 (83.3 %) cases had thrombocytopenia. Leucopenia (leukocyte count of less than 4000 cell/mm^3) was present in 12 (20 %) cases (25).

According to the study conducted in LRH Peshawar the number of males were 31.29±13.65 years, while females were 12 (5.85%). Ages of patients were in the range of 10-65 years. Mean age was 31.29±13.65 years. total TLC count ranged from 1600 to 9000/mm^3 with mean TLC 4283/mm^3+1919 and the platelets ranged from 15000 to 271000 with mean of 69290/mm^3+50820.5 and HCT ranged from 33 to 49.1% with mean of 42%+_4.1(27).
A study conducted in the department of pathology and microbiology at Adesh Institute of Medical Sciences & Research, Bathinda showed mean age of the dengue patient was 27 years and the most belonged to the 21-30 year age group, which included 73 patients (32.44%). Mean hematocrit value was 38.7% and only 15% patients had hematocrit more than 45 %.
Mean total leukocyte count was 5239 cells/ cu.mm and 160 patients (37.8%) had leucopenia (<4000 cells / cu.mm) (32).

Gajera vv et al. Out of 100 patients, majority 82(82%)cases were in age group of 15 to 35 years. 70 (70%) patients were male and 30 (30%) were females with a male to female ratio of 2:1. Raised haematocrit was found in (> 40%) in 28 (28%) cases, thrombocytopenia (<1,00,000/mm3) was observed in 81% of the patients, leucopenia(<4,000/mm^3) was observed in 39 (39%) cases(31).
A study conducted by Dr. Chetal Suva et al. in a tertiary care hospital from January 2014 to November 2015 Out of 200 patients, 132 males and 68 females with M:F=1.94:1. The mean age of these patients was 28.3 years and the highest proportion was seen in the age group of 20-29 years (53%). thrombocytopenia was present in 158 patients out of total 200 patients followed by leucopenia in 112 patients, HCT (≥45%) in 28 patients(26).
Farhan F et al. showed that majority of patients; 29% were in age groups of 21 to 30 years. Male to female ratio was 0.98:1, thrombocytopenia (<100,000) was present in 90(90%) of patients, hematocrit value of >45 was noted in 19% patients (33).

OBJECTIVE:

Objective of this study is to determine the hematological changes occur in dengue seropasitive (NS1, IgM, IgG) patients at Northwest general hospital and research center Peshawar.

MATERIAL AND METHODS

This is a cross sectional study with analysis of patients who were admitted for dengue fever in the department of general medicine at northwest general hospital and research center Peshawar Pakistan. This study was conducted on 111patients admitted in 1st September to 30 November 2017.
Study design:
Cross sectional study
Study setting:

Northwest general hospital and research center Peshawar Pakistan

Study duration:

Four months after approval of synopsis

Study population:

Dengue positive patients which fulfill the inclusion criteria were selected.

Inclusion criteria:

- Patients with serologically confirmed NS1 antigen, IgM antibody, and IgG antibody positive dengue infection.

Exclusion criteria:

- Serologically positive dengue cases which were also positive for other co-existing infection e.g. typhoid, malaria etc.

Sample size:

By using WHO sample size calculator, Total sample size was 111 by taking 17% population proportion from previous study (9) with 95% confidence interval and 7% margin of error".

Sampling technique:

Consecutive sampling, a non probability sampling technique.

Specimen collection and handling:

For the collection of blood samples, collection site cleaned clearly with antiseptic liquid to kill germs. 3ml blood was collected from all patients in BD vacationer K2 EDTA 5.4mg in tube for complete blood count. Used an automated mixer for at minimum of 5 minutes. Wrongly filled, coagulated, hemolyzed, sample were not tested. Examine intravenous blood samples within 24 hours of collection. The samples were not refrigerated for platelet and differential counts. If platelet and differential were not necessary then store coagulated and whole blood sample at 2-6 **C**. For dengue serology blood is collected in serum separator tube, centrifuged, and assayed immediately for dengue serology. During specimen collection must use personal protective equipment.

Methodology:

Serology is derived from a venous blood sample collected in serum separated tube from the patients suspected of dengue infection. A commercially available dengue immune chromatographic test kit was used to detect NS1 antigen and differential detection of IgM and IgG antibodies to dengue virus in the human serum. The results were expressed as positive/negative for antigen and antibodies.

Evaluation of hematological parameters of confirmed serologically positive cases were done by collecting 2ml of venous blood in EDTA prefilled vacationers which were examined for Hematocrit, hemoglobin, platelet counts, and total leukocyte counts. The analysis is done by automated hematology analyzer

CELL DYNE RUBY.

Data collection procedure:

The study was conducted after approval from NWIHS and hospital ethical and research committee. All the patients presenting to northwest general hospital with positive dengue serology and a consent form, is included in study. Dengue serology is performed by I.C.T technique. Patient with dengue positive serology is included in study.CBC was performed by CEL DYNE RUBY haematology analyser.

Analysis plan:

Data were analyzed through SPSS version 20, mean and standard deviation calculated for continuous variable. Frequency and percentages were calculated for categorical variable. All the data were presented in the form of charts, groups and tables.

RESULTS:

In the present study out of 111 patients; 74 (66.66%) were male and 37(33.33%) were female(Table 1). According to age maximum cases 31(27.92%) were in 21 -30 years and the rest 20(18.0%) in 41-50 years, 16(14.41%) were in 11-20 years, 16(14.41%) in 31-40 years, 10(9.0%) in 1-10 years, 10(9.0%) in 51-60 years, 8(7.20%) in >61 years(Table 2).

Table 3.1: Gender wise Distribution of study population.

Gender	Number of cases	Percentage
Male	74	66.66%
Female	37	33.33%
Total	111	100%

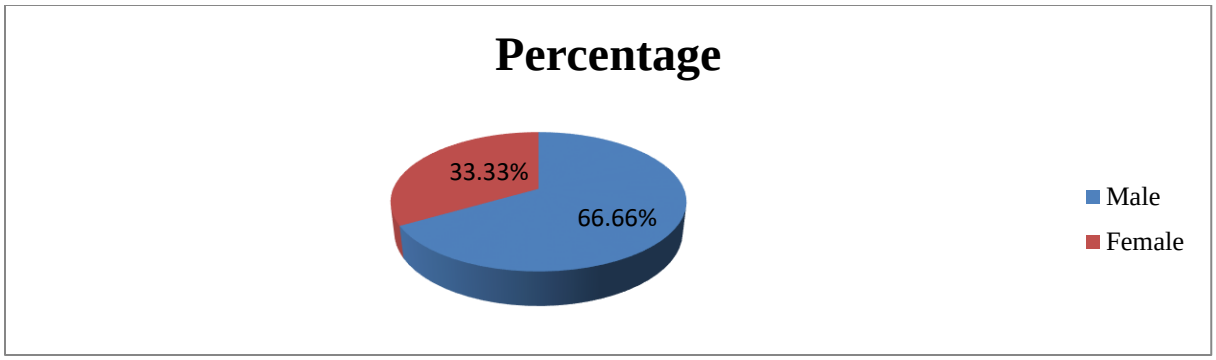

Figure no.3.1: Graphical representation of gender wise distribution of patients

Table 3.2: Age wise Distribution of study population.

Age (years)	Number of cases	Percentage
1 – 10	10	9.0%
11 – 20	16	14.41%
21 – 30	31	27.92%
31 – 40	16	14.41%
41 – 50	20	18.0%
51 – 60	10	9.0%
>61	8	7.20%
Total	111	100%

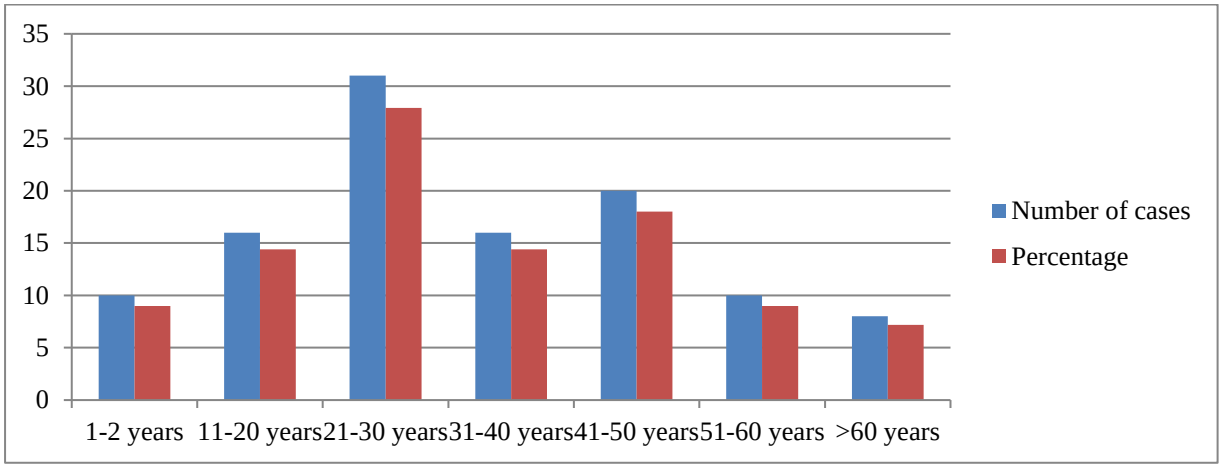

Figure no.3.2: Graphical representation of age wise Distribution of study population.

In the present Study, 73(65.76%) cases were NS1antigen positive, 8(7.2%) cases were NS1antigen+Ig M antibody positive, 1(0.9%) cases were NS1antigen+Ig G antibody positive, 17(15.3%) cases were NS1antigen+IgM+IgG antibodies positive, 7(6.3%) cases were IgM antibody positive, 1(0.9%) case was IgG antibody positive, 4(3.6%) cases showed positivity for both IgM+IgG antibodies(table 3).

Table 3.3: Distribution of study population by serological parameters.

Parameters	Number of cases	Percentage
NS1 only	73	65.76%
NS1+IgM	8	7.20%
NS1+IgG	1	0.9%
NS1+IgM+IgG	17	15.31%
IgM only	7	6.30%
IgG only	1	0.9%
IgM+IgG	4	3.60%
Total	111	100%

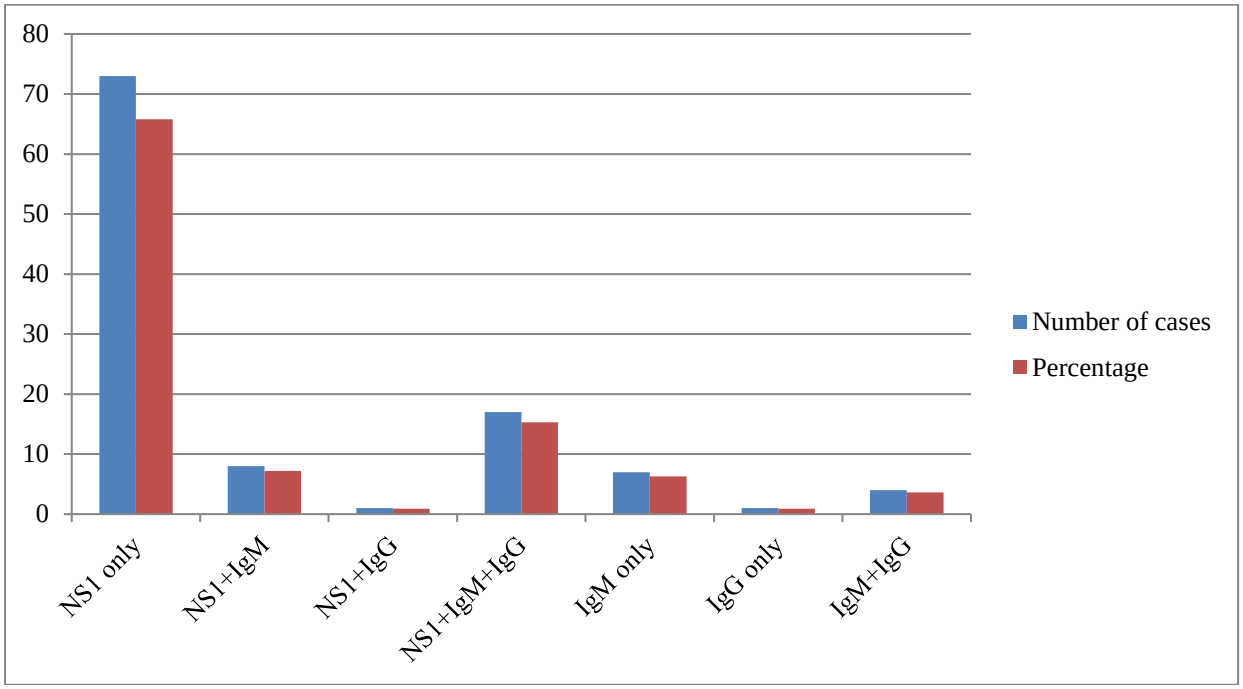

Figure.3.3: Graphical representation of distribution of study population by serological parameters.

In the present study, hematocrit value ranged from 27.70% -56.10% with a mean value of 41.34%. 47 (42.34%) of patients had hematocrit <40%. 36(32.43%) of patients hematocrit ranged from 40-45% .28 (25.22%) of patients were having hematocrit >45% (Table 4).

Table 3.4: Distribution of study population by hematocrit.

Hematocrit	Number of cases	Percentage
<40%	47	42.34%
40 – 45%	36	32.43%
>45%	28	25.22%
Total	111	100%

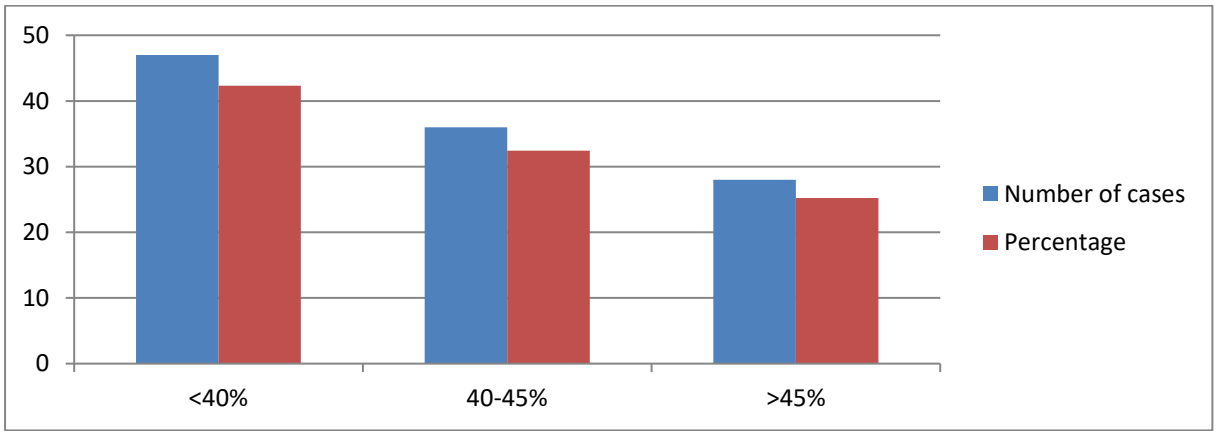

Figure.3.4: Graphical representation of distribution of study population by hematocrit.

In the present study total leukocyte count ranged from 1750 to22700 cell/mm^3, with mean total leukocyte count was 7072cell/mm^3. A total leukocyte count of less than 4,000 cell/mm^3 was present in 16 (14.41%) patients whereas a total leukocyte count of more than 11,000 cell/mm3 was present in 8 (7.20%) patients. 87 (78.37%) patients had total leukocyte counts between normal range(4000-11000) (Table 5).

Table 3.5: Distribution of cases according to total leukocyte count.

TLC (cell/mm^3)	Number of cases	Percentage
<4000	16	14.41%
4000 – 11000	87	78.37%
>11000	8	7.20%
Total	111	100%

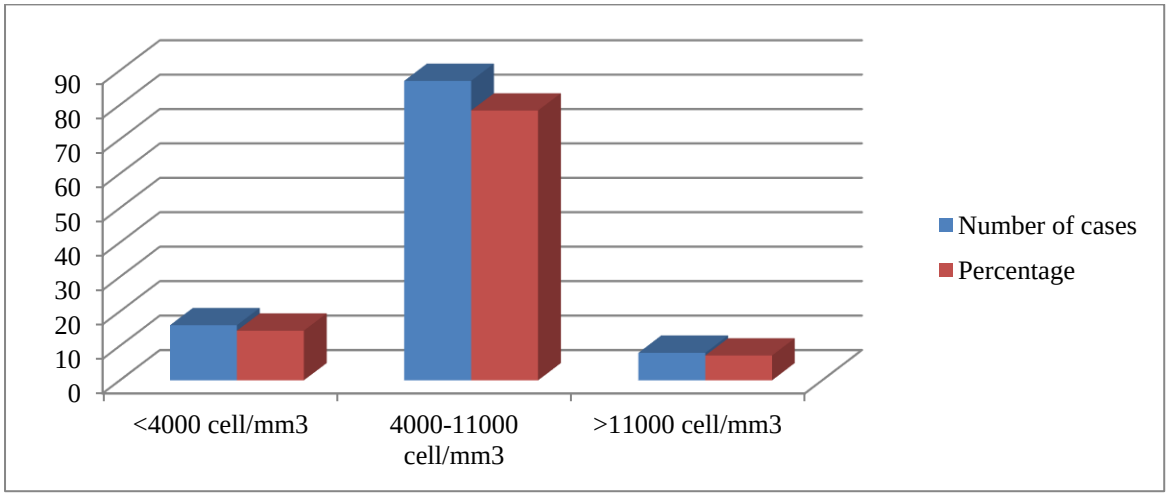

Figure.3.5: Graphical representation of distribution of cases according to total leukocyte count.

In present study the hemoglobin levels among these patients ranged from 8.08-18.9g/dl with a mean of 13.73g/dl. 2(1.80%) had a hemoglobin level of more than 18 g/dl. 2(1.80%) were hemoglobin level of 6 – 8.9g/dl. 60(54.05%) patients were hemoglobin level of 12 – 14.9g/dl. 31(27.92%) patients were hemoglobin level of 15 – 17.9g/dl. 16(14.41%) patients were hemoglobin level of 9 – 11.9g/dl. (Table 6).

Table 3.6: Distribution of study population by Hemoglobin level.

HB (gm/dl)	Number of cases	Percentage
6 – 8.9	2	1.80%
9 – 11.9	16	14.41%
12 – 14.9	60	54.05%
15 – 17.9	31	27.92%
>18	2	1.80%
Total	111	100%

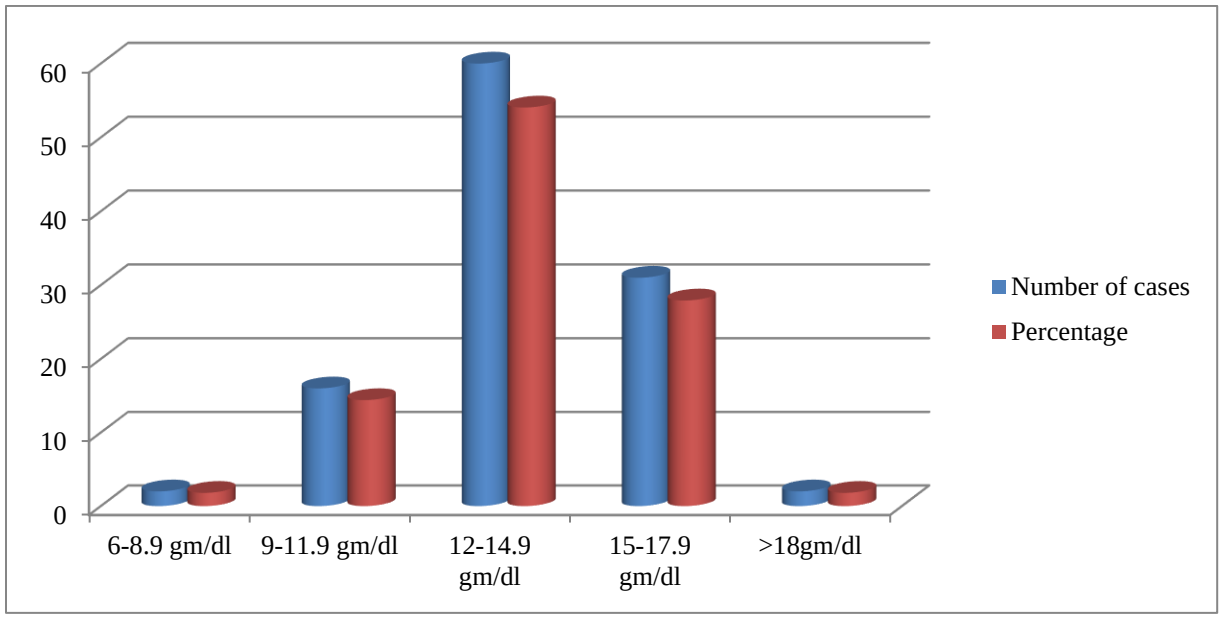

Figure.3.6: Graphical representation of distribution of study population by hemoglobin level.

In present study, the range of platelet count was 0.17-4.16 lacs with a mean platelet count of 170,000 cells/ cu.mm. Out of 111 patients 50(44.35%) had thrombocytopenia, 2 (1.8%) had severe thrombocytopenia, 9 (8.1%) patients had a mild thrombocytopenia and 10 (9.0%) had moderate thrombocytopenia. In this study 29 (26.12%) patients had a platelet level at the lower normal level ranging from1.0 lacs to 1.5 lacs and 61(54.95%) patients had normal level more than 1.5 lacs (Table 7).

Table 3.7:Distribution of study population by platelet count and grade of thrombocytopenia.

Grade	Platelets count(cells/ul)	Number of cases	Percentage
Normal	>150,000	61	54.95%
Low normal	100,000-150,000	29	26.12%
Mild	60,000-100,000	09	8.1%
Moderate	20,000-60,000	10	9.0%
Severe	<20,000	O2	1.8%
Total		111	100%

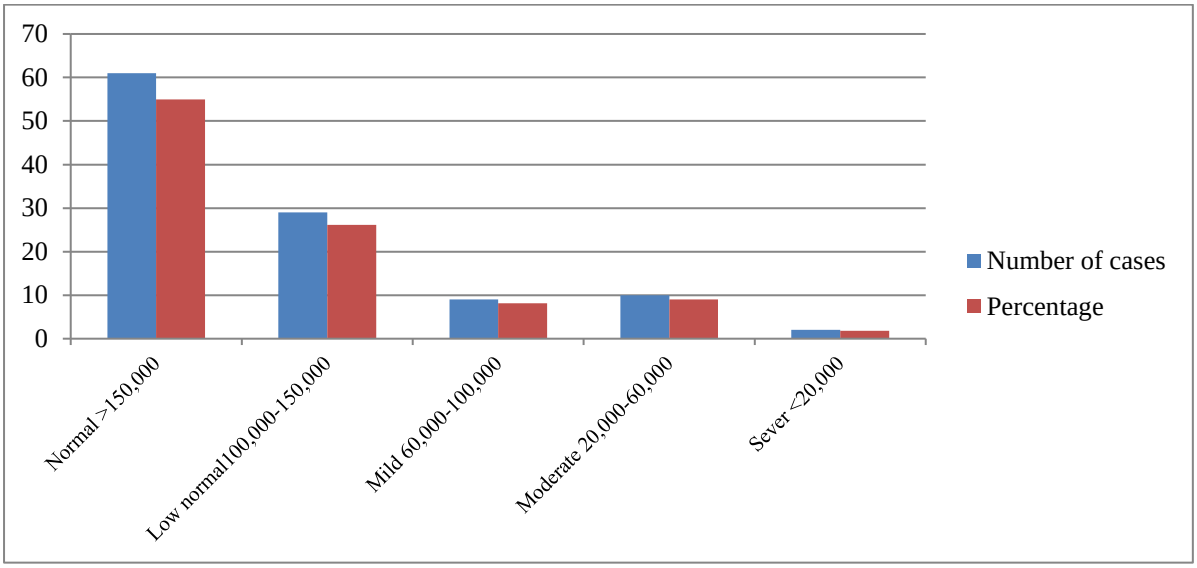

Figure.3.7: Graphical representation of distribution of study population by platelet count and grade of thrombocytopenia.

DISCUSSION:

Dengue fever is the one of the most important viral infection in tropic regions of world. It has become a major global public health problem in Pakistan. Dengue Epidemics are becoming more frequent now days. Classical dengue fever is an acute febrile illness but in a small percentage of dengue infection, a more severe form of disease known as DHF occurs. Early diagnosis and management are very important to save precious lives from this fatal disease.

In the present study majority of patients i.e., 27% were in the age group of 21-30 years followed by 20(18.0%) patients in the age group of 41 to 50 years, 16(14.41%) patients in the age groups of 31 to 40 and 11 to 20 years, 10(9.0%) patients in the age groups of 1 to 10 and 51 to 60 years, 8(7.2%) patients were in the age group of >61 years. It was more common in younger population.

Observations made by Meena KC et al showed that majority of patients i.e., 29% were in age group of 21-30 years which is almost similar to the present study (28).

Shamsunder Khatroth studied 60 patients, 30 (50%) were in age group of 20 to 30 years followed by13 (21.6%) cases in the age group of 41 to 50 years, 10 (16.6%) cases in the age group of 31 to 40 years and 05 (8.3 %) cases with age 51 to 60 years, 02 (3.3 %) cases were in the age group of > 61 years (25).
Deshwal, et al. studied a total of 515 patients of Dengue. In their study too maximum patients were in 21-40 year age group (62.91%) (29). Our findings compare well with the observations of the above authors.

In present study out of 111 patients 74(66.6%) were males compared to females 37 (33.3%) and the male to female ratio was 2:1.
In the study of Shamsunder Khatroth the number of males was 40 (66.6%), while females were 20 (33.3%) with male to female ratio of 2:1 approximately(25). Meena, et al. (n=100) also observed a male predominance with 63 cases (63%) and 37 (37%) female patients. (28)

In the study by Ahmed, et al. the number of males was 193 (94.15%), while females were 12 (5.85%) with male to female ratio of 9:1 approximately (27).
Deshwal, et al observed a male predominance in their studies with 72.8%. (29) Our present study finding correlate well with the above authors study. The male predominance in present study and other study can be due to the fact that usually it's the male population that has excess outdoor activity and the likelihood of being exposed to the vector mosquito bites. Further, female in pakistan are usually better clothed than males, hence they are less exposed.
In the present Study, 73(65.76%) cases were NS1antigen positive, 8(7.2%) cases were NS1antigen+Ig M antibody positive, 1(0.9%) cases were NS1antigen+Ig G antibody positive, 17(15.3%) cases were NS1antigen+IgM+IgG antibodies positive, 7(6.3%) cases were IgM antibody positive, 1(0.9%) case was IgG antibody positive, 4(3.6%) cases showed positivity for both IgM+IgG antibodies which is similar to the study done by Gajera, et al observed ,81 cases were NS1 positive, 16 cases were Ig M positive & 5 cases showed positivity for both.15 cases were IgG positive(30).

In present study, the range of platelet count was 0.17-4.16 lacs with a mean platelet count of 170,000 cells/ cu.mm. In our study out of 111 patients 50(44.35%) had thrombocytopenia, 2 (1.8%) had severe thrombocytopenia, 9 (8.1%) patients had a mild thrombocytopenia and 10 (9.0%) had moderate thrombocytopenia. In this study 29 (26.12%) patients had a platelet level at the lower normal level ranging from 1.0 lacs to 1.5 lacs and 61(54.95%) patients had normal level more than 1.5 lacs.

Sham sunder Khatroth study observed 60 cases of dengue fever, 50 (83.3 %) cases had thrombocytopenia, in which 32 (53.3%) patients had platelet count between 20,000-50,000/cu.mm, 10 cases (16.6%) had platelet count of 50000- 1.4 lacs cumm and 8 (13.3%) cases had < 20,000/cu.mm. though it kept on falling further during hospitalization under observation(25).

In Meena, et al. study, the range of platelet count was 0.07-3.14 lacs with a mean platelet count of 52,840 cells/ cu.mm, (n=100), 90 (90%) cases had thrombocytopenia, in which 61 patients had platelet count between 20,000-60,000 (28). Farhan F et al showed the incidence of thrombocytopenia in 73% which is higher than present study (31).

Cause of thrombocytopenia is controversial, but the possibilities include impaired megakaryocyte production earlier in the disease, platelet injury by virus itself, platelet specific antibodies, immune complexes or DIC.

In the present study total leukocyte count ranged from 1750 to22700 cell/mm^3, with mean total leukocyte count was 7072cell/mm^3. A total leukocyte count of less than 4,000 cell/mm^3 was present in 16 (14.41%) patients whereas a total leukocyte count of more than 11,000 cell/mm3 was present in 8 (7.20%)

patients. 87 (78.37%) patients had total leukocyte counts between normal range(4000-11000).

Shamsunder Khatroth study, total leukocyte count ranged from 1500 to >11000 cells/mm3. A total leukocyte count of less than 4,000 cell/mm3 was present in 12 (20 %) cases, count of 4000-11000 cells/cu mm seen in 38(63.3%**)** cases and >11000/ cumm was seen in 10 cases (16.6 %) (25), which is almost similar to present study.

In Meena, et al.study total leukocyte count ranged from 1310 to16700 cell/mm3, with mean total leukocyte count of 4701 cells/cumm. A total leukocyte count of less than 4,000 cell/cumm was present in 51 (51%) patients which is higher than present study. whereas, a total leukocyte count of more than 11,000 cell/cumm was present in 4 (4%) patients. Almost 45% patients had total leukocyte counts between the normal ranges(28).

In present study the hemoglobin levels among these patients ranged from 8.08-18.9g/dl with a mean of 13.73g/dl. 2(1.80%) had a hemoglobin level of more than 18 g/dl. 2(1.80%) were hemoglobin level of 6 – 8.9g/dl. 60(54.05%) patients were hemoglobin level of 12 – 14.9g/dl. 31(27.92%) patients were hemoglobin level of 15 – 17.9g/dl. 16(14.41%) patients were hemoglobin level of 9 – 11.9g/dl.
In the study by Meena, et al. hemoglobin ranged from 7.5-17.5 g/dl, mean hemoglobin value was 12.6 g/dl. Hemoglobin level more than 15gm% was seen in 6% cases (28), which is almost similar to present study.

In the Shamsunder Khatroth study showed hemoglobin (Hb) ranging from 6 gm% to >15 gm% , 25 (41.6%) cases were Hb of 9-11.9 gm %, followed by 20 (33.3%) cases were Hb of 12-14.9 gm %, 05 (8.3%) had Hb of 6-8.9 gm % and 10 (16.6 %) had Hb of 15-17.9 gm%(25).

In the present study, hematocrit value ranged from 27.70% -56.10% with a mean value of 41.34%. 47 (42.34%) of patients had hematocrit <40%. 36(32.43%) of patients hematocrit ranged from 40-45% .28 (25.22%) of patients were having hematocrit >45% which is similar with study done by Shamsunder Khatroth they found 30(50 %) cases showed hematocrit of 27-36% and 20 (33.3 %) showed hematocrit of 37-46%. Raised hematocrit (>47%) was noted in 10(16.6%) of patients at presentation(25).

In Meena, et al. study hematocrit ranged from 20% to 51% with mean hematocrit of 39.08%, Hematocrit value >45% was found in 13% patients. Hematocrit <40% found in 54% patients (28), which is lower than present study.

CONCLUSION:

In our study Male and young adult are more commonly affected by dengue. Most of the cases were NS1 antigen positive and NS1+IgM+IgG positive, Thrombocytopenia (44.35%) was most predominant hematological discrepancy. Raised hematocrit (25.22%) was also significant in our study. Leucopenia (14.41%) was less significant (78.37% had normal leukocyte count) in our study.

LIMITATIONS:

This study has some limitations which are as follows:

- The time for the study was short.
- It was a hospital based study therefore not represents the entire populations.
- The numbers of patients were less due to end of outbreak.
- Generalizability of our finding is not yet possible due to the non-probability sampling technique adopted in this study.

RECOMMENDATIONS:

Hematological parameters are not a specific test to diagnose dengue infection. However, it helps to improve early diagnosis of dengue fever because dengue affects hematological parameters. If patients have low platelets, leukocytes, and raised HCT must do further confirmation test for dengue especially in dengue epidemic region. Therefore thrombocytopenia, leucopenia, raised hematocrit are important in dengue diagnosis and give a clue in early diagnosis.

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