A cross sectional study of thrombocytopenia in malaria positive cases in a tertiary care hospital of Bareilly

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INTRODUCTION

Malaria is a protozoal disease caused by infection with parasite of genus Plasmodium. Thrombocytopenia is a common and early sign of malarial infection and 60-80% thrombocytopenia is observed in malarial cases and present more frequently and severe in complicated P. falciparum malaria.

METHODS: A cross sectional study done in Central Pathological Lab of Department of Pathology, RMCH, Bareilly. Blood samples collected in ethylenediaminetetraacetic acid vial and blood smear was examined for malaria parasite within red blood cells. Malaria rapid test was done for detection of Plasmodium species and platelet count was done.

RESULTS: 780 cases of malaria was studied from September 2018 to December 2018, male predominance of 54.5%, maximum malarial positive cases 26.92% in the age group of 21-30 years, maximum 86.28% cases were of P. vivax, and thrombocytopenia was observed in 91.54% cases.

CONCLUSIONS: Mostly developing countries with limited resources and trained health manpower are malaria-endemic region of world. Thrombocytopenia is associated with both P. vivax and P. falciparum infections. In our study significance association between malaria and thrombocytopenia has been observed. We suggest malaria should be a consideration in all patients with fever and thrombocytopenia.

Keywords: Malaria, P. vivax, Thrombocytopenia
Grading of thrombocytopenia

Grading of thrombocytopenia was carried out according to National Cancer Institute common terminology criteria for adverse events version 3.0 according to that patients with thrombocytopenia have been divided into following 5 grades:

- **Grade 0**: within normal limit, platelet count 1,50,000 or above.
- **Grade I**: platelet count between 75,000 - 1,50,000.
- **Grade II**: platelet count between 50,000 - 75,000.
- **Grade III**: platelet count between 25,000 - 50,000.
- **Grade IV**: platelet count <25,000.

**Ethical approval**

Ethical approval was taken from college ethical committee, RMCH, Bareilly.

Statistical analysis was done by SPSS version 21.

**RESULTS**

Maximum malarial cases were in 21-30 years age group and minimum cases were in 71-80 years age group. Maximum cases of malaria were found among males.

Maximum thrombocytopenia of all grades was found in 21-30 yrs age group. Maximum thrombocytopenia in males was of grade IV and maximum thrombocytopenia of grade III was found in females.

Maximum P. vivax cases was found in 21-30 yrs age group while maximum cases of P. falciparum was found in 11-20, 21-30 and 41-50 yrs age group and maximum cases of mixed infection in 31-40 yrs age group.

Maximum cases of P. vivax and mixed infection were found among males while P. falciparum was found equal in both sexes.

Maximum cases of grade I thrombocytopenia was found in both (P. vivax and P. falciparum) while grade III thrombocytopenia was found in mixed infection.
Table 1: Demographic profile (n=780).

| Age group (yrs) | Number | %     |
|-----------------|--------|-------|
| 0-10            | 78     | 10.00 |
| 11-20           | 157    | 20.13 |
| 21-30           | 210    | 26.92 |
| 31-40           | 142    | 18.20 |
| 41-50           | 72     | 09.23 |
| 51-60           | 74     | 09.49 |
| 61-70           | 43     | 05.52 |
| 71-80           | 04     | 00.51 |

Sex

| | Male | Female |
|---|------|--------|
| Number | 425  | 355    |
| %     | 54.50| 45.50  |

Table 2: Correlation of demographic profile with platelets.

| Correlation with platelets | Thrombocytopenia with different grades | P value/ Chi square |
|---------------------------|---------------------------------------|---------------------|
| Age group (yrs)           | Normal (%) | Grade 1 (%) | Grade 2 (%) | Grade 3 (%) | Grade 4 (%) | Total (%) |
| 0-10                      | 7 (10.61) | 11 (06.55) | 17 (11.64) | 24 (11.27) | 19 (10.16) | 78 (10.00) |
| 11-20                     | 08.97 | 14.10 | 21.79 | 30.77 | 24.37 | 100.00 |
| 21-30                     | 12.78 | 17.82 | 17.82 | 28.02 | 23.56 | 100.00 |
| 31-40                     | 08.11 | 24.31 | 22.40 | 24.31 | 20.97 | 100.00 |
| 41-50                     | 04.29 | 02.11 | 21.13 | 25.35 | 21.83 | 100.00 |
| 51-60                     | 04.17 | 13.89 | 20.82 | 30.56 | 30.56 | 100.00 |
| 61-70                     | 05.07 | 10.71 | 05 (03.42) | 22 (10.33) | 24 (12.83) | 74 (09.36) |
| 71-80                     | 06.76 | 24.32 | 06.76 | 29.73 | 32.43 | 100.00 |
| Total                     | 11.63 | 27.92 | 06.96 | 32.56 | 20.93 | 100.00 |
| Total                     | 00.00 | 02.11 | 01 (00.69) | 00 (00.00) | 01 (00.54) | 04 (00.51) |

Sex

| | Male | Female |
|---|------|--------|
| Number | 38 (57.58) | 90 (53.57) | 92 (63.01) | 99 (46.48) | 106 (56.68) | 425 (54.49) |
| | 09.84 | 21.88 | 21.65 | 23.29 | 24.94 | 100.00 |
| Female | 28 (42.42) | 78 (46.43) | 54 (36.99) | 114 (53.52) | 81 (43.32) | 355 (45.51) |
| | 07.89 | 21.97 | 15.21 | 32.11 | 22.82 | 100.00 |
| Total | 66 (100.00) | 168 (100.00) | 146 (100.00) | 213 (100.00) | 187 (100.00) | 780 (100.00) |
| | 08.46 | 21.54 | 18.72 | 27.31 | 23.97 | 100.00 |

DISCUSSION

Age distribution

In our study, out of total 780 study population maximum 210 (26.92%) cases were in 21-30 year age group, followed by 157 (20.13%) in 11-20 year age group and minimum 04 (0.51%) in 71-80 year age group. Similar finding 56% cases in 15-40 year age group, 38% in 18-30 year age group was observed by Gupta et al, 38.20 % in 21-30 year age group, 20.00% in 31-40 year age group, 2.6% in 61-80 year age group was observed by Jairajpuri et al, 34.61% in 21-30 years age group by Khuraiya et al while maximum 43.33% cases were under the age of 20 years was found by Gill et al.29-32
**Sex distribution**

In our study, out of 780 malarial patients 54.50% were males while 45.50% were females. 52% males and 48% females was observed by Ahmad et al, 63.33% males and 36.66% females was found by Gill et al, 65.22% males and 34.78% females females was found by Gupta et al, 69% males and 31% females was reported by Jairajpuri et al, 77.15% males and 22.85% females was reported by Kalavathi et al. The males thought to be at a higher risk due to more outdoor activity and less protection from mosquito bites.

**Type of malaria**

Out of 780 cases of malaria we found 86.28% cases of *P. vivax*, 02.31% cases of *P. falciparum* and 11.41% mixed infection.

**Correlation of malaria with platelets**

In our study out of 780 malarial cases thrombocytopenia was found in 91.54% cases. Normal platelet was observed in 08.46% out of which 07.1% were in *P. vivax*, 0.26% in *P. falciparum* and 01.03% in mixed infection. Maximum 27.3% thrombocytopenia grade III was found in our study followed by 23.97% grade IV than 21.54% in grade I and minimum18.72% in grade II.

| Table 3: Correlation of demographic profile with type of malaria parasite. |
|-----------------|-----------------|-----------------|-----------------|
| **Correlation with platelets** | **Malaria parasite with different types** | **P. vivax** | **P. falciparum** | **Mixed** | **Total** |
| **Age group (yrs)** | | | | | **P value/ Chi square** |
| 0-10 | 67 (09.96) | 01 (00.06) | 10 (11.24) | 78 (10.00) | |
| 85.90 | 1.28 | 12.82 | 100.00 |
| 11-20 | 134 (19.91) | 04 (22.22) | 19 (21.35) | 157 (20.13) | |
| 85.35 | 2.55 | 12.10 | 100.00 |
| 21-30 | 198 (29.42) | 03 (16.67) | 09 (10.11) | 210 (26.92) | |
| 94.29 | 01.43 | 04.29 | 100.00 |
| 31-40 | 117 (17.3) | 04 (22.22) | 21 (23.60) | 142 (18.21) | |
| 82.39 | 2.82 | 14.79 | 100.00 |
| 41-50 | 58 (08.62) | 04 (22.22) | 10 (11.24) | 72 (09.23) | |
| 80.56 | 5.56 | 13.89 | 100.00 |
| 51-60 | 62 (09.210) | 01 (05.56) | 11 (12.36) | 74 (09.49) | |
| 83.78 | 01.35 | 14.86 | 100.00 |
| 61-70 | 33 (04.90) | 01 (05.56) | 09 (10.11) | 43 (05.51) | |
| 76.74 | 02.33 | 20.93 | 100.00 |
| 71-80 | 04 (00.06) | 00 (00.00) | 00 (00.00) | 04 (00.51) | |
| 100.00 | 0.00 | 0.00 | 100.00 |
| Total | 673 (100.00) | 18 (100.00) | 89 (100.00) | 780 (100.00) | |
| 86.28 | 2.31 | 11.41 | 100.00 |

**Sex**

| | **Male** | **Female** | **Total** |
| **P value/ Chi square** | | | |
| **Male** | 363 (53.94) | 09 (50.00) | 53 (59.55) | 425 (54.49) | |
| 85.41 | 02.12 | 12.47 | 100.00 |
| **Female** | 310 (46.06) | 09 (50.00) | 36 (40.45) | 355 (45.51) | |
| 87.32 | 02.54 | 10.14 | 100.00 |
| **Total** | 673 (100.00) | 18 (100.00) | 89 (100.00) | 780 (100.00) | |
| 86.28 | 02.31 | 11.41 | 100.00 |

In our study we found thrombocytopenia (91.54%). Similar finding 92% thrombocytopenia was observed by Jairajpuri et al, 81.9% thrombocytopenia was found by Agravat et al, 77.83% by Gupta et al, 71.61% was found by Akthar et al. In our study we found normal platelets in *P. vivax* (07.18%), *P. falciparum* (00.26%) and in mixed infection 01.03%, while normal platelets was found only in *P. vivax* (07.90%) and normal platelets was not found in *P. falciparum* and mixed infection by Jairajpuri et al. while normal platelets in *P. vivax*
(05.23%, 13.04%, and 10.81%), in *P. falciparum* normal platelets (13.24%, 08.69%, and 13.51%) and in mixed infection (00.00%, 00.43% and 2.70%) by Agravat et al, Gupta et al and Akthar et al. In our study we found grade I thrombocytopenia (21.54%) while 16.51% grade I thrombocytopenia was observed by Jairajpuri et al and 26.13% by Agravat et al. In our study grade II thrombocytopenia was found (18.72%) while 31.01% grade II thrombocytopenia was found by Agravat et al and 2.83% by Jairajpuri et al, in our study Grade III thrombocytopenia (27.31%) was found, while 21.31% was observed by Agravat et al and 41.03% was found by Jairajpuri et al, Grade IV thrombocytopenia was found in our study (23.97%). 21.23% by Jairajpuri et al and in contrast 3.14% was found by Agravat et al.

### Table 4: Correlation of type of malaria parasite with platelets.

| Malaria parasite | Grade normal | Grade I | Grade II | Grade III | Grade IV | Total | P value/ Chi square |
|------------------|--------------|---------|----------|-----------|----------|-------|--------------------|
| *P. vivax*       | 56 (84.85)   | 137 (81.55) | 126 (86.30) | 180 (84.51) | 174 (93.05) | 673 (86.28) |                          |
|                  | 08.32        | 32.47    | 18.72    | 26.75     | 25.85     | 100.00 |                          |
| *P. falciparum*  | 02 (03.03)   | 07 (04.17) | 01 (00.69) | 06 (02.82) | 02 (01.07) | 18 (02.31) | 0.076/ 14.218          |
|                  | 11.11        | 38.89    | 05.56    | 33.33     | 11.11     | 100.00 |                          |
| Mixed            | 08 (12.12)   | 24 (14.28) | 19 (13.01) | 27 (12.67) | 11 (05.88) | 89 (11.41) |                          |
|                  | 00.90        | 26.97    | 21.35    | 30.34     | 12.36     | 100.00 |                          |
| Total            | 66 (100.00)  | 168 (100.00) | 146 (100.00) | 213 (100.00) | 187 (100.00) | 780 (100.00) |                          |
|                  | 08.46        | 21.54    | 18.72    | 27.31     | 23.97     | 100.00 |                          |

### Table 5: Correlation of malaria with platelets.

| Thrombocytopenia | Our study (n=780) (%) | Jairajpuri et al (n=230) (%) | Agravat et al (n=287) (%) | Gupta et al (n=230) (%) | Akthar et al (n=74) (%) |
|------------------|-----------------------|-------------------------------|---------------------------|-------------------------|-------------------------|
| Normal platelets | *P. vivax*            | 07.18                         | 07.80                     | 05.23                   | 13.04                   | 10.81                   |
|                  | *P. falciparum*       | 00.26                         | 00.00                     | 13.24                   | 08.69                   | 13.51                   |
|                  | Mixed                 | 1.03                          | 00.00                     | -                       | 00.43                   | 2.70                    |
| Total            |                       | 08.46                         | 7.80                      | 18.47                   | 22.17                   | 27.03                   |
| Grade I          | *P. vivax*            | 17.56                         | 14.62                     | 08.71                   |                         |                         |
|                  | *P. falciparum*       | 00.90                         | 00.47                     | 17.42                   |                         |                         |
|                  | Mixed                 | 03.07                         | 01.42                     | -                       |                         |                         |
| Total            |                       | 21.54                         | 16.51                     | 26.13                   |                         |                         |
| Grade II         | *P. vivax*            | 16.15                         | 18.40                     | 19.86                   |                         |                         |
|                  | *P. falciparum*       | 00.13                         | 00.94                     | 11.15                   |                         |                         |
|                  | Mixed                 | 02.44                         | 01.89                     | -                       |                         |                         |
| Total            |                       | 18.72                         | 02.83                     | 31.01                   |                         |                         |
| Grade III        | *P. vivax*            | 23.08                         | 37.26                     | 02.09                   |                         |                         |
|                  | *P. falciparum*       | 00.77                         | 00.94                     | 19.13                   |                         |                         |
|                  | Mixed                 | 03.46                         | 02.83                     | -                       |                         |                         |
| Total            |                       | 27.31                         | 41.03                     | 21.31                   |                         |                         |
| Grade IV         | *P. vivax*            | 22.30                         | 17.45                     | 01.05                   |                         |                         |
|                  | *P. falciparum*       | 00.26                         | 01.42                     | 02.09                   |                         |                         |
|                  | Mixed                 | 01.41                         | 02.36                     | -                       |                         |                         |
| Total            |                       | 23.97                         | 21.23                     | 3.14                    |                         |                         |

**CONCLUSION**

Mostly developing countries are with limited resources and trained health personnel. The haematological aspects of malarial infection constitute a very interesting area and may be used in addition to the clinical assessment, to heighten the suspicion of disease. Thrombocytopenia is associated with both *P. vivax* as well as *P. falciparum* infections. So thrombocytopenia with acute febrile illness in the tropics, increases probability of malaria, as in our study we found thrombocytopenia in about 92% in malarial cases.

**Funding:** No funding sources  
**Conflict of interest:** None declared  
**Ethical approval:** The study was approved by RMCH, College Ethical Committee, Bareilly
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Cite this article as: Agarwal AK, Katiyar GD, Khan S, Chaudhary BC, Sharma M, Kumar D. A cross sectional study of thrombocytopenia in malaria positive cases in a tertiary care hospital of Bareilly. Int J Community Med Public Health 2019;6:5348-54.