

Epidemiological Study on *Plasmodium Vivax* in Al-Tameem Province

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Summary

Background: Malaria is one of the most prevalent human disease in the world. The weather and irrigation and fertilization of land for agriculture in Iraq speed the reproduction rate of *Anopheles* mosquito, which may explain why malaria is endemic in this country. The recorded death rate among the affected population for period 1929-1956 is 12.7%.

Objective: The aim of the study is to identify the prevalence of *Plasmodium Vivax* (*P. Vivax*) in Al-Tameem province.

Subject & Methods: Epidemiological study of Malaria was done in Al-Tameem province, which is the most endemic area, between June 1999 and August 2000. Blood samples were collected and tested in Al-Tameem General hospital and Public Health Central Laboratory in Al-Tameem province.

Results: The results showed that 61 (1.01%) out of 59942 individuals were infected with *Plasmodium Vivax*. The highest infection rate was in Al-Debis Nahiya (4.28%) followed by Laylan Nahiya (1.56%), province centre (1.01%), Alton-Kopri Nahiya (0.97%), and the lowest was in Al-Hawija district (0.07%). The infection rate was higher in males (0.79%) than in females (0.23%). Regarding the age groups, the highest infection was among those from 16-30 years old. Acute and relapse cases recorded, 49 and 12 respectively.

Conclusion: This study concluded that malaria is endemic in Al-Tameem province especially in Al-Debis Nahiya and Alton kopri Nahiya, and all infected cases were with *P.vivax*. Both sexes were infected, and age range was 5 years to 53 year. Acute, and relapse cases were detected. We recommend more researches to be done in all country in order to reduce the infection rate.

Key wards: Epidemiology, Malaria, Al-Tameem province.

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Introduction:

Malaria is one of the most prevalent human disease in the world that is mentioned in the ancient languages in Egypt, India, China, and in the Al-Rafidain valley in ancient Babylon and Asseria (1,2). Malaria is transmitted by *Anopheles* mosquito, and there are approximately 380 type, 66 type of them can transmit malarial (3). Difference in weather affects mosquito life cycle, growth and development of malarial parasites and its transmission and prevalence. The most suitable temperature for parasites development in mosquito ranges between 20-30 C, and the growth rates decreases at less than 16 C and when the suitable relative humidity for the parasites development is less than 60%. Mild weather with irrigated and fertilized land for agriculture in Iraq speed the reproduction rate of *Anopheles* mosquito, which may be responsible for malaria to be endemic in Iraq. The death rate for infected individuals have been recorded at 12.7% between 1929-1956 (6).

According to the yearly reports of the Health Promotion and Environmental Protection Center and Center for Control Transmissible Diseases in Iraq showed that the number of infected individuals for the years

1990,1991,1992,1993,1994,1995,1998,1999,2000 was 5001, 1832, 1764, 1832, 8894, 96421, 76064, 586, and 87 respectively.

Infection with malaria in Al-Tameem province is mostly from March until end of September, and the most important vectors were *Anopheles superpictus*, *Anopheles sacharovi*, and *Anopheles dalhali* j. *Anopheles algeriensis* is also a vector but at less rates (7,8).

This study was done to identify the prevalence of *P.vivax* in Al-Tameem province.

Materials and Methods:

Epidemiological study of Malaria was done in Al-Tameem province, which is the most endemic area for malaria, from June 1999 to August 2000, and blood samples collected and tested at Al-Tameem General hospital and the Public Health Central Laboratory in Al-Tameem province.

This study was done in Al-Debis Nahiya, Laylan Nahiya, Al-Riyad, Al-Abbasy Nahiya, Alton-Kopri Nahiya and Al-Hawija.

A Questionnaire was prepared and information about infected individuals were recorded, including these information included name, age, sex, blood group, address, weight, height, skin fold thickness, and left arm circumference and chest circumference.

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Blood samples were collected and thick and thin blood films were stained with Giemsa stain and studied with oil lens 100X (9).

Results:

The results are shown in table 1. The infection rate of the overall tested samples was 1.03%, and in all the infected individuals the agent was *Plasmodium vivax*.

The number of infected individuals in the

Table (1):epidemiology of *P.vivax* in center of Al-Tameem Province and arreded areas.

| Rate of infection % | No. positive slides | No. slides | Areas |
|---------------------|---------------------|------------|--------------------|
| 1.01 | 3 | 297 | Province center |
| 0 | 0 | 239 | Al-Rivad Xahiya |
| 0.07 | 2 | 2655 | Al-Hawije Nahiya |
| 0 | 0 | 513 | Al-Abbasy Nahiya |
| 0 | 0 | 410 | Al-Zab Nahiya |
| 4.28 | 49 | 1144 | Al-Debis Nahiya |
| 0.97 | 6 | 620 | Altun kopri Nahiya |
| 1.56 | 1 | 64 | Laylan Nahiya |
| 1.03 | 61 | 5942 | Total |

$X^2=15.2$ D.F=7 P<0.001

Table 2 shows the sex of infected individuals, and there is significant statistical differences P<0.01 between males and females; the number of infected males was 47(77.05%) whereas the number of infected females was 14 (22.95%). The infection rate in males was 0.79%, which was higher than that in females 0.23%.

The age range of the sample was 4 to 53 years, and table-2 shows a significant difference in different age groups. The most affected age group is 16-30 years followed by age group 31-45 year.

Table (2): Infection distribution of *P.vivax* according to age group and sex.

| Females | | Males * | | Age |
|------------------|-----|------------------|-----|--------------------|
| Infection rate % | No. | Infection rate % | No. | |
| 0 | 0 | 0 | 0 | 6 months to 1 year |
| 3.28 | 2 | 0 | 0 | 2 year to 5 year |
| 1.64 | 1 | 0 | 0 | 6 year to 10 year |
| 0 | 0 | 1.64 | 1 | 11 year to 15 year |
| 13.11 | 8 | 57.38 | 35 | 16 year to 30 year |
| 4.92 | 3 | 14.75 | 9 | 31 year to 45 yaer |
| 0 | 0 | 3.28 | 2 | 46 year to 60 year |
| 0 | 0 | 0 | 0 | 61 year to 76 year |
| 22.95 | 14 | 77.05 | 47 | Total |

$X^2=12.82$ D.F=7

* Significant differences P<0.01 between females and males in malarial infection Table(3)showed that the number of acute and The number relapsed cases was 49(80.33%), and acute

province center and other areas is shown in table 1, which shows significant differences (P<0.001) in parasite distribution in province center and other areas; the highest infection rate recorded in Al-debis Nahiya 4.28% followed by Laylan Nahiya 1.56%, province center 1.01% and Altun kopri-Nahiya .97%, and the lowest rate in Al-Hawije 0,07%.

cases was 12 (19.67%) There is a significant difference (P<0.05) in infection distribution between relapsed and acute cases.

Table (3):Type of infection of *P.vivax* and its distribution between females and males.

| Percent % | No. Infected females | Percent % | No.** infected males | Percent % | No. positive cases | Type of infection |
|-----------|----------------------|-----------|----------------------|-----------|--------------------|-------------------|
| 13.11 | 8 | 67.21 | 41 | 80.33 | 49 | Acute * |
| 9.84 | 6 | 9.84 | 6 | 19.67 | 12 | Relapse |
| 22.95 | 14 | 77.05 | 47 | 100 | 61 | Total |

$X^2=5.64$ P<0.05 D.F=7

◆Significant differences PO.05 in type of infection (acute and relapses).

**Significant differences P<0.05 between males and females in acute cases of Infection.

Results in table.3 also indicated that there is significant differences (P<0.05) in acute cases between males and females; the number of infected males and females was 41(67.21%) and 8(13.11%) respectively, whereas the number of infected males and females in relapsed cases was 6(9.84%).

Discussion:

In comparing the rate of infection in this study with other studies done in Al-Tameem province, we notice that the rate of infection in 1962, 1972, and 1986 was 0.001%, 0.88%, and 0.007% respectively (8,10,11). *P.vivax* infection occurred at low rates in 1980-1990, and increased in 1991-1997 because of the economic sanction and unavailability of new drugs used against malarial parasites. The number of infected individuals with *P.vivax* in AL-Tameem province in 1995, and 1997 was 409(2.24%) and 397(2.02%) respectively (12,13) The number of infected individuals decreased to 26 in 1998; this due to the continuous and organized spraying campaign against vector of malaria.

In this study, there is elevated rates of *P.vivax* infection Al-Debis Nahiyaand Laylan Nahiya, this is due to the existence of blocked water channels, which provide suitable environment for mosquito reproduction, whereas infection with *P.vivax* in the province is due to travel of peoples from the center of the province to the surrounding areas to work on farms, and also the center of the province is the main road to other provinces (Arbil,

Al-Sulaymania, Al-Mosul), which are endemic for malaria. Salman (13) pointed to the same results and also indicated that the rate of infection with *P.vivax* in Al-Debis and the center of the province was 4.06% and 2.61% respectively. Al-Jebouri (12) noticed a high rate of infection in Al-Debis 0.92% and in the province center was 0.02%. The high rate of infection in males in comparison to females is because males are exposed to the vector more than females because of working on farms and this agree with (13,14) which showed the rate of *P.vivax* infection in Al-Tameem province was in males more than females. In other studies the results showed that the rate of infection in Al-Nagef province was in males less than females (15) whereas Fernandez (16) indicated that males and females infected with malaria at equal rates.

In this study the rate of *P.vivax* infection was high in the age group 16-30; this is because this age group is more suitable for working on farms, and are more exposed to the infection. Table.5 shows that the number of infected males in this age group was 35 where in females was 8, and there are significant differences ($P < 0.01$) between infected males and females in this age group. Other studies done in Iraq proved that the age group older than 15-year are more accessible to the malarial infection (13,17), but Fernandez pointed out that all age groups are liable to be infected but the death rate is higher before the age of years.

The high rates of acute cases of *P.vivax* infection in this study may be due to the fact that malaria is endemic in this area for along time, and the high rate of relapse may due to incomplete treatment with antimalarial drug, chloroquine primaquine, and especially primaquin, which act on the asexual phases in liver, which are responsible of relapses cases of *P.vivax*. Studies and researches have been done on transmissible diseases indicated that incomplete antimalarial drug is the most important factor in relapse, or may be *P.vivax* is resistant to the primaquine (18,19). This study agree with Al-Jebouri study (12) which pointed to the high rate of acute cases 350(88.16%) of *P.vivax* recorded in Al-Tameem province while relapses were 47(11.83%). Also agrees with Kadir and Amin (14) who pointed that the number of acute cases of *P.vivax* infection in Al-Tameem was 350(88.16%) whereas relapse cases was 47(11.83%).

These results agree with (13) which noticed that the number of acute infected males and females was 191(46.60%) 131(32.12%) respectively. Whereas relapse cases in males and females was 40(9.77%), 47(11.51%) respectively.

This study concluded that malaria is endemic in Al-Tameem province especially in Al-Debis Nahiya and Altun kopri Nahiya, and all infected

cases was with *P.vivax*. Both sexes are infected (age groups from 5 years to the 53 year) and acute and relapsed cases are reported.

We recommend that more research is carried out in all provinces in order to reduce the infection rate

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