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Malaria is a health problem in pregnant women of Bannu district, Khyber Pakhtunkhwa province, Pakistan

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Abstract
The study was conducted in Women & Children Teaching Hospital (WCTH) district Bannu for the incidence of plasmodium species in pregnant women. For this study those pregnant women were selected who visited to the hospital with the complaints of high fever, shivering, vomiting and headache. A total of 250 blood samples were collected, among these 57 (22.80%) blood samples were found positive and 193 (77.20%) were negative. Among the positive blood samples, 52 (20.80%) and 5 (2.00%) were infected with *P. vivax* and *P. falciparum* respectively Women of the age group 20-30 years were more susceptible to the plasmodium infection. In most of the patients, plasmodium density 1 was recorded. Women of the rural area were more infected than the urban area. The number of parasite per field in microscope is called as plasmodium density. The main reasons of the malaria transmission were the improper hygienic condition, diagnosis, high temperature and standing water in lands in district Bannu. In addition the study helps us for the improvement of malaria control and other strategic plan among the pregnant women in district Bannu.

Keywords: Malaria, health problem, pregnant women, Bannu district

Introduction
District Bannu is situated in between the 31.28^0 North latitude and 73.25^0 East longitudes. It is located in the southern region with its borders contain districts Karak, Lakki Marwat and the North South Waziristan Agencies. According to 2017 Census the estimated population of district Bannu is 1,167,892 with annual growth rate of 2.81% respectively. The total area of district Bannu is 1,227 square kilometers, but the cultivated area is 74196 Hectors. The climate is warm in summer (48 ^{0}C) and cooled in winter (6 ^{0}C) season. 45% of area is irrigated through canal systems, while the remaining area is depend upon the rain fall. Malaria is caused by protozoan parasite of genus plasmodium, among these the *Plasmodium falciparum* is considered to be very fatal with respect to the human being. It is a life threatening parasite with most complicated life cycle including in the human body and female *Anopheles quadrimaculatus* mosquito act as a vector, these parasite causes infections equally in all types of human ages. Malaria is also easily spread, when human being can expose to the mosquito bite in particular areas [1]. Malaria is highly endemic and *P. vivax* parasite is most common in Pakistan, therefore the *P. falciparum* are rising from 35 to 40% of infections [2]. Approximately 300 to 500 million peoples suffered from malaria and 2 to 3 million peoples died each year [3]. Fifty million pregnant women are suffered from the malaria called pregnancy-associated malaria (PAM) throughout the world, among these 2,500-10,000 motherly deaths per year [4-5]. The plasmodium parasite is also causes danger and significant side effect for children of the women infected by the malaria during pregnancy because of connected to the structures of the placenta [6]. Anemia is the most common hematological sign of malaria parasite infection. It is mainly obvious with *P. falciparum*, which deteriorations the red blood cells (RBCs) of all types of human ages [7]. Anemia is one of the most severe health problems worldwide.

The occurrence of anemia in pregnancy is significantly different because of the differences in socioeconomic situations, health-seeking behaviors and lifestyles of various cultures. Anemia infects 42% of all women and 52% of pregnant women globally [8]. The aim of current study was to estimate the incidence of plasmodium infection in pregnant women in district Bannu.

Materials and Methods

Patient's selection and slides preparation

The present study was conducted in Women & Children Teaching Hospital (WCTH) district Bannu to analyze the plasmodium species in pregnant women. For this study those pregnant women were selected who visited to the hospital with the complaints of high fever, shivering, vomiting and headache. The finger of the patient was cleaned with spirit moist cotton, the first drop of the blood was removed and 2-3 drops of blood was taken by pricking with sterile pricker. New pricker was used for each patient. The thick smear slides was formed and stained with 3% Giemsa's stain.

Microscopy/parasite count

After preparation of the slide one drop of emersion oil was kept at the centre of the slide, examined by the binocular Japan Olympus microscope at the lens of power 100x. Majority of the slides contained one parasite densities per field with ring trophozoite stage.

Results

The blood sample sizes of suspected pregnant women were 250 respectively. Among these 57 (22.8%) blood samples were positive and 193 (77.20%) were negative. Among the positive, 52 (20.80%) blood samples were *P. vivax* and 5 (2.00%) blood samples were *P. falciparum* (Figure 1).

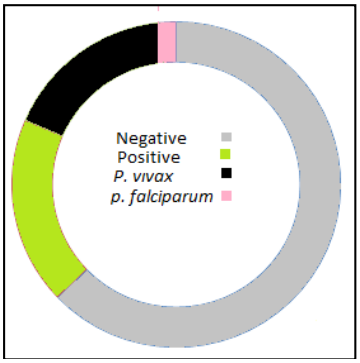

Fig 1: Incidence of plasmodium species in pregnant women

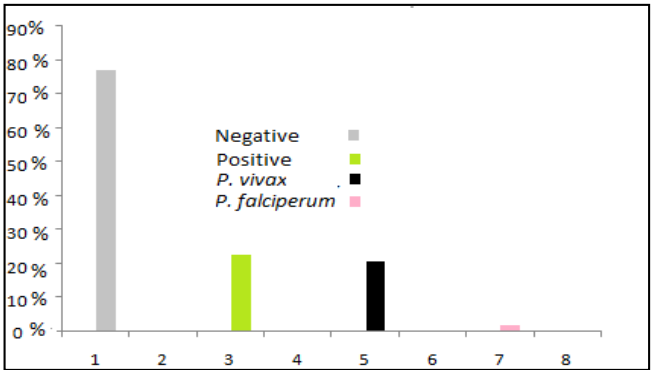

Fig 2: Percentile wise incidence of plasmodium species in pregnant women

The subjects taken for this study were divided in to four groups with ten year gape. The lower age group was more infected than 50 year of age group. From the table it is cleared that the upper (20-30) age group was more susceptible to the plasmodium infections (Table 1).

Table 1: Age wise incidence of plasmodium species in pregnant women

Age (Years)	Positive	*P. vivax*	*P. falciparum*
20-30	26	24	02
31-40	20	18	02
41-50	10	09	01
>50	01	01	00

Number of plasmodium parasite per field under microscope called as plasmodium density. The maximum *P. vivax* density was recorded 4 in 8 patients, while the minimum *P. vivax* density was 01 in 20 patients. The *P. vivax* density 02 was recorded in 17 patients, while the minimum 07 patients have 03 *P. vivax* densities. Similarly 03 patients have minimum 01 *P. falciparum* density, while 02 patients have maximum 02 *P. falciparum* densities (Table 2).

Table 2: Plasmodium species densities with number of patients (n*)

n*	*P. vivax* densities	n*	*P. falciparum* densities
20	01	03	01
17	02	02	02
07	03	00	00
08	04	00	00

In urban area the *P. vivax* was recorded in 22 patients, while *P. falciparum* was recorded in 1 patient. In rural area the *P. vivax* and P. *falciparum* were recorded as 30 and 04 respectively. From the table it is clear that the rural area was more infected than the urban area (Table 3).

Table 3: Incidence of plasmodium species on the basis of locality of patients

Locality	Negative	Positive	
		P. vivax	*P. falciparum*
Urban	59	22	01
Rural	134	30	04

Discussion

The blood sample sizes of suspected pregnant women were 250 respectively. Among these 57 (22.8%) blood samples were positive and 193 (77.20%) were negative. Among the positive, 52 (20.80%) blood samples were *P. vivax* and 5 (2.00%) blood samples were *P. falciparum.* Individuals with age group of 20-30 years were more susceptible to the *P. vivax* 24 (26.37%) and *P. falciparum* 02 (2.19%) respectively. Individuals > 50 years of age were recorded less prevalent for *P. vivax* (25.00%) and *P. falciparum* infection among the pregnant women.

Study was conducted by [9] total of 1400 pregnant women were examined, of which 1035 (73.9%) patients were positive with *P. falciparum* infection. (26–30) years of age were more susceptible to the *P. falciparum* 327 (31.6%) and the age groups; 15-20 years, 31-45 years and 41-45 years individuals were moderately infected with *P. falciparum* 78 (7.5%), 298 (28.8%) and 2.9% respectively. These findings were higher from the present study because the present study has short duration. A study was conducted in Pakistan by the [10] total of 43 blood samples of the pregnant patients were examined, among these 24 (55.8%) were infected with *P. vivax*, 18 (41.9%) with *P. Falciparum* and 1 (2.3%) with *P. ovale* respectively. Another study was put forwarded by the [11] during which a total of 100 pregnant women were analyzed, among these 80 (81%) were positive for *P. falciparum*. Individuals with 15-20 years of age were more prevalent (86.6%), while 31-35 years of age were less susceptible to the *P. falciparum* (59.00%) respectively. A study was conducted by the [12] in which a total of 836 pregnant women were

examined, among these 219 (26.2%) were infected with *P. falciparum* infection. In this study 21-30 years of age individuals were more susceptible to the plasmodium and is in agreement with the present study.

Another study was conducted by [13] who examined 250 blood samples, among these 180 (72%) were infected with *P. falciparum*. 36-39 years of age were more prevalent 15 (88.2%), while (>40) years of age were less susceptible 2 (40.00%) to the malaria parasite. A study conducted in India, in which a total of 2127 blood samples of the pregnant women were analyzed. Of which 121 (33%) were infected with *P. vivax*, while 244 (67%) were infected with *P. falciparum* respectively [14]. Similarly, in another study, a total of 2104 pregnant women were identified by [15]. Among these 816 (38.8%) were positive (54 (2.6%) were infected with *P. malariae*, while 762 (36.2%) were infected with *P. falciparum*) respectively. Another study was conducted by the [16] who collected total of 300 blood samples of pregnant women, among these 175 (58.3%) was infected with *P. falciparum*. The highest plasmodium infections were recorded in irrigated rural area 58 (80.88%), while in township and non-irrigated area were recorded 12 (22.6%) and 108 (60.3%) respectively. A study was put forwarded in Nigeria [17] a total of 272 pregnant women were analyzed, among these 163 (59.9%) were infected with *P. falciparum*, the first trimester pregnant women have high parasite burden (81.4%). Total 50 pregnant women were analyzed by [18] the overall positive prevalence was recorded 26/50 (52.00%) respectively. Of which 16 (84.6%) were infected with *P. falciparum*, while 10 (15.4%) were with *P. malariae* respectively. In this study 20-30 years of age have highest parasite burden.

Conclusion

The number of parasite per field in microscope is called as plasmodium density. So it was concluded that the malaria is very serious and fatal in pregnant women because in most cases it causes abortion. The main reasons of the malaria transmission were the improper hygienic condition, diagnosis, high temperature and standing water in lands in district Bannu. In addition the study helps us for the improvement of malaria control and other strategic plan among the pregnant women in district Bannu.

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