Journal of Medical Sciences

ISSN 1682-4474

science alert

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Research Paper

JMS (ISSN 1682-4474) is an International, peer-reviewed scientific journal that publish original article in experimental & clinical medicine and related disciplines such as molecular biology, biochemistry, genetics, biophysics, bio-and medical technology. JMS is issued six times per year on paper and in electronic format.

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J. Med. Sci., 3 (3): 214-219
May-June, 2003

Resurgence of Malaria in Quetta

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The prevalence of malaria in Quetta was estimated from blood films made during malaria survey, held over 12 consecutive months. The highest parasite rate occurred during the months of August-October. *Plasmodium vivax* was the most common infecting species of mosquitoes during the year, while *Plasmodium falciparum* predominated the later transmission season. The data also reveal the slight prevalence of malaria in the male members of the family, and in the children between 1-16 years. The data pertaining to the years 1995-1998 reveal the resurgence of malaria intensity.

Key words: Malaria, parasite, *Plasmodium vivax*, *Plasmodium falciparum*, vector, Anopheles

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Introduction

Malaria is a disease that can have its victims in all parts of Pakistan. Comparatively, the malaria transmission trend in Balochistan is still considered to be low. (Government of Pakistan, 1988). In Balochistan and especially in Quetta, malaria never became a public hazard, nor faced any epidemic like other provinces of the country. After the worldwide malaria eradication efforts of the 1960s malaria resurged in the early 1970s, but declined after 1974. Then, again a moving average of positive slides was observed (Government of Balochistan, 1998). This gradual increase in malaria cases in Quetta might be attributed to the arrival of Afghan refugees.

Literature survey reveals that almost no entomological or parasitological data of this area has been published, except for the surveys conducted by the Malaria Control Center. Therefore, the investigations reported herein were designed to study the parasitological aspect of malaria, month by month for the whole year, so as to find out the prevalence of parasite ***(Plasmodium vivax*** or ***Plasmodium falciparum)*** in a certain time frame.

Materials and Methods

For the investigation of the type of malarial parasite present through out the year, random population screening was conducted in the malarial patients in Quetta city. The parasite was examined with the help of thick and thin slides prepared by the routine method and stained by Giemsa staining.

A private laboratory was selected and blood was collected by pricking the finger of incoming patients. Confirmed malarial patients of both the sexes and of all ages were registered daily with the type of parasite present. A record of their address, age and sex was also maintained.

Processing of blood films

Thick and thin blood films were made on the same slide. The number of asexual and sexual stages of ***Plasmodium vivax (P. vivax)*** and ***Plasmodium falciparum (P. falciparuum)*** were counted against white blood cells (WBCs) in the same oil immersion field under 1000 times magnification. The thick film was used for counting, but the diagnosis was confirmed by reading the thin film. The thin film was fixed with methanol and the whole slide was stained for 30 minutes with 3% Giemsa diluted in a phosphate buffer solution of pH 7.2. Parasites were recorded per 500WBCs with the exception of high parasitaemias, when only 100 to 200 WBCs were counted. The density of parasitaemia was estimated using 8000 WBC mm^{-3} of blood as a standardized value (Strickland ***et al.***, 1985).

Data processing

Parasitological data was coded and fed into an IBM personal computer, model 586 + CD ROM drive installed. This unit was used for storing and processing the data.

Results and Discussion

The distribution of malarial parasites was determined in a year long study by recording the number of positive slides for malarial parasite from malarial patients. The number of patients

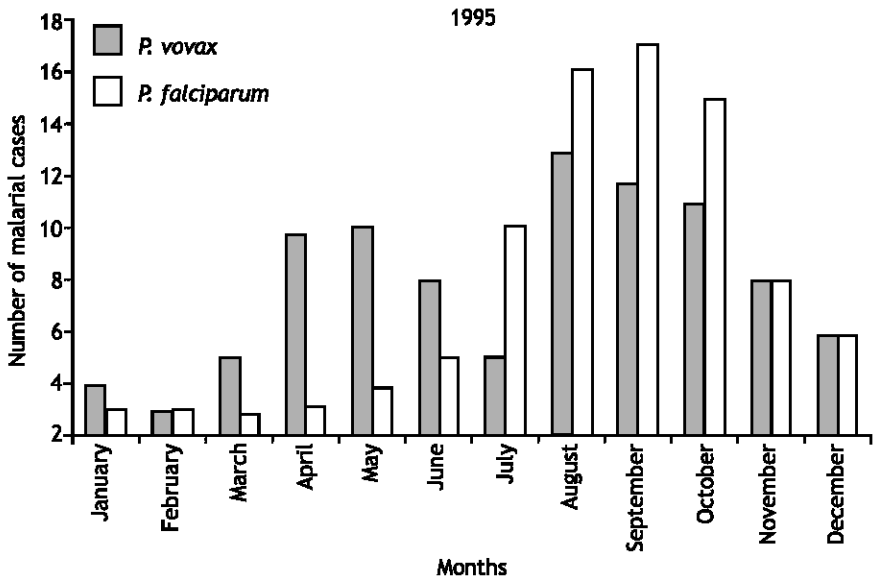

Fig. 1: Monthly pattern of Malaria parasite in Quetta valley

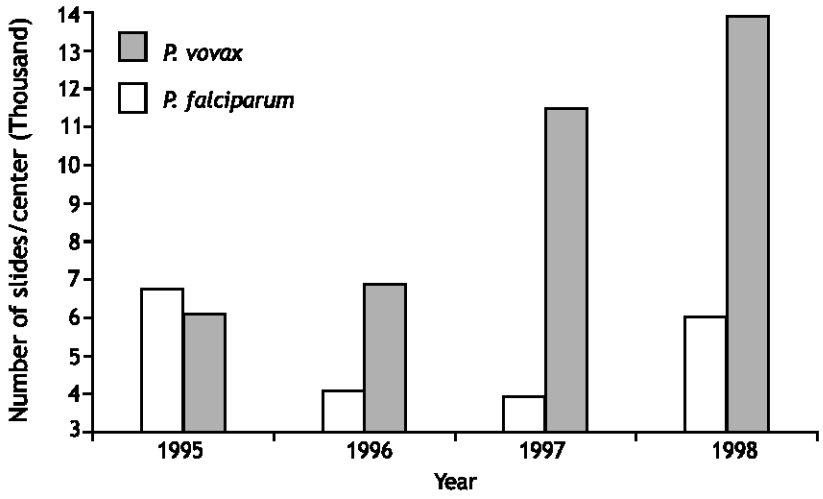

Fig. 2: Annual increase of malaria parasite *Plasmodium vivax (P.vivax)*and *Plasmodium falciparum (P. falciparuum)* number in Malaria Control Centre, Quetta

Table1: Malaria incidence by age and sex

AGE (YEARS)	0-1	1-4	5-9	10-19	20-29	30-39	40-49	50-59	60-80
MALE (No.)	3	13	8	9	8	6	4	3	2
FEMALE (No.)	3	14	9	4	6	2	2	3	1
TOTAL (No.)	6	27	17	13	14	8	6	6	3

shown in Fig. 1, represent a rough estimation of the type of parasite prevailing in that certain month or period. Since the study was conducted in a private laboratory, therefore the number of patients was not very large Distribution of the type of malarial parasite is clarified by the data shown in Fig.1. However, it is quite clear that malaria exists in the city throughout the year, although the number of patients suffering with malaria drop considerably during winters. This could be explained by the drop in the number of Anopheles species (vectors), as the winter approaches. The rise of *P. vivax* in the month of April is quite amazing and does not coincides with our entomological data (Mansoor, 1999); which indicates the appearance of vector in a very small number in this month. Therefore, this rise could be attributed to the travelers coming from Sindh and Punjab, or may be due to the exoerythrocytic cycle which causes the relapse of the disease.

The second wave of *P.vivax*, during late summers could be attributed to the increased density of vectors. *P.falciparum* also inclines with the approach of summer and peaks enormously during the months of August, September and October. The highest rate of infection occurs during these two months due to the combined effect of both the species.

The incidence of malaria by *P. falciparum* declines rapidly as the temperature falls sharply in November, which causes the death of vectors. During the freezing winters, the vector hardly survives but still few malarial cases have been reported. This may be either due to some of the vectors which survive indoors, or might have been brought by the migrants or tourists from Sindh, Punjab or Afghanistan, or due to relapse of the disease.

Another explanation for the early predominance of *vivax* infections is the greater ability of *P.vivax* to produce gametocytaemia when conditions become favorable for transmission during August and September. It also has a relatively larger gametocyte reservoir, a lower critical temperature for sporogony and a shorter incubation period than *P.falciparum* (Bruc-Chwatt, 1980). *P. falciparum* parasites, on the other hand, because of their shorter life span, usually begin with a low gametocyte reservoir, require higher temperature for sporogony and have a longer incubation period (Strickland *et al.*, 1985).

Few mixed infections were also reported during the year, mostly in September; but the number was not large enough to be plotted in a graph.

The annual data relating to the incidence of malarial parasite from 1995-1998 was obtained from Malaria Control Center. Due to its location in such an area, most of the patients coming in this Center belong to the different ethnic groups of Afghanistan. This data was analyzed so as to figure out malaria transmission with changes in seasonal and vectoral intensity. Fig. 2 show the resurgence of malarial parasite in Quetta. *P. vivax* inclined rapidly in 1997, which was quite stable in 1995 and 1996, but was more than double in 1998. A gradual change was also observed in *P. falciparum*. Although its number was slightly greater than *P. vivax* in 1995 but reduced significantly in 1996 and slightly in 1997, but then inclined in 1998. It seems that 1998 was a year of malarial parasite explosion. If such an increase continued for another few years then malaria will become the top ranking disastrous disease of Quetta.

The drastic increase of malarial cases in 1998 as compared to the previous three years (1995, 1996, 1997); is quite amazing. Although a gradual decrease in Plasmodium falciparum was observed in 1996 and 1997 which correlates with a similar gradual decrease in the density of ***Anopheles stephensi***. It seems that ***A.stephensi*** was trying to spread rapidly because of the favorable changing conditions (***i.e.*** urbanization) of Quetta (Mansoor, 1999). The only resisting factor to the increasing vectors is the annual spray conducted by the Malaria Control Programme; but the presence of high vector density in the valley proves that Anopheles has developed resistance to insecticidal spray. Thus, the magnitude of malaria incidence in Quetta could be stated to be very high. In 1977 the total positive slides for Balochistan were 462 (Report of Director General Health, 1977) which now is almost 40 times greater.

In 1998 the percentage of ***Plasmodium falciparum*** was much higher (65.8%) than ***P.vivax*** (33.3%). However, with the help of the present four year data we can conclude that number of malarial cases related to both the parasites are on an incline.

Malaria incidence by age and sex

The monthly data collected in 1995 to detect the type of parasite in male and female patients was also analyzed to calculate the percent distribution of malaria incident by age and sex (Table 1).

In terms of its incidence by sex, malaria is found in both the sexes, but is more prevalent among the male members of the family. It is perhaps of their occupation and type of clothing. Women in Balochistan are well clothed than men, which explains their lower rate of malaria incidence.

Agricultural or other laborers may work under such conditions so that they have an increased exposure to the vector (Zaidi and Kazmi, 1990). Some men work at night and some travel to other places so that they are exposed to the risk of being attacked by malaria, otherwise sex is not a direct factor involved in malaria incidence

Table 1 also shows the percentage distribution of malaria incidence by age. It appears that the young children of either sex are the most effected group. Highest suffering belongs to the group of the children between 1-4 years and then decline gradually with the increase in ages. Infants under one year seem to be lesser infected by this parasite. The comparative resistance of the newborn (from non-malarias mothers) up to 4-6 months could be traced to maternal milk contains protective antibodies (Playfair, 1982). The congenital immunity is acquired from maternal transfer of serum containing antibodies were shown to be IgG. The longer the man is exposed to malaria infections, the higher is his resistance to disease due to the development of acquired immunity. Hence, immunity plays a great role in malaria epidemiology, otherwise age as such do not seem to be an important factor for the rate of malaria incidence.

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