

A small epidemiological survey for vivax malaria in Kimpo-gun, Kyonggi-do, Korea undertaken after detecting two consecutive cases

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Abstract: On July and August 1997, two 15-year-old mates of a football team of Tongjin Middle School in northern Kyonggi-do, Korea were consecutively diagnosed as vivax malaria by peripheral blood smear. They had no histories of travelling abroad or drug abuse. They witnessed that other mates in the team were ill of fever in the same period. A small survey was therefore undertaken to determine whether vivax malaria was outbreaked locally. A total of 57 students of the team living together in a dormitory was examined for history of fever, presence of splenomegaly, blood smear and anti-*P. vivax* antibody test by immunofluorescent antibody test (IFAT). Except for the above two patients, only one case revealed a marginal titer of IFAT. No other positive findings of vivax malaria were found. In the results of this local survey, no more cases of vivax malaria were revealed except the two sporadic cases.

Key words: vivax malaria, local transmission, Korea

In Korea, indigenous vivax malaria, known as Hakjil, was rampant for centuries. After a strenuous effort by the Malaria Eradication Team of Korean government, the incidence of malaria had been gradually and persistently lowered in the 1960s. The main and effective strategy of malaria control was passive case detection and chloroquine/primaquine treatment of the detected cases. In the 1980s, vivax malaria was extinct and not transmitted in the territory of Republic of Korea (Paik *et al.*, 1988).

However, in 1993, a vivax malaria case was detected again in a soldier who served in Paju-gun in northwestern Kyonggi-do (Chai *et al.*,

1994). Exactly after the index case detection, a soldier serving in Demilitarized Zone (DMZ) and a civilian living in northwestern Kyonggi-do were found ill of vivax malaria (Cho *et al.*, 1994). The malaria outbreak was known to public. Thereafter, case detection and surveillance were facilitated by military medical evacuation system and National Medical Insurance coverage. By the surveillance, two remarkable findings have been recognized for the reemerging malaria in Korea. Since 1994, the incidence is quickly increasing from scores to hundreds in a year. Another important finding is that about 80% of the cases are army soliers serving in a confined area of northwestern Kyonggi-do. Same geographic distribution of the detected cases were recognized every year. Furthermore, almost all of the civilian cases are either ex-soliers recently discharged from

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ROK Army service after residing in the same area or civilians residing near to Civilian Control Zone (Yim *et al.*, 1996; Anonymous, 1997).

The northwestern Kyonggi-do has been exceptionally preserved area in ecology for a reason of military strategy (Kim, 1997). Therefore, *Anopheles sinensis* mosquitoes are comprising more than 90% of all mosquitoes captured by light trap (Cho *et al.*, 1994). This situation attracted attentions for a possibility of reintroduction of vivax malaria and local active transmission. In this context, we experienced two consecutive cases in a small focus in Kimpo-gun, an administrative district of northwestern Kyonggi-do. A small survey was undertaken to examine the possibility of a local outbreak.

On July and August, 1997, two 15-year-old patients were admitted consecutively to Kangnam St. Mary's Hospital, Catholic Medical Center in Seoul because of intermittent fevers. Both patients were mates of a football team of Tongjin Middle School which is located in northwestern Kimpo-gun, Kyonggi-do and which is about 8.5 km south of DMZ. They had no histories of travelling abroad or drug abuse. In both patients, fever began almost same time of mid-July although they were hospitalized separately in a month interval. Physical examination revealed mild splenomegaly without anemia. Peripheral blood smears revealed ring forms and round gametocytes of *P. vivax* in enlarged RBC with Schüffner's dots. They were treated with conventional doses of chloroquine phosphate and primaquine. They were bitten by mosquitoes frequently when living together in a dormitory for the football team which was surrounded by rice paddy. The two patients said that there were some more mates in the team who complained of fever.

After obtaining agreement of the individuals and their parents, a small epidemiologic survey was undertaken for a total of 57 members of the football team (median age, 15 years; 12-18 years in range). Histories of travel, either domestic or abroad, and of fever, either intermittent or persistent, for longer than seven days in recent one year were enquired individually. Physical examination was performed to

detect anemia and organomegaly of which abnormality was regarded positive when three physicians agreed. Thin peripheral blood smears, stained by Diff-Quik, were examined microscopically by two institutions (CUK, and NIH). Immunofluorescent antibody test (IFAT) for anti-*P. vivax* was undertaken as Gillespie and Hawkey (1995) described. Antibody titer of 1:32 or higher was regarded as positive.

In the past one year, they had histories of domestic travels together several times, but did not travel abroad. In one of our two patients, spleen was palpable even at the time of survey. Otherwise, nobody experienced fever longer than a week or revealed splenomegaly or anemia. No blood smears were positive for malaria parasites. IFAT titers were all negative except a case without malaria history who showed a marginal titer of 1:64. IFAT titers in the above two patients were 1:256 and 1:2,048, respectively.

Our survey results suggest strongly that vivax malaria had not been transmitted in the local area. The witness of two patients stating that there were additional cases of fever was not related with vivax malaria. Marginal IFAT titer of anti-*P. vivax* seems an insignificant finding which falls into a range of non-specific reactions of the antibody test. It seems more reasonable to think that the present cases contracted vivax malaria individually after bitten by infective mosquitoes flown from somewhere.

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=초록=

경기도 김포군 통진중학교 축구부원들에 대한 삼일열 말라리아의 역학조사

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1997년 7월과 8월에 경기도 김포군 통진중학교 축구부 부원인 15세 남자 환자 두 명이 각각 발열을 주소로 강남 성모병원에 입원하여 말초혈액 박충 도말검사상 삼일열 말라리아로 진단받고 chloroquine과 primaquine으로 치료받았다. 이들은 외국여행이나 마약사용 경험이 없었으며, 학교 내 축구부 숙소에서 합숙생활을 하고 있었다. 환자들은 합숙하는 친구 중에 발열환자가 더 있다고 주장하였으므로 말라리아가 집단으로 발생하였을 가능성이 있다고 생각하고, 축구부원에 대한 역학 조사를 실시하였다. 합숙소에서 생활하는 학생들은 총 57명이었다. 문진 결과상 1주일 이상 지속되는 발열 과거력을 가진 사람은 없었다. 진찰 결과 이번에 환자이었던 1명에서만 비장 중대가 관찰되었고, 환자로 입원했던 2명에서 IFAT 항체가 각각 1: 256 및 1: 2,048이었다 (양성 기준 항체가, 1: 32). 말라리아 병력이 없었던 사람 중에는 IFAT 항체가 1: 64이었던 1명을 제외하고 모두 음성을 나타냈다. 말초혈액 박충도말 검사도 모두 음성이었다. 경기도 김포군에 위치한 통진중학교 축구부 학생 두 명에서 거의 동시에 발생한 삼일열 말라리아는 이 지역에서 전파되어 감염된 것은 아니라고 생각된다.

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