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Research Note

Prevalence of Antibody to *Toxoplasma gondii* among Pregnant Women and Umbilical Cords in Hyogo Prefecture, Japan

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Infection with *Toxoplasma gondii* acquired during pregnancy is well recognized as a direct cause of some congenital abnormality in the fetal development, which may result in spontaneous abortion or birth of a premature or full term infected baby. Previous surveys of antibody to this parasite among women in obstetric populations (reviewed by Remington and Desmonts, 1982) indicate the prevalence rates at 12.5% – 38% in London and various areas of the United States and Norway. Much higher prevalence was reported in Paris (87%) and El Salvador (75%). In Japan, there are few studies on the prevalence among pregnant women, which showed 25.3% as assessed by the dye test (Kobayashi *et al.*, 1974) and 21.3% by the latex agglutination test (Ise *et al.*, 1981) both in Tokyo district. Recently, a series of our surveys for *Toxoplasma* antibody has been carried out by an enzyme-linked immunosorbent assay (ELISA), to reveal the current situation of the prevalence especially in Hyogo Prefecture (Takahashi *et al.*, 1985; Konishi *et al.*, 1986; Konishi and Takahashi, in press). The present paper focuses on pregnant women and umbilical cords as an indispensable step for the series.

Serum samples obtained from 600 pregnant women at the first trimester and 1,200 umbilical cords of newborn babies were kindly provided from the Department of Obstetrics and Gynecology of Palmore Hospital in Kobe. The women aged from 21 to 41 years with a mean age of 28.3. These samples were tested for IgG antibody in the ELISA system as previously described (Konishi and Takahashi, 1983).

Figure 1 shows the age-prevalence curve obtained from pregnant women, in comparison with those of other human populations surveyed previously, i.e., female patients (Takahashi *et al.*, 1985) and female farmers (Konishi

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This paper includes two preliminary reports: Soeripto, N. (1982), Enzyme-linked immunosorbent assay for quantification of *Toxoplasma* antibodies in pregnant woman sera (preliminary report). ICMR Annals, 2, 105–112; Kabir, A., Konishi, E., Takahashi, J. and Matsumura, T. (1983), Quantitation of antibodies to *Toxoplasma gondii* in umbilical cord sera by enzyme-linked immunosorbent assay (preliminary report). ICMR Annals, 3, 95–100.

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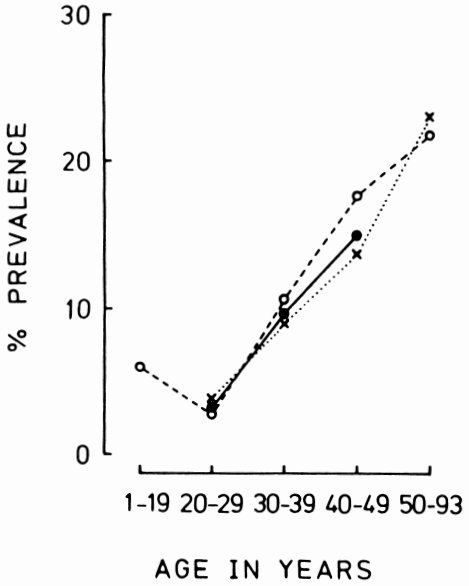

Fig. 1 Age-prevalence curves of *Toxoplasma* in pregnant women (●) and other human populations including female patients (○: data from Takahashi *et al.*, 1985) and female farmers (×: data from Konishi and Takahashi, in press) surveyed in Hyogo Prefecture, Japan.

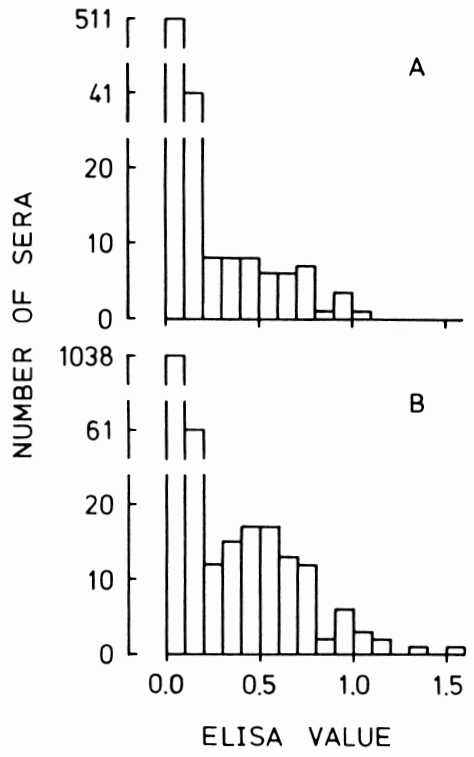

Fig. 2 Frequency distribution of IgG antibody levels to *Toxoplasma* obtained by ELISA for 600 pregnant women at the first trimester (A) and 1,200 umbilical cords at the birth (B).

and Takahashi, in press). The positive ratio increased with age, consistently observed in these populations. The overall prevalence rates was 5.8% among pregnant women (35 positive cases per 600 samples) and 6.8% among umbilical cords (81 positive cases per 1,200 samples). This result was much lower than those in Tokyo district described above. Yearly risk of congenital infection is estimated to be 17 infected infants per 10,000 birth (0.17%), when the incidence rate of newly acquired infection in pregnant women during a 9-month gestational period (0.426%) is calculated from the age-prevalence curve (Fig. 1) as described by van der Veen and Polak (1980) and this was adjusted by the 40% fetal infection rate as reported by Desmonts and Couvreur (1967). The estimated fetal infection rate of 0.20–0.26% in Tokyo (Kobayashi *et al.*, 1974; Kobayashi, 1977) is higher than our data in accordance with the difference in overall prevalence among pregnant women.

The ELISA values for IgG antibody distributed in bimodal pattern, and the maximum value was 1.053 in pregnant women and 1.550 in cords (Fig. 2). A concept of a depression in the immune responses during pregnancy has been reported for explaining the fact that the mother accepts her fetus as an allograft even if many antigenic sites of the fetus are different from those of the mother (Nelson *et al.*, 1973). In mice, the pregnancy and related sex hormones were associated with a remarkably decreased resistence to *Toxoplasma* infection (Luft and Remington, 1982; Pung and Luster, 1986). In our quantitative data, the mean ELISA values for the positive sera were 0.627 in pregnant women and 0.653 in umbilical cords. Although these values tended to be smaller than those in other populations, such as 0.709 in female patients (Takahashi *et al.*, 1985) and 0.686 in female farmers (Konishi

and Takahashi, in press), these differences were not significant at least in the Student's t-test ($P>0.05$). Another approach will be required to know the effect of pregnancy on human humoral immunity.

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