

Epidemiologic Study of Hepatitis B in Pregnant Korean Women

Yung Ho Chang, M.D., Gwan Su Choi, M.D., Won Jae Jeong, M.D.
Kwang Sook Park, M.D., Ji Woon Kim, M.D.
and Nam Ki Joung, M.D.

*Department of Internal Medicine,
St. Columban's Hospital, Mokpo, Korea*

Sang Yong Lee, M.D., Ho Jun Choi, M.D., Dae Yong Choi, M.D.
Chae Young Lim, M.D. and Seung Kwan Shin, M.D.

*Department of Obstetrics and Gynecology,
St. Columban's Hospital, Mokpo, Korea*

The positive rates of hepatitis B viral markers according to many epidemiologic factors were analyzed in 2,873 pregnant women who delivered at St. Columban's Hospital in Mokpo City from April 1st, 1985 to March 31st, 1986.

The following results were obtained:

- 1) *The overall HBsAg positivity in all pregnant women was 8.3%.*
- 2) *The positive rate of HBsAg was unrelated to age. It was 13.2% in the 11-20 year age group, 12.5% in the 31-40 year age group, 7.8% in the 21-30 year age group and 0.0% in the 41-50 year age group.*
- 3) *The positive rate of HBsAg was slightly related to locality. It was a little higher in women who grew up in rural areas (8.6%) than in urban areas (7.7%).*
- 4) *The positive rate of HBsAg was unrelated to educational background.*
- 5) *The positive rate of HBsAg was unrelated to economic status. It was 8.7% in the highest income group and 8.6% in the lowest income group.*
- 6) *The positive rate of HBsAg was higher in cases who had injections more than four times.*
- 7) *The positive rate of HBsAg was higher, but not significantly, in cases who had received blood transfusion.*
- 8) *The positive rate of HBsAg was higher, but not significantly, in cases who had more than three siblings ($0.05 < p < 0.1$).*
- 9) *There was no significant difference in HBsAg positivity if there had been a history of venereal disease.*
- 10) *The effect of a family history of liver disease: The positive rate of HBsAg showed significant increase if there was a family history of liver disease ($p < 0.005$). The positive rates of Anti-HBs, Anti-HBc, HBeAg and Anti-HBe were increased, but not significantly, in cases with a family history of liver disease.*
- 11) *The effect of acupuncture: The positive rate of HBsAg showed a significant increase according to the frequency of acupuncture ($0.025 < p < 0.05$). The positive rate of*

HBeAg was increased proportionately ($0.05 < p < 0.1$), but the positive rates of Anti-HBs, Anti-HBc and Anti-iHBe showed no difference according to the frequency of acupuncture.

12) The positive rate of Anti-HBs was significantly higher in student nurses (48.6%) and graduate nurses (58.0%) than in female university students (27.7%) ($p < 0.005$). The positive rate of Anti-HBc tended to be higher ($0.05 < p < 0.1$). The positive rates of HBsAg, Anti-iHBs and Anti-HBc didn't show any apparent tendency to increase in student and graduate nurses according to their year by year contact with patients.

Key Words : *Epidemiologic study, Pregnant woman*

INTRODUCTION

In 1967, after Krugman^{1,2)} discovered that HBV infection is transmitted both parenterally and non-parenterally, many epidemiologic studies on Hepatitis B transmission routes were reported in Korea and in other countries.

Since HBsAg was detected not only in the blood but also in the saliva, tears, semen, vaginal secretions, menstrual blood, urine, pleural fluid, bile and breast milk,³⁻¹⁹⁾ non-parenteral transmission of HBV is deemed quite possible. It would be attributed mainly to the environmental hygienic factors in this country.

The prevalence of HBV markers differ according to age, sex, locality, race, sexual behavior, socioeconomic, immunologic and genetic factors.²⁰⁻²⁴⁾ Korea, located in the Far East is the most endemic area of HBV infection. The very high prevalence of HBV infection here might have been due to lack of hygienic facilities, limited family dwelling space and population density.^{22,25-27)}

Although vertical transmission is deemed to be of importance in this country where the prevalence of HBeAg is very high, it will take a long time to discover the real mode of transmission of HBV infection here. Other than the many recent studies on vertical transmission^{28,30-34)} and intra-familial infection,^{35,36)} there are few reports about epidemiologic study on the environmental factors in HBV transmission.

In this study, to assess the possible influence of many environmental factors in the prevalence of HBV infection in Korea, we tested HBV markers in pregnant women, female university students, student nurses and graduate nurses who grew up in Mokpo City. The positivity of each viral marker was analyzed according to locality, educational background, income, frequency of acupuncture, family history of liver disease, frequency of injections, frequency of blood transfusions,

number of siblings, history of venereal disease and the duration of contact with patients in the hospital.

MATERIALS AND METHODS

Two thousand, eight hundred and seventy three pregnant women who delivered at St. Columban's Hospital in Mokpo, Jollanamdo, Korea from April 1st, 1985 to March 31st, 1986 were tested for HBsAg. Of these, 330 were selected for Anti-HBs, Anti-HBc, HBeAg and Anti-HBe analyses.

Forty seven Mokpo University Home Economics students, 72 Mokpo Holy Spirit College nursing students and 50 of St. Columban's Hospital graduate nurses were selected for HBsAg, Anti-HBs and Anti-HBc analyses.

To observe the effect of contact with patients, we selected only those who had no history of liver disease in the family, who were not infected with clinical liver disease, who had no hepatitis vaccination, no acupuncture, who didn't have many injections, who grew up in urban areas and whose economic status was middle class.

SGPT was determined by using MA 701 (IATRON Lab., Japan) and borderline cases were rechecked.

HBsAg, Anti-HBs, Anti-HBc, HBeAg and Anti-HBe were assayed by ELISA technique (Abbott Diagnostics, North Chicago, Ill). All sera were stored in a -20°C refrigerator and repeated when the result was doubtful.

RESULTS

1. Epidemiologic Factors and Positive Rates of HBsAg in 2,873 Pregnant Women

1) Positive rates of HBsAg according to age (Table 1)

Out of 2,873 pregnant women, 238 were positive for HBsAg, which is equivalent to 8.3%. The HBsAg positivity in the under twenties had the highest frequency, 13.2%. The 21-30 age group

was 7.8% and the 31-40 age group was 12.5%. The over forties came out at 0.0%. There was no significant difference in HBsAg positivity according to age.

2) Positive rates of HBsAg according to locality (Table 2)

The survey was done on 2,873 pregnant women. Out of the 1,822 cases who grew up in rural areas, 157 or 8.6% showed HBsAg positivity. Eighty one or 7.7% of the 1,051 who grew up in urban areas were positive for HBsAg. The HBsAg positivity in pregnant women who grew up in rural areas was slightly higher.

3) Positive rates of HBsAg according to educational background (Table 3)

The survey was done on 2,873 pregnant women. The HBsAg positivity was 3.2% in female university graduates, 12.1% in female junior college graduates, 7.4% in female high school graduates, 10.1% in female middle school graduates, 5.9% in primary school graduates and 10.5% in women who had no formal education. There was no significant difference in HBsAg

positivity according to educational background.

4) Positive rates of HBsAg according to economic status (Table 4)

We did a survey on 2,873 pregnant women divided into 5 income groups. The HBsAg positivity was 8.7% in the over 500,000 won income group, 7.8% in the 400,000-500,000 won income group, 9.0% in the 300,000-400,000 won income group, 7.8% in the 200,000-300,000 won income group, and 8.6% in the income group below 200,000 won. There was no significant difference in HBsAg positivity according to economic status.

5) Positive rates of HBsAg according to family history of liver disease (Table 5)

Our total survey consisted of 2,873 pregnant women. We eliminated 721 cases who had received acupuncture treatment more than once. Of the remaining 2,152 cases, 280 cases had a family history of liver disease and 1,872 cases didn't. Thirty eight or 13.6% of 280 showed HBsAg

Table 1. Positive Rates of HBsAg According to Age

Age groups	N	No. of HBsAg (%)
— 20	38	5(13.2)
21 — 30	2555	199(7.8)
31 — 40	273	34(12.5)
41 —	7	0(0.0)
Total	2873	238(8.3)

Table 2. Positive Rates of HBsAg According to Locality

Locality group	N	No. of HBsAg (%)
Village	1822	157(8.6)
City	1051	81(7.7)
Total	2873	238(8.3)

Table 3. Positive Rates of HBsAg According to Educational Background

Education group	N	No. of HBsAg (%)
University	95	3(3.2)
Junior College	182	22(12.1)
High School	1405	104(7.4)
Middle School	902	91(10.1)
Primary School	270	16(5.9)
No Formal Education	19	2(10.5)
Total	2873	238(8.3)

Table 4. Positive Rates of HBsAg According to Income

Income/month (10,000 won)	N	No. of HBsAg (%)
50 —	286	25(8.7)
40 — 50	255	20(7.8)
30 — 40	435	39(9.0)
20 — 30	1117	87(7.8)
— 20	780	67(8.6)
Total	2873	238(8.3)

Table 5. Positive Rates of HBsAg According to Family History of Liver Disease

Family history	N	No. of HBsAg (%)
—	1872	131(7.0)
+	280	38(13.6)*
Total	2152	169(7.9)

*p<.005

Table 6. Positive Rates of HBsAg According to Frequency of Acupuncture

Frequency of acupuncture	N	No. of HBsAg (%)
0	1953	130(6.7)
1 — 3	437	36(8.2)
4 — 10	102	8(7.8)
11 —	64	7(10.9)*
Total	2556	181(7.1)

*0.025<p<.05

positivity. One hundred and thirty one or 7.0% of 1,872 showed HBsAg positivity. The statistics indicate that the incidence of HBsAg positivity was significantly higher in cases with a family history of liver disease ($p < 0.005$).

6) Positive rates of HBsAg according to frequency of acupuncture (Table 6)

Our total survey consisted of 2,873 pregnant women. We eliminated 317 cases with a family history of liver disease. We divided the remaining 2,556 cases into four groups. The HBsAg positivity was 6.7% in 1,953 cases who didn't have acupuncture, 8.2% in 437 cases who had

acupuncture 1-3 times, 7.8% in 102 cases who had acupuncture 4-10 times and 10.9% in 64 cases who had acupuncture more than 11 times. Statistics indicate that the incidence of HBsAg positivity was present more significantly in cases who had acupuncture more than 4 times ($0.025 < p < 0.05$).

7) Positive rates of HBsAg according to frequency of injections at the hospital (Table 7)

Our total survey consisted of 2,873 pregnant women. We eliminated 339 cases with a family history of liver disease and 66 cases who had received acupuncture treatment more than 11 times. Of the remaining 2,478 cases, the HBsAg positivity was 6.9% in 822 cases who received injections less than 3 times, 7.5% in 1,656 cases who received injections more than 11 times. Positive rates of HBsAg were increased according to the frequency of injections but not significantly.

8) Positive rates of HBsAg according to frequency of blood transfusion (Table 8)

The survey was done on 2,873 pregnant women. The HBsAg positivity was 8.1% in 2,768 cases who had no blood transfusion, 14.5% in 55 cases who received 1-2 pints of blood, 10.0% in 30 cases who received 3-4 pints and 10.0% in 20 cases who received more than 5 pints. Positive rates of HBsAg were higher, but not significantly, in cases who had received blood transfusion.

9) Positive rates of HBsAg according to number of siblings (Table 9)

Our total survey consisted of 2,873 pregnant women. We eliminated 328 cases with a family history of liver disease and 66 cases who had received acupuncture treatment more than 11 times. Of the remaining 2,479 cases, the HBsAg positivity was 4.2% in 213 cases who had less than two siblings, but 7.6% in 2,266 cases who had more than 3 siblings. Positive rates of HBsAg were higher in cases who had more siblings, but not significantly ($0.05 < p < 0.1$).

10) Positive rates of HBsAg according to history of venereal disease (Table 10)

The survey was done on 2,873 pregnant women. The HBsAg positivity was 8.3% in 2,812 cases who had no history of venereal disease and 8.2% in 61 cases who had. There was no significant difference in HBsAg positivity according to history of venereal disease.

2. The Positive Rates of HBV Markers in 330 Pregnant Women

1) The effect of a family history of liver disease

Table 7. Positive Rates of HBsAg According to Frequency of Injection at Hospital

Frequency of injection	N	No. of HBsAg (%)
0 - 3	822	57(6.9)
4 -	1656	124(7.5)
Total	2478	181(7.3)

Table 8. Positive Rates of HBsAg According to Frequency of Blood Transfusion

Frequency of blood transfusion	N	No. of HBsAg (%)
0	2768	225(8.1)
1 - 2	55	8(14.5)
3 - 4	30	3(10.0)
5 -	20	2(10.0)
Total	2873	238(8.3)

Table 9. Positive Rates of HBsAg According to Number of Siblings

No. of siblings	N	No. of HBsAg (%)
0 - 2	213	9(4.2)
3 -	2266	172(7.6)*
Total	2479	181(7.3)

*.05 < p < .1

Table 10. Positive Rates of HBsAg According to History of Venereal Disease

History of venereal disease	N	No. of HBsAg (%)
-	2812	233(8.3)
+	61	5(8.2)
Total	2873	238(8.3)

(Table 11)

We tested all 5 HBV markers in 330 pregnant women, of whom 243 were carriers and 87 non-carriers. Two hundred and thirty four of our 330 survey cases had no acupuncture treatment. Of 185 cases who had no history of liver disease, 38 or 13.6% were Anti-HBs positive, 156 or 84.3% were Anti-HBc positive, 42 or 22.7% were HBeAg positive and 42 or 22.7% were Anti-HBe positive. Among the 49 cases who had a family history of liver disease, 7 or 14.3% had Anti-HBs positivity, 45 or 91.8% had Anti-HBc positivity, 14 or 28.6% had HBeAg positivity and 15 or 30.6% had Anti-HBe positivity. The Anti-HBs, Anti-HBc, HBeAg and Anti-HBe positivities were higher in cases with a family history of liver disease.

2) The effect of acupuncture (Table 12)

We eliminated 69 who had family history of liver disease from our total survey of 330 cases. Out of 182 cases who had no acupuncture treatment, 21 or 11.5% were Anti-HBs positive, 154 or 84.6% were Anti-HBc positive, 42 or 23.1% were HBeAg positive and 40 or 22.0% were Anti-HBe positive. Of the 55 cases who had acupuncture treatment one to three times, 4 or 7.3% had Anti-HBs positivity, 44 or 80.0% had Anti-HBc positivity, 12 or 21.8% had HBeAg positivity and 14 or 25.5% had Anti-HBe positivity. Of the 16 cases who had acupuncture treatment four to ten times, 1 or 6.3% was Anti-HBs positive, 15 or 93.8% were Anti-HBc positive, 5 or 31.3%

were HBeAg positive and 4 or 25.0% were Anti-HBe positive. Of the 8 cases who had acupuncture treatment more than eleven times, 1 or 12.5% had Anti-HBs positivity, 7 or 87.5% had Anti-HBc positivity, 4 or 50.0% had HBeAg positivity and 1 or 12.5% had Anti-HBe positivity.

The incidence of HBeAg positivity was progressively higher in cases who had a history of acupuncture treatment according to the frequency of acupuncture. There was no difference in the incidence of Anti-HBc and Anti-HBe positivities between those who had acupuncture treatment and those who had not.

3) Positive rates of HBsAg, Anti-HBs and Anti-HBc in university students, student nurses and graduate nurses according to their duration of exposure in hospital work (Table 13).

The Anti-HBs positivity was 27.7% or 13 of the 47 female university students, 48.6% or 35 of the 72 student nurses and 58.0% or 29 of the 50 graduate nurses. The statistics indicate that the Anti-HBs positivity was significantly higher in student nurses ($0.01 < p < 0.025$) and in graduate nurses ($p < 0.005$) than in female university students.

The Anti-HBc positivity was 47.0% or 22 of 47 female university students, 61.1% or 44 of 72 student nurses and 62.0% or 31 of 50 graduate nurses. The statistics indicate that the incidence of Anti-HBc positivity was higher in student nurses and in graduate nurses than in female university

Table 11. Positive Rates of Anti-HBs, Anti-HBc, HBeAg and Anti-HBe According to Family History of Liver Disease

Family history of liver disease	No. positive/N (% positive)			
	Anti-HBs	Anti-HBc	HBeAg	Anti-HBe
-	19/185(10.3)	156/185(84.3)	42/185(22.7)	42/185(22.7)
+	7/ 49(14.3)	45/ 49(91.8)*	14/ 49(28.6)	15/ 49(30.6)
Total	26/234(11.1)	201/234(86.0)	56/234(23.9)	57/234(24.4)

* .05 < p < .1

Table 12. Positive Rates of Anti-HBs, Anti-HBc, HBeAg and Anti-HBe According to Frequency of Acupuncture

Frequency of acupuncture	No. positive/N (% positive)			
	Anti-HBs	Anti-HBc	HBeAg	Anti-HBe
0	21/182(11.5)	154/182(84.6)	42/182(23.1)	40/182(22.0)
1 - 3	4/ 55(7.3)	44/ 55(80.0)	12/ 55(21.8)	14/ 55(25.5)
4 - 10	1/ 16(6.3)	15/ 16(93.8)	5/ 16(31.3)	4/ 16(25.0)
11 -	1/ 8(12.5)	7/ 8(87.5)	4/ 8(50.0)*	1/ 8(12.5)
Total	27/261(10.3)	220/261(84.3)	63/261(24.1)	59/261(22.6)

*.05 < p < .1

students ($0.05 < p < 0.1$).

There was no significant difference between the three groups when observed for HBsAg positivity. But the number of cases surveyed in each group was small.

HBsAg, Anti-HBs and Anti-HBc positivities didn't show any apparent tendency to increase in student and graduate nurses according to their year by year contact with patients.

DISCUSSION

High prevalence of HBV infection and many poor environmental conditions make epidemiologic study imperative in this country. The many studies reported on the prevalence of HBsAg were mostly observations of a specific hospital's patients or a specific occupation's employees within a short-term period.^{27,35-61} There are few reports of epidemiologic study on environmental and risk factors with long-term follow-up observation in relation to epidemiologic factors influential in the transmission of HBV.

In the course of our epidemiologic study to discover the real transmission mode of HBV in Korea including the perinatal, we made several interesting observations.

The prevalence in Korea of HBsAg according to age, sex, occupation and locality was reported

by RPHA, double immunodiffusion, RIA and EIA methods.⁴⁸⁻⁵⁰ The HBsAg positivity of young pregnant women in our data was 8.3% by EIA and higher than 5.7% in women from Incheon by RIA in the study by Chang et al.⁴⁰ But in the case of pregnant women in their twenties, our data revealed 7.8% and was slightly lower than 9.1% by Chang et al.⁴⁰

Szmunesz²³, Chang et al⁴⁰ and Banke et al⁶² all reported that HBsAg positivity decreases with increase in age. But Ro et al⁴⁵ found to the contrary that HBsAg positivity increases with increase in age. Our study revealed that HBsAg positivity in pregnant women showed no significant difference by age. It was same with Ahn et al's report.⁴³

In foreign countries, the incidence of HBsAg positivity has been found to be higher in urban inhabitants than in people from rural areas.^{63,64} Ann et al⁴³ reported that it showed no difference in the female according to locality. Our study showed that HBsAg positivity tended to be higher in people from rural areas (8.6%) than in those from urban areas (7.7%), but there was no significant statistical difference.

Although reports have shown that HBsAg positivity is lower in the well educated whose hygiene facilities and living conditions are good, our study found no significant difference

Table 13. Positive Rates of HBsAg, Anti-HBs and Anti-HBc in University Students, Student Nurses and Graduate Nurses According to Duration of Exposure in Hospital Work

Groups	No. positive/No. cases (% positive)		
	HBsAg	Anti-HBs	Anti-HBc
University student			
1st year	2/14(14.3)	3/14(21.4)	7/14(50.0)
2nd year	0/17(0.0)	4/17(23.5)	6/17(35.2)
3rd year	1/16(6.2)	6/16(37.5)	9/16(56.2)
Total	3/47(6.4)	13/47(27.7)	22/47(46.8)
Student nurse			
1st year	1/13(3.2)	19/31(61.3)	22/31(71.0)
2nd year	0/22(0.0)	8/22(36.4)	12/22(54.5)
3rd year	0/19(0.0)	8/19(42.1)	10/19(52.6)
Total	1/72(1.4)	35/72(48.6)*	44/72(61.1)***
Graduate nurse			
1 year	2/21(9.5)	14/21(66.7)	14/21(66.7)
2 year	0/16(0.0)	9/16(56.2)	10/16(62.5)
over 3 year	2/13(15.4)	6/13(46.1)	7/13(54.0)
Total	4/50(8.0)	29/50(58.0)**	31/50(62.0)****
Total	8/169(4.8)	77/169(45.6)	97/169(57.4)

*0.01 < p < 0.025

***0.05 < p < 0.1

** < p < 0.005

****0.05 < p < 0.1

according to educational background.

The HBsAg positivity was 8.7% in the highest income group and 8.6% in the lowest income group. There was no significant difference according to economic status.

It is a well known fact that Korea is one of the countries in the world with a high prevalence of HBV infection.²⁷⁾ The contaminated blood products brought in from abroad during the Korean War and the lack of hygiene facilities and the poor socioeconomic conditions prevailing after the War are believed to be the main causes.

At the time of World War II in 1942, over 50,000 U.S. Army personnel developed overt acute icteric hepatitis following yellow fever vaccination which was identified as contamination with HBV.²⁹⁾ Lack of sterile technique and facilities in rural health centers and in doctorless areas has also been one of the main contributing factors to the widespread HBV infection in Korea.

Krugman et al²⁾ reported that 1cc of contaminated blood ingested was enough to get hepatitis B. Barker⁶⁵⁾ reported that 10,000-fold diluted blood containing HBV, given by intravenous injection, could cause hepatitis B.

Lack of sterile technique in acupuncture may also be an important factor in the transmission of HBV in Korea. Of the 2,873 pregnant women surveyed, 918 had received acupuncture treatment more than once. If we eliminated those 317 with a family history of liver disease, the HBsAg positivity would have been 8.5% in 601 cases. The HBsAg positivity was highest, 10.9%, in those who had acupuncture treatment more than eleven times. The HBsAg positivity was lowest, 6.7%, in those who didn't have any acupuncture treatment ($0.025 < p < 0.05$). According to the frequency of acupuncture, the positivity of HBsAg and HBeAg were progressively higher and the positivity of Anti-HBs and Anti-HBe were not changed. Acupuncture may be an influential factor in increasing the prevalence of both HBV infection and the carrier stage.

There have been many reports on HBV within residential and family dwellings. Blumberg et al⁷¹⁾ and Carbonara et al⁷²⁾ reported that chronic HBsAg carrier can occur by autosomal recessive trait in accordance with Mendel's law. Dumble et al⁷³⁾ reported the importance of the genetic factor, for example, the difference of HLA types and subtypes of HBsAg. Szmunn et al^{22,23)} emphasized that besides the hereditary factor, the environmental factor has an influence.

Kim et al⁸⁵⁾ reported that HBsAg positivity in family members of 1,959 HBsAg positive blood donors was 29.4%. Lee et al⁸⁶⁾ reported that HBsAg positivity in family members of 74 patients with HBsAg positive liver disease was 26.7%. Kim et al⁴⁴⁾ reported that 12.5% of 869 HBsAg positive blood donors had a family history of liver disease.

Of the 2,873 pregnant women surveyed 1,001 had a family history of liver disease. If we eliminate the 721 cases who had acupuncture treatment more than once, the HBsAg positivity was 13.6% in the remaining 280 cases. The HBsAg positivity in cases with no family history of liver disease was 7.0% ($p < 0.005$). In 330 cases with family history of liver disease, the positivity of Anti-HBs, Anti-HBc, HBeAg and Anti-HBe was increased but not significantly. The effect of acupuncture was slightly different with the influence of intra-familial infection.

Several foreign researchers reported that one source of HBV infection is the use of unsterilized needles when giving injections^{80,81)}. But this is not reported in Korea. In our study, the positive rate of HBsAg was 6.9% in 822 cases who hadn't had injections or who had injections less than three times up to the time of delivery. But the positive rate of HBsAg was 7.5% in the 1,656 cases who had injections more than four times.

Some investigators have found that post-transfusion viral hepatitis B occurs as a result of blood transfusion⁸²⁻⁸⁴⁾. But in Korea, Kim et al¹¹⁾ reported that a history of blood transfusion was noted only in 2.4% of 869 HBsAg positive blood donors. In our study, the positive rate of HBsAg was higher in cases who received blood transfusions (12.4%) than in those who didn't (8.1%).

Jun et al⁶¹⁾ reported that HBsAg positivity was higher the larger the family per room. In our study, the positive rate of HBsAg was higher, but not significantly, in cases who had many siblings.

There are a lot of reports about the transmission of hepatitis B by heterosexual or homosexual contact in foreign countries. But there are few reports in Korea and it would be difficult to do a study of this kind in Korea. Our study found no difference in HBsAg positivity according to the history of venereal disease. A study on sexual transmission of hepatitis B should be done on males in Korea with close observation and exclusion of other possible factors.

Many reports indicate that HBsAg positivity is high among hospital personnel and that these are

more liable to become carriers.

Yu et al³⁷⁾, Mosley et al⁷⁴⁾ and Feldman et al⁷⁶⁾ found that among dentists and Lee et al⁴⁶⁾ reported that among doctors HBsAg positivity gets higher as they advance in their years of practice.

Hiroshi et al⁷⁵⁾ held that there was no change in HBsAg positivity but that Anti-HBs and Anti-HBc positivity were much higher in dental university students after one year of clinical practice.

Especially among graduate nurses, HBsAg positivity was found to vary in each reporter's survey, as follows: Yu et al⁴⁷⁾, 6.3%, Yu et al³⁷⁾, 4.7% and Lee et al⁷⁶⁾, 5.4%. This variation is thought to be due to the sensitivity of test methods and to regional and environmental differences.

In our study, HBsAg positivity was 4.8% among 50 graduate nurses. Our result was a little lower because we observed cases free of other possible epidemiologic factors. Anti-HBs positivity was significantly higher in student and graduate nurses than in female university students ($p < 0.005$) and the Anti-HBc positivity tended to be higher ($0.05 < p < 0.1$). This means that the more exposure there is to HBV, the greater is the incidence of HBV infection.

But the positivity of HBsAg, Anti-HBs and Anti-HBc showed no tendency to get higher as the duration of contact with the patients got longer. This finding might be due to the method of selection and to limiting it to small numbers.

Taking all the results into consideration, locality, sex, economic status and educational background can have an indirect bearing on the incidence of HBV infection, but acupuncture and intra-familial infection can have a more direct and significant influence. It has been seen that according to the frequency of acupuncture, it may be influential in increasing the prevalence of HBV infection and in decreasing antibody formation.

Because teenagers and those in their twenties have already shown a high prevalence of HBV infection, we must study many other environmental and hygienic factors with a view to improving them. We must also engage in epidemiologic study that is forward looking so that the young generation of the present and of the future will grow up in improved living conditions and receive HB vaccination.

REFERENCES

1. Krugman S, Giles JP, Hammond J: *Infectious*

hepatitis: evidence for two distinctive clinical, epidemiological and immunological types of infection. JAMA 200:365, 1967

2. Krugman S, Giles JP: *Viral hepatitis: New light on an old disease. JAMA 212:1019, 1970*

3. Akdamar KA, et al: *S.H. Antigen in bile. Lancet 1: 909, 1971*

4. Ward R, Borchert P, Wright A: *Hepatitis B antigen in saliva and mouth washing. Lancet 2:726, 1972*

5. Tanno H: *Virus B hepatitis antigen in saliva. Lancet 2:823, 1972*

6. Tripatzis I: *Australia antigen in urine and feces. Am J Dis Child 123:401, 1972*

7. Marcolongo R, Debolini A, Barberi A: *Hepatitis B antigen in saliva. Lancet ii:1269, 1973*

8. Konno T, Shirachi R, Ishida N: *Serial surveys for hepatitis B antigen in an institution for the mentally retarded: A detection of antigen in saliva. Tohoku J Exp Med 110:297, 1973*

9. Villarejos VM, et al: *Role of saliva, urine and feces in the transmission of type B hepatitis. N Engl J Med 291:1375, 1974*

10. Darani M, Gerber M: *Hepatitis B antigen in vaginal secretions. Lancet 2:1008, 1974*

11. Scott Mazzur: *Menstrual blood as a vehicle of Australia antigen transmission. Lancet 1:749, 1973*

12. Brodersen M, Stegmann S, Klein KH, Trulzsch D, Rensch P: *Salivary HBsAg detected by radioimmunoassay. Lancet i:675, 1974*

13. Heathcote J, Cameron CH, Dane DS: *Hepatitis B antigen in saliva and semen. Lancet i:71, 1974*

14. Wong ML, Lehmann NI, Gust ID: *Detection of hepatitis B surface antigen in the saliva of patients with acute hepatitis B and of chronic carriers. Med J Aust 2:52, 1976*

15. Alter HJ, Purcell RH, Gerin JL, London WT, Kaplan PM, McAuliffe VJ, Wagners J, Holland PV: *Transmission of hepatitis B to chimpanzees by hepatitis B surface antigen-positive saliva and semen. Infec Immun 16:928, 1977*

16. Irwin GR, Allen AM, Bancroft WH, et al: *Hepatitis B antigen in saliva. J Infect Dis 142:67, 1980*

17. Scott RM, Snitbhan R, Bancroft WH, Alter HJ, Tingpalapong M: *Experimental transmission of hepatitis B virus by semen and saliva. J Infect Dis 142:67, 1980*

18. Hess G, et al: *Transmission of hepatitis B virus by pleural effusion containing Dane particles. Hepato-Gastroenterol 28:151, 1981*

19. SI Lee, HJ Choi, MS Lee: *HBsAg in semen and saliva. Korean J of Int Med 28:191, 1985*

20. Prince AM: *Prevalence of serum hepatitis related antigen (SH) in different geographic regions. AM J Trop Med Hyg 19:872, 1972*

21. Blumberg BS, Sutnick AI, London WT, Melartin L: *Sex distribution of Australia antigen. Arch Intern Med 130:227, 1970*

22. Szmuness W, Prince AM, Hirsch RL, Brotman B: *Familial clustering of hepatitis B infection. N Engl J Med* 289:1162, 1973
23. Szmuness W: *Recent advances in the epidemiology of hepatitis B. Am J Pathol* 81:629, 1975
24. Szmuness W, Hirsch RL, Prince AM, Levine RW, Harley EJ, Ikram H: *Hepatitis B surface antigen in blood donors: Further observations. J Infect Dis* 131:111, 1975
25. Schiff ER: *Epidemiology of virus B hepatitis. Med Clin N Amer* 59:835, 1975
26. Cerubin CE, Purcell RH, Lander JJ, McGinn TG, Cne LA: *Acquisition of antibody to hepatitis antigen in three socioeconomically different medical populations. Lancet* 2:149, 1972
27. HH Kwon, DJ Suh: *The changing pattern of occurrence of HBsAg in Korean patients during a period of 5 years. Korean J Int Med* 20:423, 1977
28. SJ Paik, SI Lee, HS Lee, KS Kim, KZ Ryu, HJ Choi: *Study on vertical transmission of hepatitis B virus in Korea. J of Korean Med Assoc* 27:331, 1984
29. Seeff LB, Beebe GW, Norman JE, Buskell-Bales Z, Hoofnagel JH: *Serologic follow-up of 1942 yellow-fever vaccine-associated hepatitis outbreak. Hepatology* 5:959, 1985
30. JK Lee, DB Kim, YS Shin, JH Chung: *Viral hepatitis B in pregnancy. Korean J Ob and Gyn* 27:1865, 1984
31. SG Lee, ZY Kim, YJ Lee, TH Cho: *A Study of transmission of hepatitis B virus in the HBsAg positive mothers and their newborns. Korean J Ob and Gyn* 27:2121, 1984
32. YI Chee, MH Lee, CY Kim: *Role of maternal infection with hepatitis B Virus for the development of chronic liver disease in Korea. Korean J Int Med* 23:659, 1980
33. JM Eum, SY Chough: *A Study of HBsAg in the sera of the mother, cord, and the infants. Korean J Ob and Gyn* 27:160, 1984
34. JJ Koo, DH Hwang, WJ Kim, YM Kim: *Status of vertical transmission of HBs antigen and HBs antibody in Korean term pregnant women. Korean J Ob and Gyn* 27:168, 1984
35. YJ Kim, SK Kim, SH Park, US Yang, BH Liu: *A study on distribution of hepatitis B virus (HBV) markers in families of HBsAg-positive blood donors. Korean J Int Med* 26:884, 1983
36. JJ Lee, IM Kim: *Intrafamilial spread of hepatitis B virus infection. Korean J Int Med* 25:1191, 1982
37. G Yu, CY Kim: *Epidemiological consecutive studies on incidence and status of HBsAg carriers among university employees in Korea. Korean J Int Med* 23:649, 1980
38. IS Song, CY Kim: *Seasonal and annual variations in occurrence of HBsAg and acquisition of anti-HBs in Korea. Korean J of Int Med* 22:1007, 1979
39. WS Hong, CY Kim: *Seroepidemiologic survey on type A and B viral hepatitis in Seoul area. Korean J Int Med* 25:19, 1982
40. KM Jang, SH Woo, DH Yun, KR Lee, YO Kwon, JY Kang, KH Tai, YJ Moon: *Seroepidemiologic survey on type B viral hepatitis in Incheon area. Korean J Int Med* 26:1331, 1983
41. SJ Jeon, SJ Kim: *The positivity of HBsAg and anti-HBs in Gwang-Ju, city area. Korean J Gastroenterology* 17:387, 1985
42. GS Choi, WJ Jeong, KS Park, JW Kim, NK Joung: *Epidemiologic study on several factors of type B viral Hepatitis Infection in Mokpo Area. Korean J Gastroenterology* 17:395, 1985
43. YO Ahn, CY Kim, JB Lee, BJ Park, EH Kwon, JH Lee, NK Kim: *An epidemiologic observation on HBs antigenemia in Korean voluntary blood donors for a $6\frac{1}{3}$ year period, 1975-1981. J of Korean Med Assoc* 26:425, 1983
44. YC Kim, JS Kim, SH Kim, SM Lee, WB Shim, HK Moon: *Chemical liver function tests and epidemiologic studies of HBsAg positive blood donors. Korean J Int Med* 27:1, 1984
45. SK Rho, JJ Kim, KC Shin, KH Choi, JK Roh, YH Shim: *Occurrence of HBsAg and anti-HBs in coal miners. Korean J Int Med* 27:1466, 1984
46. SH Lee, ST Uh, SW Cho, CS Shim: *Occurrence rates of HBsAg in clerks, laborers and medical personnel. Korean J Gastroenterology* 17:151, 1985
47. G Yu: *Epidemiologic study of HBsAg carriers. Korean J Int Med* 27:699, 1984
48. KS Park, GT Lee, SM Lee, BH Liu: *A study for detection of HBV marker by CIEP, RPHA and RIA technique on various liver diseases. Korean J Gastroenterology* 16:159, 1984
49. CY Kim, HS Lee, PC Yu, HO Baik, YO Song, HC Jung, SW Choi: *Comparison of radioimmunoassay (RIA) and reversed passive hemagglutination assay (RPHA) in the detection of hepatitis B surface antigen (HBsAg). J of Korean Med Assoc* 27:49, 1984
50. HS Bom, SJ Kim: *Comparison of enzyme immunoassay (EIA) with radioimmunoassay (RIA) method in detection of hepatitis B virus (HBV) Markers. Korean J Gastroenterology* 16:413, 1984
51. DJ Suh: *Serological profiles of hepatitis B virus infection in acute and chronic liver diseases. Korean J Int Med* 25:599, 1982
52. NY Lee, SJ Kim: *The profile and prevalence of HBV markers in various liver diseases. Korean J Int Med* 28:787, 1985
53. JC Kim, HS Beyn, WS Joo, IH Park, DY Choi, GD Huh: *Study on serological markers of hepatitis B virus and some liver function tests in various liver diseases in Korea. Korean J Int Med* 29:556, 1985

54. SK Kang, CK Park, YG Lee, SH Lee, MY Chi, YM Kim: *A clinical study of HBsAg, anti-HBs in various liver disease. Korean J Int Med* 26:590, 1983
55. HC Kim, SJ Kim, DW Ryang, SW Juhng, JY Yoo: *Prevalence rate and serological pattern of hepatitis B markers in Korean child and adult liver diseases. J of Korean Med Assoc* 27:841, 1984
56. WK Cho, JS Kim, YB Son, ER Jung, DS Ahn, DH Choi: *Clinical, serological and histological study on HBsAg in chronic liver disease. Korean J Int Med* 28:76, 1985
57. MJ Kim, TY Nho, HJ Pyo, KU Min, YJ Kim: *The changes of serum markers of hepatitis B virus in uremic patients with or without maintenance hemodialysis. Korean J Int Med* 29:390, 1985
58. SH Lee, KC Jo, HK Mo'on, SM Lee: *Study on serological markers of hepatitis B virus and some liver function tests in hepatitis and liver cirrhosis. Korean J Gastroenterology* 16:165, 1983
59. SY Hong: *The prevalence of serologic markers of hepatitis B in patients with alcohol related liver disease. Korean J Int Med* 29:390, 1985
60. PK Kim, KS Kim, YH Kim, IJ Choi: *Incidence of positive serum HBsAg and anti-HBs in renal diseases of children. J of Korean Med Assoc* 25:750, 1982
61. GH Jum, JJ Kim, DH Shin, SD Yoon: *A survey of HBs antigenemia among healthy primary and middle school children, pregnant women in Kyungpook Province. Korean J Pediatric* 26:30, 1983
62. Banke O, Dybkjaer E, Norderfelt E, Reinicke V: *Australia antigen and antibody in 10,000 Danish blood donors. Lancet* 1:860, 1971
63. Szumuness W, Prince AM, Brotman B, Hirsch RL: *Hepatitis B antigen and antibody in blood donors: An epidemiologic study. J Infect Dis* 127:17, 1973
64. Williams AO, Williams AIO, Buckels J, Smith JA, Francis TI: *Carrier state prevalence of hepatitis associated antigen (AU SH) in Nigeria. Amer J Epidemiol* 96:227, 1972
65. Barker LF, Shulman NR, Murray R: *Transfusion of serum hepatitis. JAMA* 211:1509, 1970
66. Edward Tabor, Robert H Purcell, William T London, Robert J Gerety: *Use of and interpretation of results using inocula of hepatitis B virus with known infectivity titers. J Infect Dis* 147:531, 1983
67. Brotman B, Prince AM, Godfrey HR: *Role of arthropods in transmission of hepatitis B virus in the tropics. Lancet* 1:1305, 1973
68. Jupp PG, McElligott SE, Lecatsas G: *The mechanical transmission of hepatitis B virus by the common bedbug (Cimex lectularius L.) in South Africa. S Afr Med* 63:77, 1983
69. Willis W, Larouze B, London WT, et al: *Hepatitis B virus in bedbugs (Cimex hemipterus) from Senegal. Lancet* 217:19, 1977
70. Prince AM, Metselaar D, Kafuko GW, et al: *Hepatitis B antigen in wild mosquitoes in Africa. Lancet* 247:50, 1972
71. Blumberg BS, Melartin L, Guinto RA, Werner B: *Family studies of a human serum isoantigen system (Australia antigen). An J Genet* 18:594, 1966
72. Carbonara AO, Trinchieri G, Bedarida G, Fillippi GA: *A caucasian population with a high frequency of Au 'carriers': Genetic analysis of the condition. Vox Sang* 19:288, 1970
73. Dumbel, et al: *The first international symposium on HLA. Digestion* 15:254, 1977
74. Mosley JW, Edwards VM, Casey G, Redeker AG, White E: *Hepatitis B virus infection in dentists. N Engl J Med* 293:729, 1975
75. Hiroshi Mochizuki, Motoi Morimoto: *Incidence of hepatitis B virus infection in dental students during clinical dental training. J Infect Dis* 148:181, 1983
76. Feldman RE, Schiff ER: *Hepatitis in dental professionals. JAMA* 232:1228, 1975
77. Sampliner RE, Loevinger BL, Tabor E, Gerety RJ: *Intrafamilial clustering of hepatitis B virus infection: Study of a large family in the United States. Am J of Epidemiology* 113:50, 1981
78. Ohbayashi A, Okochi K, Mayumi M: *Familial clustering of asymptomatic carriers of Australia antigen and patients with chronic liver disease or primary liver cancer. Gastroenterology* 62:618, 1972
79. Van Etta LL, Peterson LR, Gerding PN: *Asymptomatic hepatitis B carriers in a Family. N Engl J Med* 305:1093, 1981
80. Seeff LB, Zimmerman HJ, Wright EC, et al: *Hepatic disease in asymptomatic parenteral narcotic drug abuser; a Veterans Administration collaborative study. Am J Med Sci* 270:41, 1975
81. Bewley TH, Ben-arie O, Marks V: *Relation of hepatitis to self-injection techniques. Br Med J* 1:703, 1967
82. Grady GF, Chalmers TC: *the Boston Inter-Hospital Liver Groups: Risk of post-transfusion viral hepatitis. N Engl J Med* 271:337, 1964
83. Gocke DJ, Kavey NB: *Hepatitis antigen: Correlation with disease and infectivity of blood donors. Lancet* 1:1055, 1969
84. Alter HJ, Holland PV, Purcell RH, et al: *Post-transfusion hepatitis after exclusion of commercial and hepatitis-B antigen-positive donors. Ann Int Med* 77:691, 1972