

A Study on the Seropositivity of HBsAg among Biennial Health Examinees ; A Nation-wide Multicenter Survey

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Objective : The primary objective of this study was to estimate the prevalence of HBsAg-positives in the late 1990' s among Korean adults. In addition, we evaluated the association of age, a residential area, a vaccination rate, a family history of chronic liver diseases and a past history of acute liver disease with the seropositivity of HBsAg, and estimated the prevalence of chronic HBV infection by follow-up for 6 month or more.

Methods : A total of 10 areas, six metropolitan and four small cities, were selected. In each cities, one health screening center was selected for recruitment of study subjects. The study subjects were enrolled from a general health examination program that is provided by medical insurance companies. Questionnaires on various risk factors were administered to the study subjects. Sera was drawn and tested for HBsAg by radioimmunoassay. HBeAg and ALT were also tested for those of HBsAg positive. The HBsAg positives was retest for HBsAg 6 months later.

Results : Among the study subjects (n= 1816), the seroprevalence of HBsAg was 5.5% (95% CI= 4.5%-6.6%), 7.4%

in men (95% CI= 5.8-9.4) and 3.6% in women (95% CI= 2.5-5.0). A past history of acute liver disease and a family history of chronic liver diseases was shown to be risk factors for HBsAg positivity. Among the 31 HBsAg-positives, negative seroconversion rate was estimated to be 3.2 %, Thus, prevalence of chronic HBV infection was estimated to be 5.3% (95% CI= 3.7-6.6).

Conclusion : In this study, the HBsAg seroprevalence rate was lower than that of the other studies in 1980' s, particularly in young adult and women. Considering the public health importance of liver cancer and chronic liver diseases, the further effort is needed to prevent and reduce the HBV infection.

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Key Words: Prevalence, Chronic Hepatitis B, Hepatitis B Surface Antigens, Hepatitis B e Antigens, Seroepidemiologic Studies, Korea

INTRODUCTION

Hepatitis B virus (HBV) infection is highly prevalent in Korea [1-2]. HBV is a major etiologic factor of acute and chronic liver diseases as well as hepatocellular carcinoma [3-6]. The prevalence of HBsAg increased in Korea until the mid-1980s, after which it began to decline [1-2]. In 1980' s, 8-10% of the Korean population were HBsAg positive. A study [7] con-

ducted in the early 1990' s showed a positive rate of about 5%. This decline was more prominent in childhood and adolescence. Fewer than 2% of children were sero-positive for HBsAg in the early 1990' s [8]. The declining trend was accompanied by the introduction of hepatitis B vaccine to the public by both the government and the private sector, for example, medical insurance companies [9]. We expect the prevalence to have been

considerably reduced during the 1990' s in Korea. However, few studies have been done to estimate a prevalence rate of HBV in the 1990' s, particularly in the late 1990' s.

Chronic HBV infection has serious implications with respect to both clinical and public health considerations. Those with chronic HBV infection are not only a principal source of HBV infection for other susceptible people but also represent a population at high risk for developing other serious diseases, such as liver cirrhosis and hepatocellular carcinoma. The probability of

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becoming a chronic HBV infection depends mostly on the age at which HBV infection occurs [10]. The probability is 60-90% of those infected in the perinatal period, which is higher than that of those infected in post-infant period.

Chronic HBV infection is usually identified by repeated serological tests for HBsAg at intervals of six or more months. Prevalence of the chronic HBV infection can be estimated from the follow-up studies of HBsAg-positives for six or more months. There has been few reports on the prevalence of chronic HBV infection in Korea. A previous study [11] estimated that seroconversion rate was 35.9% during a two-year follow-up study in a fixed cohort of 64 HBsAg positive Korean males. According to the study, the number of chronic HBV infection in Korea could be estimated to be roughly two thirds of all the HBsAg positive persons. The negative conversion rates of HBsAg are various according to country and follow-up period ; 3.6% during a six-months of follow-up in New Zealand [12], 7.8% during one year of follow-up [13], and 14% during 2.1 years of follow-up [14]. By definition, the prevalence of chronic hepatitis B would be better estimated by a study with an interval of 6 months. Thus we planned the follow up interval of 6 months to estimate prevalence rate of chronic HBV infection.

The primary objective of this study was to estimate the prevalence of HBsAg-positives in the late 1990's among Korean adults. In addition, we estimated the prevalence of chronic HBV infection and evaluated the association of a residential area, a vaccinated rate, a family history of

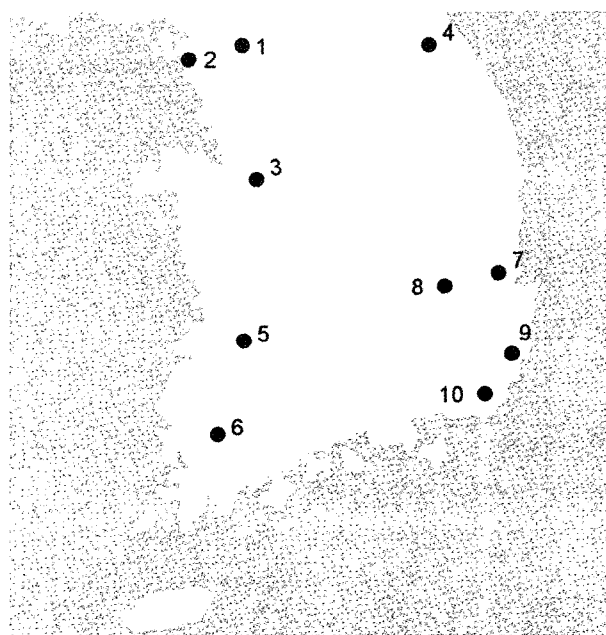


Figure 1. Map of Korea (South) and the location of the health promotion centers in which study subjects were recruited. (Names of the numbered regions are listed in Table 1.)

chronic liver disease and a past history of acute liver disease with the seropositivity of HBsAg.

MATERIALS AND METHODS

1. Study design

A nation-wide cross-sectional sample survey was applied to find the HBsAg-positives, who were then followed-up for six or more months in order to identify negative seroconversion. A total of 10 areas, six metropolitan and four small cities as shown in figure 1, were selected so as to be representative of general population. In each region, one health screening center, that is affiliated with a university or teaching hospital, was selected for recruitment of study subjects. The study subjects were enrolled from a general health examination program that is provided by medical insurance companies biennially to all of their beneficiaries. From January through April 1998,

questionnaires on basic demographic factors, HBV vaccination, past history of acute liver diseases, and family history of chronic liver diseases including chronic hepatitis, liver cirrhosis, and liver cancer were administered to the study subjects. The sera drawn were stored at -20°C or lower temperature until they were tested. At six months or more following recruitment, HBsAg seropositive persons were retested for HBsAg and HBeAg. Those who was positive for HBsAg for six months or more were regarded as chronic HBV infection.

2. Sample size calculation and study sample

An adequate sample size to measure the prevalence of HBsAg-positive individuals was calculated on the assumption that the HBsAg prevalence rate among Korean adults was 5.0%, and that a maximum allowable length of a 95% confidence interval was 1.0

Table 1. Age, sex, and regional distribution of study subjects; sample size planned (P) and recruited (R)

| | Men | | | Women | | |
|-------------------------|-----------------|-----|-----|-----------------|-----|-----|
| | P | R | R/P | P | R | R/P |
| Age group | | | | | | |
| 20-29 | 285 | 242 | 85% | 280 | 265 | 95% |
| 30-39 | 303 | 265 | 87% | 285 | 248 | 87% |
| 40-49 | 197 | 184 | 93% | 192 | 187 | 97% |
| over 50 | 217 | 197 | 91% | 241 | 228 | 95% |
| Mean age \pm SD | 38.6 \pm 10.8 | | | 38.8 \pm 11.6 | | |
| Number of Region (city) | | | | | | |
| 1 (Seoul) | 239 | 221 | 92% | 239 | 224 | 94% |
| 2 (Incheon) | 232 | 215 | 93% | 220 | 208 | 95% |
| 3 (Cheonan) | 70 | 60 | 86% | 64 | 63 | 98% |
| 4 (Gangneung) | 63 | 51 | 81% | 63 | 57 | 90% |
| 5 (Jeungeup) | 87 | 77 | 89% | 87 | 78 | 90% |
| 6 (Gwangju) | 29 | 28 | 97% | 28 | 26 | 93% |
| 7 (Kyoungju) | 61 | 54 | 89% | 61 | 58 | 95% |
| 8 (Daegu) | 55 | 39 | 71% | 58 | 48 | 83% |
| 9 (Ulsan) | 78 | 59 | 76% | 85 | 81 | 95% |
| 10 (Busan) | 88 | 84 | 95% | 93 | 85 | 91% |
| Total | 1002 | 888 | 89% | 998 | 928 | 93% |

Abbrev: SD= Standard deviation

Table 2. Characteristics of the HBsAg-positives in the study subjects

| Characteristics | Men (n=66) | Women (n=33) |
|--|-----------------|----------------|
| Mean age \pm SD (years) | 40.0 \pm 10.5 | 42.3 \pm 9.9 |
| serum ALT over 35 U/L | 3 (4.5%) | 0 (0.0%) |
| HBeAg positive | 21 (31.8%) | 9 (27.3%) |
| Past history of acute liver diseases | 10 (15.1%) | 4 (12.1%) |
| Family history of chronic liver diseases | 13 (19.7%) | 9 (27.3%) |

Abbrev: SD= Standard deviation, ALT= Alanine aminotransferase

percentage points.

The required sample size was estimated to be 1,825. Therefore a total of 2,000 individuals, 1,002 men and 998 women, was planned as the target number of study subjects. They were then allocated to each region proportionally to the census data of 1995 by sex and age group (Table 1). The study sample by sex and age group in each center was randomly selected from the study population enlisted in each center. Finally a total of 1816 questionnaires and sera stored for individual sample were collected (Table 1).

3. Serological tests for HBsAg, HBeAg

All the sera were tested for HBsAg by radioimmunoassay (RIA) method

(AUSRIA by Abbott Lab.). For samples of HBsAg-positive sera, a quantitative assay of HBsAg was carried out using HBsAg 1st IS 80/549 (subtype:ad) as standard antigen. The concentration of HBsAg positive control used in the assay was 16.8 IU/ml. A quantitative assay of HBsAg in each serum was done by using 1/2-sequentially diluted (from 8.4 to 0.13 IU) positive control solutions. HBeAg and ALT were also tested for those of HBsAg positive.

4. Statistical analyses

A χ^2 -test was applied to test independency of two discrete variable except when expected values are not enough for χ^2 -test, where Fisher's exact test was applied. Confidence interval of

proportion was estimated by exact binomial distribution. A p-value of 0.05 was considered statistically significant. All statistical tests were done by two-tailed test. All statistical analyses were done using the SAS for Windows 6.12.

RESULTS

1. Characteristics of the HBsAg-positives

Among the study subjects (n=1816), 99 were found to be HBsAg-positives; 66 men and 33 women. Mean age and its standard deviation of the HBsAg-positives was 40.0 \pm 10.5 in men and 42.3 \pm 9.9 in women. ALT was elevated over 35 U/L in three men. HBeAg was positive in 21 (31.8%) men and 9 (27.3%) women. 15.1% of the men and 12.1% of the women had a past history of liver disease. 19.7% of the men and 27.3% of the women had a family history of chronic liver disease (Tables 2).

2. Prevalence of HBsAg

The seroprevalence of HBsAg in Korean adults was 5.5% (95% CI= 4.5%-6.6%). The prevalence in men (7.4% with 95% CI of 5.8-9.4) was 2.1 times higher than that of women (3.6% with 95% CI of 2.5-5.0). In men, the seroprevalence of HBsAg in their twenties, thirties, forties and fifties or more were estimated as 5.8%, 7.2%, 10.9%, and 6.6%, respectively. Whereas among women they were estimated as 1.5%, 4.4%, 4.3%, and 4.4%, in the respective age groups (Table 3).

To compare the prevalence of HBsAg by region, sample regions were categorized into metropolitan areas and the other areas. In men, the seropreva-

lence of HBsAg of metro-politan areas was 6.5% (95% CI= 4.7-8.7) and that of the other area was 9.9% (95% CI= 6.5-14.4).

The difference was not statistically significant. Otherwise, in women, the seroprevalence of HBsAg in metropolitan areas (4.5% with its 95% CI of 3.0-6.3) was higher than that in the other areas (1.2% with its 95% CI of 0.2-3.4). The difference was statistically significant (p-value= 0.02) (Table 3).

The HBsAg prevalence in those who had past history of acute liver disease was 34.5% in men and 21.4% in women. The HBsAg prevalence in those with a past history of acute liver disease was significantly higher than that of those without a past history of acute liver disease. Those who had a family history of chronic liver diseases showed an HBsAg prevalence rate of 22.6% in men and 10.5% in women. Those who had a family history of chronic liver diseases showed higher HBsAg prevalence than those without a family history of chronic liver diseases, which was statistically significant in both men and women (Table 3).

The HBsAg prevalence rate of the vaccinated group was significantly higher (9.7% in men and 5.2% in women) than that of the unvaccinated group (3.5% in men and 1.4% in women).

Those who had vaccinated for hepatitis B were 38.6% of total study subjects, 38.8% in men and 38.4% in women. There was no significant difference in vaccination rate with age group in men. In women, there was significant trend of vaccination rate decreasing with age (Table 4).

3. Follow-up

Table 3. Positive rates of serum HBsAg by various factors

| Factors | Men | | Women | |
|--|----------------|------------------|-------|-----------------|
| | N | %Pv (95% CI) | N | %Pv (95% CI) |
| Age group | | | | |
| 20-29 | 242 | 5.8 (3.2- 9.5) | 265 | 1.5 (0.4- 3.8) |
| 30-39 | 265 | 7.2 (4.4-11.0) | 248 | 4.4 (2.2- 7.8) |
| 40-49 | 184 | 10.9 (6.8-16.3) | 187 | 4.3 (1.9- 8.3) |
| 50+ | 197 | 6.6 (3.6-11.0) | 228 | 4.4 (2.1- 7.9) |
| | χ^2 -test | p > 0.05 | | p > 0.05 |
| Region | | | | |
| Metropolitan areas * | 646 | 6.5 (4.7- 8.7) | 672 | 4.5 (3.0- 6.3) |
| Other areas | 242 | 9.9 (6.5-14.4) | 256 | 1.2 (0.2- 3.4) |
| | χ^2 -test | p > 0.05 | | p = 0.02 |
| Past history of acute liver diseases | | | | |
| No | 785 | 6.8 (5.1- 8.7) | 747 | 3.4 (2.2- 4.9) |
| Yes | 29 | 34.5 (17.9-54.3) | 14 | 21.4 (4.7-50.8) |
| | Fisher' s test | p = 0.001 | | p = 0.01 |
| Family history of chronic liver diseases | | | | |
| No | 761 | 6.7 (5.0- 8.7) | 683 | 3.1 (1.9- 4.7) |
| Yes | 53 | 22.6 (12.3-36.2) | 76 | 10.5 (4.7-19.7) |
| | Fisher' s test | p = 0.001 | | p = 0.005 |
| HB vaccination | | | | |
| No | 494 | 9.7 (7.3-12.7) | 458 | 5.2 (3.4- 7.7) |
| Yes | 313 | 3.5 (1.8- 6.2) | 286 | 1.4 (0.4- 3.5) |
| | Fisher' s test | p = 0.001 | | p = 0.007 |
| Total | 888 | 7.4 (5.8- 9.4) | 928 | 3.6 (2.5- 5.0) |

Abbrev: N = Number of the tested. %Pv = Seroprevalence(%) of HBsAg. CI = Confidence interval.

* It includes Seoul, Incheon, Gwangju, Daegu, Ulsan, and Busan.

Table 4. Hepatitis B vaccination rate by sex and age group

| Age group | Men | | | Women | | |
|----------------|--------|-----|-----------|--------|-----|-----------|
| | Tested | Vac | VR | Tested | Vac | VR |
| 20-29 | 213 | 91 | 42.7 | 201 | 120 | 59.7 |
| 30-39 | 254 | 104 | 40.9 | 177 | 74 | 41.8 |
| 40-49 | 168 | 57 | 33.9 | 105 | 59 | 35.7 |
| 50+ | 172 | 61 | 35.5 | 201 | 33 | 16.4 |
| Test for trend | | | p = 0.225 | | | p = 0.001 |

Abbrev: Vac = Number of the vaccinated among tested. VR = Vaccination rate (%)

Twenty-five men and six women were able to be followed up for the repeated test at intervals of six or more months after initial tests. Table 5 shows the difference in sex ratio, age, family history of chronic liver disease, and past history of liver disease between those followed-up and those who were not able to be followed-up. Men were more followed up than women, in which the difference in follow-up rate was statistically significant. The study subjects with more age, with a HBeAg, with a family history of chronic liver disease, or with a past history of liver disease

were more followed up, which were, however, not statistically significant (Table 5).

1) HBsAg seroconversion and prevalence of chronic HBV infection

Among the 31 HBsAg-positives who were followed up, 30 were HBsAg-positive after the follow-up period. HBsAg-negative seroconversion rate among cross-sectionally proven HBsAg-positives was estimated to be 3.2% with 95% confidence interval of 0.1% - 16.7%.

Thus, when we adjust for those who were not followed up, prevalence of

Table 5. Comparison of those followed-up with those dropped-out among HBsAg-positive subjects

| Characteristics | Follow-up (n=31) | Dropped-out (n=68) | p-value |
|--|------------------|--------------------|---------|
| Percent of women | 19.4 % | 39.7 % | 0.046 |
| Age over 50 | 32.3 % | 19.1 % | 0.151 |
| HBeAg-positive at initial test | 32.3 % | 30.5 % | 0.865 |
| Family history of chronic liver diseases | 25.8 % | 19.7 % | 0.500 |
| Past history of acute liver diseases | 17.2 % | 12.9 % | 0.582 |

Table 6. The changes in HBeAg in the subjects of HBsAg-positives who were followed up

| Initial test | | Retest after 6 months or more | |
|--------------|----------|-------------------------------|----------|
| HBeAg | | HBeAg | |
| | Positive | Positive | Negative |
| Positive | | 6 | 4 |
| Negative | | 0 | 21* |

* Negative seroconversion of HBsAg was occurred in one person of this group

chronic HBV infection was estimated to be 5.3% (95% CI= 3.7-6.6).

2) HBeAg seroconversion

Among those 31 followed up, Ten (32.3%) of the HBsAg-positives were HBeAg-positive at initial test. After six or more months of follow-up, seroconversion from HBeAg-positive to HBeAg-negative was occurred in 4 persons. Thus, the seroconversion rate in HBeAg positives was 40.0 % (95% CI= 12.2%-73.8%) during study period. There was no positive seroconversion in the HBeAg negatives (Table 6).

DISCUSSION

A prevalence study is valid when the study population represents source population. Although the study subjects were recruited from nationwide survey, they may not be representative of general population because they are examinees of health screening. If the study subjects had tendency to have health problem that is related to liver diseases, the study subjects cannot be a representative sample of the general population and the prevalence might be a biased estimate. There is no direct way to

assess the representativeness of the study population. An alternative way is to compare the exposure rate of study population with that of general population. Comparing the rate of past history of acute liver disease with that of general population [15] revealed no significant difference ; 2.7% in this study subjects and 3.0% in general population (p-value= 0.452).

We previously estimated the HBsAg positive rate in the 1980's to be 8.0% and 6.1% in Korean men and women, respectively [1]. Chun et al [16] estimated the HBsAg prevalence rate in Korea from review of 74 articles published in 1980's. He reported the HBsAg prevalence to be 7.9% in total population and the age group in their thirties showed highest prevalence. According to the result of this study, the prevalence rate in Korea seems to be decreasing more prominently in women than in men because the seropositivity in women decreased to 3.6%, whereas the seropositivity in men is not considered to decreased significantly. Two studies conducted in the early 1990's in Korea showed that HBsAg prevalence rate was 3.8% - 4.5% in blood donors [7],[17]. Considering that the study subjects of

the two studies were all blood donors, who tend to be relatively health and younger population, a comparison of the results from our study and the two previous studies should be done carefully.

The HBsAg prevalence was highest in men in their forties and showed inverted-U shape by the age group. On the other hand, the prevalence rate showed a plateau after age thirty in women. Most of the studies conducted in the 1980's in Korea have shown that people in their thirties have highest prevalence rate. A previous study [7] showed that the HBsAg prevalence rate had decreased more in younger age group, particularly in those in their twenties and thirties, than in the older age group during the nine years of observation from 1986 through 1994. In our study, the marked tendency of prevalence to decrease in young people seems to result in the highest prevalence in their forties. It is probably due to that vaccine efficacy is reduced over 40 years of age [18-20], and that the highest prevalent age group migrates to the older age group over calendar time. Moreover, the HBV vaccination rate was higher in people under forty (46.0%) than over forty (32.5%) in this study. Park et al [21] reported the HBV vaccination rate to be 33.9%, 35.3%, 41.0% and 32.7% in their twenties, thirties, forties and fifties, respectively, in a study conducted from 1990 to 1991. The vaccination rate shown in our study is higher than that of Park's study especially in their twenties and thirties, which seems to have contributed to the decrease in HBV prevalence rate in twenties and thirties.

In this study, the regional difference in HBsAg positive rate was significant

in women but not in men. The sexual difference in HBsAg positive rate was not significant in metropolitan areas but in the other areas. A previous study [22] conducted in both rural and urban area showed that the sexual difference in HBsAg positive rate was marked in urban area. This could be explained by the difference in social activity of men and women. We estimated the HBsAg positivity rate in urban areas with various size. The sexual difference of HBsAg was remarkable in non-metropolitan area. The possible interpretation of our study result is that, in metropolitan cities, the difference in social activity of men and women is not so substantial as to affect the HBsAg positive rate. On the other hand, in the other areas, HBsAg positive rate was much higher in men than women, where the difference is more remarkable than that shown in other previous studies [22-24] conducted in urban area. The marked difference in HBsAg positive rate between men and women may partially due to the difference in social activity of men and women in small cities where this study was done, along with statistical error due to small sample size. Following studies will be needed to clarify this issue.

A family history of chronic liver disease was shown to be a strong risk factor for HBV infection. This means that those who have a family history of chronic liver disease are more prone to be a patient with chronic liver disease than other persons of HBsAg positive. In terms of public health concerns, preventive intervention has to be focused upon who have a family history of chronic liver disease, particularly in their early life.

This study had a problem in follow-up for the HBsAg-positives. We were

able to retest the serum only in 31 persons of the HBsAg-positives. There would be a considerable bias in estimating the prevalence of chronic HBV infection due to the drop-out. Men were more followed-up than women, although the difference in the other variables were not statistically significant. However, considering that there are few evidences that the likelihood of chronicity after acute hepatitis B depends on gender, the influence of the difference in the drop-out rate by sex would be minimal. Another problem due to the drop-out is a reduction in sample size, which made the confidence interval wider than expected. However, this study can suggest that the HBsAg seroconversion rate in the late 1990's in Korea is not so high as shown in the previous studies [1],[11],[25] conducted in the 1980's in Korea.

This study showed those in replicative stage of the Hepatitis B (HBeAg-positives) was about one-third of the HBsAg-positives. 40 percent of those in replicative stage turned out to be in nonreplicative stage after six month. The seroconversion rate of HBeAg was much higher than known rate which is 10-15 percent per year. This was probably due to the small sample size of the followed-up. Further studies are required to identify more precise HBeAg seroconversion rate in Korean adults.

In conclusion, the prevalence rate of HBsAg in men was about twofold of that in women. The prevalence rate of our study result was much lower than that of previous studies in 1980'. In men, the seroprevalence of HBsAg in their twenties, thirties, forties and fifties or more were estimated as 5.8%, 7.2%, 10.9%, and 6.6%, respectively.

Whereas among women they were estimated as 1.5%, 4.4%, 4.3%, and 4.4%, in the respective age groups. In women, the seroprevalence rate of metropolitan area was significantly higher than that of the other area. A past history of acute liver disease and a family history of chronic liver diseases were significantly associated with HBsAg positivity. HBsAg-negative seroconversion rate was estimated to be 3.2%. The Prevalence of chronic HBV infection was estimated to be 5.3% (95% CI= 3.6-7.4).

This national survey showed that there has been a considerable decrease in HBsAg seropositivity rate in Korea and the decrease was marked in the younger population. However, chronic liver diseases including primary liver cancer are still major causes of deaths in Korea [26]. There should be more intensive preventive interventions including the HBV vaccination program in Korea.

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1998년 한국인 성인에서 혈청 HBsAg 양성률 추정을 위한 조사연구

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목적 : 1998년 한국인 성인에서의 혈청 HBsAg의 양성률을 추정하는 것을 일차적 목적으로 하며, HBsAg 양성률의 연령별 분포, 지역적 차이, 과거 간질 환력, 만성간질환 가족력 및 예방접종과의 관련성을 파악하며 또한 양성자를 6개월간 추적후 재검사 하여 B형간염의 만성보균율을 파악하고자 하는 것을 이차적 목적으로 하였다.

방법 : 1998년 전국 10개 지역에서 의료보험관리공단의 정기건강검진 수진자를 대상으로 하여 HBsAg의 혈청유병률을 조사하였다. HBsAg 양성인 사람들을 대상으로 6개월 이상 추적조사하여 B형간염 만성보균율을 파악하였다. 총 1,816 명에 대한 혈청과 설문서가 수집되었다. HBsAg 는 RIA 로 측정하였다.

결과 : HBsAg의 혈청유병률은 5.5% (95% CI= 4.5-6.6)였으며 남자에서 7.4% (95% CI= 5.8-9.4), 여자에서 3.6% (95% CI=2.5-5.0)로 나타났다. 급성간질환 과거력파 만성간질환 가족력을 HBsAg 혈청검사결과와 비교한 결과 유의한 관련성이 있는 것으로 나타났다. HBsAg 양성자에서 6개월 후에 음성으로 전환한 사람은 3.2 % (95% CI= 0.1-16.7)였으며 따라서 B형간염의 만성보균율은 5.3% (95% CI= 3.7-6.6)로 추정되었다.

결론 : 본 연구결과에서는 HBsAg 의 양성률이 1980년대의 연구결과들에 비하여 비교적 낮게 추정되었으며 이는 특히 여성과 젊은 연령층에서 두드러지게 나타났다. 그러나 우리나라에서의 간염 및 만성간질환의 공중보건학적 중요성을 고려하면 지속적인 간염발생의 예방대책이 필요하다고 할 수 있다.