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Original Article

Hepatitis B Surface Antigen (HbsAg) Prevalence and Risk Factors in Women of Childbearing Age in Eastern Algeria

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ABSTRACT

Background: Hepatitis B is the most common chronic viral infection and a significant contributor to morbidity and death globally. Based on the mother's hepatitis B e antigen (HBeAg) status, the probability of perinatal HBV infection in children delivered to mothers with HBV ranges from 10% to 85%.
Aim: to determine the prevalence of hepatitis B virus infection among women of childbearing age in the eastern region of Algeria and investigate risk factors for infection to recommend ways to reduce the disease's impact on neonatal morbidity and mortality.
Methods: We conducted a cross-sectional study in Sétif, Algeria, from 2005 to 2007 to assess the prevalence of Hepatitis B Surface Antigen among women of childbearing age. This study is the first and only one in Algeria. Data on risk factors, obstetrics, and sociodemographic were gathered using structured questionnaire; they were subsequently tested using an enzyme-linked immunosorbent assay for HBsAg. The data collected were entered and processed using Epi info 3.3.2 software. Infection prevalence, sociodemographic, clinical, obstetric and risk factors variable frequency distributions were calculated. The student's t-test and Fisher's exact test were applied, at a significance level of 5%.
Results: There are834 women of childbearing age's medical records were examined for this study. 1% of HBsAg test findings were positive. Positive HBsAg didn't significantly correlate with any other variables, including age, place of residence, municipality, marital status, occupation, parity, current pregnancy, reason for current consultation, transmission risk factors (blood transfusion, recent piercing, dental care, shared personal hygiene equipment, injection with multiple use equipment, tattoo, scarification, partner characteristics). However, history of jaundice has a significant protective effect against HBsAg positive.
Conclusion: Although our results classify the two municipalities studied as low prevalence areas (< 2%). Prenatal HBsAg screening is strongly advised.
Keywords: Women of childbearing age, Viral Hepatitis B, Prevalence, Algeria Risk factors.

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INTRODUCTION

Viral hepatitis B is one of the leading causes of life-threatening complications, including cirrhosis-related end-stage liver disease and hepatocellular carcinoma.

Mother-to-child transmission (MTCT) is an essential link in the maintenance of hepatitis B virus (HBV) infection, especially in highly endemic countries.[1] It has been established since the early 1970s that mothers who are HBsAg carriers can pass the virus on to their offspring, particularly if the mother's HBV is highly replicative. Transmission may occur postnatally, during pregnancy, or during delivery.[1]

As it is not an embryopathy, maternal-fetal HBV infection does not lead to malformities syndrome. Abortion and premature birth are potential outcomes of severe maternal acute hepatitis.[2] Intrauterine growth retardation, with early cholestatic hepatitis in the newborn, has been also described. Newborns born to chronic hepatitis B-infected women have a 90% likelihood of developing chronic HBV infection and its persistence. [3] In case of chronic carriage, patients are usually asymptomatic, but in the long term they are at risk of hepatocellular carcinoma,[4] because of this age-related risk of chronic infection, even in nations with low prevalence, detecting and vaccinating at-risk newborns is a main priority for hepatitis B control. Serological testing of all pregnant women at the end of the second trimester is the cornerstone of the prevention of mother-to-child transmission.

It should be remembered that knowledge of the seroprevalence of this infection in women of childbearing age, who are at risk of becoming pregnant at any time, is a prerequisite and a corollary to any intervention in the field concerning the woman herself, her partner, and her newborn child.

The use of epidemiological data from other settings is not recommended considering the great variability of the results documented so far, which motivated our choice to evaluate the seroprevalence of hepatitis B in women of childbearing age in the wilaya of Sétif and more precisely in the municipalities of Sétif and Ain El-Kébira.

The aim of this work is to study the serological status hepatitis B in woman of childbearing age residing in 2 municipalities of the wilaya of Sétif (Sétif and Ain El-Kébira), which would make it possible to estimate their seroprevalence, and propose means of prevention adapted to the local context to reduce the share of this disease in neonatal morbidity and mortality.

METHODS

This is a cross-sectional epidemiological study on seroprevalence of Hepatitis B Surface Antigen (HBsAg) among women of childbearing age, conducted from January 2005 to December 2007, carried out in 3 mother-and-child protection centers of the municipalities of Sétif and Ain El-Kébira. These two municipalities are part of the wilaya of Sétif, which is the capital of the high plateaus with an altitude of 1300 m, covers an area of 6504 Km^2, composed of sixty communes, regrouping a large population of 1,553,387 inhabitants, mainly young, with a very strong concentration on the high plains. It represents the second wilaya in terms of demography in Algeria after Algiers.

The municipality of Sétif, considered as urban zone, is part of the high plains, it is located in the center of the wilaya, covers an area of 127.30 km^2 and has 286,715 inhabitants. The

number of women of childbearing age (15-49 years) is estimated at 82,400.

The municipality of Ain El-Kébira, considered as urban and rural area, is part of the mountainous zone, it is located 27 km northeast of Sétif and has 40,554 inhabitants including11,655 women of childbearing age (15-49 years).

The successive recruitment of consultants took place every day of the week, reaching a representative sample of 834 women of childbearing age from all walks of life, with no prior knowledge of infection or disease, who agreed to participate in the study and residing in both municipalities Sétif and Ain El-Kébira in the commune of Sétif and the commune of Ain El-Kébira, with417 women in each one.

Our choice for the 3 health centers of Sétif is motivated by several reasons: the availability of centrifuges and freezers, their location which allows a significant recruitment of consultants, the multiplicity of socio-economic levels; The fact that consultations are free of charge facilitates access to care for all social strata.

The data was collected using a questionnaire filled in by the midwife Containing Sociodemographic variables including age, place of residence, marital status, profession; gynecological-obstetric variables including age of current pregnancy, number of previous pregnancies, evolutionary disorders during previous pregnancies.

Various possible routes for HBV infection exposure variables: to the risks of blood transmission, dental care, tattoo, use of multiple-use syringes, sharing of Individual Hygiene Equipment, partner's characteristics; given that Infancy ear piercings were done on all women, we looked for the notion of piercing done in adolescence and adulthood.

Variables associated with the clinical history of jaundice, variables related to sexual behavior: number of partners, use of condoms and the reason for current consultation.

10 cc venous blood sample was taken from each woman. The serum collected after centrifugation was kept at -18°C until the serological tests could be carried out. HBsAg testing was performed at the laboratory of Sétif teaching hospital on frozen serum, all the tests are performed by the same technician over a period of 3 weeks.

We used the murex HBs Ag version 3 which is a rapid and sensitive enzyme immunoassay for the detection of hepatitis B surface antigen in human serum or plasma. The sample is pre-incubated in wells coated with a mixture of mouse monoclonal antibodies specific for different epitopes of the HBsAg a-determinant; affinity chromatographically purified goat antibodies to HBsAg conjugated to horseradish peroxidase are then added to the sample in the well.

During the two incubation steps any HBsAg present in the sample forms an antibody-antigen-enzyme complex in the well; after washing to remove the sample and unbound conjugate a solution containing tetra methyl benzidine and hydrogen peroxide is added to the wells. Cups containing HBsAg develop a purple color. All positive tests are checked with another ELISA.

Ethics

The verbal consent of each woman was required for the administration of the questionnaire, and no refusal was recorded. However, three women wished to remain completely anonymous.

Statistical Methods and Data Analysis

The data collected were entered and processed using Epi info 3.3.2 software (version 6 CDC Atlanta - WHO - ENSP France). Infection prevalence, sociodemographic, clinical, obstetric and risk factors variable frequency distributions were calculated. The student's t-test and Fisher's exact test were applied, at a significance level of 5%.

RESULTS

The total number of women included in the study was 834, Socio-demographic, obstetrical and clinical features of the population sample are shown in Table 1. Age varies between 18 and 48 years; the average age is 32.16 years with a standard deviation of 7.30 years. The majority of women are over 25 years of age (78.1% of cases), with an equal distribution before and after 30 years of age. In terms of marital status, married women made up 98.6% of the sample, while single women made up 1.4%.

The study population was composed of two samples from the communes of Sétif and Ain El-Kébira, each with a total of 417 women. Up of 54.4% of women (n= 454) from urban areas and 45.6% of women (n= 380) from rural areas. 95.9% (n=800) are unemployed, health professionals constitute 1.6% (n=13) of the total number of women.

Almost all the women studied are sexually active (98.9%). The partner is known in 98.8% of cases, and is unique in 98.7% of cases. Concerning the number of births, 21 (2. 5%) had no children, 731 (87.6%) had between one and 6 children, and more than 6 children. History of jaundice is reported by 5 women.

Table 1. Socio-demographic, obstetrical and clinical characteristics in women of childbearing age participating in the study.

Variables	N (%)
Age group (years)	
15 - 20	17 (2)
21 - 25	166 (19.9)
26 - 30	195 (23.4)
31 - 35	169 (20.3)
36 - 40	162 (19.4)
41 & more	125 (15)
Municipality	
Ain El-Kébira	417 (50)
Sétif	417 (50)
Residence	
Rural	380 (45.6)
Urban	454 (54.4)
Employment	
Unemployed	800 (95.9)
Health worker	13 (1.6)
public servant	19 (2.3)
liberal profession	2 (0.2)
Marital Status	
Married	822 (98.6)
Single	12 (1.4)
Sexual activity	
Yes	825 (98.9)
No	9 (1.1)
Partner	
Known	824 (98.8)
Unknown	1 (0.1)
Unique	823 (98.7)
Multiple	2 (0.2)
Parity	
0	21 (2.5)
1 - 6	731 (87.6)
>6	82 (9.8)
Current pregnancy	
Yes	330 (39.6)
No	504 (60.4)
History of jaundice	
Yes	5 (0.6)
No	829 (99.4)

Eight women of childbearing age out of 834 are infected with the hepatitis B virus, giving a seroprevalence of 1 % (table 2).

Table 2. Distribution of the population according to HBs antigenemia in the communes of Sétif and Ain El-Kébira.

Ag HBS	Frequency	Proportion (%)	Cl95%
Positive	8	1	0.4 – 2.0
Negative	826	99	98.0 – 99.6
Total	834	100	

The mean age of women in positive and negative HBsAg groups was 32.0±6.5 years (21-39 years) and 32.16 ± 7.3 years (18-48 years), respectively, this seroprevalence is not related to age (Student Test 0.065) (Table 3).

Table 3. Population distribution by age according to HBsAg test results.

Age (years)	Ag HBS		P (Student Test)
	Positive Frequency (%)	Negative Frequency (%)	
15 – 20	0 (0.0)	17 (0.1)	
20 – 25	1 (1.5)	165 (2.0)	
25 – 30	2 (2.0)	193 (2.4)	0.065
30 – 35	2 (2.0)	167 (2.2)	
35 – 40	3 (3.5)	159 (1.2)	
40 & plus	0 (0.0)	125 (1.1)	
Total	8 (10.0)	826 (10.0)	
Means	32.00	32.16	

**. Student test statistically significant< =0.05*

Hepatitis B virus infection does not appear to be related to any of the socio-demographic and obstetric characteristics studied (Table 4 and Table 5).

Table 4. Prevalence of HBsAg in relation to socio-demographic characteristics.

Socio-demographic Characteristics	Ag HBs Positive Frequency (%)	Fisher Exact
Municipality		
Sétif	5 (1.2)	0.36
Ain El-Kébira	3 (0.7)	
Residence		
Urbain	5 (1.1)	0.46
Rural	3 (0.8)	
Marital status		
Married	32.00	0.89
Single	0 (0.0)	
Occupation		
Housewife	8 (1.0)	0.95
Employed	0 (0.0)	

**. Fisher exacts statistically significant < 0.05*

Table 5. Prevalence of HBsAg in relation to obstetrical characteristics.

Obstetrical Characteristics	Ag HBs Positive n (%)	Ag HBs Negative n (%)	Fisher exact
With history of pregnancy	8 (1.0)	805 (99.0)	0.814
Without history of pregnancy	0 (0.0)	21 (100.0)	
Parity			
0	0 (0.0)	21 (100.0)	
1 – 6	7 (1.0)	724 (99.4)	0.877
>6	1 (1.2)	81 (98.8)	

Obstetrical Characteristics	Ag HBs Positive n (%)	Ag HBs Negative n (%)	Fisher exact
Non-pregnant	6 (1.2)	498 (98.8)	
Pregnant	2(0.6)	328(99.4)	0.323
Pregnant with previous pregnancy	2(0.6)	327(99.4)	0.993
Primiparous	0 (0.0)	1(100.0)	

Fisher exacts statistically significant< = 0.05

There was no significant difference between HBsAg test results and obstetrical characteristics such as previous pregnancy (p =0.814), parity(p=0.877), current pregnancy(p=0.323), and previous pregnancy among pregnant women(p=0.993) (Table 5). The prevalence of HBs Ag among pregnant women is 0. 6% (Table 5). For the clinical history, the notion of jaundice is associated with HBV and has a significant protective effect against HBsAg positive (Table 6).

Table 6. Distribution of seroprevalence of HBs antigen by history of jaundice.

History of Jaundice	HBs Ag		Fisher exact	OR (Cl 95%)	RR
	Positive Frequency (%)	Negative Frequency (%)			
Yes	1 (20.0)	4(80.0)	0.36	0.034 (0.003—.344)	0.806
Ain El-Kébira	3 (0.7)				
No	7(0.8)	822(99.2)	0.46		

Fisher exacts statistically significant < 0.05

Oral contraception was the current reason for consultation for 6 HBs Ag positive women (75%); the other two cases consulted for threatened abortion and prenatal examination (Table 7).

Table 7. Distribution of HBs antigenemia according to the current reason for consultation.

Reason for consultation	Ag HBs	
	Positive Frequency (%)	Negative Frequency (%)
Abortion	0(0.0)	7(0.8)
Oral contraception	6(7.0)	476(5.6)
Screening	0(0.0)	23(0.8)
Pregnancy stopped	0(0.0)	2(0.2)
Threatened preterm birth	0(0.0)	5(0.6)
Threatened abortion	1(1.5)	23(0.8)
Antenatal	1(1.5)	287(3.7)
IUD	0(0.0)	2(0.2)
Vaccination	0(0.0)	1(0.1)
Total	8(10.0)	826(10.0)
Probability1		

**IUD= Intrauterine device*

DISCUSSIONS

This is the first and only survey on sero-prevalence of HBs antigenemia (Ag HBs) in Algeria that specifically targeted women of childbearing age; previous and subsequent studies looked at the seroprevalence of HBV infection in the general population and in blood donors.

To assess the seroprevalence of hepatitis B, we chose to estimate the seroprevalence of Ag HBs in women of childbearing age because it is only on this basis that we can prevent the

contamination of the newborn. Eight out of 834 women of childbearing age are infected with hepatitis B virus in our study, giving a seroprevalence of 1%.

Our results are similar to those obtained by several national studies, thus, Ayed 5 in a study carried out in 1991 in Algeria among 1112 blood donors without risk factors and 715 pregnant women, found a prevalence of 3.6 % in the first group and 1.6 % in the second group. According to a survey carried out by the Algerian Pasteur Institute,6 the prevalence of HBs Ag carriage in the general population is 2.15%, confirming Algeria's position as a medium endemic zone (2-7%) but at the lower limit.

The seroprevalence of viral hepatitis B (HBsAg) since it was declared separately from the rest of hepatitis reached an annual national rate of 3.13 cases per 100,000 inhabitants in 2004.7 The most important outbreaks are found in the southern wilayas and certain cities in the high plateaux: Tindouf (104.64), Tamanrasset (93.92), Illizi (59.78), Béchar (18.15), El Bayadh (13.52), Tébessa (11.70) and Ouargla (10.21), 37 cases were noted in the willaya of Sétif 2004.7According to the 2006 blood transfusion report, the national incidence among blood donors is 0.99%, with a seroprevalence rate of 5% at the Sétif CTS and 0.64% at Ain El-Kébira.8

The seroprevalence of HBsAg in Algeria is lower than that reported in some North African countries. In Tunisia, the prevalence of HBsAg among blood donors varies from 5 to 10% depending on the study;[9,10] this prevalence reaches 13% in certain regions of the south and Centre west.[11] In Morocco, a study of 783 consecutive Moroccan patients (591 men, 192 women, mean age 40 years) found a prevalence of 3.3% of HBsAg.[12] In Mauritania the prevalence of HBsAg in pregnant women is 15.7%.[13]

The mean age of the 8 infected women is 32.0 years; Seroprevalence is not related to age either when comparing the distributions or when comparing the means which are close to 32 years for both categories (seropositive and seronegative). The same result is reported in the Malian study.[14] Some studies report an association of antigenemia with age, reporting an increased risk of infection with age.

The Saudi study, for example, estimates positivity for women under 20 years of age at 0.5% compared to 2.6% for older women;[15] Similar results are also reported in other surveys. [16, 17]

All HBsAg-positive women are married and have no occupation, five of them are from urban areas; however, there is no statistically significant relationship between these three parameters and HBsAg. But, some studies report marital status as a risk factor for HBs Ag seropositivity.[18, 19]

The 8 infected women had previous pregnancies ranging from 1 to 7 with an average of 3.8 pregnancies, the only history of progressive pregnancy disorders found in these women was abortion (two cases out of eight);the relationship between obstetrical history and HBs antigenemia remains statistically insignificant. Only one study compared the number of parity and found a similar result to ours.[14] Two infected women are pregnant in their first trimester, with an average pregnancy age of eight weeks.

Oral contraception is the current reason for consultation for 6 HBs Ag positive women; the other two HBs Ag positive cases consulted for threatened abortion and antenatal examination.

Only one woman among those infected, reported a history of jaundice, the overall comparison showed that a history of jaundice has a significant protective effect against HBs Ag positive. The history of icterus may be related to a previously cured hepatitis B. Other studies have found no relationship between HBs antigenemia and history of jaundice.[17, 19]

Hepatitis B is the most common sexually transmitted disease in the world, in our study all infected women were married, but the relationship between sexual intercourse and HBs antigenemia was not significant.

In terms of potential nosocomial risk in infected women, the main exposure was dental care (50%), which was not a risk factor for current HBsAg carriage in our study, this was also reported in the Saudi 16 and Mexican 19 studies. However, dental care is a significant factor in the transmission of the hepatitis B virus from caregiver to caregiver. It should be remembered that even a very small amount of blood that the practitioner may not realize is present on an instrument can cause hepatitis B in the next patient if the instrument is not treated appropriately before being used again.

The highest viral risk appears to be associated with the use of rotating instrument holders. Various experimental studies have shown that a backflow of biological fluids into the internal channels and chamber occurs even with instruments equipped with a backflow prevention system. Then, when the device is reused, a gradual release of potentially infectious biological products takes place in the mouth of the next patient.[20] Infection of the patient by an infected carer is also possible. Porter reports the case of 55 patients contaminated in 3 years by a dentist who was infected with the hepatitis B virus and did not apply the usual rules of prevention.[21] After the implementation of systematic glove wearing, no contamination occurred in 8000 patients treated by this practitioner.

As for the piercing, limited to the wearing of earrings, it concerns 100% of the population according to family traditions and is done in childhood, most often after the age of one year. For some years now, we have been witnessing the adoption (following the new fashion) of this gesture by adult women (13.8% in our study), who are again piercing their ears. Recent piercing, practiced by 25% of the women infected with the hepatitis B virus, did not constitute a risk for current HBs Ag carriage.

However, we would like to note that these practices are by no means without risk, as several observations of acute hepatitis B transmitted by piercing have been published in the past, which leave no room for doubt, including two cases of fatal fulminant hepatitis in the USA.[.22, 23] In the Netherlands, two closely related cases of acute hepatitis B were formally attributed to the same piercing shop.[24] Three larger studies, conducted using different methodologies by Abdool-Karim, Johnson and Mele, in South Africa, USA and Italy respectively, found a statistically significant association (in multivariate analysis) between HBV antibody carriage and ear piercing.[25-27] They constitute strong indirect arguments to support the reality of this infectious risk. In our case, the piercing (recent) did not constitute a factor of risk of current portage, of the antigen HBs, because the only reused material (gun) does not risk in no case to be contaminated by blood since the perforation of the part of the ear is done directly by the jewel to be posed but only the study of the antibodies anti HBc could confirm or refute the

association between seroprevalence of the hepatitis B and this risk factor.

The use of multiple-use syringes, as well as the sharing of hygiene equipment and tattooing, were not risk factors for the current carriage of HBsAg (all the women using these methods are seronegative).This can only be explained, a priori, by the low circulation of the germ in the population of the communes concerned due to the low prevalence of the disease as shown by the incidence rate among blood donors (0.5% at the CTS of Sétif and 0.64% at Ain El-Kebira); however, the association between these risk factors and the seroprevalence of hepatitis B can only be estimated by studying anti-HBc antibodies. A Malian study found a statistically significant relationship between HBs antigenemia, tattooing and scarification. [(14)] All of these socio-demographic characteristics of the affected women did not identify risk factors, as the relationship between these characteristics and HBs antigenemia was statistically insignificant in all cases.

The relationship between these characteristics and HBs antigenemia was statistically insignificant in all cases. HBs antigenemia is very useful in the management of the woman herself, and in the prevention of transmission to those around her, particularly her partner and the newborn child, and this is the main interest of our study.

On the other hand, it is not possible to envisage selective preventive strategies through the isolated analysis of this marker because only the analysis of anti HBc antibodies can testify to a previous encounter with the virus and make it possible to estimate the seroprevalence of hepatitis B among women of childbearing age in the two communes.

In addition, we can already point out certain shortcomings in the management of the disease, none of the women in the study population was screened for HBsAg!

This lack of knowledge of the serological status can have harmful repercussions at several levels, The woman herself, because of her current status, risks not only seeing her disease develop into serious complications in the short or long term, but also aggravating the liver damage by taking ill-considered medication; in our study, six infected women consulted for oral contraception, which is formally contra-indicated in cases of hepatitis. This woman is a potential source of infection for several people, her partner through sexual contact, her entourage through blood and horizontal transmission. Her newborn child if she remains a carrier of the virus until the 3rd trimester, or if she is a chronic carrier, in fact the risk of contamination in the case of acute hepatitis occurs in 65 to 100% of cases and in this dreadful situation the newborn child will be a chronic carrier in 70 to 90% of cases.

By not being aware of her disease, this woman will cause her newborn child to lose the chance to benefit from sero-vaccination protection at birth.

Although we could not define risk factors for HBV contamination in our study population, we did find dangerous behaviors that facilitate HBV contamination, thus, we must teach our population to protect themselves from certain risk behaviors such as unprotected sex with unknown partners; sharing personal items (e.g., toothbrushes and razors) that may be infected with blood. Tattooing and skin piercing also pose a risk of transmitting the virus. Care should be taken in choosing who performs these procedures; the practice of universal

blood safety precautions, including the use of single-use syringes and needles.

The introduction of vaccination against hepatitis B in Algeria since 2003 and the choice of the universal strategy, i.e., vaccination of all infants, is an important decision given the expected collective benefit to control, or even ultimately eliminate hepatitis B and the individual benefit in the short and medium term depending on age: avoiding the disease in case of future risky practices (Sexual transmission, intravenous drug use and other modes of parenteral contamination). However, because seroprophylaxis of newborns at birth is an essential curative measure in the case of a seropositive mother, the universal vaccination program shouldn't replace serological screening of pregnant women.

CONCLUSION

Our results classify the two municipalities studied as low prevalence areas (< 2%). Given that the carriage of HBs Ag in women of childbearing age in terms of contamination, it constitutes a risk for the partner, the family and the procreation (chronic carriage), the systematic screening of the HBV infection, in any woman having a sexual activity, in prenuptial and prenatal, is necessary, which will allow in case of positivity to take charge of the woman herself, to inform and educate her; to apply prophylactic measures (sero-vaccination) to the child from birth and to the partner. The rigorous organization of early prenatal screening must be the first concern, and cannot be conceived without clear information for pregnant women and healthcare teams.

Since vertical transmission occurs mainly during childbirth, the screening date should be towards the end of the second trimester. If it has not been done or the result is not available, it should be requested urgently at the time of delivery. The test should be repeated in every pregnancy. Serum HBs Ag is the only useful viral marker in this respect.

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Conflict of Interest

All authors declare no conflict of interest, and agree to publish the article in journal.

Ethical consideration

Ethics clearance was obtained prior to start of study and all participants provided the written consent.

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