Should pregnant urban South African women be screened for hepatitis B?

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Abstract **The prevalence of hepatitis B virus (HBV) infection in the South African urban obstetric population, which consists of white, black, coloured and Asian patients from different socio-economic, cultural and geographical backgrounds, is unknown. Routine screening performed in 3 469 urban pregnant women revealed that 42 patients were HBV surface antigen-positive (a prevalence of 1,21%). Only 2 patients (4,6%) were hepatitis B e antigen (HBeAg)-positive (0,06% of the entire cohort), whereas the remaining 40 were identified as hepatitis B e antibody-positive. Despite a significant increase in the numbers of black patients, there has not been an accompanying increase in the number of HBV carriers. Replicative infection was equally distributed among white and black pregnant women.**

Because the low prevalence of HBeAg results in lack of perinatal transmission and the prevention of a single case of neonatal hepatitis B infection is costly, we conclude that in South African urban hospitals, routine screening for hepatitis B is not cost-effective.

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Studies evaluating cost-effectiveness of mass screening to detect hepatitis B surface antigen (HBsAg) in the obstetric population suggest that it is highly cost-effective.[1-6] Infants of mothers positive for HBsAg are at risk of acquiring hepatitis B virus (HBV) infection while those born to mothers who test positive for HBsAg and hepatitis B e antigen (HBeAg) almost invariably become chronic carriers and have a lifetime risk of long-term complications of hepatitis B (HB) infection, including chronic hepatitis, cirrhosis and hepatocellular carcinoma.[1-5] Because perinatal or vertical transmission is the usual route of acquisition for neonatal HB infection in endemic areas, administration of HB immunoglobin and vaccine shortly after birth will prevent development of the chronic carrier state in the infant.[7-10] Therefore, neonatal HB immunoprophylaxis requires identification of those pregnant women who are HBsAg-positive.

The conclusions of these published studies, undertaken predominantly in developed countries, lead one to believe that if antenatal screening of all pregnant mothers is instituted, preventive measures will reduce the likelihood of HBV infection transmission to the infant.

Comprehensive antenatal screening to detect the pregnant HB carrier is easy when medical resources are unlimited. In South Africa, however, financial restraints have precluded routine screening for HBV in pregnant mothers. Until 1990 the perception at Johannesburg Hospital was that routine screening was not cost-effective as our antenatal patients were almost exclusively white. However, since 1990, our obstetric population has changed from a predominantly white to a predominantly non-white one. This is the consequence of progressive and rapid urbanisation of non-white South Africans and our obstetric population now consists of patients of different races from a variety of socio-economic, cultural and geographical backgrounds. During 1990 and 1991 we therefore instituted a study to determine the cost-effectiveness of prenatal screening and immunisation for HB by routinely screening all antenatal patients, not only to determine the number of HBV carriers, but also to determine whether there was any change in the prevalence of HB over the 2-year study period.

Materials and methods

Between 1 January 1990 and 1 November 1990, 1 392 pregnant women attending Johannesburg Hospital for their first antenatal visit had a serum sample assayed for the presence of HBsAg and antibody (anti-HBs), HBeAg and antibody (anti-HBe) and antibody against the HB core antigen (anti-HBc) by means of commercially available radio immunoassays, AUSRIA, AUSAB, HBe/anti-HBe TM and CORAB, respectively (Abbott Laboratories, Abbott Park, North Chicago, USA).

Risk factors, including race of patient, previous blood transfusion, dialysis, history of liver disease and intravenous drug abuse, were documented. All newborn infants whose mothers were HBsAg-positive were given HB prophylaxis.

Between 1 January and 31 August 1991, 2 077 pregnant women were screened for the presence of HBsAg only. HBsAg-positive samples were further analysed for the presence of HBeAg, anti-HBe and anti-HBc using the radio-immunoassay techniques described previously. The risk factors were documented and infants born to HBsAg-positive mothers were immunised.

The data were analysed by means of the χ^2 test with Yates's modification for small numbers, and Fisher's exact test for the coloured and Asian patients.

Results

Between 1 January and 1 November 1990, 15 patients tested positive for the HBsAg, a prevalence of 1,07%. The cohort of patients consisted of 809 (58,1%) whites, 364 (26,2%) blacks, 117 (8,4%) coloureds and 102 (7,3%) Asians.

Only 1 white patient tested positive for HBeAg (1,07% of the HBsAg-positive or 0,07% of the cohort of patients). Fourteen of the 15 patients were anti-HBe-positive.

Between 1 January and 31 August 1991, 27 patients tested positive for HBsAg, a prevalence of 1,30%. The cohort of patients now consisted of 907 (43%) white, 861 (41%) black, 169 (8%) coloured and 160 (8%) Asian pregnant women. There was 1 black patient who was HBeAg-positive. The distribution of HBsAg in our obstetric population during 1990 and 1991, as well as the prevalence of HBsAg according to race groups when compared with white patients, are shown in Tables I and II respectively.

TABLE II.
Prevalence of HBsAg according to race groups when compared with white patients

	Black	Mixed	Asian
1990	$P < 0,0001$	$P = 0,027$	NS*
1991	$P < 0,0001$	$P = 0,029$	NS

* NS = not significant

Discussion

Cost-effectiveness must be considered in every screening recommendation. The cornerstone of preventive medicine is not necessarily that it must be cheaper but that it should yield results that are superior to those achieved by curative medicine. In general, most published studies suggest that it is cost-effective routinely to screen all antenatal women for HBsAg and to administer HB immunoprophylaxis to those infants born to HBsAg-positive mothers.[1-5] These studies have considered factors such as direct and indirect cost involved when taking into account patient outcome probabilities should HB viral infection ensue.[2] Others have used the cost of preventing a single case of post-transfusion HB infection to justify routine antenatal screening.[1] More simply, Chin[11] suggests that maternal screening be considered in populations with HBsAg carrier rates of 10/1 000 or greater. If we were to follow this recommendation, than all our black 23/1 000 and coloured 17/1 000 pregnant mothers should be screened routinely. The prevalence among the white patients (4,5/1 000) does not justify routine screening.

TABLE I.
Distribution of HBsAG among different ethnic groups in the obstetric population at Johannesburg Hospital

	White	Black	Mixed	Asian
1990				
No.	809	364	117	102
HBsAg	5 (0,6%)	6 (1,6%)	3 (2,5%)	1 (1,0%)
HBeAg	1	0	0	0
1991				
No.	907	841	169	160
HBsAg	3 (0,33%)	22 (2,6%)	2 (1,18%)	0
HBeAg	0	1	0	0
Total				
No.	1 716	1 205	286	262
HBsAg	8 (0,46%)	28 (2,32%)	5 (1,7%)	1 (0,38%)
HBeAg	1 (0,05%)	1 (0,08%)	0	0

TABLE III.
Overall prevalence of HBsAg

	1990		1991		
	No.	%	No.	%	Significance
Whole population	15/1392	1,07	27/2077	1,30	NS ($P = 0,55$)
Black population	6/364	1,6	22/841	2,6	NS ($P = 0,31$)
Black obstetric population	364/1392	26,2	841/2077	41,0	$P < 0,001$

At the outset of our study we anticipated that the number of HBV carriers would increase significantly over the 2-year study period. However, although we did notice a significant increase in the number of urban- and rural-born black women, we did not see a significant change in the overall prevalence of HBsAg or HBeAg carriers (Table III). We estimate that approximately 10% of our black patients are rural-born, but this figure cannot be verified as the majority of these patients supply inaccurate details with regard to place of birth and address. There was, however, a significant difference in the prevalence of HBsAg between white and non-white women (Table II). Replicative disease was found in only 2 patients (1 white and 1 black) i.e. 4,6% of the HBsAg-positive mothers. Had we screened only those patients who had associated risk factors, we would have identified only 31% of the mothers shown to be HBsAg-positive. Had we considered race as a risk factor and included all the black and coloured patients, we would have identified 88% of the carriers.

If we were to create a worst-case scenario and consider the outcome had we not screened any of our antenatal patients, based on the prevalence of HBsAg and HBeAg in our obstetric population, we estimate that 7 infants would have acquired HB infection, i.e. 1/500 deliveries. This estimate assumes that mothers who are HBsAg- and HBeAg-positive or HBsAg-positive and anti-HBe-positive will transmit the infection to their infants in 90 - 100% and 10 - 12% of cases respectively.[12-17] Therefore, the estimated cost of preventing a single case of neonatal HBV infection in our population was R12 384. The cost of each HBsAg screening test was R24,99 and this gave a total cost of R86 690 for the 2-year study period. Yet despite this hypothetical scenario, in a study of 2 364 urban-born black children between the ages of 3 and 19 years, it was found that the youngest chronic carrier of HBV was 7 years old.[18] In an earlier study among rural children born to mothers who were HBsAg-positive, only 1% of children under 6 months of age were HBsAg-positive.[19] These studies clearly highlight the lack of perinatal transmission of HBV in South Africa. In our own study only 4,6% of the HBsAg-positive mothers showed evidence of replicative disease, while the remaining 95,4% were anti-HBe-positive. This contrasts with pregnant Asian HB carriers, of whom 40-50% are HBeAg-positive, and vertical transmission accounts for the majority of chronic carriers among neonates.[12, 19-21] In our cohort of Asian women, 28 were Chinese (one of whom was HBsAg-positive) and 234 were Indian.

For the individual R24,99 may be a small amount, but for the general population the cost of routine screening of pregnant women is mammoth. The implementation of First-World recommendations and protocols is a goal to strive for, but which of these should take precedence in a developing country requires critical appraisal. Our cohort of patients alone should have yielded at least 7 neonates who were seropositive as a result of perinatal transmission. However, as in other studies in South Africa, this was not the case, probably because of the low HBeAg-prevalence. It would therefore appear that routine screening in a South African urban hospital is impractical and not cost-effective. A more appropriate preventive measure would be to introduce routine immunisation of all new-born infants; this would curtail the 'horizontal' spread of the virus and reduce substantially the carrier rate in our population.

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