

Influence of antenatal screening on perinatal mortality caused by syphilis in Swaziland

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SUMMARY In a survey of 283 deliveries in Swaziland, active syphilis (positive results in the *Treponema pallidum* haemagglutination assay (TPHA) and the rapid plasma reagin (RPR) test) was found in 37 (13.1%) and possibly active infection (positive TPHA but negative RPR test results) in a further 87 (30.7%). The perinatal mortality of untreated mothers with active disease was 21.9% (7/32). The RPR test carried out antenatally by nurses had a sensitivity of 36% (13/36) and predictive accuracy of 48% (13/27).

Awareness of this incidence of syphilis led to improved antenatal clinic measures and the prophylactic treatment of all newborn infants.

More comprehensive serology is discussed and the prophylactic treatment of mothers considered. The need for health education aiming at safer sexual practices is of paramount importance in a society facing the arrival of the human immunodeficiency virus.

Syphilis is common in several African countries, with a prevalence of around 10% (Widi-Wirski R and D'Costa J, 13th conference technique, OCEAC, Yaoundé, Cameroun, 1980).¹⁻³ Morbidity seems to be low in adults,^{1,3} but neonatal syphilis is common and there is high perinatal mortality.³⁻⁵ In 1979 syphilis was shown to be venereal in origin in Swaziland,⁶ and 6.5% to 14% of women of childbearing age had active infection.⁶⁻⁸ The present study assesses the effectiveness of antenatal screening and the perinatal mortality resulting from untreated maternal disease.

Patients and methods

Syphilis screening was provided by nurses for antenatal mothers booking at the Public Health Unit, Mbabane, Swaziland. The rapid plasma reagin (RPR) test (Syfacard-R, Wellcome) using undiluted serum gives a simple positive or negative result. Women with positive results were treated with benzathine penicillin 2.4 MIU a week for three weeks.

During July and November 1986 the syphilis status of mothers was checked at more or less consecutive deliveries at Mbabane Hospital Maternity Unit, and details of screening, treatment, and outcome were

recorded. Serum was obtained and frozen from 100 cord samples and 178 maternal samples. There were five sets of twins, which were each considered as two separate deliveries. The July samples were checked by the RPR test and the *Treponema pallidum* haemagglutination assay (TPHA) (Syfatect, Wellcome), both in dilution, by the Institute of Tropical Medicine, Antwerp, and the results were confirmed by the fluorescent treponemal antibody absorption (FTA-ABS) test. The November samples were tested by the authors by the RPR test in dilution and by qualitative TPHA only.

Positive RPR test results are evidence of active disease, and become negative after treatment. False positive results at low titres, however, may occur in pregnancy,⁹ so a titre of 1/1 can only be considered borderline or indicative of possibly active syphilis. The TPHA is specific for treponematoses, but titres drop very little after treatment.¹⁰ Thus active syphilis is defined by a RPR titre of 1/2 or more and a positive TPHA result, and possibly active syphilis by a RPR titre of 1/1 or a negative result and a positive TPHA result.⁶

Perinatal syphilis serology testing was not available routinely, so all newborns were treated with benzathine penicillin 0.15 MIU, which has appreciably reduced the admission to hospital of older infants with congenital syphilis in Mbabane (McGrath E, *et al*, unpublished observation).

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Table 1 Results of antenatal rapid plasma reagin (RPR) test with undiluted serum compared with results of *Treponema pallidum* haemagglutination assay (TPHA) and RPR test with diluted serum at 283 deliveries to 278 mothers. (Figures are numbers of deliveries (numbers of perinatal deaths)).

Group	Antenatal RPR test result	No	Active at delivery (n = 32) (TPHA positive, RPR:		Possibly active at delivery (n = 92) (TPHA positive, RPR:		Negative at delivery (n = 159) (TPHA negative, RPR:	
			≥ 1/8	1/2 & 1/4)	1/1	Negative)	Negative	Positive)
A	Positive and treated	27	2	6	3	2	12	2
B	Negative	172	7 (3)	5 (1)	11	45 (1)	97 (3)	7
C	Not available	84	9 (3)	3	7	24 (3)	38 (1)	3
Total		283	18 (6)	14 (1)	21	71 (4)	147 (4)	12

Results

Table 1 shows the results of antenatal screening compared with those of serology tests at delivery.

We found that 27 mothers (group A) had positive results by the antenatal screening and treated them with penicillin as described, but treated few sexual partners. There were no perinatal losses, but the TPHA gave negative results in 14, which suggested that these had been biological false positives antenatally. The remaining 13 were counted as having had active disease before treatment.³ Thus a total of 37/283 (13.1%) had active disease and 87/283 (30.7%) had possibly active disease.

Of 172 deliveries with apparently negative antenatal results (group B) at delivery 56 were to mothers with possibly active disease (with one loss), but 12 were to mothers with active syphilis, and four of their infants, including a pair of twins, died. This group of 12 mothers possibly had either late seroconversion or false negative antenatal test results.

Of 84 deliveries for which no antenatal serology test results were available (group C), active disease was

present in 14.3% (12) and possibly active in 36.9% (31). These levels were higher than in the 199 deliveries for which antenatal serology test results were available (groups A and B), 25 (12.6%) of which were to mothers with active disease and 56 (28.1%) to mothers with possibly active disease. The absence of a result was sometimes related to poor antenatal attendance, but often the result was just not recorded.

At best these results show that RPR tests carried out by clinic nurses have a sensitivity (true RPR positives (group A)/true RPR positives (group A and B) of 36% (13/36) and a predictive accuracy (true positives (group A)/true + false positives (group A) of 48% (13/27) (using the methods of Yerushalmy).¹¹ In addition 84/283 (30%) mothers were missed by antenatal screening.

Untreated active syphilis was a risk factor in 24 deliveries that resulted in seven perinatal losses, a mortality of 29.2%. Mortality in women with possibly active syphilis was 4.6% (4/87) and in those with negative results 2.8% (4/145). The association between perinatal mortality and active syphilis was appreciable, but less than that found by Meheus and

Table 2 Details of 15 perinatal losses.

Case No	Mother's		Antenatal				Result at delivery of:	
	Age	Parity	RPR result	Date (week)	Weight of baby (kg)	Clinical features	RPR	TPHA
1	21	0	Negative	Nil	0.8	Fresh stillbirth—abruptio	1/128	1/1024
2	22	3	Nil		0.9	Neonatal death	1/128	1/1024
3	17	0	Nil		3.8	Macerated stillbirth	1/8	Positive
4	15	0	Nil		2.8	Macerated stillbirth	1/8	Positive
5	19	0	Negative	32/52	2.0	Macerated stillbirth—twin	1/8	Positive
6	19	0	Negative	32/52	2.1	Fresh stillbirth—twin	1/8	Positive
7	24	1	Negative	23/52	3.1	Macerated stillbirth	1/4	Positive
8	27	1	Nil		3.3	Fresh stillbirth—abruptio	Negative	Positive
9	28	2	Nil		2.9	Macerated stillbirth	Negative	Positive
10	20	0	Nil		1.9	Macerated stillbirth	Negative	Positive
11	22	3	Negative	Nil	1.3	Neonatal death—Apgar 5-8	Negative	Positive
12	20	1	Negative	28/52	2.5	Neonatal death—?infection	Negative	Negative
13	25	2	Negative	21/52	3.0	Macerated stillbirth—pre-eclampsia	Negative	Negative
14	23	2	Negative	34/52	1.5	Macerated stillbirth at 34/52	Negative	Negative
15	17	0	Nil		2.6	Macerated stillbirth	Negative	Negative

RPR = rapid plasma reagin test
 TPHA = *Treponema pallidum* haemagglutination assay.

Piot.¹² The slight excess mortality associated with possibly active disease in this survey, however, was not significant. Because all newborn infants were treated with penicillin, late neonatal morbidity was avoided. Table 2 shows details of perinatal losses; necropsies were not performed.

The mortality attributable to active syphilis was 26.4% (29.2 - 2.8) and the proportion of mothers with active disease was 13.1% (37/283) so that overall perinatal mortality attributable to active syphilis would have been 3.5% ($13.1 \times 26.4 \div 100$). At most 13 mothers with active disease were treated, leaving 24 untreated, a mortality of 1.2% ($3.5 \times 13 \div 37$) avoided. Thus the screen averted 35% (13/37) of losses but missed the remaining 65% (24/37).

Discussion

This survey shows evidence of past or present syphilis in 44% (124/283) of Swazi mothers and active disease in 13% (37/283). This was a very high level of infection, and screening was not very effective in dealing with it. Of mothers with active disease, 65% were missed and few sexual partners were treated, so that an expected perinatal mortality due to syphilis of 3.5% was only reduced to 2.3%.

Despite this poor showing, screening indicated roughly the level of disease and stimulated clinical awareness. Earlier surveys led to screening,⁶⁻⁸ but the extent of perinatal and paediatric problems has only been shown recently (McGrath E, *et al*, unpublished observation). This led to other measures being adopted to combat the problem, including checking for vulval sores in the antenatal clinic, mothers with previous perinatal losses or vulval lesions starting treatment immediately, and all newborn infants receiving benzathine penicillin.

The screening programme for syphilis described could certainly be improved. Mothers should be screened when they book at the antenatal clinic and also in the third trimester³; technically trained staff should check positive results in dilution and with the TPHA. A further problem of screening, however, was the failure to contact women with positive results. Nearly all mothers had antenatal cards, but many cards had no record of the RPR results.

In hospitals that do not provide syphilis screening, a prevalence survey would indicate the extent of the problem and increase clinical awareness. Starting screening, however, will add appreciably to the cost and workload of antenatal clinics, and few hospitals in Africa can afford comprehensive screening as described above.

In areas with a high level of sexually transmitted disease, mass treatment has been suggested.¹³ We think that a one dose prophylactic regimen of penicillin for

mothers booking at antenatal clinics would be more cost effective. This would free staff to investigate reservoirs of infection in high risk groups, and intermittent surveys would check progress in dealing with the problem.

The RPR card test is simple to perform, although some experience is needed to read the end point. Separating serum is easy with a centrifuge, but this is not essential if you wait for clot retraction; nor is the shaker essential, as the card can be kept in motion by hand. Batch testing after the clinic seems easiest, but mothers then have to return for their results, which is the commonest cause of screening failure.

A method has been proposed so that screening can be carried out in clinics.¹³ Blood is taken by finger prick into a microhaematocrit tube; the tube is spun giving a packed cell volume reading and providing serum rapidly for the RPR card test. The method requires tubes and a centrifuge, but seems to be appropriate when a rapid answer will increase screening efficiency.

It seems to be inevitable that human immunodeficiency virus (HIV), whose pattern of transmission in Africa is similar to that of syphilis, will shortly reach Swaziland. If 45% of mothers at present show evidence of syphilis and patterns of sexual partnership remain the same, a similar proportion are likely to contract HIV. The outcome for the future generation cannot be predicted for certain, but mortality of mothers and children will make the present perinatal mortality due to syphilis seem insignificant.

With the relative inefficiency of screening and the threat of HIV, an attempt must be made to educate the next generation towards safe sexual partnership. The one to one relationship of marriage provides protection, a legal structure, and a family environment. Marriage should therefore be facilitated, but cultural patterns alter only slowly. Outside marriage, methods of safe sex should be encouraged, but here again a conservative society sees this as promoting promiscuity. Understanding is needed at all levels.

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