

## **Congenital syphilis at Goroka Base Hospital: incidence, clinical features and risk factors for mortality**

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### **SUMMARY**

A prospective study of all cases of congenitally acquired syphilis diagnosed at Goroka Base Hospital was conducted between January 1998 and December 1999. 67 affected neonates and children were seen, of whom 19 died during the first admission and 3 died during the period of follow-up. Congenital syphilis caused 5.5% of 994 neonatal admissions, but 22% of all neonatal deaths. The major risk factor for death in affected babies was low birthweight. A birthweight of less than 2 kg had an odds ratio for death of 30.0 (95% confidence interval 6.90-131.1). During the time of the study 5385 women attended antenatal care at Goroka Base Hospital, of whom 382 had both positive VDRL and TPHA tests. The incidence of syphilis in women attending antenatal care was 7.1%. Syphilis is a major cause of neonatal mortality and morbidity and a major cause of morbidity among women of childbearing age in the Eastern Highlands Province. Current antenatal screening is inadequate, covering less than 30% of pregnant women. New ways to extend syphilis screening and treatment to all affected pregnant women are urgently required and must be formally assessed.

### **Introduction**

Neonatal mortality in Papua New Guinea (PNG) is high: 35% of total child mortality occurs in the neonatal period (about 40 deaths per 1000 livebirths). There are about 6000 neonatal deaths per year throughout the country. Syphilis was first recognized in adults in PNG in 1960 and reported cases increased 15-fold in the decade after Independence (1). Congenital syphilis was first reported in PNG in 1971. It is uncertain to what extent syphilis contributes to neonatal and infant mortality, or to the proportion of babies with low birthweight. Data collected in 1994 published in the PNG National Health Plan (2) does not mention congenital syphilis either as a cause of admission to hospital or of neonatal death.

### **Aims**

1 To describe the clinical features and the incidence of congenital syphilis at Goroka Base Hospital.

2 To determine risk factors for death from congenital syphilis.

3 To determine the incidence of syphilis among pregnant women attending antenatal care at Goroka Base Hospital.

### **Methods**

This was a prospective study of all children admitted to the Goroka Base Hospital with congenital syphilis between 1 January 1998 and 31 December 1999. Congenital syphilis was diagnosed if some of the following were present and the baby had a positive Venereal Disease Research Laboratories (VDRL) test: characteristic skin lesions, hepatomegaly, splenomegaly, radiographic evidence of lytic bone lesions, anaemia or jaundice. The following data were collected at presentation: maternal VDRL titre and antenatal care attended; clinical signs of syphilis and the VDRL and *Treponema pallidum*

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haemagglutination (TPHA) tests in the child. We recorded outcome in terms of mortality at the initial admission to hospital and late morbidity and mortality in children who presented again during the two years of the study. To determine the incidence of syphilis among antenatal mothers at Goroka Base Hospital over the same time period we retrospectively reviewed the antenatal records and laboratory VDRL and TPHA serology results book. Maternal syphilis was only considered to be present if both the VDRL and the TPHA tests were positive. To determine the number of admissions, total mortality and weight-specific mortality among all neonates admitted to Goroka Base Hospital we retrospectively reviewed the Neonatal Unit admissions record.

All neonates with congenital syphilis were treated with benzylpenicillin 30 mg/kg every 6 hours for 10 days. They were admitted to the Neonatal High Dependency Unit, where supportive care included supplemental oxygen, blood transfusion and treatment for other sepsis as indicated.

Data were analyzed using Stata 5.0. Logistic regression was used to calculate odds ratios and 95% confidence intervals for risk factors for mortality. Relative risk was used to describe the risk of mortality in low birthweight babies with syphilis compared to those without syphilis.

**Results**

67 children were identified with congenital syphilis, of whom 55% were male. Median birthweight was 2.4 kg (interquartile range 1.7-3.1 kg). 18 weighed less than 2 kg at presentation and 9 weighed less than 1.5 kg. 19 died and 48 were discharged well after the first hospitalization. 7 of the discharged children were later readmitted, 5 with pneumonia and 2 with meningitis, and 3 of these 7 children died. The total mortality rate in the two years of follow-up was therefore 22/67 (33%). Table 1 shows clinical and laboratory variables and their predictive power for death, measured at the time of initial presentation. Only low birthweight was a strong predictor of death (Figure 1).

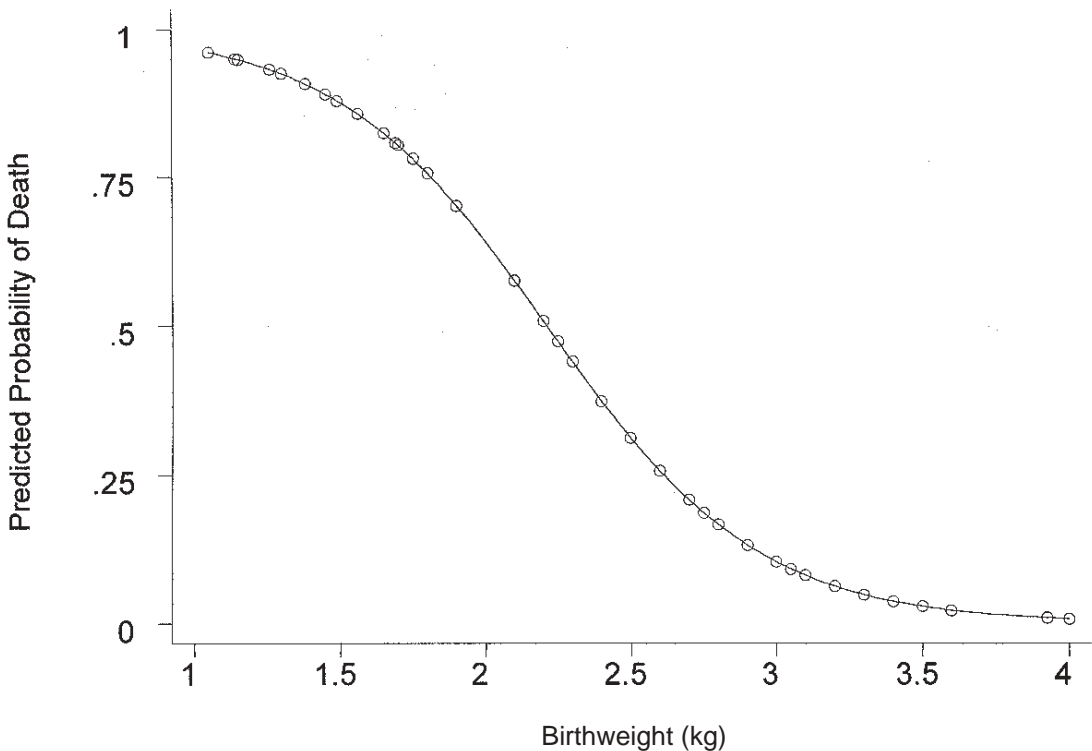


Figure 1. Log linear graph showing the predicted probability of death according to birthweight in congenital syphilis.

**TABLE 1**  
RISK FACTORS FOR DEATH IN CHILDREN WITH CONGENITAL SYPHILIS

Clinical signs	Prevalence (No with sign/No recorded)	No with sign who died	Sensitivity	Specificity	PPV	NPV	Odds ratio (95% CI)	p value
Birthweight < 1.5 kg	9/57	8	36	93	89	76	25.1 (2.90 - 219)	0.003
Birthweight < 2 kg	18/57	15	68	98	83	86	30.0 (6.90 - 131.1)	<0.001
VDRL titre of baby							1.1 (0.92 - 1.27)	0.32
Anaemia	27/60	12	57	62	21	73	0.04 (<0.01 - 2.83)	0.14
Splenomegaly	30/60	13	62	56	43	73	0.3 (0.01 - 10.26)	0.52
Hepatomegaly	34/60	17	80	56	50	61	38.8 (0.13 - 11177)	0.20
Jaundice	13/61	5	24	80	38	67	1.0 (0.02 - 40.6)	0.99
Pneumonia	20/60	6	29	64	30	63	0.4 (0.01 - 12.21)	0.59

PPV = Positive predictive value

NPV = Negative predictive value

VDRL = Venereal Disease Research Laboratories test

In the two years of this study there were 994 neonates admitted to Goroka Base Hospital and 86 died (total neonatal mortality 8.7%). Of the 67 children in this study, 55 presented in the first month of life and the 19 early deaths were in neonates. Congenital syphilis therefore caused 5.5% of neonatal admissions, but 22% of total neonatal deaths.

In the two years of the study there were 179 babies weighing less than 2 kg admitted to the Neonatal Unit; of these 18 had syphilis. There were 55 deaths in babies weighing less than 2 kg, of which 15 were caused by syphilis (Table 2). The relative risk from syphilis for death in babies weighing less than 2 kg was therefore 3.35 (95% confidence interval 2.39-4.71).

Antenatal care attendance (or not) was recorded for 49 of the 67 mothers. 25 (51%) of mothers had at least one antenatal visit and 24 (49%) of the mothers did not receive any antenatal care. Of the 25 booked mothers, 18 received antenatal care at a hospital with screening facilities and 7 had antenatal care at health centres or smaller health facilities where VDRL screening was not done. Of the 18 mothers attending antenatal care where screening could be done, 6 had negative VDRLs, 9 were positive and a result for 3 could not be found. These latter 3 attended antenatal care at a District Hospital where the standard of health care is poor and it is likely that the VDRL was not done, or was not followed up. Mortality in the first admission was lower in babies whose mothers received hospital antenatal care: 3 of 18 died, compared with 14 deaths in 31 children of mothers not receiving hospital antenatal care (Fisher's exact test = 0.06). Medium-term mortality was not, however, lower in babies of women who

received hospital antenatal care, as 2 of these babies died on subsequent readmission (compared with 1 death in the babies of mothers who did not receive hospital antenatal care).

In the two years of this study there were 5385 women who attended antenatal care at Goroka Base Hospital. There were 535 women with positive VDRL tests and 382 with both positive VDRL and TPHA tests. Therefore the incidence of syphilis in women who attended antenatal care at Goroka was 7.1%.

## Discussion

This study shows that congenital syphilis is a major cause of morbidity and mortality among neonates in the Eastern Highlands Province. One-third of babies born with syphilis died, despite treatment, and syphilis was the cause of 22% of in-hospital neonatal deaths. Other studies from developing countries have shown that maternal syphilis infection is a strong independent risk factor for neonatal and infant mortality (3). In our study the risk of death was greatest in those weighing less than 2 kg at birth and syphilis contributed substantially to mortality in low birthweight babies.

In the Eastern Highlands screening for syphilis in pregnant women began in the 1970s. Screening is now only done at the Goroka Base Hospital and sporadically at two major health centres. Of the approximately 10,000 babies born in the province each year, less than 3000 occur at Goroka Hospital and no deliveries are done (because of lack of running water) at one of the other two health centres where screening sometimes occurs. Therefore,

**TABLE 2**

COMPARISON OF ALL NEONATES WEIGHING LESS THAN 2 KG ADMITTED OVER TWO YEARS

Final outcome	Died (%)	Survived (%)	Total
Congenital syphilis	15 (83.3)	3 (16.7)	18 (100)
Non-syphilis*	40 (24.8)	121 (75.2)	161 (100)
<b>Total</b>	<b>55 (30.7)</b>	<b>124 (69.3)</b>	<b>179 (100)</b>

\*Causes of death from non-syphilis low birthweight neonates were septicaemia (50%), extreme low birthweight <1 kg (23%) and complications of prematurity and congenital anomalies

more than 70% of all pregnant women are not screened. The incidence of syphilis among antenatal care attenders at Goroka was 7.1%. With more than 7000 pregnant women annually not being screened in the province, there may be as many as 500 pregnant women with syphilis who do not get screening each year ( $0.071 \times 7000 = 497$ ) and who deliver babies (or have abortions) without being treated. This calculation assumes a similar incidence of syphilis in women who attend antenatal care as in those who do not.

In our study, of those who were screened, but yet had a baby with syphilis, 6 had a known negative test result. These results must either represent maternal infection with syphilis after screening or false negative tests. No results were available for 3 women attending antenatal clinics where screening was theoretically available. Either they were not screened or the results were misplaced or not recorded. 9 women had positive VDRL tests in pregnancy, but still delivered babies with congenital syphilis. We do not know how many of these mothers received treatment with benzathine penicillin. Factors that may explain this failure are non-attendance at antenatal follow-up visits (where test results could have been reviewed and treatment given), failure of clinic staff to follow up results, re-infection after penicillin treatment, or failure of penicillin treatment. Failure of benzathine penicillin given antenatally has previously been reported (4) but is apparently rare. A study of VDRL-positive pregnant women in South Africa suggested that treatment with 2 or more doses of benzathine penicillin in the last month of pregnancy considerably reduced the risk of congenital syphilis. 15 babies with congenital syphilis were born to 69 mothers with a positive VDRL and TPHA but only 1 of 18 mothers who were treated delivered an affected baby; the other 14 affected babies were born to mothers who did not receive treatment (5). During the time of our study 382 women with serologically confirmed syphilis attended antenatal care and we saw only 9 babies with syphilis born to serologically positive mothers. This suggests that the screening and treatment, for the minority of pregnant women in the province in whom it was done, was reasonably effective. Our study, however, included 15 screening

failures (9 born to serologically positive mothers and 6 born to mothers with negative results).

This study shows that syphilis is a major public health problem in highlands PNG. The current antenatal screening program is inadequate. To control mortality from congenital syphilis, serological screening must be extended to all maternal and child health clinics, and for all women attending antenatal clinics. Far more women need to be attracted to formal antenatal care services, but this will be difficult with the quality of services that currently exist.

There are major problems if expansion of syphilis screening involves tests being done in a central laboratory (such as the Provincial Base Hospital Laboratory). Blood will be lost in transit, as will test results; there will be failure of health workers to follow up test results; there are problems with access from remote health centres to the Goroka Base Hospital; and many women will not return for a necessary second or third antenatal visit. One solution would be a rapid test that could be done in the health centre at the first antenatal care visit. The woman could then be shown the positive test and given benzathine penicillin immediately and asked to return in a week for another benzathine penicillin injection. Rapid tests cost about K2 per test, but may be cost-effective. A program that was extended to the third of all women who attend health centre antenatal care would cost K6000 for tests alone and might expect to diagnose 300 women with syphilis. The cost per positive diagnosis (and mother treated and pregnancy saved) would therefore be approximately K20, plus K8 for benzathine penicillin (2 adult doses).

Given that the incidence of syphilis among pregnant women is so high, there may be an alternative cost-effective argument for routine administration of 2 or 3 doses of benzathine penicillin to all antenatal mothers, without screening. Such population-based treatment, if it were to occur, would need to be rigorously evaluated.

If an expanded program for syphilis control among adults in highlands PNG were undertaken, neonatal mortality from congenital

syphilis would decrease and the health of mothers and fathers would improve. Given the magnitude of the problem it is also very likely that there would be a measurable and significant fall in overall infant mortality.

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