Unbooked mothers and their babies — what causes the poor outcomes?

Q Ndiweni, E J Buchmann

Objectives. To compare perinatal outcome between booked and unbooked mothers of similar gestational age using birth weight as a proxy for gestational age.

Design. 91 unbooked mothers were obtained from a pool of 2 054 mothers from the Chiawelo district in Soweto delivered consecutively at the local community clinic or at Baragwanath, the referral hospital. For each of these, a single booked control from the same pool was found, matched to within 50 g birth weight. Detailed information from case notes was used to compare the two groups and their perinatal outcomes.

Results. Unbooked mothers tended to be at lower obstetric risk. None of the unbooked versus 10 of the booked mothers had a poor obstetric history (2 previous abortions or a previous perinatal death). There was a trend to more twin pregnancies (5 v. 1) and more previous caesarean sections (12 v. 8) in the booked mothers. Perinatal mortality rates were not significantly different (unbooked 258/1 000; booked 268/1 000). Perinatal morbidity, as assessed on the basis of need for neonatal admission and ventilation, was similar in the two groups.

Conclusion. Booked mothers were at higher risk, with worse obstetric histories, which probably influenced their decisions to book for antenatal care. Unbooked mothers seemed to be at lower risk, often presenting ‘unbooked’ because of preterm complications. Many of the latter would probably have booked had their pregnancies advanced uneventfully. As such, unbooked status should not be regarded as a high-risk, poor prognostic category. These mothers and their babies should therefore receive the same perinatal care as booked patients.


It is commonly considered a fact that unbooked mothers constitute a high-risk group with poor perinatal outcome relative to booked mothers. The traditional studies that have entrenched this strongly held belief have major methodological flaws: they are mostly hospital-based and therefore biased in their selection of patients; they also make crude comparisons between booked and unbooked mothers without controlling for gestational age and thus overlook the important confounding factor of prematurity.4-3
The reduced opportunity for antenatal care in mothers with preterm birth produces a spurious relationship between prematurity (with associated perinatal death) and the lack of antenatal care. For example, a mother who presents in labour at 24 weeks of pregnancy is far less likely to have booked for antenatal care than one who presents at term. These two mothers cannot be compared in respect of their use of antenatal care. It is therefore necessary to adjust for this discrepancy in studies comparing booked and unbooked mothers by matching cases and controls for gestational age. Failure to make this adjustment results in the well-described ‘preterm delivery bias’. The objective of this study was the comparison of perinatal outcome between booked and unbooked mothers of similar gestational age. Given obvious difficulties in establishing gestational age in the unbooked group, it was necessary to use birth weight as a proxy for gestational age.

### Methods

#### Setting and data pool

Information on booked and unbooked mothers was obtained from the Chiawelo Perinatal Psychosocial Health Study of the Greater Soweto Maternal and Child Health Project. This was undertaken from October 1994 to May 1995. Chiawelo Clinic was chosen because its catchment area, in the south-western corner of Soweto, is easily defined and thought to be typical of greater Soweto in its proportion of old, modern and informal settlements. The population of about 150 000 is generally of low socio-economic status and is known to make good use of the government health services. Two thousand and fifty-four consecutive deliveries of babies weighing over 499 g were recorded, and detailed clinical data were obtained from maternal and neonatal case notes. This included all births at Chiawelo Clinic and at Baragwanath Hospital, where mothers had given home addresses from the Chiawelo district. Home deliveries from the area were also included if patients presented postnatally at the clinic or hospital. Hypertension was defined as a diastolic blood pressure measurement of at least 90 mmHg on two occasions or more hours apart. Antenatal booking status was recorded in all cases. Neonatal morbidity was assessed by recording admissions to the neonatal unit and the need for artificial ventilation in the intensive care area at Baragwanath Hospital. Only infants weighing 1 000 g or more were included for this analysis, because of a neonatal unit protocol that does not allow newborns under 1 000 g to be ventilated.

#### Case-control analysis

From the above data pool, we selected unbooked mothers (cases), i.e. those who delivered without having attended an antenatal clinic. Controls were mothers who had made at least one antenatal visit. From a list of possible controls matched within 50 g birth weight, a single control from the same pool was randomly selected for each case, using a random number table.

Comparison was made of antenatal risk factors, intrapartum problems, neonatal morbidity and perinatal outcome. A crude comparison of all unbooked versus all booked mothers preceded the matched case-control analysis. All statistical procedures were performed on Epi-Info 6.02 software. Calculations included relative risk with 95% confidence intervals (CIs), chi-square test (with Yates’ correction where necessary) and Fisher’s exact test. Statistical significance was accepted at $P < 0.05$.

### Results

#### Crude comparison

Two thousand and fifty-four mothers gave birth to 2 083 infants. Nineteen babies of unknown birth weight (all alive, 1 in the unbooked group) were excluded, and results of a crude comparison of birth weights and perinatal mortality rates in booked and unbooked pregnancies are shown in Table I. The crude relative risk for perinatal death in unbooked mothers is 6.3 (95% CI 4.1 - 9.9).

### Table I. Comparison of perinatal mortality and mean birth weights between unbooked and booked pregnancies before case-control matching (birth weights > 499 g)

<table>
<thead>
<tr>
<th></th>
<th>Unbooked (N = 93)</th>
<th>Booked (N = 1 971)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perinatal deaths</td>
<td>24</td>
<td>81</td>
<td>RR = 6.3 (95% CI = 4.1 - 9.9)</td>
</tr>
<tr>
<td>Perinatal mortality rate/1 000 births</td>
<td>258</td>
<td>41</td>
<td>$P &lt; 0.0001$</td>
</tr>
<tr>
<td>Mean birth weight (g) (SD)</td>
<td>2 171 (998)</td>
<td>3 019 (595)</td>
<td></td>
</tr>
</tbody>
</table>

RR = relative risk; CI = confidence interval; SD = standard deviation.
Antenatal problems. Thirty-five per cent of unbooked mothers had unknown gestational ages. Frequencies of antenatal risk factors are shown in Table II. Poor obstetric history was defined as a previous perinatal death or more than one previous miscarriage.

Labour and delivery. Of the unbooked mothers, 54 delivered in hospital, 20 at the clinic and 17 at home, while the booked mothers had 51 hospital, 38 clinic and 2 home deliveries. Problems encountered during labour are shown in Table II.

Table II. Comparison of frequencies of antenatal risk factors and obstetric problems

<table>
<thead>
<tr>
<th></th>
<th>Unbooked (N = 91)</th>
<th>Booked (N = 91)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (yrs)</td>
<td>25</td>
<td>26</td>
<td>NS</td>
</tr>
<tr>
<td>Parity &gt; 4</td>
<td>13</td>
<td>3</td>
<td>0.02</td>
</tr>
<tr>
<td>Previous caesarean section</td>
<td>8</td>
<td>12</td>
<td>NS</td>
</tr>
<tr>
<td>Poor obstetric history</td>
<td>0</td>
<td>10</td>
<td>0.002</td>
</tr>
<tr>
<td>Multiple pregnancy</td>
<td>1</td>
<td>5</td>
<td>0.12</td>
</tr>
<tr>
<td>Meconium passage in labour</td>
<td>19</td>
<td>8</td>
<td>0.002</td>
</tr>
<tr>
<td>Hypertension</td>
<td>12</td>
<td>18</td>
<td>0.23</td>
</tr>
<tr>
<td>Antepartum haemorrhage</td>
<td>6</td>
<td>3</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS = not significant.

Perinatal outcome. Perinatal mortality rates appear in Table III, categorised according to both standard birth weight definitions (minimum 500 g or 1 000 g). In comparison of neonatal morbidity of infants weighing less than 999 g, 15 of 68 babies in the unbooked group required admission, versus 11 of 73 in the booked group (relative risk 1.46, 95% CI 0.72 - 2.96). Five and 6 babies, respectively, were ventilated in the unbooked and booked groups.

Table III. Comparison of PNM rates in unbooked and booked pregnant women, for birth weight categories > 500 g and > 1 000 g

<table>
<thead>
<tr>
<th>Birth weight</th>
<th>Unbooked</th>
<th>Booked</th>
<th>RR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 500 g</td>
<td>93</td>
<td>97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deaths</td>
<td>24</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNM rate/1 000</td>
<td>258</td>
<td>268</td>
<td>0.96</td>
<td>0.81 - 1.55</td>
</tr>
<tr>
<td>&gt; 1 000 g</td>
<td>69</td>
<td>73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deaths</td>
<td>6</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNM rate/1 000</td>
<td>87</td>
<td>96</td>
<td>0.91</td>
<td>0.32 - 2.56</td>
</tr>
</tbody>
</table>

PNM = perinatal mortality; RR = relative risk; CI = confidence interval

Discussion

The value of antenatal care as an integral part of preventive medicine in mother and child health cannot be denied. It offers the opportunity for health education and, of great importance in our setting, for detection of syphilis and hypertension.1 However, the true benefits of routine antenatal care for perinatal outcome are as yet unknown. This study sought to compare perinatal outcomes between booked and unbooked mothers delivering at similar gestational ages. The use of birth weight as a proxy for gestational age has obvious limitations as it cannot take into account growth-impaired fetuses but is acceptable here because the unbooked mothers frequently did not know their menstrual dates and neonatal gestational age scoring was not done.

The crude comparison of perinatal mortality rates between booked and unbooked pregnancies showed a high relative risk for perinatal death of 6.3 in the unbooked mothers. Similar results appeared in the study by De Jong et al. in the Western Cape.7 The striking difference in mean birth weight of over 800 g in favour of booked pregnancies, however, invalidates this comparison and suggests that low birth weight or prematurity, and not booking status, is the cause of the higher perinatal mortality rate. Birth weight is clearly a major confounder in such studies and needs to be controlled for if a valid comparison between the groups is planned. In our study, there was an obvious trend towards lower rates of unbooked pregnancies in the higher birth weight groups, suggesting that the majority of unbooked mothers may have gone on to book had their pregnancies not become complicated prematurely. This was demonstrated in a similar study in Zimbabwe.7 The alternative explanation is that antenatal clinic attendance prevents preterm delivery; this is, however, unlikely as shown in a recent review.7

Higher parity was associated with unbooked pregnancy, possibly as a result of a 'practice makes perfect' attitude on the part of some multiparas. There was a trend to more twin pregnancies and more previous caesarean sections in the booked mothers. The number of mothers with poor obstetric histories was significantly greater in the booked group, giving a picture of high-risk pregnant women selecting themselves and booking early in their pregnancies. Unbooked mothers may therefore be characterised as being of high parity and low obstetric risk, a finding borne out by two recent studies in Soweto.8,9

Intrapartum complications (hypertension and antepartum haemorrhage) occurred with similar frequencies in the two groups. The higher incidence of meconium staining of the liquor in unbooked pregnancies is difficult to explain, but may reflect a tendency among these women to self-medicate with ishlanbezo,9 or the presence of some cases of intra-uterine growth impairment among unbooked mothers.

Given the inherently poor prognosis of extremely low birth weight (500 - 999 g) and a policy in our hospital of withholding artificial ventilation from babies of less than 1 000 g, it is not surprising that these infants had poor outcomes, whether they were born to booked or unbooked mothers. Perinatal death rates in babies weighing above 999 g were similar in the two groups, as were rates of morbidity assessed on the basis of the need for neonatal admission and artificial ventilation. Unbooked state, per se, was therefore not synonymous with high risk and poor fetal prognosis. This contradicts the traditional notions about unbooked pregnancies.

A limitation of this study is that, because of small numbers, we were unable to control for the presence of antenatal risk factors which, like birth weight, also influence the perinatal outcome.
Conclusion
We have shown that the poor perinatal outcome of unbooked pregnancies has more to do with low birth weight than failure to book for antenatal care. Unbooked mothers and their babies should receive the same care as booked patients and should not automatically be placed in a poor prognosis category. The booking status of a mother should not be used as a criterion for the allocation of neonatal intensive care.

The authors thank Professor L Wagstaff and Mrs R Ramontja of the Greater Soweto Maternal and Child Health Project, which is supported by the South African Medical Research Council and the Independent Development Trust, for their assistance, and Dr H Saloojee of the Department of Paediatrics at Baragwanath Hospital, for allowing access to neonatal case files.

REFERENCES

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Fetal vibro-acoustic stimulation with a can — a clinical study
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Objective. To assess the usefulness of the can as a fetal vibro-acoustic stimulator in the clinical environment.

Patients and setting. 112 high-risk obstetric patients at Coronation Hospital, Johannesburg.

Method. 161 vibro-acoustic stimulation tests with a can and 159 non-stress tests (NSTs) were performed. The results of the can test were compared with those of the NSTs and with fetal outcome at delivery.

Results. The can test showed poor sensitivity (5/9). Three of the 4 false-negative results were due to placental abruption that occurred subsequent to the can test. The ability of the can test to predict a reactive NST and good fetal outcome was 94% (negative predictive value).

Conclusions. In view of the reasonable negative predictive value, the test should be evaluated further as a screening test at primary care level, where there are few or no cardiotocographic facilities.


Vibro-acoustic stimulation has been shown to decrease the false-positive rate of non-stress tests (NSTs) and equivocal biophysical profiles, and to be comparable to the NST as a predictor of poor fetal outcome when performed within 7 days of delivery. Fetal movement in response to vibro-acoustic stimulation is considered a marker of fetal wellbeing and Luz recommends that it be used as a screening procedure when cardiotocography is unavailable. However, conventional vibro-acoustic stimulators are not available in most primary care settings. The use of auscultation to detect fetal heart rate accelerations as part of a clinical fetal arousal test has not, to our knowledge, been reported previously.

This article discusses the clinical part of a study to assess the usefulness of vibro-acoustic stimulation with an empty soft-drink can as a predictor of fetal outcome. The similarities between the sound pressure generated by the can and the Corometrics 146 vibro-acoustic stimulator were discussed in an earlier short report in this journal.

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