Outcome in low risk pregnancies

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Abstract

***Aims*—To determine the obstetric and neonatal outcomes of a cohort of very low risk pregnancies in hospital, that would be suitable for home delivery.**

***Methods*—A retrospective analysis was undertaken of computerised records covering five years from July 1988 to August 1993 of 32424 pregnant women who delivered at the North Staffordshire Maternity Hospital, Stoke on Trent, during that period.**

***Results*—Of 32424 deliveries, only 1314 (4%) fulfilled our criteria for being low risk. Sixty seven (5.1%) of the low risk group had an operative delivery, with Caesarean section accounting for 32 (2.4%) cases, 16 (23.9%) babies were resuscitated and three were intubated. A normal vaginal delivery occurred in 1245 women, but a paediatrician attended 122 births (9.22%), assisted ventilation was provided in 65 cases (5.2%), and five babies were intubated (0.4%). Fourteen babies in total were admitted to the neonatal unit and one died.**

***Conclusions*—These results suggest that at least 5% of women suitable for delivery at home will require transfer in labour. Midwives attending home births must be skilled in bag and mask resuscitation as only rarely will an urgent intubation be required. The British Paediatric Association Working Party report on neonatal resuscitation suggests a need for resuscitation in only 0.2% of low risk deliveries: but these findings suggest that the need is greater.**

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The Department of Health report *Changing Childbirth: the Report of the Expert Maternity Group* recommends that women should have an informed choice with regard to the place of birth.[1] This includes the opportunity for a planned home birth, an option 1 in 8 British women would be interested in pursuing.[2] The report states that when evaluating the risk of an unexpected emergency at home, this should be balanced against the evidence from published studies which show higher obstetric intervention rates in hospital.[3–9] These studies, however, have largely concentrated on the obstetric aspects of the pregnancy and include little analysis of the role of the paediatrician at the delivery. Indeed, there is a lack of published data available on the neonatal outcome of low risk pregnancies in this country.[10] This information is required in planning a service that is likely to include a much larger proportion of home deliveries.

At the North Staffordshire Maternity Hospital computerised records have been kept of all deliveries since 1988. This database contains information about complications arising during pregnancy and outcomes for both mother and child, including details of neonatal resuscitation. Data are collected for the deliveries booked for both the consultant and the GP units. There are over 6000 deliveries a year and referrals are accepted from other hospitals in the region for high risk pregnancies. This comprehensive database provided an opportunity to perform a retrospective analysis of the outcome of a very large number of pregnancies. The aims of this study were to determine:(i) the proportion of the study population falling into the low risk category using predefined criteria; (ii) the rate of obstetric intervention required in the low risk group; and (iii) the incidence of paediatric intervention, resuscitation, and neonatal outcome in these remaining low risk deliveries.

Methods

The study was based on a population of women booked at the North Staffordshire Maternity Hospital in the years from July 1988 to August 1993. Mothers booked into both the consultant and GP units were included. Patients who delivered but were not booked at the hospital were excluded.

To select our low risk population, we excluded those pregnancies associated with any recognised risk factors [11 12] either at the time of booking or developing during the pregnancy (table 1). Those selected were women in good health with at least one previous uneventful pregnancy. All these women would have been suitable candidates for home delivery.[13 14]. Information regarding birthweight, gestational age, sex and Apgar scores was collected.

Patients who had an instrumental delivery were identified. The reasons for intervention were analysed. The group was divided into those performed urgently to reduce the risk to the fetus and those performed for other reasons. The requirement for paediatric support or resuscitation was considered separately in this group as it is likely that these patients would have been transferred to hospital before delivery.

In the normal vaginal delivery group analysis of the incidence of complications, paediatric involvement, and the numbers of infants resuscitated was performed. Fetal distress was defined as an abnormal fetal heart rate either

Table 1 Risk factors excluded from population studied

Personal characteristics	Age < 17 or > 35, height < 155 cm, unsupported mother
Obstetric history	Primigravida or parity > 3; previous Caesarean section; previous termination of pregnancy > 12 weeks; recurrent abortions or previous spontaneous abortions; involuntary infertility; previous postpartum haemorrhage or blood transfusion; third degree tear or retained placenta; myomectomy or previous hydatidiform mole
Previous babies	Previous babies < 2500 g, or large for dates (> 4500 g), premature infants < 37 weeks, previous stillbirth or neonatal death
Maternal history, past or current	Diabetes, hypertension, chest disease, heart disease, epilepsy, immune thrombocytopenia, myasthenia gravis, systemic lupus erythematosus, renal disease, thrombosis or hepatitis
Current pregnancy	Twin or breech presentation, preterm delivery < 37 weeks, high serum αfetoprotein, amniocentesis, if labour was induced

on Pinnard auscultation or on cardiotocograph (CTG), with type 1 and/or 2 dips, bradycardia or fetal tachycardia, or an abnormal fetal scalp pH (< 7.2). The presence of meconium in the liquor with or without an abnormal cardiotocogram was considered a separate category, but the grade of meconium was not qualified. Failure to progress was defined as a failure of the cervix to dilate at a rate of 1 cm/hour over a four hour period of observation despite good contractions. Where more than one complication was present, the patient was allocated to the category which was considered to be the most important in that patient's care.

The resuscitation received was classified into four categories: none/suction only; facial oxygen, bag, and mask ventilation; and intubation with or without cardiac massage. Resuscitation performed by midwives was noted. The case notes were reviewed in all cases where intubation took place to obtain as much information as possible about the need for intubation. The case notes of a sample of babies who received bag and mask ventilation were also compared with the database to check the level of validation.

Outcome with regard to deaths and admission to the neonatal intensive care unit (NICU) was assessed for all low risk deliveries.

Results

During the study period there were 32424 deliveries at the hospital. Of these, only 1312 (4.0%) fulfilled the criteria for being extremely low risk.

Six hundred and sixty three mothers (50.5%) had been booked for delivery in the GP unit but 132 (10.1%) were transferred to the consultant unit due to a problem arising during labour. The other 768 mothers delivered as booked in the consultant unit. Twelve women delivered unexpectedly either at home or before arrival at hospital.

The mean gestational age of the infants was 40 weeks (range 37 to 47 weeks) and there were similar numbers of boys (n = 635) to girls (n = 677). The mean birthweight was 3500 g, all the babies apart from two being within the range 2000-5000 g. One baby was small for dates (1760 g) and the other, large for dates (5080 g), and neither had been diagnosed before delivery. Despite being so large, the 5080 g baby did not have any problems and did not require any resuscitation. The Apgar scores were equal to or greater than 7 at 1 minute in 1231 babies (93.8%), but 75 babies (5.7%) had a score of less than 7, and of these, 13 had a score of less than 4. The 5 minute Apgar score was equal to or greater than 7 in 1305 babies (99.5%). However, five babies still had a low score after 5 minutes and one did not have a score recorded as he was being ventilated and receiving cardiac massage at the time.

Table 2 Reasons for assisted delivery

Complication	*Assisted delivery (n=67) (%)*
Fetal distress	23 (34.3)
Failure to progress	18 (26.9) (5)*
Abnormal presentation	11 (16.4) (5)*
Meconium stained liquor	9 (13.4)
Cord prolapse	5 (7.5) (2)*
Other reason	1 (1.5)

* These figures refer to the deliveries where there was also associated fetal distress

ASSISTED DELIVERIES

Obstetric intervention was required in 67 (5.1%)deliveries. Of these, 32 women had an emergency Caesarean section (2.4%), 23 had a ventouse extraction (1.8%), and 10 had a forceps delivery (0.8%). Two women had a breech delivery as the breech presentation was not diagnosed until they were in labour. The reasons for intervention are shown in table 2.

In 44 of these deliveries there were also signs of fetal distress. Furthermore, in the groups that required intervention for prolonged labour or abnormal presentation three infants received bag and mask ventilation and one infant was intubated despite the absence of fetal distress. Only one of the five infants with cord prolapse required intubation, and one received bag and mask ventilation. No morbidity was experienced by this group. Nevertheless, a delay in delivery could have had an adverse effect on outcome. In total 47 (70%) of this group (3.6% of the entire low risk group) may have been at greater risk for this reason.

With regard to outcome, five babies were admitted to the NICU. Three required ventilation in association with meconium stained liquor and all three went on to develop convulsions. One of the three died with severe hypoxic ischaemic encephalopathy. The remaining two non-ventilated babies showed signs of mild asphyxial encephalopathy but subsequently made a good recovery.

NORMAL VAGINAL DELIVERIES

There were 1245 normal vaginal deliveries (94.9%). In 185 (14.8%) of these, there was a complication. The prevalence of each complication is shown in table 3. A paediatrician was called to 122 deliveries (9.8%).

Although 531 women delivered in the GP unit (40% of the total low risk group), there was a complication in 31 deliveries (5.4%) and 21 babies received bag and mask ventilation or were intubated. There were nine deliveries with meconium stained liquor and despite being in hospital, there was not enough time before delivery for the women to be transferred to the consultant unit.

Table 3 Complications arising during labour or after delivery

Complication	Normal vaginal delivery (n=1245) (%)
Meconium stained liquor	101 (8.1)
Failure to establish respirations	37 (3.0)
Fetal distress	30 (2.4)
Cord around neck	7 (0.6)
Shoulder dystocia	3 (0.2)
Other reason	7 (0.6)

Table 4 Level of resuscitation required after normal vaginal delivery

Level of resuscitation required	Normal vaginal delivery (n=1245) (%)
None/suction only	1029 (82.7)
Facial oxygen	151 (12.1)
Bag and mask	60 (4.8)
Intubation	5 (0.4)
Intubation plus cardiac massage	1 (0.1)

The level of resuscitation provided is shown in table 4. Assisted ventilation was given to 65 babies (5.2%). Of these, five were intubated and one also required cardiac massage. The reasons for assisted ventilation were recorded as failure to establish respirations despite simple measures such as suction and stimulation (n = 32), meconium stained liquor (n =14), fetal distress (n = 9), cord round the neck (n = 7), and shoulder dystocia (n=3).

In 35 (53.8%) cases assisted ventilation was carried out by the paediatrician including all the intubations, whilst the other 30 were managed by midwives.

In this group of 65, 47 mothers required either no analgesia or Entonox alone. Six mothers had an epidural and 12 mothers had pethidine before the delivery. Eleven of the babies received naloxone at the time of resuscitation.

INTUBATED BABIES

Five babies from the normal vaginal delivery group were intubated. The case histories for the babies are as follows.

The first baby had a falling heart rate just before delivery. He was floppy and apnoeic after birth, but had a good heart rate. He was intubated and received intermittent positive pressure ventilation for 4 minutes because of failure to respond to bag and mask ventilation for 3 minutes. He established regular respirations at 7 minutes and was extubated. Apgar scores were 4 and 8 at 1 and 5 minutes, respectively. His birth weight was 3.75 kg.

In the second case there was fresh meconium stained liquor at delivery. The baby was given suction and there was no meconium below the cords. He was intubated and ventilated with intermittent positive pressure ventilation for 6 minutes because he failed to establish respirations. Apgar scores were 7 and 9 at 1 and 5 minutes. His birth weight was 3.33 kg.

The third baby had meconium stained liquor and shoulder dystocia at delivery. He had irregular respirations and was intubated and received intermittent positive pressure ventilation for over 6 minutes. There was no meconium below the cords. Apgar scores were 6 and 8 at 1 and 5 minutes, respectively. His birth weight was 4.24 kg.

In the fourth case meconium stained liquor was discovered on artificial rupture of membranes 10 minutes before delivery which was precipitous in the second stage. The cord was tight around the neck. The baby initially had a good heart rate but poor respiratory effort. Two minutes after delivery, the heart rate fell to 60 beats per minute; tone, colour and respiratory effort were poor. The infant was slow to respond to bag and mask ventilation and was intubated for 1 minute with a good response. There was no meconium below the cords. Apgar scores were 4 and 10 at 1 and 5 minutes. His birthweight was 3.8 kg.

In the fifth case there was meconium stained liquor at delivery, and as the head was delivered the cord was tight around the neck. The cord was cut and clamped but there was difficulty in delivering the body due to shoulder dystocia. The baby was born in poor condition and was intubated from birth and received cardiac massage for 6 minutes. He was transferred, ventilated, to the NICU and subsequently developed hypoxic ischaemic encephalopathy and convulsions. He was extubated after 48 hours and was discharged home with a course of anticonvulsants. Apgar score at 1 minute was 2; the 5 minute Apgar score was not recorded. His birthweight was 4.11 kg.

ADMISSIONS TO NEONATAL INTENSIVE CARE

Nine babies from the normal vaginal delivery group were admitted to the NICU. Only one of the babies who had been intubated at birth was admitted. One baby was unexpectedly small for dates (1760 g), three had meconium aspiration syndrome—one in association with shoulder dystocia. A further two babies had shoulder dystocia and showed signs of birth asphyxia. Three other babies were slow to develop spontaneous respirations. All of these infants recovered, although one of the babies with shoulder dystocia and meconium aspiration was ventilated. He subsequently developed moderate hypoxic ischaemic encephalopathy. He was started on anticonvulsants and continued taking them once at home. Another infant had a diaphragmatic hernia and was transferred, ventilated, to a surgical unit.

Discussion

In assessing the potential risks to infants of a home delivery ideally data on low risk deliveries conducted in the home are needed. With the drive in the 1970 and 1980s [15-17] for hospital deliveries, there are currently few home deliveries to study. In the North Staffordshire region, until now, only 16 to 20 women a year have elected to have their babies at home. The outcome of low risk pregnancies may be affected by the socioeconomic status of the population and therefore we wished to obtain information relevant to our own population. The only way to achieve this was to study hospital based deliveries, although about half of

these were planned for the GP unit where obstetric intervention is kept to a minimum unless complications arise.

In selecting our low risk population we excluded patients on the basis of known risk factors which only left 4%. There are, of course, problems in retrospectively analysing computerised data. For example, we were not able to differentiate mild from severe asthma and so all patients classified as having chronic chest problems were excluded from the low risk group. In practice the attending physician would use clinical judgment to determine the importance of any given risk factor in an individual patient and thus greatly refine the selection criteria. Nevertheless, in this study we are confident that all significant risks were excluded, leading to the selection of the lowest risk population possible. Furthermore, the use of risk factor analysis is an imperfect indicator for predicting whether a delivery would be low or high risk, but this method is currently in use in clinical practice in many booking clinics. The use of these risk factors may place a low risk woman into a high risk category, but is unlikely to miss any with clinically relevant obstetric illness.[18-20] Accepting that transfer of patients in labour will be required for assisted delivery, the numbers of patients actually delivering at home would be further reduced to 3.8%. Clearly if a target of 20-25% home delivery rate is anticipated then further work will be required to determine which of the risk factors is most significant and which should be dropped.

We were concerned that over 5% of this group of patients with no known risk factors did not have a normal vaginal delivery. It might be argued that this figure would be much lower had the patients actually delivered at home. Nevertheless, this level of support/need for transfer and its subsequent consequences should be accounted for at the planning stage of community services until it is confirmed that this is an overestimation. In providing informed choice any additional risk to a distressed infant arising from a delay in delivery should be discussed with the mother.

Over 5% of those infants who might well have been considered suitable for homebirth received resuscitation at a level which included assisted ventilation. In many of these cases complications could not have been anticipated until the time of delivery or shortly before. The presence of meconium stained liquor is one reason for prompt transfer to hospital but this can present late on in labour and there may not be time for the transfer to take place before the baby is delivered. Indeed, in this study, nine babies with meconium stained liquor delivered in the GP unit as there was not enough time before delivery, even in hospital, to be transferred down to the consultant unit. A paediatrician was called to attend 9.8% of normal deliveries and although this may be a reflection of local guidelines, the reason for attendance in this low risk group was for anticipated problems with the baby, such as meconium stained liquor or failure to establish respirations.

Only five infants were actually intubated, one patient for each year of study. The rate of intubation varies among hospitals.[21] The skill of the resuscitator may influence intubation rates, with skilled operators providing a much lower level. Skilled operators may be better at selecting patients for intubation, or they obviate the need because their skills in managing the pre-intubation resuscitation are more effective. It is clear that midwives or the person taking responsibility for the delivery will need to develop these skills and occasionally there will be an unexpected need for intubation. It may be difficult for personnel to acquire or retain skills in intubation when the procedure is so rarely called for in this group. Perhaps this problem could be overcome if staff rotate through high risk units and are given responsibility for resuscitation in this group as well. It may be unrealistic to expect community midwives/GPs to intubate, and a paramedic flying squad may be an alternative. The increased risk of an adverse outcome from any delay in resuscitation should be discussed with parents considering a home delivery.

The BPA Working Party Report cites a need for neonatal resuscitation in only 0.2% of low risk births.[22] This figure was based on a Swedish study by Palme-Kilander.[23] In our study 5.2% of the babies born by normal vaginal delivery received assisted ventilation, although only five (0.4%) were intubated. The studies are not directly comparable. In the Swedish study the parameters for identifying the low risk population were not defined and the need for resuscitation was assessed on the basis of low Apgar scores. The North Staffordshire study is more representative of the British situation and should serve to inform the debate.[24-35]

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Commentary

In England and Wales home births are still uncommon, but their numbers are rising steadily. After falling to an all time low of 0.89% in 1987, the percentage of maternities occurring at home reached 1.94 % in 1995.[1] Despite this doubling, the numbers of home births in most districts are still small, making it difficult to monitor trends and predict the implications for services. Data are also in short supply at any level, apart from a survey of planned and actual home births in the Northern Region in 1993[2] and the National Birthday Trust's as yet unpublished survey of planned home births in 1994.

The authors' ingenious response to the lack of data for their own population was a retrospective analysis of computerised data about selected women who actually experienced hospital care.They interpret this cautiously, conscious that benefits and hazards of hospital care are different from those associated with home delivery, and that the outcome might have been different if the same group of women had planned to deliver at home. How does their analysis help us, what questions does it raise, and what further information is needed?

The authors were concerned to find that 5% of women in their extremely low risk group might have required transfer in labour and felt that this was a cause for concern. From a statistical perspective, however, their approach could be viewed as a screening procedure, with a relatively low rate of false negative results and thus a high sensitivity of 95%. Although it identified a group of women in which the rate of complications is low, it cannot by its very nature predict which individual women in the group will experience these complications.

People faced with the problems of planning services and providing care for women who need to transfer to hospital in labour and for babies born at home with problems might well find this statistical observation frustrating. On the other hand, emergency measures will always be needed anyway to deal with the usually more acute problems which can arise when labour or birth occurs outside hospital unintentionally. Previous surveys have found that about a third of births occurring at home were precipitate births to women who had booked to deliver in hospital, or were to women who had made no arrangements at all.[2 3] This has implications for the training of home birth practitioners and of ambulance staff, particularly paramedics.

The authors found that just over 5% of the babies born to women in their low risk group were resuscitated, but that only five out of 65 were intubated. This suggested that most could be cared for by appropriately trained midwives. They did comment, however, that the proportion resuscitated was higher than that observed in a Swedish study[4] cited in the report of the BPA Working Party on Neonatal Resuscitation.[5] It is difficult to interpret this difference, given that the comparison is based on retrospective data from two separate sources. A collaborative prospective study, using common definitions, would be needed to investigate whether the difference is a real one or an artefact of differences in practice or methods of data collection.

When it comes to specificity, the authors' selection procedure leaves a lot to be desired as they acknowledge themselves. They use criteria which are far more stringent than are usually applied in practice, so much so that only 4% of deliveries satisfied them. They did not estimate the proportion of women who did not satisfy their criteria but went on to have an uncomplicated delivery. It would not be surprising if this was quite high. They point out that the risk approach, although an imperfect indicator, is used in many booking clinics and may place "low risk" women into a "high risk" category.

The authors use two types of exclusion criteria. The first type is based on adverse events and other factors in the individual woman's clinical background and her current and previous pregnancies. This is therefore specific to the women concerned. More importantly, some of the factors which may affect decisions about place of delivery do not arise until after initial booking, so it may be unduly restrictive to rule out home delivery categorically at that stage.

The second type of criterion is based on probabilities of adverse events among women in particular age, parity, height and social groupings. Thus primiparous women are excluded and the age and height criteria are very restrictive. Unsupported mothers' are excluded, but not defined. These criteria were first put forward in the 1950s and 1960s to