

PAPERS AND ORIGINALS

Obstetric practice and outcome of pregnancy in Cardiff residents 1965-73

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Summary

Trends in management and outcome of pregnancy in Cardiff residents from 1965 to 1973 were reviewed. The mean age and parity of parturients fell. Hospital delivery became almost universal, monitoring the fetus during pregnancy was introduced, and induction and acceleration of labour became commonplace. These developments were not associated with any striking change in either the total perinatal death rate or the timing or cause of perinatal death. Possibly a real change in perinatal mortality between 1965 and 1973 was masked by random fluctuation of small numbers, or possibly factors peculiar to the Cardiff population prevented a decrease in perinatal mortality that would otherwise have resulted from improved medical care. Only by large-scale randomised trials can the true value of induction and other medical developments be assessed.

Introduction

Largely as a result of public discussion of developments in obstetrics there is currently a re-evaluation of the costs and benefits of certain elements of modern obstetric practice. An aspect that has commanded considerable attention is the increased use of induction of labour.

Except when the indications are acknowledged to be social or logistic, intervention to terminate pregnancy by induction of labour implies a judgment that the intrauterine environment is a greater threat to fetal well-being than delivery. It has been suggested that an increased use of induction is one of the major

contributory factors in reducing perinatal mortality in recent years.¹ Others have ascribed a similar reduction of perinatal mortality to the introduction of routine intrapartum monitoring techniques.² The use of continuous fetal heart rate monitoring and fetal acid-base estimation in labour was only introduced on an appreciable scale in Cardiff during 1973.

We have used data from the Cardiff Births Survey to examine the changing pattern of obstetric practice and outcome of pregnancy in the Cardiff population during 1965-73. During this period there were considerable demographic and obstetric changes. The mean age and parity of parturients fell, domiciliary confinement became rare, there were technical innovations in fetal monitoring during pregnancy, and induction and acceleration of labour became widely used.

The use of Cardiff residents as the study population overcomes the limitations inherent in hospital-based data, which suffer from uncertainties about the degree to which the hospital case load is representative of the parent population and the extent to which characteristics of the case load have changed over time.

Patients and methods

The Cardiff Births Survey contains extensive information on all women delivered in Cardiff since 1965. Data are available on all births occurring in Cardiff, whether delivery occurred in hospital or elsewhere, and also on all women who are normally resident in Cardiff but who delivered outside the city.

There was close agreement between the Registrar General's returns for total births to Cardiff residents and those covered by the Births Survey. The only exception was a 6% discrepancy in 1967 when the city boundaries were enlarged. Validation studies performed in 1969 and 1975 have shown an extremely high quality of data coding with an overall error rate of about 1%.^{3,4} The coding of all perinatal deaths was undertaken by a senior obstetrician throughout the project.

The annual number of births to Cardiff residents fell from 4846 in 1965 to 3781 in 1973. This study is based on a total of 39 864 cases delivered during this period. Each case was recorded on a data coding form designed for computer processing. At the start of the study, we copied the data from punched cards on to magnetic tape in a form suitable for analysis by the Algol Data Analysis Program (ADA).⁵ This was run on the Welsh National School of Medicine's shared computer facility (an ICL 4-70) at the Cardiff Joint Computing Centre in the South West Universities computer network. χ^2 for trend in proportions was used to examine the secular pattern of perinatal mortality.⁶

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Results and comment

CHARACTERISTICS OF THE PARTURIENT POPULATION

Mean maternal age declined steadily from 27 years in 1965 to 25½ years in 1973. The proportion of women delivering first babies increased from 32% of all parturients in 1965 to 41% in 1973. The proportion of women delivering a fourth or subsequent infant declined from 21% to 12% over the same period.

The proportion of mothers in social classes IV and V remained constant over the period examined, but there was a relative increase in women of social classes I and II when the boundary change in 1967 added a relatively prosperous suburb to the population of Cardiff.

Throughout the study about half the patients did not smoke during pregnancy. Those who did smoke increased their average daily cigarette consumption from 11.1 cigarettes in 1965 to 14.2 in 1973.

CHANGES IN OBSTETRIC PRACTICE

The proportion of women delivered at home fell from one in five in 1965 to one in 100 in 1973. There were considerable developments in the management of labour (table I). In 1965 only 7.5% of labours

TABLE I—Percentage of labours induced and accelerated in Cardiff residents in 1965-73

Year:	1965	1966	1967	1968	1969	1970	1971	1972	1973
All inductions (%)	7.5	13.5	18.7	18.5	18.6	24.5	27.0	29.5	26.5
Amniotomy plus oxytocin (%)	1.0	2.9	3.8	6.1	7.5	12.0	16.3	23.6	23.2
Accelerated (%)	0.3	0.7	0.6	2.0	2.7	6.7	10.0	12.5	16.7

TABLE II—Incidence of forceps delivery, episiotomy, and perineal tear in Cardiff residents in 1956-73

Year:	1965	1966	1967	1968	1969	1970	1971	1972	1973
Episiotomy (%)	24.4	25.1	31.1	33.1	33.4	38.0	37.6	42.5	46.7
Tears (%)	18.2	19.5	17.2	17.6	17.6	17.1	17.3	15.9	14.9
Forceps (%)	6.4	6.2	8.2	9.9	10.5	10.0	11.1	11.5	16.6

TABLE III—Primary causes of perinatal deaths among Cardiff residents 1965-73. Rates are per 1000 total births and percentages are of total perinatal deaths

Year:	1965	1966	1967	1968	1969	1970	1971	1972	1973
Total births	4846	4740	4486	4785	4482	4356	4362	4026	3781
<i>Total perinatal deaths</i>									
No	122	145	104	133	118	99	117	103	95
Rate	25.2	30.6	23.4	27.8	26.3	22.7	26.8	25.6	25.1
<i>Prematurity and respiratory distress syndrome</i>									
No (%)	24 (19.7)	24 (16.6)	27 (26.0)	29 (21.8)	15 (12.7)	24 (24.2)	17 (14.5)	14 (13.6)	13 (13.7)
Rate	5.0	5.1	6.0	6.1	3.3	5.5	3.9	3.5	3.4
<i>Congenital abnormalities</i>									
No (%)	28 (23.0)	33 (22.8)	15 (14.4)	26 (19.5)	26 (22.0)	17 (17.2)	25 (21.4)	13 (12.6)	17 (17.9)
Rate	5.8	7.0	3.3	5.4	5.8	3.9	5.7	3.2	4.5
<i>Anoxia and birth injury</i>									
No (%)	32 (26.2)	35 (24.1)	19 (18.3)	32 (24.1)	31 (26.2)	20 (20.2)	34 (29.1)	35 (34.0)	32 (33.7)
Rate	6.6	7.4	4.2	6.7	6.9	4.6	7.8	8.7	8.5
<i>Toxaemia</i>									
No (%)	4 (3.3)	13 (9.0)	8 (7.7)	8 (6.0)	5 (4.2)	21 (21.2)	5 (4.3)	9 (8.7)	9 (9.5)
Rate	0.8	2.7	1.8	1.7	1.1	4.8	1.1	2.2	2.4
<i>Ante-partum haemorrhage</i>									
No (%)	7 (5.7)	14 (9.7)	10 (9.6)	17 (12.8)	16 (13.6)	9 (9.1)	21 (17.9)	22 (21.3)	17 (17.9)
Rate	1.4	3.0	2.2	3.6	3.6	2.1	4.8	5.5	4.5
<i>Haemolytic disease of the newborn</i>									
No (%)	4 (3.3)	3 (2.1)	4 (3.8)	3 (2.3)	5 (4.2)	3 (3.0)	5 (4.3)	1 (1.0)	
Rate	0.8	0.6	0.9	0.6	1.1	0.7	1.1	0.2	
<i>Infection</i>									
No (%)	6 (4.9)	2 (1.4)	1 (0.1)	6 (4.6)	1 (0.8)		4 (3.4)	3 (2.9)	
Rate	1.2	0.4	0.2	1.2	0.2		0.9	0.7	
<i>Acute or chronic disease in mother</i>									
No (%)			1 (0.1)		2 (1.6)			1 (1.0)	1 (1.0)
Rate			0.2		0.4			0.2	0.3
<i>Others or not known</i>									
No (%)	19 (15.6)	21 (14.5)	19 (18.3)	12 (9.0)	17 (14.4)	5 (5.1)	6 (5.1)	5 (5.0)	6 (6.3)
Rate	3.9	4.4	4.2	2.5	3.8	1.1	1.4	1.2	1.6

were induced. This rose to 29.5% in 1972. From 1969 onwards oxytocin became increasingly used, both to induce labour in conjunction with amniotomy and to accelerate labour of spontaneous onset. The proportion of accelerated labours rose from 0.3% of all labours in 1965 to 16.7% in 1973. The proportion of labours lasting over 12 hours fell progressively from 27% of cases in 1965 to only 9% in 1973. The incidence of prolapsed cord, which may be considered a possible risk of amniotomy, remained relatively constant over the nine years of the study at an average frequency of 0.26%.

During the period when the greatest changes in the use of induction were occurring (1969-72) there was an initial rise in the incidence of caesarean section during labour from 2% of all deliveries in 1969 to 3% in 1970. Thereafter the rate remained steady and showed no tendency to increase with increasing use of induction and acceleration of labour. The incidence of elective caesarean section rose from 2% of all deliveries in 1965 to 2.9% in 1967. It remained at this level until 1973, when there was a further rise to 3.4% of all deliveries.

After rising during the first four years of the study period the incidence of forceps delivery remained fairly steady at just over 10% of all deliveries between 1968 and 1972 (table II). In 1973 there was a dramatic increase to 16.6%, possibly because of the introduction of epidural anaesthesia during that year. The incidence of episiotomy rose progressively from 24.4% in 1965 to 46.7% in 1973, and it is interesting that the incidence of perineal tears remained fairly constant at about 17% of all deliveries (table II).

OUTCOME

Increased intervention to terminate pregnancy before the onset of spontaneous labour resulted in a fall in mean gestational age at delivery from 40.3 completed weeks in 1965 to 39.9 completed weeks in 1973. There was a corresponding fall in mean birth weight from 3300 g to 3240 g, but no increase was observed in the proportion of those infants born weighing 2500 g or less.

In England and Wales there was a steady and statistically significant fall in the perinatal mortality rate from 27 per 1000 total births in 1965 to 21 per 1000 total births in 1973. The Cardiff rates over this period were based on 95 to 145 perinatal deaths a year and therefore show small-number fluctuation (table III). Although there was a slight downward trend that was not significantly different from the national trend, it was so slight as to be statistically compatible with random variation and at most represented an annual decrease of just

TABLE IV—Time of perinatal death among Cardiff residents 1965-73. Rates are per 1000 total births and percentages are of total perinatal deaths

Year:	1965	1966	1967	1968	1969	1970	1971	1972	1973
Total births	4846	4740	4486	4785	4482	4356	4362	4026	3781
<i>Total perinatal deaths</i>									
No	122	145	104	133	118	99	117	103	95
Rate	25.2	30.6	23.4	27.8	26.3	22.7	26.8	25.6	25.1
<i>Macerated stillbirth</i>									
No (%)	40 (32.8)	42 (29.0)	37 (35.6)	31 (23.3)	39 (33.1)	34 (34.3)	28 (23.9)	31 (30.1)	34 (35.8)
Rate	8.3	8.9	8.2	6.5	8.7	7.8	6.4	7.7	9.0
<i>Fresh stillbirth</i>									
No (%)	24 (18.9)	34 (23.4)	19 (18.3)	31 (23.3)	31 (26.3)	19 (19.2)	15 (12.8)	11 (10.7)	13 (13.7)
Rate	4.7	7.2	4.2	6.5	6.9	4.4	3.4	2.7	3.4
<i>Intrapartum death</i>									
No (%)	8 (6.6)	12 (8.3)	3 (2.9)	4 (3.0)	2 (1.7)	5 (5.1)	22 (18.8)	15 (14.6)	12 (12.6)
Rate	1.7	2.5	0.7	0.8	0.4	1.1	5.0	3.7	3.2
<i>Neonatal death under 24 hours</i>									
No (%)	27 (22.1)	31 (21.4)	30 (28.8)	36 (27.1)	26 (22.0)	20 (20.2)	21 (17.9)	32 (31.1)	21 (22.1)
Rate	5.6	6.5	6.7	7.5	5.8	4.6	4.8	7.9	5.6
<i>Neonatal death 1-6 days</i>									
No (%)	25 (20.5)	26 (17.9)	15 (14.4)	31 (23.3)	20 (16.9)	21 (21.2)	31 (26.5)	14 (13.6)	15 (15.8)
Rate	5.2	5.5	3.3	6.5	4.5	4.8	7.1	3.5	4.0

over one perinatal death a year in the Cardiff population. There was no striking redistribution by primary cause of perinatal death over the years examined (table III). In particular, there was no reduction in those deaths ascribed to antepartum, intrapartum, or postpartum anoxia and asphyxia and that small number due directly to birth trauma.

In addition there was little change, if any, in the time at which perinatal death occurred (table IV). The apparent increase in intrapartum deaths at the expense of fresh stillbirths from 1970 onwards might have resulted from the greater proportion of labours managed entirely in hospital, thus making a diagnosis of intrapartum death more certain.

Both measures of fetal morbidity used in this study may have been subject to bias due to observer variation. Bias may also have resulted from both increased exposure to observation, as more labours were managed in hospital, and the frequency and changing nature of the observations themselves—for example, intermittent ultrasound phonocardiography related to uterine contractions.

Fetal distress (defined here as the presence of meconium-stained liquor or a fetal heart rate persistently outside the range 120-160/min in labour, or both) was observed more often (table V). As the component of this rate represented by meconium-staining occurring before the onset of labour probably became less common with increased use of induction the observed trend may well have represented a real change. Although the proportion of infants born in very poor condition (Apgar score 1-3) remained more or less constant, there was an apparent increase in the proportion born with moderate hypoxia (Apgar score 4-7) (table V).

TABLE V—Incidence of fetal distress in labour and low Apgar scores in Cardiff residents in 1965-73

Year:	1965	1966	1967	1968	1969	1970	1971	1972	1973
Fetal distress (%)	4.0	7.6	8.9	8.6	10.0	12.9	16.9	20.9	20.9
Apgar score 1-7 (%)	16.4	17.2	13.8	16.8	16.7	20.2	20.5	22.7	22.2
Apgar score 1-3 (%)	3.8	3.8	2.5	3.2	2.7	2.8	3.4	4.5	4.2

Discussion

The apparently unchanging picture of perinatal mortality in Cardiff residents from 1965 to 1973 is depressing. Not only has the total rate failed to show any significant downward trend but the incidence of fresh stillbirths and deaths due to anoxia, asphyxia, and birth injury has shown no tendency to decline. It is these deaths particularly that have prompted policies of universal hospital confinement, the introduction of antepartum monitoring with placental function tests and ultrasound cephalometry, and the more widespread use of caesarean section, induction, and acceleration of labour.

Possibly this picture results from our analysis of an annual average of only 4430 births and 115 perinatal deaths; but other populations of similar size have experienced a significant fall in perinatal mortality. Whatever the statistical significance of our observations, a Cardiff woman ran the same risk of losing her baby in 1973 (25.1 per 1000) as in 1965 (25.2 per 1000), and her attendants have not witnessed a decline in perinatal mortality rate in the population that they serve.

These findings might be explained by some combination of four hypotheses: either (a) there have been changes in the characteristics of the Cardiff parturient population that have increased the risk of perinatal loss to such an extent that the effect of improved medical care has been counteracted; or (b) some aspect of medical practice in Cardiff has prevented an improvement in perinatal mortality similar to that experienced by other populations; or (c) perinatal mortality in Cardiff has been influenced primarily by non-medical determinants, which have remained essentially unchanged during the period examined; or (d) there has been a real change in the risk, but due to random fluctuation of small numbers this has been masked.

Establishing causal relation in this field presents considerable problems. Baird showed that an extended use of induction for postmaturity during the 1950s was associated with a reduced perinatal mortality.⁷ Turnbull and Anderson went on to develop an improved technique for administering oxytocin in the mid-1960s,⁸ but their work was aimed primarily at reducing the incidence of prolonged labour and they made no claims of a reduced perinatal mortality; indeed they hoped that a taller, younger, healthier parturient population would result in a decreased need for oxytocin in labour.⁹

Because the availability of an efficient technique for controlling labour has increased the scope for induction the indications have been widened beyond those on which there is general agreement. Apart from those cases that are induced on social or logistic grounds, the more recent indications for induction often seem to rest on a somewhat arbitrary redefinition of the limits within which a pregnancy is deemed to be normal.

The only satisfactory way of establishing the true place of induction, within these newer diagnostic categories, and of other medical innovations, is by experiment.¹⁰ Different techniques to induce labour have been satisfactorily evaluated by randomised controlled trials,^{11 12} and policies of elective induction have also been studied using this research technique.^{13 14}

The conduct and organisation of such trials present many problems, particularly now that informed consent of the participants may be more difficult to obtain. Nevertheless, only by using such a research design, with adequate numbers to permit

observation of all those aspects about which there is current disagreement, will some light be thrown on the rather heated public and professional debate on modern obstetric practice.

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Obstetric practice in the Oxford Record Linkage Study Area 1965-72

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Summary

The secular trends in induction in 111 818 births over eight years in the largely rural areas of Oxfordshire and west Berkshire were analysed. Although the induction rate started to rise only in 1969, the forceps and episiotomy rates had been increasing throughout, but both procedures were always twice as prevalent in induced as in non-induced cases. The proportion of women given an anaesthetic was also consistently higher in induced cases, but that of women with long labours fell considerably over the period. The reduction in stillbirth rate was more apparent in induced than in non-induced births.

Introduction

The management of labour and delivery has become a subject of heated debate recently. The pointed questions about the value of induction, the dangers to the fetus, the possible harm to the mother, and the alleged increased need for anaesthesia, have come largely from the articulate lay public rather than the medical profession. It became apparent that there were little or no data on the prevalence and outcome of various obstetric procedures with which to answer the questions and possibly refute the allegations.

In an attempt to provide some basic data for discussion we have analysed two aspects of this subject. In this first paper we consider the epidemiology of induction in one area over eight years to show the trends. In a further study,¹ the results of induction in a hospital group covering some 5000 births a

year will be discussed in more depth for one particular year. We do not aim to provide definitive answers but rather to attempt to put the whole topic in perspective and provide data to focus attention on those areas in which further study seems to be advisable.

Methods

The Oxford Record Linkage Study^{2,3} collects information on every delivery in Oxfordshire and west Berkshire. The area is largely rural with several market towns and the two small cities of Reading and Oxford and has a total population of about 800 000. Details of each pregnancy, labour, and delivery and the subsequent morbidity of mother and child are abstracted from hospital case records and, in the case of domiciliary deliveries, midwives' notes. The degree of case ascertainment is checked by matching the cases with birth and stillbirth certificates, photocopies of which are forwarded to us by the Office of Population Censuses and Surveys.

In the present analysis we included all those deliveries to women resident and delivered in the area in 1965-72. Social class was coded using the definitions of the Registrar General (1961, 1966, and 1971) from information on paternal occupation recorded on the birth and stillbirth certificates. Parity is the number of previous pregnancies resulting in either a livebirth or a fetal death of gestation 28 weeks or more.

Induction was defined as a procedure, such as artificial rupture of the membranes or administration of oxytocin, designed to start contractions. Such procedures were not coded as inductions if they were intended merely to accelerate a labour that had already begun. The length of labour is the length of time from the onset of regular contractions to the delivery of the infant, and must, by definition, be less than the induction to delivery interval (IDI). Anaesthesia includes all general and local anaesthetics but excludes simple analgesic procedures such as "gas and air."

Results

The annual number of births fell gradually over the eight years, and the proportion of these delivered at home fell from 25% in 1965 to only 3% in 1972 (table I). The proportion of infants delivered to primiparae increased slightly throughout, whereas the proportion delivered to grand multiparae declined considerably. There was little variation in the illegitimacy rate, but, in accord with data for the country as a whole, the proportion of deliveries to women in the

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