

Technological childbirth in northern Jordan: descriptive findings from a prospective cohort study

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This study was funded by the Vice-Chancellor's Research Studentship (VCRS) at the University of Ulster.

Abstract

Background. In 1985, the World Health Organization (WHO) stated that no country should have an induction rate higher than 10%. Inappropriate use of induction technology in childbirth is leading to higher rates of induction, more instrumental birth and lower rates of vaginal birth. Many countries do not routinely collect data on induction and this study was undertaken in Jordan in 2004, where this type of data were not collected.

Aim. This paper provides a description of one small aspect of a large doctoral study and presents the first baseline data on birth outcomes for a prospective, self-selected cohort of 200 primiparous women, who gave birth in one major maternity hospital in Northern Jordan.

Method. An exploratory, descriptive approach was necessary to collect data from a prospective cohort of women booking for their first pregnancy at one large maternity unit. A convenience sample was selected and all women who booked for their first pregnancy in one major unit during the 12-week period allocated to recruitment were eligible to participate (n=530). Data were analysed using SPSS version 11 and will be presented in this paper descriptively. Ethical approval was granted from the Human Subject Committee at Jordan University of Science and Technology.

Findings. Although 530 primiparous women booked during the study period, a full data set of three entries for each participant was available for only 200 women. Of these, the majority (n=161, 81%) underwent induction of labour. Half (n=100) of the babies were admitted to the neonatal intensive care unit for resuscitation after birth and 19 were re-admitted to hospital within the first four weeks, mainly due to respiratory problems. A total of 25 mothers (13%) were re-admitted to hospital within four weeks of birth with urinary tract infection, anaemia, mastitis and wound infection. This research was limited due to the lack of randomisation, geographical clustering and the need for multi-centre involvement. However, it demonstrates sufficient evidence to support the recommendation for the development of a national data set on maternal and infant morbidity and mortality (including induction rates), as well as the development of a national policy for the promotion of 'normal' birth. Further international research in this area is required in order to pool data.

Key words: Induction, maternal morbidity, Middle East, birth technology, prospective study

Background

The Central Intelligence Agency (CIA) world factbook website estimated the following health statistics for the year 2006 for Jordan. In a population of nearly six million people with a median age of 23 years, the crude birth rate is estimated at 21.25 per 1000 population, the fertility rate at 2.63 children born per woman (CIA, 2006). The World Health Organization (WHO) reported a maternal mortality ratio of 41 per 100,000 live births, a perinatal mortality of 22 per 1000 total births, a neonatal mortality of 16 per 1000 live births and an infant mortality of 28 per 1000 live births. In total, 99% of all women received antenatal care and 99.5% were attended by a healthcare professional during labour and delivery, 97% gave birth in hospital, but the caesarean section (CS) rate was 16% in 2004 (World Health Organization, 2004). It is estimated that the majority of infant deaths occur in the neonatal period, with the major causes and proportional mortality being respiratory distress syndrome (40%), sepsis (14%), and asphyxia (12%) (World Health Organization, 2004).

Jordan is essentially an urban society with about 75% of

its population living in towns and therefore close to health-care facilities. These figures identify Jordan as one of the most privileged countries in the Middle East in terms of maternal and child health. However, it is worth noting that data on maternal and infant morbidity are not generally available, and that the induction rate is increasing and the CS rate has increased from 10.7% in 1997 to 16% in 2004 (WHO, 2004, 2006). The rate of caesarean birth in 2004 in two major hospitals in northern Jordan – King Abdullah University Hospital and Bade'a Hospital – was 36.6% and 20% respectively (King Abdullah University Hospital, 2004; Bade'a Hospital, 2004).

The rise in the use of technology and childbirth has been a concern for some time. In 1985, the WHO convened a joint interregional conference in Fortaleza, Brazil, in response to the increased use of routine birth technology. The conference issued a report including 21 recommendations about the use of technology in childbirth. One of these recommendations made it clear that 'birth should not be induced for convenience, and induction should not take place unless there was

a medical indication'. Recommendations for a 10% induction rate were also proposed (WHO Regional Office for Europe, 1985). A subsequent publication on guidelines for good care in labour recommended a de-medicalisation of childbirth and, in particular, that electronic fetal monitoring (EFM) should only be used in the presence of medical indications (WHO, 1996). However, despite these recommendations there is evidence that intervention rates and the use of routine birth technology have continued to increase.

A structured literature search was conducted to identify the evidence concerning the use of technology in pregnancy, but more specifically for induction of labour and its consequences in general, and more specifically in Jordan. The following databases were explored: Ovid (1966-present), MEDLINE (1966-present), Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982-present), Allied and Complimentary Medicine Index (AMED) (1985-present), British Nursing Index (BNI) (1985-present), and the Cochrane Database of Systematic Reviews. The computer-based search was supplemented by a manual search of the references listed. The key words used for the search strategy were 'induction of labour' and/or 'induced labour'. These were combined to 'amniotomy', 'oxytocin', 'sweeping of membranes', 'prostaglandins', 'survey', 'post-term pregnancy', 'indication', 'morbidity', 'mortality' and subsequently combined with 'northern Jordan', 'Jordan' and 'Middle East'. The selected languages for the literature review were English and/or Arabic.

The search revealed no paper dealing specifically with the Jordanian obstetric situation. Therefore, a more general search was undertaken to provide an overview of induction from available literature. A synopsis is presented here.

The appropriate use of birth technology in childbirth continues to be debated worldwide (Wagner, 1994; Sinclair and Gardner, 2001). The use of obstetrical interventions has sometimes led to a complex chain of reactions that are closely related to each other and that are conducted by midwives or obstetricians for women during the antenatal, intranatal and postnatal periods. Birth technology may have been initially aimed at decreasing maternal and fetal mortality and morbidity, but there is evidence that it strongly influences obstetrical and midwifery practice (Sinclair, 1999; Sinclair and Crozier, 2004), and includes strict antenatal monitoring, active management of labour, an increased use of induction of labour, continuous electronic fetal monitoring, epidural analgesia, episiotomy, lithotomy position, instrumental deliveries and CS.

According to the National Institute for Health and Clinical Excellence (NICE), induction of labour in the UK is defined as 'an intervention designed to artificially initiate uterine contractions leading to progressive dilatation and effacement of the cervix and birth of the baby. This includes both women with intact membranes and women with spontaneous rupture of the membranes, but who are not in labour. As with any other intervention, induction of labour may have unwanted side-effects. Induction of labour is indicated when it is agreed that the fetus or mother will benefit from a higher probability of a healthy outcome than if birth

is delayed. The process of induction of labour should only be considered when vaginal delivery is felt to be the appropriate route of delivery. Induction of labour is a common procedure, about 20% of pregnant women will have labour induced for a variety of reasons. Induction does not usually involve just a single intervention, but is a complex set of interventions and as such presents challenges for both clinicians and mothers' (NICE, 2001a).

Labour can only be said to be induced after the legal viability age, for example, after 24 completed weeks of gestation in the UK (NICE, 2001a, 2001b). Prior to that gestational age, even if the clinical approach might be similar, the convention is to use the term 'termination of pregnancy'. Induction of labour can be indicated where the maternal or fetal health is judged to be compromised, for example, medical illness pre-dating the pregnancy, or pregnancy complications such as pre-eclampsia and intrauterine growth retardation.

It is clear from the NICE guidelines and from others (Wagner, 1994; Sinclair, 1999) that an induction should only be used for the benefit of either mother or fetus, to reduce perinatal mortality and morbidity, but there is evidence of labour being induced for convenience (Boulvain et al, 2001; Sinclair and Crozier, 2004). Less obvious factors have also led to an increase in induction rates, for example, the decrease in the autonomous role of midwives, and the increase in the concentration of births in hospitals (Oakley, 1984). Anecdotal information indicates that reasons for the increasing rate include the hospitalisation of birth, replacing low technology with sophisticated technology, and the domination of the medical model in maternal care. In developed countries, it has been linked to the current litigious society.

One of the main areas of concern regarding the potential risks of inducing labour is that of post-term pregnancies. A wide variety of policies have been adopted with routine induction at 40, 41, or 42 completed weeks' gestation, with or without evidence of maternal and/or fetal abnormalities identified during careful antenatal surveillance (Enkin et al, 2000).

The general literature identified a number of possible risk factors for mothers and babies from induction, such as an increase in the incidence of both instrumental deliveries and CS, more perineal trauma, greater requirement for analgesia, neonatal admission to special care, lower Apgar score (Duff and Sinclair, 2000; Bailit et al, 2002), and increased chance of haemorrhage, low gestation age, low birthweight (Enkin et al, 2000). Induction by using amniotomy is associated with increase rate of CS for fetal distress and lower Apgar score (Fraser et al, 2000). Induction by using sweeping of membranes has been associated with bleeding, irregular contractions and discomfort during vaginal examination (Boulvain et al, 2005). UK scientific investigators have noted that the use of oxytocin to induce labour increases the incidence of jaundice in the newborn, and it is associated with increased use of pain relief and continuous fetal heart monitoring (Tan and Hannah, 2000a) and unsuccessful vaginal delivery within 24 hours (Kelly and Tan, 2001). Continuous EFM is associated with increased risk of operative delivery and CS for fetal distress (Thacker and Stroup, 1999). The challenge to EFM is that its introduction has correlated with

an increasing rate of operative delivery without the anticipated correlation of a reduction in the incidence of cerebral palsy and disability (Haggerty, 1999). It has been argued that EFM technology per se is not the problem, it lies with health professionals who require expert knowledge and skills necessary to interpret the data presented to them from the visual display unit (Sinclair, 2001b, 2001c).

Identifying potential complications in the unnecessary use of interventions, such as induction of labour or EFM has led to the recommendations by NICE and WHO that such interventions should only be used in the presence of specific maternal and/or fetal risks (WHO, 1996; NICE, 2001b). The literature search was supplemented by contacting the Jordanian government to request statistical data on induction of labour and national guidelines. None was available. However, statistics from King Abdullah University Hospital and Bade'a Hospital for CS birth for 2003 to 2004 were provided and were 37% and 20% respectively, but induction rates were not provided. (King Abdullah University Hospital, 2004; Bade'a Hospital, 2004). Therefore, this study provides an important first data set for northern Jordan. With rising rates of induction ranging from 10% to 30% (Dosa, 2001), and the steady increases in operative vaginal delivery and CS in Europe and many other parts of the world (Chamberlain and Zander, 1999), it is important to examine maternal and perinatal outcomes carefully.

Method

A prospective cohort study was designed to collect data on birth technology usage and data on induction in particular, using a convenience and purposive sample of 200 nulliparous women who gave birth in 2004. A retrospective design was considered, because it would enable the analysis of a larger dataset, but this approach had to be rejected, because the quality of the medical records was such that it was impossible to decipher them and create a reliable database. A prospective design provided the researcher with an opportunity to follow women through pregnancy into the puerperium and to gather data on morbidity six weeks after birth.

The study took place in a maternity hospital in the northern part of Jordan located in Irbid and under the authority of the Ministry of Health. Irbid is the second largest city in Jordan. With about 9000 deliveries a year (Abu-Ekteish et al, 1997), the hospital provides maternity services to the majority of women in the area and acts as a tertiary centre with an occupancy rate of 82% (Department of Statistics, 2002).

A convenience, purposive sample of women who were primiparous aged 18 years and above was selected. Convenience samples are probably the most frequently used of all types of sample in both types of research (Parahoo, 1997).

The project was advertised on posters placed in the antenatal and postnatal clinic as well as the local health centres. The posters displayed details of the study including title, process, aims, benefits, and inclusion criteria.

Instrument and measures

A specially-designed questionnaire was developed to collect data about maternal and infant outcomes during

the intrapartum and postnatal period. Data extraction were confirmed by cross-referencing data held in the case notes. The construction of the questionnaire took into consideration the culture, language and the educational level of women targeted for the study. Translation from English to Arabic and back translation from Arabic to English was carried out because the majority of women spoke Arabic only.

Validity and reliability

The instrument was constructed after an extensive review of the literature and was subjected to significant pre-testing by conducting three pilot studies to enhance the validity and reliability. Content validity was assessed by two methods. The first one was an organised review of the questionnaire's content by the researcher and the researcher's supervisors to ensure that the instrument met the research objectives. The second method was submitting the questionnaire to a panel of experts who could make suggestions on the adequacy and relevance of the questions.

Data analysis

A total of 200 women completed the full research study and all data were analysed using the SPSS version 11.0 statistical package (SPSS Inc, Chicago, US). Data were subjected to descriptive analysis including frequency, mean, median, standard deviation and cross-tabulation.

Ethical approval

Approval to conduct the study was given by the Human Subject's Committee at the Jordan University of Science and Technology. In order to obtain access to all governmental hospitals, a letter was sent to the Ministry of Health and permission was granted to collect the data.

Findings

A total of 200 women completed the data entries at all three points in time, antenatally, just after birth and within six weeks postnatally. Of these, 161 had induced labour and 39 had spontaneous labour or planned CS.

Demographic profile of participants

All of the women were married and aged between 19 and 38 years. The majority (128/200 – 64%) had attended school for at least 12 years, less than half (71/120 – 35.5%) had a university education; one woman had no formal education and was illiterate. The majority were housewives (145/200 – 72.5%), with just under a third (55/200 – 27.5%) working outside the home. Most women (180/200 – 90%) had a family income of less than £360 per month. A small number smoked cigarettes (23/200 – 11.5%) at the onset of pregnancy, but nine of these women stopped smoking during pregnancy.

The gestational age at delivery ranged between 30 and 42 weeks and the majority of women delivered at term, but 28/200 (14%) gave birth before 37 completed weeks of gestation. This group included four twin pregnancies, so

the total number of babies born to these 200 women was 204. Five infants died at birth, all of them were twins, three of them were the first twin and two were the second twin. The cause of death was respiratory distress syndrome as a result of prematurity. Birthweights ranged from 1.5kg to 4.5kg with a mean of 3.1kg (SD=0.55).

Use of technology during pregnancy and childbirth

The majority of births were supported, managed and controlled by the use of technology. In the antenatal period, the number of ultrasound scans ranged from one to 27 (mean 9.7, SD=5.4) and the majority of women expected to be scanned at every visit. Qualitative data demonstrated that women perceived the quality of their care to be better if they had more scans and more EFM in the antenatal and intranatal setting. Women reported a need to 'see' how well their baby was growing.

Induction was the 'norm' with 161/200 (80.5%) being induced. The majority of inductions did not appear to have any clear indication and the data were checked by accessing case notes in addition to women's self-reporting. The majority of women (65%, n=129) had their labour induced at a gestational age of between 38 and 39 weeks, with only 12 women (6%) experiencing spontaneous labour. Those who had spontaneous labour went into labour at home and presented themselves to hospital staff in early labour.

A range of technological interventions was recorded: 144 (72%) women had an artificial rupture of membranes, 145 (72.5%) had their labour augmented with oxytocin, 178 (89%) had continuous EFM and 132 (66%) had an episiotomy.

Birth outcomes

The majority of the women (128/200 – 64%) had a vaginal birth, four (2%) had an instrumental delivery, 27 (14%) had a planned CS, and 41 (21%) had an emergency CS. The overwhelming majority of women who had a vaginal delivery – spontaneous or instrumental (125/132 – 95%) stated they suffered perineal trauma.

Apgar scores at one minute ranged from two to eight, with a mean of 6.9 (SD=1.2), and at five minutes, ranged from five to nine with a mean of 8.3 (SD=1). A total of 74 babies (37%) of the sample had a low Apgar score (less than 7) at the first minute, and 10.5% (n=21) had a low Apgar score at the fifth minute. None of the women had umbilical cord prolapse or ruptured uterus. Half of the babies (n=100, 50%) were admitted to the neonatal care unit for resuscitation; their length of stay in the neonatal unit ranged from one hour to 18 days.

Self-reported problems postpartum and at six weeks

Many women reported feeling pain at the episiotomy site on the tenth day (n=83, 42%), painful intercourse at six weeks (n=81, 41%), high temperature with shivering (n=54, 27%), infection at the episiotomy site (n=28, 14%), mastitis (n=24, 12%), urinary incontinence (n=19, 9.5%) and faecal incontinence (n=4, 2.5%).

Hospital readmission

A total of 19 babies and 25 mothers were admitted to hospital in the early weeks after birth. Urinary tract infection, anaemia, mastitis and wound infection were the major reasons for mothers' readmission to hospital, with respiratory and gastrointestinal problems for infants.

Discussion

The results indicate that technology is widely used to support, monitor and manage birth in northern Jordan. For example, the number of ultrasound scans in this study ranged from one to 27 throughout pregnancy. These reflect the routine use of ultrasound scans for all pregnant women in Jordan. These findings contradict the WHO recommendation of a single ultrasound scan during a normal pregnancy (WHO, 1996). Enkin et al (2000) mentioned that the value of selective ultrasound scans for specific indications in pregnancy has been clearly established. Induction is a valuable intervention in cases where mother and/or infants are at risk. However, the majority of women (n=129, 65%) had their labour induced without a clear indication. These findings demonstrate that there is an inappropriate use of induction technology in northern Jordan. The high rate of induction without clear indication leads one to conclude that induction of labour was carried out for convenience. These findings are contrary to the recommendation that labour should not be induced for convenience, and that induction of labour should be reserved for specific indications (WHO, 1996; NICE, 2001a).

The rate of induction in this study appears to exceed the WHO (2001) recommendation eight-fold, although it should be viewed cautiously as the results are based on a convenience, self-selected sample subject to bias. According to the WHO recommendation, 'no geographic region should have rates of induced labour over 10%'. These findings are higher than the rates reported in other studies (Heffner et al, 2003; Hoffman et al, 2006). It is worthy of mention that childbirth care in Jordan is based on the medical model, and that obstetricians are the care-providers during pregnancy and childbirth for the vast majority of women. In this study, the common method of induction was artificial rupture of membranes followed by artificial oxytocin (129/200 – 64.5%). Three women were recorded as being induced by amniotomy alone and the remainder appear to have been induced by amniotomy plus oxytocin, but it is not possible to accurately determine cervical dilatation at the time of the amniotomy. Amniotomy plus oxytocin has been established as being an effective method for induction of labour (Enkin et al, 2000). Although the method of induction used for these women was evidence based, the timing of the intervention was not, as the majority of women were induced at 38 to 39 weeks' gestation. The evidence available from the literature highlights that there is no benefit of elective induction before 41 completed gestation weeks (Hannah, 1996).

Further breakdown of data showed that the induced group accounted for the highest proportion of emergency CS (n=37, 18.5%) and for all instrumental vaginal deliveries (n=4, 2%). It also showed that the induced group

accounted for the higher proportion of emergency CS due to fetal distress (n=19, 11.8%) and for all emergency CS due to failed induction. The rate of CS in the induced group in this study was 18.5% compared to 2% in the spontaneous group. These findings are in keeping with other studies that found that CS increased significantly with induction of labour compared with those who had a spontaneous labour (Hoffman et al, 2006). The rate of CS in this study lies within the range reported by others who found in nulliparae who had induced labour a range of between 13.7% and 24.7% (Heffner et al, 2003).

The induction group accounted for all the instrumental deliveries. These findings are in keeping with those of Dublin et al (2000) and Alexander et al (2000). This study was limited to primipara women and it is known that primipara have the highest background rate for CS (Seyb et al, 1999).

The reasons given for CS were examined. It was noted that, in addition to 15 mothers being delivered by CS following failed induction, only 15 (9%) of all the inductions were for post-term pregnancy. There were significantly higher incidences in the induced group of CS for fetal distress (12%), arrest (0.6%), and failed vacuum extraction (0.6%). Fetal distress and failed induction were the major reasons for emergency CS (12% and 9% respectively) in the induced group. Further breakdown of the data showed that the induced group accounted for a high proportion of the different signs of fetal distress (88%, n=142/161). Findings showed that all women who were induced after 40 weeks ended up undergoing emergency CS. These findings are in keeping with those from a large retrospective observational cohort study, which included nullipara women, carried out by Yeast et al (1999) who found that the CS rate for post-date inductions was high (16.2%). The indications for CS in the induced group in this study are similar to the indications reported by Heffner et al (2003), who found that induction increased the frequency of CS for non-reassuring fetal status, failed induction, and non-reassuring fetal status plus failure to progress. Induction of labour is also associated with a requirement for pain relief and continuous EFM (Tan and Hannah, 2000b). There were 152/161 in the induced group who were monitored by continuous EFM, out of which 20 underwent emergency CS due to fetal distress, and four women required instrumental support. These findings are in keeping with those of Enkin et al (2000) and Thacker and Stroup (1999), who concluded that continuous EFM is associated with increased risk of operative delivery and CS for fetal distress.

All women who had vaginal delivery in this study had an episiotomy as a routine policy. These findings are in keeping with those of Goldberg et al (2002), who found an increased association between episiotomy and forceps delivery, and with third or fourth degree laceration. Thus, the high proportion of women who had different types of perineal trauma with episiotomy is not surprising. There is an urgent need to change practice from routine episiotomy to selective episiotomy. This can be achieved through developing network policies and educating midwives and doctors about the care of the perineum during delivery.

Results showed that 74 (37%) of babies in the sample had low Apgar scores (less than five at one minute) and 21 (10.5%) had low Apgar scores (less than seven at five minutes). These findings support the work carried out by Duff and Sinclair (2000), who found that infants born to mothers who were induced had significantly lower Apgar scores at one minute and five minutes when compared to babies born to women who were not induced.

Almost half of the babies were admitted to the neonatal intensive care unit (NICU) for resuscitation (50%, n=100), and the length of stay ranged from one to 432 hours with a mean of 21 hours (SD=62.56). Further breakdown of data showed that almost all babies who had lower Apgar scores at one minute (91%, n=67/74) and five minutes needed resuscitation and admission to the NICU. These findings support the work done by Boulvain et al (2001), who reported a trend towards a greater requirement for neonatal resuscitation and admission to the NICU in the induced group. However, these results and those of Boulvain et al (2001) stand in opposition to earlier work of Seyb et al (1999), who reported that the incidence of meconium, lower Apgar score at one and five minutes, and NICU admission were not significantly different between groups of infants who were induced and those who were not.

The impact of induction of labour on maternal and infant outcomes in this study symbolises a technological chain of events similar to that described by Sinclair (1999) and Sinclair and Crozier (2004). Once the natural cycle of normal spontaneous birth has been broken and technology is introduced, one intervention leads to another. Intervention technologies, such as amniotomy and syntocinon require monitoring technologies such as EFM and dinomapp, in order to safeguard mother and baby from iatrogenic harm. However, with appropriate use of technology and multiprofessional teamwork, the induction rate and associated morbidities can be significantly reduced through the use of NICE guidelines, evidence-based practice and effective multidisciplinary teamworking (Sinclair et al, 2007).

Conclusion

In Jordan, there is no clear policy for 'normal' pregnancy and childbirth, therefore induction of labour is not monitored or policy led. This bird's eye view of technology in one clinical setting portrays a grim picture of the outcomes of uncensored and routine use of induction technology in northern Jordan.

Limitations

This research has been limited due to the lack of randomisation, geographical clustering, the need for multi-centre involvement, and sampling difficulties. Further international research in this area is required in order to pool data. However, the study does provide new data that is sufficient to support a recommendation for the development of a national data-set on maternal and infant morbidity and mortality (including induction rates), as well as the development of a national policy for the promotion of normality and the appropriate use of induction technology.

References

- Abu-Ekteish F, Daud A, Sunna E, Obeidat A, Al-Rimawi HS. (1997) Perinatal mortality at Princess Badia' Teaching Hospital, northern Jordan. *Annals of Saudi Medicine* 17(1): 120-3.
- Alexander J, McIntire D, Leveno JK. (2000) Forty weeks and beyond: pregnancy outcomes by week of gestation. *Obstetric and Gynaecology* 96(2): 291-4.
- Bade'a Hospital. (2004) *Type and number of deliveries. Annual Report*. Bade'a Hospital Statistics Office: Irbid.
- Bailit JL, Downs SM, Thorp JM. (2002) Reducing the caesarean delivery risk in elective inductions of labour: a decision analysis. *Paediatr Perinat Epidemiol* 16(1): 90-6.
- Boulvain M, Marcoux S, Bureau M, Fortier M, Fraser W. (2001) Risks of induction of labour in uncomplicated term pregnancies. *Paediatric and Prenatal Epidemiology* 15: 131-9.
- Boulvain M, Stan C, Irion O. (2005) Membrane sweeping for induction of labour. *Birth* 32(2): 152.
- Chamberlain G, Zander L. (1999) ABC of labour care: induction. *BMJ* 318(7189): 995-8.
- Central Intelligence Agency. (2006) *The world factbook - Jordan*. Central Intelligence Agency: Washington.
- Department of Statistics. (2002) *Population and family health survey*. See: www.measuredhs.com/pubs/pub_details.cfm?ID=533&cctry_id=18&SrvyTp= (accessed 25 November 2008).
- Dosa L. (2001) Caesarean section delivery, an increasingly popular option. *Bull World Health Organ* 79(12): 1173.
- Dublin S, Lydon-Rochelle M, Kaplan RC, Watts DH, Critchlow CW. (2000) Maternal and neonatal outcomes after induction of labor without an identified indication. *Am J Obstet Gynecol* 183(4): 986-94.
- Duff C, Sinclair M. (2000) Exploring the risks associated with induction of labour: a retrospective study using the NIMATS database. Northern Ireland maternity system. *Journal of Advanced Nursing* 31(2): 410-7.
- Enkin M, Keirse M, Renfrew M, Neilson J, Crowther C, Duley L, Hofmeyr G. (2000) *A guide to effective care in pregnancy and childbirth*. Oxford University Press: Oxford.
- Fraser WD, Turcot L, Krauss I, Brisson-Carrol G. (2000) Amniotomy for shortening spontaneous labour: In: Cochrane Database Syst Rev. *The Cochrane Library Issue 2*: CD000015. John Wiley and Sons: Chichester.
- Goldberg J, Holtz D, Hyslop T, Tolosa J. (2002) Has the use of routine episiotomy decreased? Examination of episiotomy rates from 1983 to 2000. *Obstetric and Gynaecology* 99(3): 395-400.
- Haggerty LA. (1999) Continuous electronic fetal monitoring: contradictions between practice and research. *J Obstet Gynecol Neonatal Nurs* 28(4): 409-16.
- Hannah WJ. (1996) Induction of labour: post-term pregnancy and term prelabour rupture of membranes - evidence for practice. *Journal of Society of Obstetricians and Gynaecologists of Canada* 18: 85-9.
- Heffner LJ, Elkin E, Fretts RC. (2003) Impact of labor induction, gestational age, and maternal age on cesarean delivery rates. *Obstet Gynecol* 102(2): 287-93.
- Hoffman MK, Vahratian A, Sciscione AC, Troendle JF, Zhang J. (2006). Comparison of labor progression between induced and noninduced multiparous women. *Obstet Gynecol* 107(5): 1029-34.
- King Abdullah University Hospital. (2004) *Type and number of deliveries. Annual Report*. King Abdullah University Hospital Statistics Office: Irbid.
- Kelly AJ, Tan B. (2001) Intravenous oxytocin alone for cervical ripening and induction of labour: In: Cochrane Database Syst Rev. *The Cochrane Library Issue 3*: CD003246. John Wiley and Sons: Chichester.
- National Institute for Health and Clinical Excellence. (2001a) *Induction of labour*. NICE: London.
- National Institute for Health and Clinical Excellence. (2001b) *The use of electronic fetal monitoring*. NICE: London.
- Oakley A. (1984) *The captured womb: a history of the medical care of pregnant women*. Blackwell: Oxford.
- Parahoo K. (1997) *Nursing research: principles processes and issues*. Macmillan: Basingstoke.
- Seyb S, Berka R, Socol M, Dooley S. (1999). Risk of cesarean delivery with elective induction of labor at term in nulliparous women. *Obstetrics and Gynecology* 94(4): 600-7.
- Sinclair M. (1999) *Midwives' readiness to use high technology in the labour ward. Implications for Education and Training*. Queen's University Belfast (unpublished PhD thesis).
- Sinclair MK. (2001a) Midwifery managers' perspectives on midwives' use of birth technology. *All Ireland Journal of Nursing & Midwifery* 1(6): 213-19.
- Sinclair MK. (2001b) Birth technology: observations of high usage in the labour ward. *All Ireland Journal of Nursing & Midwifery* 1(3): 83-8.
- Sinclair MK. (2001c) Midwives' attitudes to the use of the cardiotocograph machine. *Journal of Advanced Nursing* 35(4): 559-606.
- Sinclair MK, Gardner J. (2001) Midwives' perceptions of the use of technology in assisting childbirth in Northern Ireland. *Journal of Advanced Nursing* 36(2): 229-36.
- Sinclair M, Crozier K. (2004) Medical device raining in maternity care: part 2. *British Journal of Midwifery* 12(8): 509-13.
- Sinclair MK, Boreland, Z, McCabe, N. (2007) Less intervention. *RCM Midwives Journal* 10(4): 214.
- Tan BP, Hannah ME. (2000a) Oxytocin for prelabour rupture of membranes at or near term: In: Cochrane Database Syst Rev. *The Cochrane Library Issue 2*: CD000157. John Wiley and Sons: Chichester.
- Tan BP, Hannah M. (2000b) Prostaglandins for prelabour rupture of membranes at or near term: In: Cochrane Database Syst Rev. *The Cochrane Library Issue 2*: CD000178. John Wiley and Sons: Chichester.
- Thacker S, Stroup C. (1999). Continuous electronic heart rate monitoring versus intermittent auscultation for assessment during labor: In: Cochrane Database Syst Rev. *The Cochrane Library Issue 4*. Update Software: Oxford.
- Wagner M. (1994) *Pursuing the birth machine - the search for appropriate birth technology*. ACE Graphics: Camperdown.
- World Health Organization Regional Office for Europe. (1985) *Joint Interregional Conference on Appropriate Technology for Birth*. WHO: Fortaleza, Brazil.
- World Health Organization. (1996) *Care in normal birth: a practical guide*. WHO: Geneva.
- World Health Organization. (2004) *Making pregnancy safer statistics in EMR - part one*. WHO: Geneva.
- World Health Organization. (2006) *Reproductive health indicators - guidelines for their generation, interpretation and analysis for global monitoring*. WHO: Geneva.
- Yeast JD, Jones A, Poskin M. (1999) Induction of labour and the relationship to caesarean delivery: a review of 7001 consecutive inductions. *American Journal of Obstetrics and Gynecology* 180(3): 628-33.