Induction of labour at a regional hospital in KwaZulu-Natal, South Africa

B Malende, MB ChB, Dip Obstet; **J Moodley**, MB ChB, FCOG, FRCOG, MD; **S R Kambaran**, MB ChB, MRCOG

Department of Obstetrics and Gynaecology, Lower Umfolozi District War Memorial Hospital, Empangeni, KwaZulu-Natal, South Africa, and Women's Health and HIV Research Group, University of KwaZulu-Natal, Durban, South Africa

Corresponding author: *B Malende (mugale2002@yahoo.com)*

Background. Clinicians working in maternity units must recognise the risks associated with induction of labour (IOL). They need to analyse the indications for IOL, methods used and outcomes on a regular basis to reduce complications.
Objective. To determine the indications for IOL and outcomes of current methods at a regional hospital in rural KwaZulu-Natal, South Africa.
Methods. Clinical data for all patients who had IOL over an 8-month period were collected and analysed.
Results. There were 6 649 deliveries, and of these patients 532 had IOL (induction rate 8.0%); 502 patient files had complete information for analysis. The main indications for IOL were hypertensive disorders of pregnancy (43.6%, *n*=219), post-dates pregnancy (25.9%, *n*=130) and pre-labour rupture of the membranes (14.7%, *n*=74). Other indications accounted for 15.7% of cases (*n*=79). The most common methods of IOL were oral misoprostol (63.5%, *n*=319) and vaginal misoprostol (30.3%, *n*=152). Vaginal deliveries were achieved in 59.8% of patients (*n*=300), and 40.2% (202) had caesarean sections (CSs); 69.7% of patients (*n*=350) delivered within 24 hours (this includes CSs and vaginal deliveries). Normal vaginal births within 24 hours accounted for 44.4% of total deliveries (*n*=223), and CSs within 24 hours for 24.3% (*n*=122). There were 34 babies (6.8%) admitted to the neonatal intensive care unit. Prematurity accounted for 10 of these admissions (2.0% of all babies), hypoxic ischaemic encephalopathy for 9 (1.8%), and congenital pneumonia for 7 (1.4%). There was 1 early neonatal death.
Conclusion. Current methods of IOL at the rural study site are associated with outcomes similar to those in a report from an urban regional hospital in South Africa.

S Afr J OG 2014;20(1):22-26. DOI:10.7196/SAJOG.675

Induction of labour (IOL) is a common obstetric procedure performed for a variety of clinical indications. The reported worldwide incidence of IOL ranges from 3% to 30%.[1] In South Africa, the rate of IOL at a regional hospital in Gauteng was reported to be 9.6%, and the main indications were hypertensive disorders of pregnancy, post-dates pregnancy and pre-labour rupture of the membranes.[2] Increasing rates of IOL worldwide have led to debate on whether elective induction improves outcomes or simply leads to increased complications and healthcare costs.[1,3,4] Maternal and neonatal complications and increased caesarean section (CS) rates associated with IOL are related to a variety of factors influencing the methods of induction used in specific clinical circumstances. These factors include the state of the cervix, parity, indications for induction, the condition of mother and fetus, the financial costs of the induction agents, and their side-effects. Because clinical protocols for IOL vary between individual South African health facilities, and because most publications emanate from tertiary centres, we decided to perform a clinical audit of IOL at a regional hospital serving a rural population in KwaZulu-Natal Province.

Methods

IOL is defined as a process of artificial stimulation of uterine contractions after the fetus is viable and before the onset of spontaneous labour, with the aim of achieving vaginal delivery.[5] For the purpose of this study, 'failed IOL' was defined as failure to achieve vaginal delivery.[1] No time limit was set for the success or failure of IOL. The hospital protocol was flexible with respect to time because of the variable indications for IOL. In high-risk patients specialist advice determined the number of cycles of IOL. A cycle of IOL refers to receiving all the scheduled doses for IOL as shown in Table 1.

The study population consisted of all patients who underwent IOL at the regional hospital over a period of 8 months (December 2009 - July 2010). This was a retrospective hospital chart review, and relevant clinical data for all patients who underwent IOL were captured on a structured form and analysed with the Statistical Package for Social Science (SPSS), version 18. The captured data included demographic information, clinical details, and maternal and neonatal complications. Women with clinical signs of infection such as fever and maternal tachycardia, those with multiple pregnancies and those with missing data in their charts, which was essential for data analysis, were excluded. Signs of infection were grounds for exclusion because infection could lead to an adverse perinatal outcome and thus influence the results of IOL. Descriptive statistics were used for analysis, and all results are presented as frequencies, percentages and proportions.

The study site was a regional referral health facility for 17 district hospitals in rural northern KwaZulu-Natal.

Institutional research ethics committee (BREC Ref BEO 18/11) and hospital permission was obtained for the study. The standard clinical protocol for IOL at the study site is shown in Table 1.

Results

The hospital records of 532 patients who underwent IOL were collected. Thirty files had missing information, so 502 files were analysed. There were 6 649 deliveries and 532 IOLs, giving an induction rate of 8.0%. The demographic characteristics of the women who had IOL are described below.

Demographic characteristics

There were 400 women (79.7%) aged <30 years and 92 women (18.3%) aged 31 - 40 years; 51.4% (*n*=258) were primigravidas and 47.0% (*n*=236) of parity 1 - 4. Maternal weight was documented in 99.2% of cases (*n*=498) and maternal height in 39.8% (*n*=200). The Bishop score was not documented in any of the charts, but all patients had a cervical assessment, which lacked all the requirements as defined by the Bishop score. The incidence of HIV infection in the study group was 32.5% (*n*=163).

Table 2 shows that the three main indications for IOL were hypertensive disorders of pregnancy (43.6%, *n*=219), post-dates pregnancy (25.9%, *n*=130) and pre-labour rupture of the membranes (14.7%, *n*=74). The two main categories of hypertension in pregnancy were gestational hypertension (30.3%, *n*=152) and pre-eclampsia (13.3%, *n*=67). The main agents used for IOL were oral misoprostol (63.5%, *n*=319) and vaginal misoprostol (30.3%, *n*=152). Vaginal misoprostol and oral misoprostol were administered to 56.6% (*n*=146) and 39.1% (*n*=101) of the primigravidas, respectively; 91.1% of the multigravidas (parity 1 - 4) received oral misoprostol (*n*=215) and 2.5% vaginal misoprostol (*n*=6). Overall, 58.4% of the patients (*n*=293) had normal (i.e. unassisted) vaginal deliveries, and the CS rate was 40.2% (*n*=202).

The main indication for CS was fetal heart rate abnormalities before the onset of active labour (32.7% of CSs, *n*=66) and during labour (26.7%, *n*=54). Other indications for CS included cephalopelvic disproportion (14.9%, *n*=30) and failed IOL (12.9%, *n*=26).

The proportion of patients who delivered with only one cycle of IOL (i.e. attempt at inducing labour, irrespective of the induction agent used) was 88.2% (*n*=443); 9.4% (*n*=47) delivered with two cycles and 2.4% (*n*=12) with three. Oral misoprostol accounted for 15.0% of patients (48/319) with repeat IOL and vaginal misoprostol for 3.3% (5/152).

Table 3 shows induction-delivery intervals. Of all the patients, 69.7% (*n*=350) delivered within 24 hours. In this group, 223 (63.7%) had a normal vaginal birth, 122 (34.8%) a CS and 5 (1.4%) an assisted delivery; 188 (53.7%) were primigravidas and 157 (44.9%) multigravidas (para 1 - 4); 208 (59.4%) received oral misoprostol and 120 (34.3%) vaginal misoprostol; and 149 (42.6%) had hypertensive disorders of pregnancy, 88 (25.1%) post-dates pregnancy, and 57 (16.3%) pre-labour rupture of the membranes.

Table 4 shows maternal and fetal outcomes following IOL. Ten women had postpartum haemorrhage, and one underwent laparotomy for puerperal sepsis (she recovered fully). There were no serious maternal adverse effects directly related to use of misoprostol. There were 34 babies (6.8%) admitted to the neonatal intensive care unit (NICU). One early neonatal death was documented. The main reasons for admissions to the NICU were prematurity (2.0%, *n*=10), hypoxic ischaemic encephalopathy (1.8%, *n*=9) and congenital pneumonia (1.4%, *n*=7).

Discussion

The induction rate at our study site was 8%. This figure is similar to the 9.6% reported by Mbele *et al.*[2] in a study at an urban regional health facility in Gauteng Province, South Africa. Our study site was a large regional health centre for a largely rural population of 972 856.[6] The referral guidelines for this rural area recommend that all patients with hypertensive disorders of pregnancy or obstetric or medical problems should be referred to the study hospital for management. Given the referral pattern and the number of district hospitals served by the regional hospital, it is surprising that the induction rate at the study site was not higher, particularly in view of the fact that induction rates in low-resourced countries are reported to be over 16%.[1] It is possible that because of transport difficulties in this rural district, only carefully selected patients requiring IOL were referred. Furthermore, guidelines for IOL are not completely standardised. Some recommend that certain patients can safely be induced in district hospitals, including those with post-dates pregnancy and no other medical or obstetric complications, and those with mild to moderate pre-eclampsia,[7] which may have influenced referrals to the study site for IOL. Ideally our audit should have included all district health facilities in our health district, to obtain a more complete induction rate.

The concept of failed IOL is controversial. Women must be counselled about the fact that CS may be necessary. Furthermore, failed IOL must be differentiated from failure to progress in

Table 1. Protocol for IOL at Lower Umfolozi District War Memorial Hospital, KwaZulu-Natal

			36+/40 weeks	
	<29/40 weeks	**29 - 36/40 weeks**	**Unripe cervix**	**Ripe cervix**
Intrauterine death	Misoprostol 100 µg PV 12-hourly	Misoprostol 50 µg PV 12-hourly	Misoprostol 50 µg PV 12-hourly	Prostin E_2 2 mg PV 6-hourly
Primigravida	Misoprostol 100 µg PV 12-hourly	Misoprostol 50 µg PV 6-hourly	Misoprostol 50 µg PV 6-hourly	Oral misoprostol OR Prostin E_2 2 mg 6-hourly
Multigravida, para 1 - 4	Misoprostol 50 µg PV 12-hourly	Misoprostol 50 µg PV 12-hourly	Oral misoprostol	Prostin E_2 1 mg PV 6-hourly
Multigravida, para >4	Oral misoprostol*	Oral misoprostol	Prostin E_2 1 mg PV 6-hourly	AROM + oxytocin
Previous CS	Consult specialist			

IOL = induction of labour; PV = per vagina; AROM = artificial rupture of the membranes; CS = caesarean section.
*Oral misoprostol regimen consists of 200 µg in 200 ml water. Start with 20 ml 2-hourly × 3 doses, then 40 ml 2-hourly for further 3 doses.

Table 2. Indications and mode of IOL, mode of delivery, indications for CS, and number of cycles of IOL

	Primigravidas	Parity 1 - 4	Parity >4	Total
Indications for IOL, *n*				
Postdates	69	61	0	130
Hypertensive disorders of pregnancy	109	106	4	219
Pre-labour rupture of membranes	39	35	0	74
Other indications for IOL	41	34	4	79
Total	258	236	8	502
Mode of IOL, *n*				
Vaginal misoprostol	146	6	0	152
Oral misoprostol	101	215	3	319
Other modes of IOL	11	15	5	31
Total	258	236	8	502
Mode of delivery, *n*				
Normal vaginal birth	126	165	2	293
CS	127	71	4	202
Forceps	2	0	0	2
Vacuum	3	0	2	5
Total	258	236	8	502
Indications for CS, *n*				
CTG abnormalities but not in labour	41	24	1	66
CTG abnormalities in labour	43	11	0	54
Development of eclampsia	3	0	0	3
Development of imminent eclampsia	0	3	0	3
Failed induction of labour, *n*				
One cycle IOL	3	7	2	12
Two cycles IOL	4	6	0	10
Three cycles IOL	1	3	0	4
Cephalopelvic disproportion	24	5	1	30
Poor cervical dilatation despite oxytocin	6	7	0	13
Other indications for CS	2	5	0	7
Total	127	71	4	202
Number of cycles of IOL, *n*				
1	240	196	7	443
2	16	31	0	47
3	2	9	1	12
Total	258	236	8	502

IOL = induction of labour; CS = caesarean section; CTG = cardiotocography.

labour and from cephalopelvic disproportion or malpresentation. Definitions of failure of IOL vary. In general, failed IOL means that the woman does not enter active labour, or that the cervical score does not improve, or that the cervix does not dilate more than 3 cm over a 12-hour period in the presence of ruptured membranes and oxytocin use.[8] For our study, we defined failed IOL as failure to achieve vaginal delivery.[1] However, it must be recognised that failed IOL is not automatically an indication for CS. Each case must be reassessed clinically and the indications for induction reviewed in terms of harms and benefits to mother and fetus. All being well, repeat IOL can be considered, immediately or after varying periods of time. Women must be told of this possibility at the initiation of the primary IOL, and that repeat IOL will improve the chances of vaginal birth while minimising harm to mother and fetus.

The three main indications for IOL were hypertensive disorders (43.6%), post-dates pregnancy (25.9%) and pre-labour rupture of the membranes (14.7%). These were also the three main indications in the report by Mbele *et al.*[2] In their study, 52.4% of patients delivered within 24 hours, and the CS rate was 42%. Our study had similar outcomes: of the 502 patients, 58.4% had a normal vaginal delivery and 40.2% a CS (Table 2). There was an increase in the CS rate with increasing duration of IOL, although

Table 3. Induction-delivery intervals

	Time (h)			
	≤24	24.1 - 47.9	≥48	Total
Parity, *n* (%)				
Primigravidas	188 (72.8)	49 (19)	21 (8.1)	258 (100.0)
Para 1 - 4	157 (66.5)	53 (22.4)	26 (11)	236 (100.0)
Para >4	5 (62.5)	0 (0.0)	3 (37.5)	8 (100.0)
Total	350 (69.7)	102 (20.3)	50 (10.0)	502 (100.0)
Mode of IOL, *n* (%)				
Oral misoprostol	208 (65.2)	75 (23.5)	36 (11.3)	319 (100.0)
Vaginal misoprostol	120 (78.9)	25 (16.4)	7 (4.6)	152 (100.0)
Other modes of IOL	22 (71.0)	2 (6.4)	7 (22.6)	31 (100.0)
Total	350 (69.7)	102 (20.3)	50 (10.0)	502 (100.0)
Indications for IOL, *n* (%)				
Hypertensive disorders of pregnancy	149 (68)	47 (21.5)	23 (10.5)	219 (100.0)
Post dates	88 (67.7)	28 (21.5)	14 (10.8)	130 (100.0)
Premature rupture of membranes	57 (77)	13 (17.6)	4 (5.4)	74 (100.0)
Other indications for IOL	56 (70.1)	14 (17.7)	9 (11.4)	79 (100.0)
Total	350 (69.7)	102 (20.3)	50 (10.0)	502 (100.0)
Mode of delivery, *n* (%)				
Normal birth	223 (76.1)	43 (14.7)	27 (9.2)	293 (100.0)
CS	122 (60.4)	58 (28.7)	22 (10.9)	202 (100.0)
Vacuum	3 (60.0)	1 (20.0)	1 (20.0)	5 (100.0)
Forceps	2 (10.0)	0 (0.0)	0 (0.0)	2 (100.0)
Total	350 (69.7)	102 (20.3)	50 (10.0)	502 (100.0)

IOL = induction of labour; CS = caesarean section.

the CS rate for inductions taking longer than 48 hours did not increase above the rate for inductions taking between 24 and 48 hours (34.8% at ≤24 hours, 56.8% at >24 - ≤47.9 hours and 44% at ≥48 hours). We could find no studies with which to compare this aspect of our results.

Hypertensive conditions are among the most common indications for IOL globally. However, there is uncertainty regarding the need to induce labour in patients with mild gestational hypertension and mild pre-eclampsia and in whom the maternal and fetal condition is stable at 36 - 37 weeks. The HYPITAT study[9] evaluated maternal and neonatal complications in patients with mild gestational hypertension/mild pre-eclampsia and other more severe grades of hypertensive conditions of pregnancy at 36 - 41 weeks. The results of this randomised trial did not resolve the issue of IOL for mild hypertension, however, as numbers in the subcategories of hypertensive disorders of pregnancy were too small to provide answers to this question.[9,10]

Induction of labour for post-dates pregnancy is also a debatable issue, although there is evidence that women with uncomplicated pregnancies should be offered IOL after 41 weeks. A systematic review of elective induction versus expectant management of pregnancy showed that elective IOL at 41 weeks and beyond is associated with a decreased risk of CS and meconium-stained liquor.[11] However, this implies that women should have an ultrasound scan before 20 weeks' gestation, which may not be practical in rural areas of South Africa, not only owing to the shortage of trained personnel and equipment, but also because many women do not present for antenatal care before the 20th week of gestation. We found that 59.8% of our patients had their first ultrasound scan after 27 weeks' gestation and only 14.7% had a scan in the first trimester.

Some women who have IOL will require more than one intervention, and repeated attempts at IOL present challenges to clinicians, healthcare workers and mothers.[7] We found that 9.4% of patients (*n*=47) had two cycles of IOL and 2.4% (*n*=12) had three. Oral misoprostol was associated with more repeat attempts at IOL than vaginal misoprostol. It has been reported that vaginal misoprostol is more efficacious than oral misoprostol,[12,13] because oral misoprostol is eliminated more rapidly (2 - 3 hours) than vaginal misoprostol (≥4 hours).[13] Other factors that may affect the induction-delivery interval are maternal ethnicity, weight, body mass index and age, gestational age and fetal weight.[14] We were unable to analyse these factors because of missing data in the patients' charts. Furthermore, as this was a retrospective study, there was poor or lack of documentation of certain parameters such as the Bishop score and maternal height. Other information was missing in some charts because health professionals do not document all essential data.

We found that cheap and relatively safe methods of IOL such as the Foley catheter were little used at the study site. This may be because the induction protocol (Table 1) was posted on the wall of

Table 4. Maternal and fetal outcomes following IOL (*N*=502)

	n (%)
Maternal outcomes	
Pyrexia	2 (0.4)
Shivering	2 (0.4)
Nausea/vomiting/diarrhoea	5 (1.0)
Primary PPH	8 (1.6)
Secondary PPH	2 (0.4)
Perineal tears	51 (10.2)
Episiotomy	79 (15.7)
Puerperal sepsis	3 (0.6)
Laparatomy	1 (0.2)
Retained placenta	5 (1.0)
Fetal outcomes	
Indications for admission to NICU	
Recession	1 (0.2)
Cyanosis	1 (0.2)
Meconium exposed	1 (0.2)
Low Apgar	5 (1.0)
Congenital pneumonia	7 (1.4)
HIE (4 convulsed, 1 ENND)	9 (1.8)
Prematurity	10 (2.0)
Total NICU admissions	34 (6.7)
Fetal weight (g)	
500 - 1 000	11 (2.2)
1 001 - 1 499	10 (2.0)
1 500 - 2 499	73 (14.5)
2 500 - 3 499	305 (60.5)
3 500 - 4 499	102 (20.3)
≥4 500	1 (0.2)
Total	502 (100.0)

IOL = induction of labour; PPH = postpartum haemorrhage; NICU = neonatal intensive care unit; HIE = hypoxic ischaemic encephalopathy; ENND = early neonatal death.

the labour ward and probably reinforced the use of oral and vaginal misoprostol as the main modes for IOL. Cheap methods such as 'sweeping of the membranes', use of the Foley catheter with or without saline infusion, rupture of the membranes, and mechanical dilators such as laminaria tents have been suggested as alternatives to the use of prostaglandins.[15,16] Most studies on the effectiveness of these agents have involved small numbers of patients, and randomised controlled trials of their use in elective IOL and in specific settings such as previous CS and multiparous women, with large sample sizes, should be performed in view of a recent report[16] showing that use of mechanical methods for IOL results in similar CS rates to prostaglandins, with a lower risk of hyperstimulation.

Neonatal outcomes in our study were generally good, 99.0% of newborns having an Apgar score of ≥7 at 5 minutes. However, nine babies (1.8%) required admission to the NICU for hypoxic ischaemic encephalopathy. Four of these nine babies had convulsions, and of these one did not recover and was recorded as an early neonatal death (CS delivery of this baby was delayed because theatre space was not available at the time). This is a matter of concern and implies that intrapartum care may have been suboptimal. Our audit did not include details about intrapartum care, but failure to provide good-quality intrapartum care has been identified as a factor contributing to high perinatal and early neonatal death rates in South Africa.[17]

There were no serious maternal adverse incidents directly associated with IOL (Table 4). Fever, pyrexia and diarrhoea were not observed (files of patients who had fever before IOL were not included in the study), although Hofmeyr[5] reported that 30 - 40% of patients who undergo IOL with misoprostol experience these side-effects. In our practice the side-effect of shivering may not be recorded, or patients may not take it seriously enough to report it. Furthermore, these side-effects may be dose related and are probably more frequent with high doses of misoprostol.[18]

Conclusion

Induction of labour requires adequate fetal monitoring and persistent vigilance on the part of those caring for the woman in labour.

Despite its limitations, our retrospective audit shows that methods for IOL currently used at our rural study site are associated with acceptable maternal and fetal outcomes, in keeping with a report from an urban setting in South Africa.[2]

1. Chigbu CO, Ezeome IV, Okezie AO, Oyefara B. Induction of labor on request in a resource-poor setting. Int J Gynecol Obstet 2007;98(3):208-211. [http://dx.doi.org/10.106/j.ijgo.2007.03.022]
2. Mbele AM, Makin JD, Pattinson, RC. Can the outcome of induction of labour with oral misoprostol be predicted? S Afr Med J 2007;97(4):289-292.
3. Hofmeyr GJ, Alfirevic Z. Misoprostol for labour induction with a live fetus. Int J Gynecol Obstet 2007;99(1):194-197. [http://dx.doi.org/10.1016/j.ijgo.2007.09.011]
4. Christensen FC, Rayburn WF, Curet LB. Increasing rates of labor induction. Obstet Gynecol 2001;97(4 Suppl 1):S34. [http//dx.doi.org/10.1016/s0029-7844(01)01220-0]
5. Hofmeyr GJ. Induction of labour with an unfavourable cervix. Best Pract Res Clin Obstet Gynaecol 2003;17(5):777-794. [http://dx.doi.org/10.1016/S152-6934(03)00037-3]
6. Dude M. Uthungulu health district. Department of Health, Province of KwaZulu-Natal. http://www.kznhealth.gov.za/uthungulu.htm (accessed 15 November 2012).
7. Gebhardt S. Standardised maternal guideline for induction of labour with misoprostol. South African Journal of Obstetrics and Gynaecology 2008;14(1):43-47.
8. Rouse E, Hauth J. Criteria for failed labor induction: Prospective evaluation of a standardized protocol. Obstet Gynecol 2000;96(5):671-677. [http://dx.doi.org/10.1016/S0029-7844(00)01010-3]
9. Tajik P, van der Tuuk K, Koopmans CM, et al. Should cervical favourability play a role in the decision for labour induction in gestational hypertension or mild pre-eclampsia at term? An exploratory analysis of the HYPITAT trial. BJOG 2012;119(9):1123-1130. [http//dx.doi.org/1010.1111/j.1471-0528.2012.0.3405.x]
10. Koopmans CM, Bijlenga D, Groen H, et al. Induction of labor versus expectant monitoring for gestational hypertension or mild preeclampsia after 36 weeks of gestation (HYPITAT): A multicenter, open-label randomized controlled trial. Obstet Anesth Digest 2010;30(3):170-171. [http//dx.doi.org/10.1111/j.147-0528.2011.03138.X]
11. Stock S, Ferguuson E, Duffy A. Outcomes of elective induction of labour compared with expectant management: A population based study. BMJ 2012:344.e2838. [http://dx.doi.org/10.1136/bmj.e2838]
12. Goldberg AB, Wing DA. Induction of labor: The misoprostol controversy. J Midwifery Womens Health 2003;48(4):244-248. [http//dx.doi.org/10.1016/S1526-9523(03)00087-4]h
13. Jindal P, Avasthi K, Kaur M. A comparison of vaginal vs. oral misoprostol for induction of labor – double blind randomized trial. Journal of Obstetrics and Gynecology of India 2011;61(5):538-542. [http//dx.doi.org/10.1007/s13224-011-008-0]
14. Barbar KIA, Malik A, Shiekh L. Factors associated with failed induction of labour in a secondary care hospital. J Pak Med Assoc 2012;62(1):6-10.
15. Summers L. Methods of cervical ripening and labor induction. J Nurse Midwifery 1997;42(2):71-85.
16. Jozwiak M, Bloemenkamp K, Kelly A, Mol B, Irion O, Boulvain M. Mechanical methods for induction of labour. Cochrane Database Syst Rev 2012;3:CD001233. [http//dx.doi.org/10.1002/14651858.CD001233.pub2]
17. Buchmann E, Pattinson R, Nyathikazi N. Intrapartum-related birth asphyxia in South Africa – lessons from the first national perinatal care survey. S Afr Med J 2004;92(11):1-143.
18. Elati A, Weeks AD. The use of misoprostol in obstetrics and gynaecology. BJOG 2009;116(Suppl s1):61-69. [http://dx.doi.org/10.1111/j.1471-0528.2009.02329.x]