Chapter - 2

Review of Literature

2.1 Introduction

The present study has collected the literatures through various electronic and print sources and presented those in following sequence.

- Literature related to incidence of induction of labour
- Literature related to indications of induction
- Literature related to methods applied for induction on maternal and neonatal outcomes
- Literature related to effects of induction
- Literature related to success rate of induction, causes of c-section and predictors of failed induction
- Literature related to maternal experience of control during labour

2.2 Incidence of Induction of labor

The overall frequency of induction has been raised more than doubled over 20 years in US. More over the early term inductions have been quadrupled between 37th and 38th week of gestation. The reason is not known but it may be due to the relaxed attitudes of physicians toward elective inductions, woman’s choice, prevention of foetal hazards by expectant management of term and post term pregnancies and availability of inducing drugs.64
The World Health Organization in its global survey on maternal and perinatal health found that all around the world there is increase in number of pregnant women who are undergoing induction of labour for a safe delivery of baby. The rate has increased up to 25% in developed countries. But in developing countries, it has been recorded that the rates is low, except in few settings where the rate is too high. 65

Though there is a steady increase in the rate of induction nearly doubled over 2 decades but it has fallen slightly in 2011, and again in 2012. This sudden changes in pre term induction, particularly at 35–38 weeks, may be due trends in obstetrics practice to avoid risks of pre term delivery and associated morbidity and mortality among newborns. 66, 67

The induction of labour is rising steadily since 20 years. The latest rise was in 2010 with 23.8% and then decreased to 23.7% in 2011 and to 23.3% in 2012. There was trends of induction in early gestational age group of 36, 37 and 38 weeks of gestation. But the scenario has changed and rate of early induction has declined for all maternal ages from 2006 to 2012 ranging from to 5% to 48%. Now the delivery below 39 weeks is declined to 12% and birth at or more than 39 weeks has increased to 9%. 68

The rate of induction is higher (47.6%) among nulliparous than multipara (41.0%). The aim is to achieve vaginal delivery. The incidence are more in elder age and higher BMI. The medical and obstetrical complications cause 90% of preterm inductions. At term about one-third of nulliparas are induced while among multiparous it is about 50%. 69

The WHO Global Survey dataset after analyzing the delivery data throughout 16 countries of Africa and Asia, a varying rate was observed across the different region of the country. The overall rate in Africa was 4.4%. Among African countries, the Nigeria had the rate of 1.4% and Algeria with 6.8%. The average rate in Asia was 12.1% and with lowest in
Cambodia (2.5%) to highest in Sri Lanka (35.5%). Japan accounted for rate of 19.0%. The data from National Center for Health Statistics, US from 1991-2006 shows the pre term induction has been raised from 2.0% to 8.0% during this period. It was highest for non-Hispanic white women and later it was rapidly increased among non-Hispanic white women.

The induction of labour like other obstetrical procedure becoming popular day by day. It is observed that during 2004 to 2005, one fifth of the labour was an induced labour in UK and the reason being medical. The most of the inductions were successful without further interventions. When the rate was compared among the Asian and Latin American countries it was found that in Niger the rate is the lowest (1.4%) and in Sri Lanka it was the highest (35.5%). Whereas the rate in Egypt in 2008 was found lowest (9.3%) of all deliveries.

The important obstetric issue and concern over the decade is the sudden rise of induction rate in UK and it has reached up to 32.3%. The major factors identified were social factors like the date of delivery, maternal preference and the family choices. The clinical factors similarly were policy of the institution, physician preference and changing trends of labour room intervention.

The 2010 National Vital Statistics data of US taken from Certificates for Live Births, showed 140% hike in the incidence rate of induction of labor that is 9.5% in 1990 to 22.8% in 2007 for all kinds of births due to one or the other reason. The rate which was 9% in 1989, became doubled in 2002 with a rate of 20.6%.

In the United States the rate of labor induction is rising faster due to higher demand of labour inducing agent for elective induction. The prostaglandins in its different preparations and doses are found effective for cervical ripening and uterine contraction, for which the use is inadvertently increasing and induction rate was found to be 7.2%.
There is an all-time high of 22 percent in the increase of induction between 1990 and 2005. Such rise indicates the trends towards acceptance of induction may be due to maternal preference or it is foetal interest. The elective induction many times are done for many reasons like maternal request, own convenience, physician preference, but the benefit must be weighed against the hazards if it is decided.  

The study conducted by POPPHI project shows that there is concerns regarding the inappropriate use of uterotonics for one or other reasons that is induction and augmentation where the National induction rates in developed countries was found as USA 22.3% (2005), Canada 22% (2001), Sweden 33.2% (2002), Australia 36.7% (2006), France 25% (1995) Scotland 24% (2004), New Zealand 20.4% (2004), UK 20.2% (2006), Wales 19.1% (2004) and Netherland 15% (2002).

The common purpose of induction was foetal death in earlier time. But over recent years the trends has been changed. Now about 20% of the deliveries are conducted with induction as initial procedure. The nature of indication and methods also has been changed from herbal product to pharmacological preparation. The major concern for an induction are the adverse effect, the failure rate and maternal satisfaction.

2.3 Reviews related to Indications of Induction

All the pregnancies should be continued up to term for the maternal and foetal interest. When the risk arises before term the induction of labour is specifically advised by comparing the benefit out of this and the risk associated with this. The induction is a standard requirement for pregnancy-induced hypertension, post dated pregnancy which accounts for 80% cases of induction and less with foetal problems.
Many clinicians suggest for induction of labour, when the risk is more by waiting for spontaneous labour than shorting the duration by artificially inducing the labour and saving the mother and baby. This problem usually arise in case of fetal growth restriction, hypertensive disorders, medical complications like diabetes, PROM, post dates, IUD, ante partum hemorrhage and twin pregnancy.\textsuperscript{7}

Studies shows that the effectiveness is accurately not proven why induction is advised for many women, but the conditions that necessitates labour induction include pre-eclampsia or eclampsia, placental abruption, foetal death or non-reassuring status, chorioamnionitis and a post dated pregnancy. These women are induced for labour with a hope that they and their babies will be benefitted by this procedure.\textsuperscript{77}

Recent studies show that higher perinatal morbidity and mortality is associated with continuation of pregnancy beyond term, as well as an increased risk to the mother and new born babies. Post dated pregnancy accounting for more than 80\% of all inductions and is the most common indication among others. Besides this other indications are the pregnancy induced hypertensions and pre labour rupture of membrane.\textsuperscript{74} But in another study the frequent reasons for induction found in most of the setting are elective induction and premature rupture of membranes.\textsuperscript{78,79}

The practice of induction of labour in rural set up shows the inductions are for compromised foetus (3.4\%), patient convenience (3.4\%), gestational diabetes (10\%), suspected macrosomia (15\%), prolonged pregnancy (18\%) and 34\% were for undocumented reasons.\textsuperscript{53}

By a search strategy between 1980 and April 2008 through MEDLINE and the Cochrane Library using various induction related terms, about 1387 abstracts and 418 full text articles pertaining to induction were reviewed. There were good evidences for indications of induction
which were found as common indications are post-dated pregnancy and PROM. The indications those were not common were GDM, multiple pregnancy, oligohydramnios, heart disease, fetal macrosomia, fetal gastroschisis and cholestasis of pregnancy. 

In 2000 in Washington about 4541 medical and other statistical records were reviewed for live, singleton births. It was observed that nearly about 7.9% of inductions had no apparent cause and 6.4% had nonstandard indications. In the United States there is sharp increase in induction of labour from 20 to 34% annually. It was found from the medical record and hospital discharge data that the induction was done in 7.9% of women without any clear clinical information.

The induction by oral misoprostol showed the major indications which were significantly present were PIH(45%), postdated pregnancy (22.1%) and PROM (20.6%). The other indications found were eclampsia, IUGR, GDM, ante partum hemorrhage, Poor obstetric history, Non-reassuring CTG, chorioamnionitis and decreased fetal movements.

Whether the induction is by misoprostol or oxytocin, the common reason for the induction is post-term pregnancy. This accounts for 70.2% of total indications. Others were Gestational hypertension, Oligohydramnios, Intrauterine growth restriction, Rh-negative mother, Cholestasis of pregnancy, Polyhydramnios, other maternal indications, and foetal indications.

It is recommended that the labor should be induced for a reasonable cause like poor labor progress, foetal interest and maternal problems. Many factors are taken into account like maternal and fetal conditions like Bishop Score, gestational period and other factors. The possible indications were placenta preavia, PIH, gestational diabetes, foetal distress, oligohydramnios, Rh incompatibility, eclampsia, PROM, Post dates and fetal growth restriction.
There are certain situations where conditions do not allow to continue the pregnancy like any genuine medical reason where mother and baby remain in danger. There are also other reasons besides the medical indications where induction of labour is done or preferred in early gestation like social popular days or dates that suits care givers, hospital and family convenience, mother doesn't want to wait more, physicians' availability, fear of big baby and operative interferance.  

The common indications found in many RCT studies are uncomplicated pregnancies (37-42 weeks gestation), postdates, twins, IUGR, gestational diabetes, mild pregnancy-induced hypertension, oligohydramnios, suspected macrosomia, and women with high-risk for caesarean section.  

Common indications for inducing labor include post datism, hypertensive disorders of pregnancy, chorioamnionitis, maternal medical problems including diabetes mellitus and chronic renal disease and suspected foetal jeopardy. But it is contraindicated when vaginal delivery is not indicated for maternal or foetal interest. The major indications since 40 years for labour induction have remained as maternal, fetal, institutional and social, or a combination of these such as prolonged pregnancy, hypertensive disorder, Placenta abruption, polyhydramnios, GDM, foetal growth restriction, isoimmunisation, and macrosomic baby.  

Among common indices for a labour induction, the major factors were Post date Pregnancy, Hypertension, Diabetes Mellitus, Intrauterine growth restriction, Psychological, PROM, IUD, Oligohydramnios, Congenital Malformation and others. There are many possible indications for labor induction. The common indications among them are hypertensive disorder of pregnancy (including pre eclampsia, and eclampsia), diabetes, PROM, foetal growth retardation and post term pregnancy.
The induction of labour is not always advised as it is associated with maternal and foetal adverse effect. When mother is at real risk or it is observed that the continuation of pregnancy is not possible like in post dated pregnancy, gestational diabetes, PIH, Rh incompatibility, pre-labour rupture of membranes, IUD, IUGR, Chorioamnionitis, history of precipitate labour, then induction is recommended.91

In some other study, it was observed that the common indications the author cited as twin pregnancy, oligohydramnios, insulin-dependent diabetes, and cholestasis, heart disease of mother, foetal gastroschisis and macrosomia.31 The common causes for which the induction was carried out in US were post dates pregnancies and hypertensive disorder of pregnancy and in few cases the pre labour rupture of membrane.92

As common indication for induction of labour, the pregnancy at term was induced for post dates (50.8%). The other indications often required are hypertensive disorders (16%), PROM (8.4%), false labour (8.4%), decreased foetal movement (7%), Rhesus negative (5%), Prolonged latent phase (3%) and other maternal and foetal indications.33

Among nulliparous women with singleton pregnancy, when induction was done at term the common indications for induction were post dates (39.9%), PROM (13.5%), gestational hypertension (12.6%), gestational diabetes, psychological, cholestatis and other foetal indications like oligohydramnios, IUGR, fetal distress and congenital anomalies.93

A prospective observational study was conducted to know the outcomes of induction by dinoprostone in few cases and others by misoprostol. The induction was done for the reasons like Post date (44.5%), PROM (19.6%), PPROM (1.7%), PIH (12%), Oligohydraminos (11.5%), Decreased FM (3.8%), Obstetric cholestasis (2.04%), GDM (1.79%), Prolonged LSOL (1.02%), IUFD (1.02%), Polyhydramnios (0.51%), and Heart disease (0.25%).34
A retrospective study was conducted over 4-months at the labour ward of the University College Hospital, Ibadan, Nigeria. One hundred and four cases of induction of labour were reviewed. Most of the inductions were done due to pre-labour rupture of membranes (26%) and post-dated pregnancies (25%). Other indications were IUD (18.3%), hypertensive disorders (13.5%), IUGR (3.8%), diabetes mellitus (2.9%) and others (2.9%).

Another similar retrospective study was conducted in Ogoja, Nigeria, for complicated and uncomplicated pregnancies over 9 years. During this period total 13,130 numbers of deliveries were managed in hospitals. The main indications for induction were Postdates (45.8%), PROM (31.9%), IUFD (12.4%), Pre eclampsia (4.7%), Preterm PROM (3.7%), Eclampsia (0.7%), IUGR (0.4%) and Gestational DM (0.4%).

2.4 Reviews related to Methods of Induction

An ideal method of induction should be the agent or procedure which is safe, to use in terms of maternal and foetal outcomes, cheap and easily available with no additional pain and effective in resulting successful delivery. The frequently used agents are oxytocin and prostaglandins (PGE₁ and PGE₂) Dinoprostone (PGE₂). These are quite effective to change unfavorable cervix to favorable one.

Some recommended methods for induction of labour are pharmacological methods like vaginal PGE₂ in the form of gel, tablet or controlled released pessary, Misoprostol, Mifepristone and surgical methods such as membrane sweeping. Also other non pharmacological methods prescribed are herbal preparations, castor oil, hot baths, acupuncture, enemas, homeopathy and sometimes sexual intercourse. Mechanical method includes balloon catheter or laminaria tents. Other methods are surgical interventions like amniotomy and/or with oxytocin. 10, 37, 76
Misoprostol available as a synthetic product made up of prostaglandin E1. It is reasonably cheap. Above all its’ oral administration is quite effective in cervical ripening and labour induction with higher maternal satisfaction. But due to lack of large number of evidences the result is not highly acceptable.\textsuperscript{96} Misoprostol (Cytotec) is also a labour inducing agent is safe and an effective cervical dilator. The vaginal misoprostol is more effective in bringing vaginal delivery within 24 hours than oxytocin or dinoprostone with decreased rate of cesarean delivery.\textsuperscript{97,98,99,101,102,103}

Misoprostol, dinoprostone and similar group of drugs which act on cervical muscles to dilate effectively and uterine muscles to contract are quite effective and safe drugs for inducing labour in term pregnancy with or without favourable cervix.\textsuperscript{104} Many studies by clinical trials found misoprostol as effective cervical dilator with several advantages like its stability at room temperature, less cost, easy availability, storage and can be administered in any route (oral, vaginal, sublingual or buccal). It is an alternative to prostaglandin E2 which is difficult to obtain for its expensive nature, lack of availability and institutional problems.\textsuperscript{105}

Many studies reveal that the prostaglandin and its group of drugs when used for ripening of cervix in case of favorable or unfavorable cervix, was effective in bringing cervical favorability and with good progress of labour by successful vaginal delivery within 24 hours. Also it is known that the Vaginal Misoprostol is comparatively safe and effective for cervical ripening, but it should be used where there is provision of monitoring techniques and adequate staffing for close observation and vigilance.\textsuperscript{106,107,108,109}

The misoprostol alone or with oxytocin proved as effective for achieving vaginal delivery. This drug has demonstrated better maternal and foetal outcomes with lowered risk of tachysystole, hyper stimulation, when compared with oxytocin, it reduced the need of oxytocin
augmentation and with better labour outcome by more vaginal delivery and reduced rate of caesarean section. 17, 40, 89, 97, 110, 111, 112, 113, 115, 116

Misoprostol is widely used by both oral and vaginal routes for labour induction at or near term. Various RCT studies have proved that it brings successful labour with reduced rate of caesarean section except in case of abnormal fetal heart rate. Even the Use of small dosages reduces the adverse outcomes. 12, 117 As center recommends the prostaglandin in the form of vaginal preparation (gel, tablet or pessary) is widely used for induction of labour. But it should be used cautiously for its association with uterine hyper stimulation. 10

The intra vaginal misoprostol like intra cervical dinoprostone is not only effective for cervical ripening but also brings successful vaginal delivery. The cost of misoprostol is much less than that of dinoprostone. It is easily available without requirement of storage in refrigerator. 88, 118

Oral misoprostol, a recommended drug for induction in any form that may be oral or sublingual is effective even in case of PROM in primi mothers with a satisfactory result of having more vaginal delivery without any failed induction and significant foeto maternal complications. 17

The administration of both vaginal and oral misoprostol was compared for vaginal delivery in case of intra-uterine fetal death (IUFD). The study finding showed that the induction to delivery time was shorter in vaginal misoprostol (13.5 + 8.3 hours) group compared to oral misoprostol (21.4 + 13.9 hours; p< 0.05), with additional requirement for oxytocin. Overall result was good in both the group without failed labour. But vaginal misoprostol had higher rate of successful induction with significantly less side effects. 119
2.5 Reviews related to effect of induction on maternal & neonatal outcome

Induction of labour has been an everyday practice in labour room. A systematic review and meta-analysis was done to investigate the risk of cesarean delivery associated with induction than with expectant management. It was observed that the rate of cesarean delivery was decreased in induction group compared to expectant management. Also a reduced rate of NICU admission and foetal death was found with better perinatal outcomes.\textsuperscript{120}

Meta-analysis of many RCTs on induction versus expectant management derived that this procedure is associated with decreased rate of caesarean section in cases of intact membrane, postdates, oligohydramnios and others. Maternal and neonatal outcomes are not differed significantly, rather a significant reduction was evident in perinatal death was observed in the induction group.\textsuperscript{86}

About 3,722 relevant articles were identified including nine RCTs which compared the effect of expectant management with elective induction of labor. The result showed 22 percent higher odds of cesarean delivery with expectant delivery. It was observed that meconium-stained amniotic fluid was present more in women those were expectantly managed than the electively induced group.\textsuperscript{121}

In a comparative study between balloon catheters and prostaglandin in case of unfavorable cervix, the rate of c-section was found similar in both the groups. The time duration between induction to delivery was longer in balloon group than the PGE\textsubscript{2} (median 24.5 vs. 23.8 hours). But both the groups demonstrated poor cord blood gas parametre. The cervical ripening with pain was significantly less in balloon catheter than PGE\textsubscript{2}.\textsuperscript{122} Some time it was observed that the induction of labour in case of post dates, prolonged rupture of membrane at term and
pregnancy induced hypertension yield more positive outcomes by reducing caesarean rate in compared to expectant management.\textsuperscript{123, 124}

Oral misoprostol when used for induction resulted in successful vaginal delivery within 24 hours (52.4\%) and caesarean section in 42.1\% cases. Only 25.6\% of women the uterine hyper stimulation was present with foetal heart rate changes. The predicting factors for unsuccessful outcomes were primi gravidity, unfavorable cervix and intact membranes.\textsuperscript{82, 125}

Many studies found, than the elective induction, the expectant management is associated with 22\% higher risk than the elective induction, mostly the rate of cesarean section and meconium aspiration.\textsuperscript{121} While in another study, the elective induction in a cohort of low risk women showed that the procedure was associated with higher rate of cesarean delivery and increased hospital costs.\textsuperscript{126}

When labour was managed expectantly beyond term, meconium staining liquor was a major problem that arouse during labour compared to induction of labour. But induction beyond term brings reduced perinatal mortality rates and both the procedures had similar rate of cesarean delivery and neonatal morbidities.\textsuperscript{127}

Induction of labour with PGE\textsubscript{2} was quite effective in term pregnancy with 83.2\% vaginal delivery irrespective of cervical status and parity. The duration of labour was within 12 hours in 50\% of women. The CS rate was 16.8\% with few (5.3\%) cases of failed induction. The maternal and fetal complications were not commonly seen.\textsuperscript{128}

Misoprostol is a potent cervical ripening agent which increases the success rate of induction by vaginal delivery. But when lower dose is used it usually associated with reduced
need for oxytocin acceleration. Also it required less epidural analgesia. There was decreased rate of uterine hyper stimulation and NICU admissions. 117

Misoprostol and oxytocin both increased the rate of vaginal delivery less than 12 hours. Mostly misoprostol was safe and not associated with any increase in risk of hyper stimulation, tachysystole or hyper tonus in comparison with oxytocin and had similar risks for adverse neonatal and maternal outcomes. 110

Though recent trials confirm that misoprostol is highly effective and reduced overall rate of caesarean sections still there is concern regarding rising rates of uterine hyper stimulation, meconium-stained fluid, and risk of PPH and rarely of uterine rupture. But the perinatal outcomes were reassuring. Very large trials can confirm the rare adverse outcomes. 129

Women using misoprostol orally are more likely to give birth vaginally within 24 hours, required less oxytocin and have a lower caesarean section, but there is an increased rate of meconium-stained liquor. However, the Apgar score was low among few babies born but the meconeum stained liquor was observed in many cases. 17

When misoprostol was compared with oxytocin induction the duration of delivery was labour shorter in misoprostol group than oxytocin. Very few patients had caesarean section in both the group. Labor induction was successful in 100% women in the misoprostol group compared with 70.59% patients in the oxytocin group. 106, 130

The prostaglandin is effective in ripening the cervix and superior to the placebo in inducing labour. The mean induction to delivery time also reduced (15.6 h vs. 43.2 h). There was reduced need for use of oxytocin. But the delivery outcome was similar like Apgar scores and mode of delivery. 131 Vaginal misoprostol is quite effective in reducing the need for oxytocin
augmentation, the risk of caesarean section and also it shorten the induction to delivery interval. Same time it was evident that it increased the NICU admissions so require further investigation to rule out neonatal safety.\textsuperscript{132, 133} Vaginal prostaglandin PGE\textsubscript{2} increases cervical favorability with successful induction by increasing rate of vaginal delivery within 24 hours. It reduces the risk of oxytocin augmentation, hyper stimulation, with foetal heart rate varablity.\textsuperscript{107}

When Misoprostol is used vaginally, it is more safe and effective for ripening cervix in 3rd Trimester. It brings reduced the incidence of caesarean section with more vaginal delivery. Foetal outcomes were good without any adverse effect, with few cases of contraction abnormality, PPH, NICU admission and Neonatal deaths without any observation of rupture uterus. It may be used in a setting where extensive monitoring techniques are not available but it is mandatory to have a close and vigilant observation.\textsuperscript{108}

Misoprostol both in vaginal and oral route proved to be a safe and effective drug to use for induction of labour by shortening the duration of labour. The vaginal route is more superior as compared to the oral route. But it associated with hyper stimulation, tachysystole and NICU admission mainly for respiratory distress syndrome.\textsuperscript{112}

Misoprostol either in oral administration or in intra vaginal application for labor induction is associated with less frequent abnormal uterine contractility and without any hyper stimulation in either group. The median induction to labour interval remains within 16 hours. The oxytocin augmentation requirement is less and there is reduced rate of cesarean section and analgesic requirement with better neonatal outcomes are observed.\textsuperscript{134}

The titrated oral misoprostol is related to decreased rate of uterine hyper stimulation and cesarean delivery with few cases of new born with low Apgar scores but with more incidence of nausea than vaginal misoprostol which is related to hyper stimulation.\textsuperscript{113, 135}
The misoprostol or dinoprostone both are effective and safe with vaginal delivery and reduced rate of cesarean section. It is often associated with uterine hyper stimulation and thick meconium. 118,116

Titrated oral misoprostol used for augmentation of labour with or without oxytocin neither reported any maternal mortality or morbidity nor fetal/neonatal mortality except few fetal/neonatal morbidity. There was no evidence of epidural analgesia, instrumental birth and maternal blood transfusion. The rates of caesarean section and uterine hyper stimulation also were very less except hyper stimulation in few cases where higher doses were administered without any occurrences of hyper tonus uterus. 40,136 Vaginal misoprostol is safe, brings cervical favorability with successful induction by increasing rate of vaginal delivery within 24 hours reduced need for oxytocin augmentation in parous women.48,88

Misoprostol when used in cases of PROM at term shortened the delivery time in women and reduced the need for oxytocin. The vaginal group resulted in few (15.5%) cases of cesarean section compared to oral group (20.2%). The uterine hyper stimulation rate was 28% in vaginal group compared to 37.5% in oral misoprostol. Though misoprostol is an effective method for labour induction but may be associated with high incidence of uterine hyper stimulation and possibly uterine rupture. 111,137

The induction of labour whether done by misoprostol or oxytocin there is no significant differences among the outcomes neither in induction-delivery interval nor in Apgar score and perinatal mortality rate. Primary postpartum hemorrhage is a frequent complaint among oxytocin group rather in misoprostol group. But cases of nausea and vomiting and ruptured uterus more found in misoprostol group without any case of maternal mortality in either group. 79
In contrary when many trials between misoprostol and oxytocin were compared, the outcomes like severe maternal morbidity and mortality, adverse foetal/neonatal outcomes found in almost no cases in both the group except foetal/neonatal morbidity in few cases. No cases reported maternal satisfaction in both the drugs. There was slight reduction in the median duration of labour in one trial in oxytocin group. The risk of caesarean section and the uterine hyper stimulation was similar in both the groups but with lower rate of tachysystole in oral misoprostol group. 40

The clinical trial between vaginal misoprostol and the oral misoprostol clearly identifies the induction to delivery interval which was shorter with vaginal misoprostol compared to oral misoprostol (p< 0.05). Oral misoprostol required more oxytocin augmentation than vaginal group (p< 0.05). No case of failed labour was reported. Minor side effects like raised temperature, diarrhea, nausea and vomiting were more common with oral misopristol. But vaginal misoprostol was associated with more vaginal delivery. 138 For a labor induction the use of common pharmacological agent many times brings with higher rate of uterine tachysystole, foetal distress, and cesarean birth for foetal indication. 139,140

Effect of planned induction in women with PIH or mild preeclampsia at term in comparison to expectant delivery was investigated among women with cervix score > 6 and possibly induced with intra cervical or intravaginal prostaglandin and amniotomy and when required augmented with oxytocin. It was believed that the maternal complications were prevented by induction of labour, but same time it enhances the risk of caesarean and instrumental delivery and for the purpose of intention to treat analysis the prevention of severe maternal and neonatal complications are considered as significant features. 141
The labour induction is associated with instrumental delivery, cesarean birth labor problems like fever, CTG abnormality, use of an epidural, shoulder dystocia, admission to the NICU, jaundice, increased length of hospital stay need for more medical interventions like an IV line and continuous electronic fetal heart rate monitoring with intense contraction that is longer than natural contractions, psychological disadvantage like upset for not giving birth by natural contraction.\textsuperscript{142}

In most the induction procedure the feature that makes all worried is uterine hyperstimulation and it again aggravated by use of oxytocic agent. The effect of hyper stimulation on fetus can’t be unrecognized. None of the induction is free from fetal hazards though it ripens the cervix for a successful delivery.\textsuperscript{76}

Compared to other inducing agents, misoprostol is associated with increased duration of labour, uterine hyperstimulation, foetal distress, cord prolapsed, and instrumental delivery but other priority outcomes remain unchanged.\textsuperscript{143} Oral or vaginal misoprostol both are associated with uterine contraction abnormalities, meconium stained liquor, foetal distress and caesarean delivery. But recent meta-analysis indicated that misoprostol reduces the caesarean section rate compared to controls group. Also the misoprostol in its’ low-dose is very effective for cervical ripening when selectively used.\textsuperscript{99}

A Population-based case-control study of low-risk women with PPH with labor induction by oxytocin or prostaglandins for standard or non-standard indications were analyzed. The findings indicated that a 20 % higher risk of PPH is associated with the Induction of labor regardless of the method of induction used. It is therefore recommended to screen all the mothers for developing PPH.\textsuperscript{89}
The maternal and perinatal outcomes in women with induction with oxytocin for failed
dilation in latent phase are chorioamnionitis, endometritis and uterine tetany as maternal adverse
outcomes without increase in neonatal morbidity. The induction process involve many side
effects and minor problems such as discomfort, nausea, hyper stimulation of uterus and fetal
distress, rupture of membrane, c-section, PPH, intoxication and neonatal jaundice.

The systematic reviews found most frequently occurring out comes after induction with
oxytocin are caesarean section, longer duration of labour, increased uterine activity, need for
analgesia, post partum blood loss, low Apgar, higher NICU admission, perinatal mortality and
morbidity, and women's experiences during labour. The rate of cesarean section is about 20%
among nulliparous women those undergone induction beyond 40 weeks and 40% in nulliparous
women with elective induction in compared to women with spontaneous labor.

Compared to oxytocin, the oral misoprostol is associated with hyper stimulation and
tachysystole, and sometime both. As secondary outcomes, durations of labor and presence of non
reassuring fetal heart rate and mode of deliver also differed between the groups. Oxytocin group
had very few adverse fetal and maternal outcomes. Compared to spontaneous labor, the induction of labour among women
at term resulted in more caesarean section compared to expectant management with higher rate
of meconeum aspiration syndrome.

Induction by cervical ripening and with oxytocin caused 23% of intrathecal use for pain
relief, 7% were c-section, 9% cases with laceration, slightly higher Apgar than spontaneous
labor, 2% cases of shoulder dystocia, 1% case with post partum bleeding, 1% case admitted in
NICU. Induced patients had a 79.4% intrathecal usage rate compared to 46.5% used by
spontaneous laboring patient.
Women with induced labor were compared with women by spontaneous labor and it was observed that the incidence of cesarean delivery is higher in induction group and again it is common in nulliparous rather multiparous women. Umbilical cord blood gas parameters remained unaffected and also the apgar score when the labour was induced augmented by oxytocin.

The Cochrane review for comparing expectant management with labor induction at 41 weeks through many RCT studies found a higher rate of cesarean delivery without significant reduction in perinatal mortality rates in expectant group. The NICU admissions, meconium aspiration and Apgar scores are not found significantly different among the groups.

Misoprostol is effective in case of poor cervical score with intact membranes at term. In spite of good dilatation the misoprostol results in higher incidence of cesarean delivery, tachysystole and hyper stimulation, but a decreased need for oxytocin use with increased meconium stained liquor.

Misoprostol and dinoprostone both required oxytocin augmentation of labor. 20.3% misoprostol-treated patients and 27.7% dinoprostone-treated patients undergone abdominal delivery. Other effects like uterine tachysystole and thick meconium passage also observed in similar frequency in the both the groups. Induction of labour is associated with perineal lacerations, increased uterotonic use, more use of anesthesia/analgesia requirements, lower Apgar scores during labour, hysterectomy, ICU & NICU admission, longer hospital stays, and delayed commencement of breastfeeding.
2.6 Reviews related to success rate of induction, causes of c-section and predictors of failed induction

Many studies revealed that the prostaglandin and its group of drugs when used for ripening of cervix in case of favorable or un-favorable cervix, was effective in bringing cervical favorability, good progress of labor with a successful vaginal delivery within 24 hours.154

The rate of cesarean section was lowered by induction is reported in many research studies. The misoprostol with it’s’ nature to dilate the cervix makes it favorable for progress of labour. The rate of successful vaginal delivery after induction was 70%, 73.5%, 78.9% and 89.1%.155, 156, 157,108

The induction of labour in cases of pregnancies beyond term results in higher rate of successful vaginal delivery (68%) than the cesarean rate (32%). The rate of success was increased with increasing parity. The primigravida had success rate of 55% compared to 84% in multiparous women. The CS rate in the induction group was higher than the spontaneous group both in nulliparous women (25.3% vs. 8.6%, P<0.001) and multiparous women (3.8% vs. 0.3%, P=0.002). 133,159,160

A retrospective case-control study was conducted between 1995 and 2010 among parous women for term singleton pregnancies. Only 3% women had cesarean delivery. The major predictors were history of preterm delivery, short maternal height and dilatation at the start of induction.41

The induction of labour by prostaglandins with oxytocin acceleration and artificial rupture of membranes in post term pregnancies brought success rate of 68%. The higher success rate (85.2%) was associated with Bishop scores ≥ 6 versus lower rate (60.4%) in lower Bishop
score. Other determining factors were multiparty and birth weight of baby [weight less than 4000 grams had higher rates of vaginal deliveries (72.8%) compared to higher weight (6.7%)].

A prospective longitudinal study was conducted among women at or beyond term with induced labour and compared with women in spontaneous labour. The success rate was 69.7% and the induction delivery interval was within 18 hrs in 61.3% of women and failed induction in 31.3% cases.

Induction of labour with misoprostol and oxytocin beyond 37 weeks of gestation showed the mean labour hour of 6.6 hr in oxytocin group compared to 13.6 hours in misoprostol group. The success rate in misoprostol was 71.1% compared to 66% in oxytocin group. Other complications were occurred in similar way.

The nulliparous women when induced, about 29.4% of women underwent cesarean delivery. The greater risk factors those were influenced the study were higher maternal age, shorter height, higher gestational week, initial cervical dilation <3 cm, greater BMI, excess weight gain and medical complications. It was recommended that the women should be counseled accordingly for modifying high risk factors.

A retrospective study was performed among women those were induced and compared with women in spontaneous labour for identifying the rate of cesarean section. It was found that the CS rate was higher in induced group than the spontaneous group (17.3% vs. 5.3%, P<0.001) both in nulliparous and multiparous women. The associated factors for this higher rate were maternal age, parity, Bishop Scores and body mass index.

The rate of induction by misoprostol is high even in a very poor health resource area. But the failure rate (24.1%) after induction was less than the success rate (75.9 %). The induction-
delivery interval was within 18 hours. The causes of failure were cephalopelvic disproportion, fetal distress, cord prolapsed and prolonged labor.²⁵

The induction of labour in patients with PROM around term pregnancy by prostaglandin E₂ gel with an unfavorable cervix resulted in initiation of labour (85%) after single application. Few of them required 2nd dose of drug and some required oxytocin acceleration. The mean induction to delivery interval was 11.5 hours. Only 7.5% of women had c-section, otherwise it was safe and effective.¹⁶²

At University College Hospital, Nigeria, a retrospective study was conducted among women who had induction of labour beyond term revealed that 44.2% of women had successful delivery within 24 hours and 36.5% had failed induction. The success of induction was determined by higher parity, late gestational week and induction by use of misoprostol.⁹⁴

Another similar retrospective study was conducted in Aga Khan Hospital on women with induction of labour. About 25% of nulliparous women had failed induction and 18% of women had cesarean delivery. The influencing variables for failed Induction were nulliparity, gestational age, poor Bishop Score, bad obstetric history and prolonged latent phase, macrosomia, and PROM.¹⁶²

The induction at term and post-term with oxytocin in laboring women resulted in higher rate of failed induction. There was need for higher use of oxytocin till achieving vaginal delivery (55.0 ± 29.8 to 89.7± 11.6 miu/min) or ending with failed induction (21.4%). To minimize this higher use it is necessary to ripen the cervix by other methods. The predictors of failed induction were primi gravidity, cervical scores that determined the success of labour.¹⁶³
The elective induction of labour at 41 weeks of gestational age among nulliparous women with unfavorable cervix was done by combinations of inducing agents as per ACOG guidelines. The overall successful rate of induction was 51.32%. The determining factors that predicted success of induction were younger age, lower BMI and lower maternal weight. Other factors that were associated with induction were methods of induction by cervical balloon and oxytocin.164

About 157 eligible RCTs on comparison of labour induction with placebo or expectant management among women with a viable singleton pregnancy were studied, which revealed the risk of cesarean delivery rate of 12% among induced group which was lower than the expectant management group[CI] 0.84–0.93; I² = 0%). The effect was seen mostly in term and post-term gestations. Neither cervical score nor method of induction or indications of induction were the predictors of successful induction.120

To determine the predictors a prospective cross-sectional study on 271 full-term pregnant women was conducted. The induction was ended with vaginal delivery in about 78.9 percent of women. The appropriate index for prediction of successful induction was cervical dilatation, the higher parity and gestational age.157

A retrospective cohort study was conducted over a one-year period to examine the risk of cesarean delivery following labor induction and relationship between indication for induction and mode of delivery. The cesarean rate was 17.1%. The fetal indications were found associated with risk of cesarean delivery. The another factor was post term pregnancy that had association with cesarean section.166

The induction of labour among nulliparous women at term with uncomplicated pregnancies was compared with spontaneous labour in Victoria from 2000–2005. The induction
ended with higher rate of cesarean section than those delivered spontaneously. The associated factors for risk of cesarean rate were methods of induction and augmentation of labour.\textsuperscript{167}

A cross sectional study on 294 women used multivariable logistic regression analysis to identify the possible association of all variables with failure and the result showed that the nulliparity, higher maternal age and gestational age, cervical score, post dates, bad obstetric history, and PROM had positive association with failed induction of labor.\textsuperscript{168} Many studies identified that the bishop score is a significant determinant for predicting success of induction of labour either in term or post term pregnancies regardless of membrane status.\textsuperscript{139, 169,170,171}

Whereas some others viewed that not only cervical status but also the parity plays a important role in predicting the success.\textsuperscript{172, 173} Many other studies reported that along with cervical score the drug dose also have influence in determining the success rate in any drug induced induction.\textsuperscript{174,175,176,177}

When dinoprostone used for a successful labour induction, gravidity was the predicting factor for failed induction and also the parity played as independent predictor of vaginal delivery, whereas Bishop Score & birth weight had no association with success of induction by vaginal delivery. The major indications for cesarean section were arrest of cervical dilation, patient request, repetitive late or severe variable fetal heart rate decelerations, arrest of fetal descent & meconium-stained amniotic fluid.\textsuperscript{179}

\section*{2.7 Maternal experiences of control during labour}

“Women should have equitable access to optimal, comprehensive health care . . . women should have the information they need to make choices about their health . . . the Society has a
responsibility to facilitate change in relation to health system issues affecting the practice of obstetrics and gynecology”. 179

Positive experiences during labour and birth of a baby with healthy outcomes are core issues and memorable event for women admitted in labour room. Negative experience is always measured in terms of adverse physical outcomes and most of the time clinicians focus on such outcomes to reduce their incidence and thereby improving care for mothers and infants. 180

Women and families expect higher care from health care professionals which based on their value system and culture. As they are different in many aspect, their need and expectation should be understood and respected. Individualized care based on their need, preferences, and expectations will help the midwives in delivering quality care and empowering the women.51

Several factors decide a woman’s attitudes toward their birth experience after delivery which includes the personal involvement in decision making, control over situation, social support and efficacy of pain control. 181, 182 Perinatal nurses have an opportunity to influence a caring environment in which women feel connected to their nurse and in control of their labor and birth. Tailoring nursing care to meet the needs of each mother, especially women who are experiencing things they had not expected in labor or during birth, may be the key ingredient to ensure optimal birthing experiences. 183

The woman’s birth experience whether positive and negative, rather than individuals is more related to experiences of choice and control. The either factor that affects the experience is technological environment and interventions done for the birth of the baby. Women supported with midwives led care and consultation before making birth-related decisions had better experience of control over birth processes. 184
The birthing experiences greatly depend on choice and control of women. The birth of a child is a valuable and critical period for a mother. The health and wellness of the entire family depends on the health and well-being of a mother and child at birth. 185

Hodnett ED explained about four factors that greatly influence childbirth experiences of mother and those are personal expectations, support from relatives or care givers, care giver-patient relationship and its quality and involvement in decision making and these factors supersede over other influencing variables like age, ethnicity, pain, immobility, the birth environment, socioeconomic status, medical interventions, preparation for childbirth and continuity of care. 224

The significance of childbirth outcome is equally important as the woman experiences during pregnancy and childbirth, for mother’s well-being which strengthen the mother and child relationship and her future child bearing experiences. 187

The woman has two ways: internal and external, to control her birth experiences. The woman’s control over not only the physical, but also the emotional, and psychological aspects of childbirth is very important. The internal control includes the expressions of pain and external control including various kinds of information, support system, choice making, involvement in intervention and explanation of procedure. Where there is lack of control, the childbirth experience is negative and when the internal and external control is good, there is a positive experience. 181

Women undergone labour induction had less positive birth experience and they were frightened that the induction procedure may damage their baby during birth which was differed as per length of pregnancy. The study clearly indicates that labour induction affects the level of women’s experiences of birth. 1, 188 The major part of control over situation is the information
regarding the intervention, medication, support system, choices, and risk association and benefits out of this and the alternative options. These should be provided beforehand by the care provider in advance and through various sources.  

Maternal satisfaction include good maternal and neonatal outcome, availability of supportive facilities, good relationship with team care provider, and mothers’ physical, psychological and social ability to receive care and interpersonal and technical aspect of care are considered as matter of concern for mother satisfaction toward health care services rather her health status. The factors greatly influence her satisfactions are the courtesy and tender care provided by midwifery.  

Active management sometime affects the level of satisfaction with care. Frequent vaginal examinations and one-to-one midwifery care are sometime significantly influence the maternal satisfaction. If the woman is cared properly during active stage of labour, it won’t adversely affect women’s satisfaction.  

As the rate of elective induction is rising with the issues related to this over human rights, the ACOG (2009) specifically recommended informing the women about the risk and benefit associated with this, counseling women why the intervention is done, what agent will be used and other complications may arise during labour. Again if she is a nulliparous woman then, she must be informed that she has two fold increased risk of cesarean delivery. The various satisfaction measurement tool for measuring intrapartal care by Intrapartal-Specific Quality from the Patient’s Perspective questionnaire, Six Simple Questions or Perceptions of Care Adjective Checklist, the Labour and Delivery Satisfaction Index is recommended.  

A psychometric tool can be developed which is well designed for the measurement of maternal perceptions of the childbirth experience including control in childbirth is required, to
enable more meaningful analysis. For this, a 10-items labour gentry scale was used for UK population for the first time. Which was as reliable as valid measure of control in childbirth? But must be examined before use in women with different ethnic and cultural background.194

Application of Childbirth Experience Questionnaire (CEQ) one month postpartum on four domains: Professional support, Own capacity, Participation and Perceived safety in early oxytocin augmentation for slow labour progress cases showed that worse childbirth experiences are mostly related to operative births with one third woman experiencing negative and depressing mood from the childbirth process, than in cases of expectant management.191

Various scales are used to measure the level of satisfaction and control during childbirth to measure women's satisfaction with labor and delivery and one out of that is Mackey Childbirth Satisfaction Rating Scale with good reliability and construct validity by analyzing fulfillment of expectations and preferences regarding pain management and the relationship between satisfactions with the experience. The scale measured the satisfaction with the experience of childbirth and that shows satisfaction is higher among women whose expectations were met and among those who accessed the pain relief.195

Mother perceives her experience of childbirth negatively or positively was evaluated by a 27-item Childbirth Perception Questionnaire and a 24-item scale: Childbirth Experience Perception Scale with three subscales: Labour and Delivery Perception, Change Perception and Control Perception among Italian women. Both scale were valid and reliable to measure different women's health for childbirth experience and clinical outcomes.23

To measure perceived control and maternal satisfaction with childbirth, instruments were prepared like Perceived Control in Childbirth Scale and Satisfaction with Childbirth Scale. The instrument shows perceived control is related to childbirth self-efficacy and childbirth
satisfaction. Results support and confirm the validity and reliability of these scales that assessed the perceived control and global satisfaction with childbirth. 196

When the overall views and expectations of the first time mothers during birth were collected using two valid and reliable questionnaires: the Expectations of Childbirth Experience questionnaire and the Expectations of Nursing Support, the most of the primigravida mothers expressed a negative experience and narrated it to be frightening, difficult, very long, and painful. This impression shows poor labour preparation, midwifery support and counseling to mother. 63

Nine Swedish women were interviewed using transcribed verbatim who had intense fear for her negative experiences during last childbirth and they were analyzed with a reflective life-world approach and the study presented a poor picture of woman’s expectation and experience as stressed, neglected, uncared, unsupported and painful for lack of concern and support from midwifery. A trusted relationship with caring model will help them to come out from such traumatic situation with positive and healthy experience. 56

A scale was developed to measure maternal satisfaction about child birth and experiences in labour and soon after labour. Two versions of this scale as: the Scale for Measuring Maternal Satisfaction-caesarean birth and the Scale for Measuring Maternal Satisfaction-normal birth with 10 subscales: 'perception of health professionals', 'comforting', 'respect for privacy', 'meeting expectations', 'nursing/midwifery care in labour', 'information and involvement in decision making' 'hospital room', 'postpartum care', 'meeting baby', 'hospital facilities', and both scales found suitable with good internal reliability and convergent validity. This scale can be used for different aspects of care, maternal expectation, the quality of care and developments in maternity services. 197
A woman with labour experience is often very different from expectations. Women who are informed and educated in advance, they get a realistic expectations and less likely to feel a failure rather with more confidence, which in turn can lead to more a positive experience. Women may have many hopes of what things are going to happen, but they need to given the picture of what might actually happen.  

Support in from relatives and midwives lead to increased levels of control and considered as the primary factor for feeling in control of behavior. Level of pain enhances the level of control.  

Perceived control reflects a mother’s belief that she was able to actively influence the childbirth situation in a way that enhances her sense of urgency and reduces stress. It is not necessary that the support and presence of medical intervention are related to higher level of perceived control. Women managed by medical model of childbirth by choosing interventions to initiate the labour, monitor the progress and pain of labor have more influence to control the situation and achieve a high level of personal control.  

Labour induced by misoprostol (cytotec) has an equal impact on women in terms of their perceptions, satisfaction, expectations and control of situation as like in a spontaneous labour.  

The labour agentry scale measures perceived control during childbirth that is a woman’s sense of mastery over internal and environmental forces. This control is linked to be a key component of birth satisfaction. The Labour Agentry Scale in its short version to measure the Sense of control during labour in post partum period in home and hospital setting found significantly no differences in feelings of control among women. Rather it was observed, the transfer of care during labour have secured score for feelings of control. Low risk women may be encouraged for their labour in their own set up as there is no difference in expected sense of control between home and hospital birth.
Over past few years there has been constant demands for the improvement of maternity services as mothers expect everything to go as per their plan during their birth period. A comprehensive approach can enhance women’s’ sense of satisfaction with their childbearing experience. Many aspects like the environment, complementary therapy and support counted when it is said about maternal experience and control during birth. Any kind of interference or intervention during delivery may affect women’s’ experience of birth with physical and emotional injury. The institutional rigid and non evidence based policy of such intervention may lead some women to seek other options.

The labour is successful not only when a baby is born, but also it relies on quality of maternity services that identifies and resolve the psychological and emotional need along with physical safety. With busy work schedule and technological environments the woman experiences fear of labour and that aggravated by support less system and lack of control over situation. Midwives can understand their expectation and assist them in achieving a positive birth experience.

Womans’ experience of achieving positive and negative expectation greatly vary by the demographic variable like parity and others are support system, midwifery care, counseling provision of health information, delivery of a healthy baby, interventions during birth, painful delivery, advocacy by midwives, involvement in decision making, feelings of control and choices. As women’s experience, expectation and choices changes over time and situation the factors essential to be considered are: acknowledging their needs and wants, exploring and addressing to their expectation, good insight into current child birth expectation, strong advocacy, protecting their emotional component, supporting them, being flexible as per their wishes in conditions that permits expression of feelings to fulfill desired issues.
The experience of mother during an induction of labour is distressing, changing their views from positive expectation from natural child birth to negative perspectives. It is therefore recommended that there should be improvement in the provision of care and delivering individualized information in order to promote informed decision-making and providing a woman-focused environment of care for a positive induction experiences. 206

The review of literature highlighted the incidence of induction which varied from country to country and study to study. Among various indications cited by various investigators, the most common indication was post dates followed by PROM, hypertensive disorders, oligohydramnious and other foetal indications and preference of physician and mother. In most of the studies better outcomes were found after induction, as compared to adverse outcomes in some studies. The maternal experience during induced labour has been discussed by many researchers to emphasize the caring and supporting aspect during labour so as to enhance their satisfaction. All the studies have tried to highlight either the advantages of induced labour or the demerits of having an induction and they have recommended to prefer spontaneous labour.