Chapter - 5

Discussion, Major Findings, Summary, Conclusion, Limitation, Nursing Implication and Recommendation

This chapter attempts to discuss the findings of the study after analysis with appropriate interpretation with relation to other studies. The chapter discussed the finding in comparison with other studies. The sections under which the study findings discussed are:

Section – A: Maternal demographic and obstetric characteristics.

Section – B: Indications of induction of labour.

Section – C: Maternal and neonatal outcomes.

Section – D: Influence of maternal co variables on primary out come

Section – E: Comparison of maternal and neonatal outcomes within base line variables

Section – F: Binary logistic regression analysis to identify the independent predictors

Section – G: Maternal experience and control

5.1 Major Findings

• The incidence rate of induction was found 12.46% in this hospital.

• Misoprostol was the common drug used by all of the obstetricians in vaginal route with dose of 25µgm.

• The most common age groups were 20-25 years (48.77 %) and 25-30 (38.94 %) years.

• Majority of women (74.21 %) were primi gravida.
• The maximum (70.70 %) numbers of women were in the gestational week of 40-42.

• Most (66.66%) of the women required one dose of misoprostol.

• About half (50.53 %) of women had good cervical dilatation from 4-8 cm.

• More than half (58.08%) of women had normal BMI.

• For few (34.21%) women there was requirement of oxytocin acceleration.

• The common cause of failure were failed induction (19.47 %) and non progress of labour (10.52%).

• Almost half (46.67 %) of women were induced for post dated pregnancy.

• Few women were suffered from vomiting (16.84 %), uterine tachy systole (04.38%), and uterine hyper stimulation (19.12%).

• Most of the women (58.24%) had induction to delivery interval within 12 hours.

• Only few (24.21 %) women had failed induction due to no dilatation or contraction even after misoprostol administration.

• Also few (10.17 %) women had non progress of labour.

• Very few (26.49%) newborn had Apgar score <7 at 5mins.

• Only 12.45% of women had meconium stained liquor.

• Very few (07.36%) newborns were admitted in NICU.

• The mode of delivery was differed among women due to their gravid status, doses of misoprostol administered and the state of cervical dilatation.
• The incidence of nausea and vomiting was due to number of doses of misoprostol and various indications of induction.

• Similarly the tachysystole was significantly influenced by the age and the action of oxytocin.

• The presence of uterine hyper stimulation was significantly influenced by age, BMI and oxytocin acceleration.

• The induction to delivery time was associated with number of doses, gestational week and cervical dilatation.

• The failed induction was found to be significantly influenced by number of doses of misoprostol, cervical dilatation and labour acceleration by oxytocin.

• Similarly the progress of labour was influenced by cervical dilatation and oxytocin acceleration.

• The Apgar score of newborn at 5 minute is not significantly varied by any factors except having correlation with cervical dilatation

• The presence of meconium in liquor was not significantly different among any of the variables

• The NICU admission of the newborn babies was mostly influenced by doses of misoprostol administration.

• The regression analysis showed the predicting factors for successful delivery were gravidity and cervical dilatation and for nausea and vomiting the factor was number of doses.
• The predictor of uterine tachysystole was the age of women and for uterine hyperstimulation, the oxytocin acceleration.

• The factors predicted induction to delivery time were cervical dilatation, gestational age and number of doses of misoprostol.

• Among neonatal outcomes the predicting factors for Apgar score was cervical dilatation and for NICU admission the drug doses.

• The overall maternal experience and control over situation was fair.

• Mothers viewed the sense of relaxation in greater differences but the feelings of being supported were uniform.

• Though they had good experience but they had less control over the situation; due to technological environment with low confidence.

5.2 Discussion

Discussion regarding maternal demographic and obstetric characteristics in relation to other studies

The study discussed the statistical findings based on the questionnaire. The induction of labour is a common procedure in labour room despite many controversies. The misoprostol is a common drug that is used in this setting mostly in vaginal route. Many other studies found prostaglandin as common method of induction.32,228

The incidence rate of induction in this hospital was found 12.46% as found from 3 years labour room data from the year 2013-2015 including all methods of induction. Some investigator found labour induction rate of 12.7% 94 whereas others found it up to 17.3% 168 and 23.2% 26.
From the study of Osaheni LL, the hospital delivery rate found was 40.3% of all obstetric patients with induction rate of 11.1%. Bukola F viewed that induction accounts for 6.3% of deliveries in Nigeria. Similarly Lydon-Rochelle MT and GV Guerra found the prevalence of induced labour as 11.4% which is lower than the developed countries, which is around 20%. Olav-Andre Klefstad et al observed an increase rate of induced labour from 38% to 65% and simultaneously the rate of caesarean section which was increased from 11.5% to 13.8% from one period of study to another with short interval. The overall induction rate as reported by Rebecca Dekker according to different age group was 23.6% (women age 25 to 29), 21.7% (age 30 to 34), 20.7% (age 35 to 39), 21.8% (age 40 to 44), and 20.7% (45 and older). M B Susan also reported labor induction rates of 16.15% among nulliparous women compared to 14.55% for multiparous women.

The study findings reveal that compared to other age groups the most (48.77%) common age groups were 20-25 years and least (2.10%) were in age group of below 20 years. Similarly Folasade A B and Oriyomi O A found 31% of women in the age group of 20-29 years. Dr Rashida. Admani reported 30% of age group within 20-24 years and 46% in the group of 25-29 years. Karen Wou found the mean maternal age of 32.1 ± 5.6 years. Masan J E similarly reported that, 65.5% of women with age group of <30 years. M. Chirwa recorded 25% of subjects were in age group of 20-24 years and 26.8% in the age group of 25-29 years. The mean age in this study was 25.39, compared to 28.2 as reported by Kristine E. Barber. Masomeh reported mean age of women 27.6±5.1 and B Beuno as 29.36.

The gravida status shows, most (74.21%) of the women were primigravida and few (25.79%) were multi gravida. Folasade A Bello and Oriyomi O Akinyotu also reported 49% of primi parous in their study. Masan J E reported 47.6% of subjects with nulliparity and 52.4%
M. Chirwa found 37.8% with nulliparity and 62.2% with multi parity. Vidyadhar B. B. found 66% women with primi para status. Isabel D N reported 43.7% of nulli para and 56.3% with multi para. The gravidity was 1.7±0.8 as found in the study of Masomeh Rezaie, whereas B Beuno recorded the mean parity as 0.30.

Gestational age of 37 to <39 weeks was observed in few (14.56%) subjects and 14.74% of women were in the gestational age group of 39 to 40 weeks and most (70.70%) of them were of 40 weeks and post dated. Whereas M. Chirwa reported 30.7% subjects in 37 to 39 weeks and 20.5% in 40 weeks and more. Mean gestational week in this study was 39.86±1.28 as compared to 39.5 documented by Nancy J. V and 40.30 by B Beuno et al.

Most (66.66%) of the women required one dose and few (27.19%) required two doses and in very few (6.07%) cases three and more doses were required. Likewise Kristine E. Barber revealed 42.4% subjects induced with one dose of cytotech. Similarly Isabel D N found majority (71%) of cases treated with misoprostol required a single administration of the medication and after which the obstetrician Judged for failed induction or poor progress or it ended with vaginal delivery. The study of Masomeh Rezaie showed 63.3% of women required increasing doses in vaginal misoprostol group while Jayaprakash reported one dose was required for 27.5% of women.

Depending on the rate of uterine contraction, the labour was accelerated in some cases by oxytocin. Less than half (34.21%) of women had weak contraction and they were accelerated by oxytocin. Abbasi claimed only 12% of women required Oxytocin. Similarly Adeniji OA clarified that the oxytocin acceleration was required in few of conditions. Sheela Jayaprakash in his study revealed that 25% of women required augmentation with oxytocin.
The cervical dilatation was below 4 cm in 29.65% of women and 4 to 8 cm in 50.53% of women and rest had more than that after administration of 1st dose of drug. Dr Rashida Admani found 83.7% with cervical ripening after vaginal administration of misoprostol. Petersen. Zeteroglu and Manisha M.L also reported very good improvement in cervical score within 24-48 hours after mifepristone administration. Dr. M. Chirwa reported contradicting findings that about 60% of women who had not undergone caesarean, they had also unfavorable cervix. Cervical ripeness was more advanced in the misoprostol as revealed by Jesper Friis.

Majority (58.08%) of mothers had normal BMI during pregnancy. Nancy J. Vanasche revealed, 38% subjects were overweight and 77% women had normal weight during pregnancy. Simillar result was found by Jesper Friis where 28.3% were normal weight. The mean BMI in Masomeh Rezaie study was 29.1±3.8.

The major reasons for cesarean section were foetal distress, failed induction, non progress of labour and meconium stained liquor. Dr Rashida Admani found the reasons for cesarean as failed (52%), foetal distress (23%) and CPD (18%). Ezechi reported the reasons for failed induction with misoprostol to include cephalopelvic disproportion, fetal distress, prolong labor, and ante partum hemorrhage. Similarly Kavita Soni found failed induction, fetal distress, on progress of labor and undiagnosed CPD, apposition as the major reasons for failure. Osaheni L L also described about Fetal distress, Prolonged labor, Cephalopelvic disproportion as reasons for cesarean section. From the study of B Bueno et al it is understood that the major reasons for cesarean delivery was induction failure (34%), non-reassuring fetal monitoring (28.9%) pelvic disproportion (17%), failure to progress (14.9%).
5.3 Discussion regarding indications of induction of labour in relation to other studies

The most (46.66%) common cause of induction was post dates and pre labour rupture of membrane. Dean Leduc and Jarson Gardosi and Lamichhane S et al, all recorded post dates as highest indication for induction of labour.\textsuperscript{12,34,244} Ekele BA viewed the main indications for induction of labor as prolonged pregnancy and hypertensive diseases of pregnancy whereas E Mozurkewich reported both post dated and PROM are the common indications for induction with high quality evidence from various studies, whereas oligo hydramnios was found with moderate evidence.\textsuperscript{31,245} Abdul MA and Guerra reported post dates and term PROM as common indications.\textsuperscript{79,214} The NICE guidelines and ACOG recommended that the induction of labor should be commonly indicated for prevention of prolonged pregnancy, pre-labor rupture of membranes after 34 weeks, intrauterine foetal death, placental abruption, chorioamnionitis and hypertensive disorders. Folasade AB and Oriyomi OA also recorded 25% indication for post dates and 26% for premature rupture of labour.\textsuperscript{94} Similarly Luis Sanchez-Ramos observed 80% of indications for Post term pregnancies and rest for pregnancy induced hypertension and PROM.\textsuperscript{172} Osaheni L L found the major indication as Postdates (45.8%),term PROM (31.9%), pre eclampsia (4.7%) and preterm PROM( 3.7%).\textsuperscript{62,35} Virginija and Guerra found post dates as frequent indication for induction.\textsuperscript{78,228}

5.4 Discussion on Maternal outcomes in relation to other studies

Nausea and vomiting were not significantly (16.84%) present among the subjects. Krisztina Bajzak reported 8.6% cases with vomiting after misoprostol administration.\textsuperscript{246} Similarly Nancy J. V at same time recorded 12.9% of nausea and vomiting with induction.\textsuperscript{239}
Most of them also experienced abdominal cramp with diarrheas. Vogel JP also reported low rate of nausea, vomiting, pyrexia after misoprostol administration. 

Uterine tachysystole is a frequent complaint in misoprostol administration. This study found the occurrence of tachysystole in 12.98% cases. Aqueela Ayaz et al also found this complication among 23% of subjects of oral misoprostol and 14% in intravaginal misoprostol. Anne D. Walling documented 48.6% tachy systole in vaginal misoprostol tablet and 30.7% in vaginal misoprostol gel and 22.2% in oral misoprostol tablet.

The hyper stimulation was also documented in a few (18.94%) cases. Simillar symptom was appeared in 14% of cases in the study of Maria Isabel. Anne D walling documented 76% hyper stimulation in vaginal misoprostol tablet. Vogel J.P clarified that misoprostol is not associated with any higher rate of hyper stimulation. Crane JM et al observed the similar uterine activity with induced labor. Rebecca Allen and Maslow found increased uterine stimulation with fetal heart rate changes among women receiving misoprostol than in oxytocin group. A A Calder reported incidence of 6% hyper stimulation after misoprostol administration.

The induction to delivery length was below 12 hours in most (58.24%) of the women and between 12-24 hours in some (36.84%) of the women and more than 24 hours in very few women. Sheela Jayaprakash reported mean interval between prostaglandin application and delivery was 11.5 hours. Whereas Isabel D N found the mean induction-delivery interval of 15.37 hours with SD = 1.94 hours for the entire group. Rayamajhi RT found the interval between induction to delivery >24 hours in 42.6% of women and 48.2% were still in the latent phase while they were taken for c-section. F A Bello et al reported that the misoprostol
resulted with higher rate of vaginal delivery with mean duration of 12.0 ± 6.6 hours. Osaheni Lucky Lawani observed the induction to delivery interval was extended up to 12± 3.6 hours. About 24.21% of women had failed induction but in most of the cases it was successful but due to one or other causes, more than half of them had cesarean section. When misoprostol was used by Osaheni Lucky Lawani et al the success rate was 77.7%. NB Khan revealed that after induction of labour ,18 % of women had failed labour. From the study of Kavita Soni it is learnt that the failed induction was appeared in 31.1 % of women after application of all kinds of induction methods.

The progress of labour was good in 89.83% of cases, but may be due to meconeum, cervical and pelvic factors, many cases were failed and caesarean was planned. The titrated doses of misoprostol was quite effective in treating delay in progress of labour without serious maternal or neonatal adverse outcomes. The present study also found some cases of non progress of labour without any further dilatation or descent. Marieke A. A reported only 15.1% of cases those were failed to progress for a vaginal delivery, Similarly Kavita Soni in her study found 23.5 % cases of failure in progress of labour.

The major outcome or success of labour was determined by mode of delivery. The caesarean delivery rate was higher than the vaginal (58.94% vs. 41.05 %). Simillar outcome was found by Marroquin GA et al with cesarean rate of 48.7% and M bele et al with 42.1%. Rashida. Admani also found in his study the success rate of 50% with similar failure rate. Folasade AB and Oriyomi OA reported 36.5% of cesarean section after induction. Similarly Casey Danielson DO recorded 28.5% of c-section. Vahratian A and Kavita Soni reported 30% of c-section. Rayborn analyzed a systematic review of the literatures on the risks associated with elective induction and was surprised to see that high cesarean rate resulted
among nulliparas as the most undesired effect with an unfavorable cervix. Women those were induced had increased rate of cesarean section than those who delivered spontaneously. But other studies showed higher rate of vaginal delivery after induction than spontaneous delivery, while other study showed no significant difference in the rate.

5.5 Discussion on Foetal outcomes in relation with other studies

The Apgar score was below 7 at 5 mins in some of the newborns and most of them were managed in labour room by the pediatrician and midwives and others were shifted to NICU. In spite of meconium staining, most of the new burns had good respiration with prompt management and resuscitation. Alfirevic Z, reported low Apgar in fewer babies born after use of oral misoprostol. S. C. Blackwell, observed 1.1% of newborn with low apgar score at 5 minute. In Masomeh Rezaie study, the apgar score was 10±0 at 5 minute among vaginal misoprostol group.

With regard to meconium stained liquor, it was observed that only 12.45% of babies had this problems those women had poor progress of labour and other medical conditions. Crane J viewed that the meconium is a rising problem among misoprostol user. Dean Leduc also reported in similar way stating that it is a rising trend with misoprostol use and or with oxytocin. Wing DA et al also reported thick meconium passage after misoprostol and dinoprostone administration. Hofmeyr G viewed though vaginal misoprostol promised as a highly effective, inexpensive and convenient agent, still it is associated with meconium stained liquor. Wennerholm UB from various clinical trial confided that elective induction resulted in lower rate of meconium aspiration syndrome even in post term pregnancy. Aron B caught observed higher rate of meconium staining in expectant managed women than electively induced
women.\textsuperscript{121} Significantly fewer babies developed meconium aspiration syndrome as reported in the study of Gulmezoglu AM et al.\textsuperscript{150}

The NICU admission was observed for few of the neonates, otherwise most of the babies were stable. Though many newborns had low apgar and foetal distress but they were managed in labour room. Barbara L. recorded 1\% case that was admitted in NICU after induction.\textsuperscript{248} Blair G. D. reported 6.2\% of NICU admission after elective induction.\textsuperscript{253} Gulmezoglu AM et al. found no significant differences in the rate of NICU admission between induction and expectant delivery.\textsuperscript{150} James M. Nicholson also reported improved birth outcome by NICU admission of 6.6\% in induction group compared to 8.2\% in expectant group.\textsuperscript{253} Olav-Andre Klefstad reported no significant increase in other interventions or in adverse newborn outcomes though there is increase in induction rate.\textsuperscript{230} Similarly Alfirevic et al found the prostaglandin associated with reduced NICU admissions compared with placebo.\textsuperscript{17} Ekaterina Mishanina also observed decreased risk of fetal death and admission to neonatal intensive care unit after induction of labour.\textsuperscript{120} Gulmezoglu AM also presented data in support of reduced NICU admission in spite of post term induction.\textsuperscript{150}

5.6 Discussion on influence of covariable on primary outcome after induction

The women with age of 25-30 years had highest rate of cesarean section than other age group. The elder age group had fewer cesarean rate may be due to less sample size. The study is not supported by any other study rather contrasting result were found. Rashida.Admani reported the success rate of induction increased with increase of age.\textsuperscript{32} Rebecca Dekker observed increasing cesarean rates with age, as 29.5\% in age 25 to 29 years, 33.0\% in 30 to 34 years and
38.5% in 35 to 39 years and so on. Rayamajhi RT also noticed failure rate of 53.8% with advanced maternal age >30 years. Sandro Gerli also viewed that age is directly related to risk of cesarean section after a induction.\textsuperscript{256}

With regard to gravida and rate of cesarean section, it was observed that the rate was higher among primi gravida women than multi gravida women. The delivery was successful mostly among multipara women and failed among primigravida women. Dublin s reported increased cesarean delivery is associated with nulliparous status.\textsuperscript{151} N B Khan observed nulliparity is a factor for failed induction.\textsuperscript{162} Hye Ran Lee and Folasade AB viewed the success rate increases with increase in parity.\textsuperscript{94, 159} A A Calder reported little higher (28%) rate of cesarean section in nulliparous women than the vaginal delivery (11%) after induction of labour with misoprostol.\textsuperscript{249} Lisa D revealed that both the nulliparas (27%) and multi paras (13%) had an increased cesarean rate compared to spontaneous labor.\textsuperscript{257} Vrouenraets FP reported that there is an an increased risk of cesarean delivery among nulliparous women at term with elective induction of labour compared to spontaneous labour.\textsuperscript{139} Induction of labor is associated with an increased risk for emergency cesarean section compared to spontaneous delivery, in both the case of nullparous and multiparous women.\textsuperscript{258}

The rate of cesarean section and vaginal delivery across the gestational age shows the early and late gestational week of above 40 had higher risk of c-section than term gestation. The rate of vaginal delivery was higher in term gestation. Alicia Ault found the major risk associated with a failed induction at 39 weeks is cesarean delivery.\textsuperscript{259} Earlier gestational age was found to be a significant predictive factor for failed induction.\textsuperscript{260} Ekaterina Mishanina viewed that the effect of induction was significant in term and post-term gestations but not in preterm gestations.\textsuperscript{120} Caughey A found whether it is 37 or 39, there is no difference in cesarean section
but at 40 and 41 weeks of gestation the women had a lower risk of caesarean delivery.\textsuperscript{121} Similarly F A Bello observed higher gestational age resulting in fewer caesarean section.\textsuperscript{94} Hurissa BF revealed induction is a failure when the pregnancy is greater for gestation.\textsuperscript{168} women undergoing induction of labor at 39 weeks without an acute obstetric medical indication were more likely to deliver vaginally than those managed expectantly.\textsuperscript{173,261} Whereas Megan Margulies reported lower rates of stillbirth, Caesarean delivery and maternal and neonatal morbidities for elective induction at 39 weeks.\textsuperscript{262}

The success of labour with vaginal delivery was dependent on cervical dilatation. With good cervical dilatation the rate of vagina delivery was higher than in case of poor dilatation. W Girma, Cristina Teixeira, S.K Laughon, Shahnaz Ahmadi, Ehrenthal DB and Dean Leduc highlighted that induction of labour among women with poor cervix dilatation is associated with higher rate of Caesarean section.\textsuperscript{12,163,154,69,157,176} Similarly Deborah A Wing revealed that the successful vaginal delivery is associated with history of prior vaginal delivery and favorable cervix.\textsuperscript{5} Rashida. Admani viewed 85\% of vaginal delivery with dilatation more than 6 cm.\textsuperscript{32} Casey Danielsen DO also stressed that a Bisop score of more than 7 should be considered before induction for a successful induction.\textsuperscript{169} Bodner A B also concluded that poor bishop score before induction resulted with higher rates of cesarean section and vacuum extraction.\textsuperscript{263} Selo-Ojeme DO viewed that regardless of membrane status, the CS rates was high in unfavorable cervix after induction of labour.\textsuperscript{15} Vrouenraets, Pevnzer L, Glantz JC. Found increased rate of failed induction and CS with women those were induced with an unfavorable cervix.\textsuperscript{139,175,19}

With regard to dose of drug, it was observed that in spite of increasing dose the rate of cesarean delivery was high and the dose increment had no influence on success of induction. Kambhampati Komala et al found no significant increase in number of vaginal delivery with
increasing doses. Timothy W. Kundodyiwa et al in their systematic review found few researchers reporting about slower labors even after using higher doses of vaginal misoprostol while others reported that high doses of oral or vaginal misoprostol are quite effective at achieving vaginal delivery. The lower doses of misoprostol were associated with more requirement of oxytocin augmentation compared to higher doses.

It was observed that the oxytocin acceleration reduced the rate of cesarean section with improvement in success rate of induction. Osman Balci also showed additional administration of oxytocin for acceleration of labour was helpful in resulting more vaginal birth. But Morgan OF reported no changes in mode of delivery with oxytocin acceleration during intravaginal misoprostol for cervical ripening and labor induction in pregnancies at term.

In respect to BMI and mode of delivery it was found that the cesarean rate was higher among under nourished and over nourished women. Marroquin GA, Crane JM and Hye Ran Lee identified one of the predictors of failed induction as BMI. Pevzner L et al similarly revealed that the duration of labor, oxytocin requirements, and cesarean delivery rates are significantly higher with increasing body mass index in prostaglandin-induced women.

With respect to various indications it was found that the failure rate was high in oligohydramnious and postdates. Similarly the premature rupture of membrane and mild PIH had higher rate of vaginal delivery. Sandro Gerli observed that cesarean section risk is higher in prolonged pregnancy. Ambreen Naveed Haq et al viewed that the rate of cesarean section is not increased after induction among the women in 41 weeks. Shrem G et al discussed in their systematic review that due to oligohydramnios there is increase in cesarean section rates with labor induction. Similarly Allahyar Jazayeri et al reported in their review that when PROM is induced with prostaglandin the cesarean section and vaginal delivery resulted in similar way.
B Bueno reported cesarean section of 52.90% in post dated pregnancy 9.8% in PROM. I Park reported that the indications specially the foetal one has great impact on risk of cesarean delivery.

5.7 Discussion on comparing the outcomes among the baseline variables in relation to other studies

When the mode of delivery was compared by obstetrical variables, a few variables were found to have significant influence while others not. The most important parameter being Bishop score. The mode of delivery was varied from woman to woman due to their gravidity, number of doses of misoprostol administered on the state of cervical dilatation. Nicholson J et al reported that dinoprostone when used for labour induction, gravidity was the predicting factor for failed induction and parity played as independent predictor of vaginal delivery. Ewert K et al observed the higher dose resulting in more vaginal delivery. Wing DA revealed the dose enhancement did not significantly reduced the rate of cesarean section. Labour induced with poor cervical dilatation in nulliparous women has increased rate of cesarean delivery Rashida.Admani also reported parity and high pre induction score influencing the success of labour. The success of labour was also associated with oxytocin acceleration. Morgan reported the oxytocin shortened the induction to delivery hour without affecting mode of delivery. William A. G found older age associated with higher rate of cesarean section in induced women. Whereas Aron B Caughey et al and Shahnaz Ahmadi et al, revealed that the success of induction is associated with increased parity and favorable cervix, and decreased gestational age. But Ekaterina Mishanina viewed that the initial cervical score, indication and method of induction did not affect the primary outcome.
higher CS rate had strong association with higher age, nulliparity, BMI, and unfavorable Bishop scores.  

The presence of nausea and vomiting was related to number of doses of misoprostol and various indications of induction. Rebecca reviewed many studies and these showed a relationship of higher dose with side effects like nausea and vomiting and recommended to use safely the lowest dose to overcome this.  

The tachysystole was significantly influenced by the age and the action of oxytocin. Kunz M reported 41% of uterine tachysystole occurred with oxytocin administration. Ewert K reported the higher dose resulting more tachysystole.  

Similarly the presence of uterine hyper stimulation was significantly differed from woman to woman by age, BMI and oxytocin acceleration. Oxytocin increases the frequency, force, and duration of uterine contractions. Similarly Hofmeyr GJ and Gulmezoglu AM reported lower doses of misoprostol associated with higher need for oxytocin use with less uterine hyper stimulation compared to higher doses.  

The induction to delivery time was associated with number of doses, gestational week and cervical dilatation. In studies of Eroglu and Cecatti G it was found that the induction to delivery time was shorter with the higher doses, While Susana Pereira found that, cervical length is a significant independent predictors for induction-to-delivery interval.  

The failed induction was found to be significantly influenced by number of doses of misoprostol, cervical dilatation and labour acceleration by oxytocin. Susana Pereira and N Banos demonstrated that, cervical length is an independent predictors for successful delivery.
Hurissa BF et al. found the major predicting factors for failed induction are primiparity, advanced age, poor Bishop score, post term PROM and bad obstetric history.

Similarly the progress of labour was influenced by cervical dilatation and oxytocin acceleration. MC Tolcher also reported better progress of labour by good cervical dilatation.

5.8 Discussion on comparison of foetal outcomes among the baseline variables in relation to other studies

In this study it was found that the Apgar score of newborn at 5 minute is not significantly varied by any factors except having correlation with cervical dilatation. GV Guerra et al in their study found the association of low Apgar with induction of labour. Beebe L reported no association of elective induction with low 5-minute Apgar score or need for admission to a special care nursery. Vrouenraets FP et al also observed that there is no difference in Apgar scores between induction of labour and spontaneous labour. Sweta Sareen also found low apgar in few newborn after misoprostol administration.

In this study it was found that the meconium staining is not significantly varied by any factors except having correlation with cervical dilatation. But Ruth H O highlighted that the routine use of oxytocin in the intra partum period could be associated with meconium-stained liquor. Aaron B. Caughey also reported that the incidence of meconium-stained amniotic fluid is higher among women who were managed expectantly than the induction group.

The NICU admission of the newborn babies was mostly influenced by doses of misoprostol administration. While neither the age of women nor any other variables influenced the NICU admission. Sweta Sareen observed in their study, few cases reporting of NICU
admission after misoprostol. Jennifer L. B. et al, Kate F and Ekaterina Mishanina, also reported that the elective induction was associated with a lower risk of ventilator use and NICU admission than the spontaneous group.\textsuperscript{120, 282}

5.9 Discussion on independent predictors of labour outcomes in relation to other studies

Among the factors (gravida, number of doses and cervical dilatation) those were significantly related to successful delivery, only gravidity and cervical dilatation were found to be the independent factors responsible for success of labour. A M Mbele et al reported that for unsuccessful outcome of induction of labour, primi gravidity was the independent predictor,\textsuperscript{82} but other studies reported that not only parity, but the cervical status also predicts the success of induction.\textsuperscript{156, 172, 173, 260, 284, and 154}. In the study of Greenberg and Ecker it was found that the failure was mostly predicted by maternal age.\textsuperscript{285} Sometime it is also associated with higher parity and later gestational age.\textsuperscript{94, 260} Whereas Nuthalapaty FS and Weiss J L reported that the pre-pregnancy weight gain shall contribute to macrosomic babies and there by an increased risk of cesarean section.\textsuperscript{110, 286} From the study of Hurissa BF et al it was learnt that, a failed labour is associated with advanced age, primi parity, unfavorable bishop score, PROM and bad obstetric history. Many others found the age, height, weight gain, BMI, medical indications and bad obstetric history sometime predicts the success of induction.\textsuperscript{168} M C Tolcher, Crane JM, Hye Ran Lee found higher rate of cesarean section significantly associated with advanced maternal age, higher BMI, lower Bishop Scores and nulliparity.\textsuperscript{93, 109, 159}

The number of doses also found independently related to development of nausea and vomiting. Nithya J. and Reddi Rani P. found that the oral misoprostol results in higher rate of
nausea and vomiting, similarly U Manaktala observed, the lower dose mifepristone is safe and acceptable drug which associated with lower incidence of nausea and vomiting.\textsuperscript{161,238}

Similarly the predictor of uterine tachysystole was the age of women. But Bofill J.A. found no association of tachysystole with maternal and foetal outcomes. For uterine hyper stimulation, the oxytocin acceleration and induction to delivery time was influenced by cervical dilatation, gestational age and number of doses of misoprostol.\textsuperscript{145}

Among neonatal outcomes the predicting factor for Apgar score was cervical dilatation and NICU admission was predicted by drug doses. Hofmeyr GJ reported that, compared to higher doses the lower doses are associated with fewer NICU admissions.\textsuperscript{117}

5.10 Discussion on Maternal Experience and control during labour in relation to other studies

Maternal experience and control depends on the types of settings and care provided. The present study came out with a conclusion that no mothers had very poor control or experience during induction except few. This shows low experience of control over themselves and their environment which is supported by Ellen Hodnett.\textsuperscript{186} Shetty et al, viewed that, the sense of control is directly dependent on staff attitudes and how they share information with women and include them in decision-making.\textsuperscript{165} in this study, though induction was resulted in prolong labour but progress was good. With good progress in a induction the experience of the control over the situation is good as viewed by Alfirevic.\textsuperscript{16} Regarding control over the labour room situation like her freedom to express her feelings, mental freeness, flexibility in situation were viewed negatively. They got support but not as they expected like to listen them always, consoling them, assisting in changing position, providing back massage and clarifying doubts,
hence all did not receive this support equally. Fair CD commented that complications with labour and birth are associated with lower satisfaction. \(^{287}\)

Experience of control is an important factor for birth satisfaction with high level of confidence. The item ‘experienced it as success was scored highest that indicated labour induction was a successful experience by most of the women though many ended with cesarean section. This reveals the success is an overall experience by the mother though they had low confidence. Runa Heimstad also found the experience of women as positive with induction of labour. \(^{136}\) The least scored item in the tool was “everything seemed in my control”, that clarifies though mothers had good experience through successful labour but they had less control over the situation; due to technological environment. Callder also reported that active management did not affect the level of women’s satisfaction with labour or delivery. \(^{249}\) Women viewed the sense of relaxation in greater differences but the feelings of being supported were uniform. Bramadat found a decreased satisfaction with childbirth while comparing an induction group with a spontaneous delivery group. \(^\text{114}\) Hodnet ED & Osborn RW viewed the social support is among the key factors for control in childbirth. \(^\text{224}\) The women were isolated without social support by relatives as a policy measure which is strongly supported by Westfall RE. Whereas Green and Coupland reported that sometimes high expectations, if unfulfilled, may lead to decreased satisfaction. \(^\text{158}\) Fawcett, Pollio and Tully argued that women with unplanned cesarean deliveries have less positive perceptions of labour than those with vaginal deliveries. \(^\text{100}\) In contrary M. Nautila commented that women have no good responses towards induction of labour. \(^\text{75}\) Overall satisfaction scores for induction of labour is lower than the spontaneous labour due to pain, length of labour and other complications as cited by P. Salmon. \(^\text{85}\) The present study therefore recommends that with prior information and education the woman can have better
control over the situation. Her level of confidence depends on her choice, the clarification she has received and the counseling she undergone. The midwives need to stress importance on issue of self confidence and provision of comfort for improved maternal satisfaction.

5.11 Discussion on correlation of selected maternal baseline variables with level of experience of control over labour situation

The correlation showed the maternal age is not positively related to the level of experience of control over labour situation rather it was negatively related to the age of women. Kate F. viewed the level of satisfaction is not significantly different among the elder age with induction and spontaneous delivered group. Similarly gravida had a negative correlation with experience and control of women during induction of labour. But surprisingly it was found that the gestational week has a mild positive correlation with level of experience of control over the situation. The administration of oxytocin also did not demonstrate any significant difference in level of women’s’ experience of control over the labour situation. Bhaumik Shah viewed that the patients with misoprostol induction were more satisfied as compared to patients with oxytocin induction.

5.12 Outcome Model

The present study aimed at finding out the maternal outcomes in terms of physical, physiological and psychological component and neonatal physiological components after the intervention by induction. Based on the study findings a model was prepared. The model comprised of 3 components: input, through put and output, which is similar to Donabedian quality health outcome model. But here additional structures have been included according to the study recommendations. The input structure includes baseline data, indication of induction and
organizational policy and physician choices which greatly influence the incidence of induction and other outcomes. Above these maternal choices, information on induction and education are incorporated which were found missing in the study setting and that influenced the maternal outcomes in terms of experience and control. The throughput is the induction process. The output is shown as outcomes that were influenced by different factors. In order to achieve better outcomes the factors that are considered here are, labour monitoring, technological support and identification and management of complications. In other hand the midwifery support and counseling are equally important for a safe delivery with healthy mother and healthy baby.

Fig. 5.1 : Outcome model based on study findings

5.13 Summary

The present study was undertaken to evaluate the effect of induction of Labour by misoprostol on maternal and foeto-neonatal outcome. The objectives of the study were:
i. To identify the common indications of induction of labour.

ii. To determine the maternal and foetal outcomes after induction.

iii. To compare the outcomes among baseline variables.

iv. To identify the independent factors for failed induction and other outcomes.

v. To assess the level of maternal control and experience during induction of labour.

vi. To correlate selected factors with maternal experience and control.

vii. To identify the independent factors responsible for failed induction.

As this was an evaluative study the system outcome model was adopted as conceptual framework for this study. Related literature on induction of labour, elective induction & effect of misoprostol, maternal satisfaction after induction were searched from print and on-line sources.

The design adopted was cross-sectional observational design. Population of the study was all women with pregnancy from 37 weeks to 42 weeks and admitted in labour room in their 1st stage of labour. 570 samples were selected purposively from the labour room of IMS & SUM Hospital as per the selection criteria. The tool was developed after an extensive literature search and peer group discussion. The tool was validated from experts and finalized. The pilot study was carried out on 60 subjects. The reliability was ensured.

The tool was slightly modified according to methodological feasibility and requirement during pilot study. The main study was conducted for a complete two years. The eligible cases were selected conveniently for observation and record. The tool was administered before, during and after labour. The subjects with greater complication like IUGR, eclampsia, congenital
anomaly were not included in the study. The data were collected by observation, measurement and recording in the check list.

The analysis of data was done through SPSS package version 19. The maternal baseline and indication data were analyzed by percentage, mean and SD. The maternal and neonatal outcome data were presented in the form of percentage,’t’ test, chi square test and binary logistic analysis. The maternal control & experience were analyzed by factor analysis.

The majority of mothers were primigravida and in the gestational age of >39 weeks. One dose of misoprostol was required mostly and as per cervical status, foetal condition and progress of labour. The common indications for induction were post dates, oligohydramnios and pre labour rupture of membrane. oxytocin was used in few cases when required. About 50.53% of women had good cervical dilatation after the first dose of misoprostol but 24.21% of women had failed induction and 10.17 % had poor progress. For which 58.94% of women were underwent c-section. The intermediate pelvic factor like CPD and foetal factor like foetal distress which in spite of good dilatation resulted in cesarean section. The failed labour was mostly due to induction failure, non progress of labour, foetal distress, meconium staining. Among maternal outcomes the less frequent symptoms were nausea and vomiting, uterine tachysystole and uterine hyper stimulation. In most of women the induction to delivery length was below 12 hours as many ended with cesarean section and very few had the length > 24 hrs.

Similarly the Apgar score at 5 minute less than 7 was observed in few of newborns and also the meconium stained liquor. The NICU admission which was reported in many studies to be high after induction but this study did not find this in large number except in 7.36% of newborns. Most of the newborns were managed in labour room those had low apgar and foetal distress.
The type of delivery was significantly varied due to gravidity, number of doses, cervical dilatation and labour acceleration by oxytocin. Similarly the nausea and vomiting was related to number of doses of misoprostol and various indications of induction, tachysystole by age and the action of oxytocin, and the difference in the presence of uterine hyper stimulation was due to age, BMI and oxytocin acceleration. The induction to delivery time significantly differed by number of doses, gestational week and cervical dilatation. The failed induction was found to be significantly influenced by number of doses of misoprostol, cervical dilatation and labour acceleration by oxytocin. Similarly difference in progress of labour was due to cervical dilatation, labour accelerated by oxytocin and indication of induction. Among neonatal outcome the Apgar score difference was due to was cervical dilatation. The NICU admission was influenced by gestational week, number of doses and BMI status of women.

The binary logistic regression was done to predict influence of confounding variable. It was found that the prominent predictors of successful delivery were gravida and number of doses of misoprostol, for nausea and vomiting the number of doses, for uterine tachysystole the age of woman, for uterine hyper stimulation the use of oxytocin, for induction to delivery time it was cervical dilatation, gestational age and number of doses of misoprostol, for failed induction drug doses and cervical dilatation and for poor progress the cervical dilatation and use of oxytocin. Similarly the Apgar was predicted by cervical dilatation and the NICU admission by drug doses. The maternal satisfaction by their control over situation was not good with better experiences. Overall they felt the labour as successful. But as the mechanical and technological intervention was more, they had less confidence and control over the situation. Again progress was good or many were terminated after one dose with cesarean section and baby was good without NICU admission, so they were satisfied with the procedure. The painful contraction was only the bitter
experience for them but they were happy with the methodological intervention. It is recommended therefore the women should feel empowered during child birth in order to achieve a good control and experience of birth. The women are not prepared to face unexpected and unavoidable situations, and they are helpless to manage those in labour room. A supportive, attentive, understanding midwife who respect her expectation and empower her to control the situation with counseling and information can, lead to a positive child birth experience.

5.14 Conclusion

The study found misoprostol is an effective agent for cervical ripening, in term pregnancy with minimal hazards to mother and baby. Rate of caesarean section was not related to induction of labour. The length of labour was reduced by misoprostol. Though failure rate was higher than the success rate but babies were in better condition. It was understood that many factors played in-between to intervene the success rate. Overall foetal outcome was good with good birth weight and less NICU admissions and no one reported PPH, uterine rupture or cervical laceration except a few with laceration. Meconeum staining is a topic of concern that arouse frequently among the neonantes. Though many women realized that the procedure was a success for them but with little control over situation. Things were not up to their expectation, which should be taken care of by proper information and midwifery education. Mother had good experience and they considered their labour process was successful but they had low confidence and they were not highly comfortable.
5.15 Implication

5.15.1 Nursing practice

This is the area of importance for nurses and midwives for the demonstration of their skill. The nurses are the key personnel to take care of women during labour. They have the vital role in reducing maternal morbidity and mortality. The induction of labour and its impact on mother and baby is a less known area among midwives. Too little researches have been conducted by nurse researcher in this aspect. The outcome of this study will:

- Empower the midwives to adopt necessary skill in preventing misoprostol related complication.

- Enlighten the midwife with new scope for nursing practices during an induction by misoprostol.

- Help the midwives to practice safely without endangering the life of mother and baby.

- Clarify on many legal and ethical dilemmas

- Encourage them to take care of mother by supporting and attending them during their crucial stage of labour to have better birth experiences.

- Motivate them to consider maternal birth satisfaction as a very important nursing concern for a quality care.

- Strengthen their skill with better evidence to manage induction related problems and thereby to improve maternal & feotal outcome.

- Prepare them to manage the adverse situation after an induction
Guide the midwives to practice evidence based skill.

5.15.2 Nursing Education

Nursing education is based on evidence based research. Imparting clinical education to student nurses and staff require depth and expertise which is obtained by reading research article. This research study on induction of labour is a boost to the midwifery education.

Nurse educator by using this study outcome will:

- Educate the student nurses on induction and associated risk and benefit.
- Aware the staff nurses on area of maternal hazards over advantages of induction.
- Highlight the issues on maternal control and experience that is necessary for a positive birth experience.
- Educate the mothers regarding positive outcomes and related risk after induction.
- Add to the content in syllabus on issues involved in induction of labour.
- Strengthen nursing curriculum by adding supporting evidence.

5.15.3 Nursing Administration

- The nurse administrator plays as change agent in context of quality nursing care.
  
The study result can help her to:
  - Prepare policies and protocol on nursing management of mother with induction of labour.
  - Conduct in-service education, CNE, workshop on maternal care and support during induction.
• Develop strategies to manage toward complications.

• Change the labour room procedure and strengthening the skill of midwives in management of women with inductive.

• Develop standard practice of supporting mothers and caring their emotional component which is much neglected section in midwifery intervention.

5.15.4 Nursing Research

• Nursing research in areas of induction of labour is lacking. This research is a new dimension for midwives to consider quality care during induction of labour as essential as delivery. This study will:

• Enlighten the midwives with new knowledge and evidence.

• Stimulate them to undertake research in newer aspect of induction and mater health.

• Contribute to the existing body of knowledge in nursing research and serve as a guideline to correlate, compare and conduct similar studies.

• Stimulate future researcher to challenge the result.

5.16 Limitation

The study has few shortfalls for generalization. Mostly the methodological deficiencies including observation and measurement of parameters.

• Only one setting was selected and procedure is observed. It is not assured that same procedure is followed in other settings also.
• Sample characteristics sometime was difficult to confirm like gestational week.

• Many other minor indications were associated with major indications, but were not considered.

• Poor progress is what doctors confirmed, all parameters were not assessed by the researcher.

• Documenting birth experiences is purely subjective and depended on type of labour

5.17 Recommendation

• If required misoprostol shall be used for augmentation of labour.

• Midwives should follow the guidelines how to monitor labour after administration of misoprostol and other prostaglandin derivatives.

• Labour room should be equipped and OT should be ready to manage the failed induction.

• Women should be properly informed about use of inducing agent and its’ complication like hyper stimulation, foetal distress and failed induction.

• Midwives should be aware of and ready to take care of distressed babies.

• Maternal positive birth experiences and satisfaction should be taken care of by informing, orienting, supporting and comforting them during labour.