

Clinical Pelvimetry Before and During Labour: A Comparative Study amongst Nulliparous Women

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Abstract

Objective: To compare the role of clinical pelvimetry performed at term prior to labour or during labour in relation to maternal and neonatal outcomes in nulliparous women.

Methodology: A prospective comparative study was conducted in Tribhuvan University Teaching Hospital, Kathmandu, Nepal from 15th February 2006 to 14th February 2007. Two hundred nulliparous women underwent clinical pelvimetry at term prior to labour (Group I) and another two hundred underwent pelvimetry at active labour (Group II). The maternal and neonatal outcomes between the two groups were compared.

Results: There were 87.5% of women with adequate pelvis, 11% borderline and 1.5% inadequate pelvis in group I. In group II, 89% women had adequate pelvis, 10% borderline and 1% inadequate pelvis. The cesarean section rate was higher in group I compared to group II but the proportion of cesarean section for dystocia was higher in group II compared to group I. Greater proportion of women in group II sustained genital tract injury during vaginal delivery than women in group I ($p=0.008$). There was no serious maternal or neonatal morbidity in the two groups of women. The two neonatal mortalities in cases of adequate pelvis in group I was not attributable to pelvic assessment.

Conclusion: This study did not show advantage of performing pelvic assessment at labour over clinical pelvic assessment prior to labour at term, in terms of maternal and neonatal outcomes and no benefit in terms of accuracy of diagnosing women with cephalopelvic disproportion.

Keywords: Clinical pelvimetry, nulliparous women, adequate pelvis, borderline pelvis, inadequate pelvis, genital tract injuries

Introduction

Maternal mortality is a matter of great concern with 6, 00,000 deaths every year and 20 to 30 % contribution from cephalopelvic disproportion (CPD) ¹. In Nepal, obstructed labour and rupture uterus constitute to 13.3% and 6.7% of the hospital deaths and at community level, obstructed labour is the cause of for maternal mortality in 16.1% of the cases². Thus, screening for CPD, one of the goals of antenatal clinic, avoids these complications.

Clinical pelvimetry, involves a detailed bimanual examination whereby various measurements of pelvis are estimated. Performing pelvimetry antenatally before or after labour has its own advantages and disadvantages. Any gross pelvic deformity diagnosed

antenatally would avoid unnecessary futile trial of labour and delay in timely referral of women needing operative delivery, thus decreasing the risk of obstructed labour and its consequences. However, over diagnosis of CPD is a disadvantage as all the determinants of successful vaginal delivery, i.e., power, passenger and passage, can not be assessed when uterus is in quiescence. Pelvimetry at labour overcomes this disadvantage.

There is still no consensus and evidence regarding proper timing of pelvimetry. Thus, this study aimed to find out which was the best time to perform pelvimetry in term pregnancy, antenatally or at labour with respect to success of vaginal delivery, maternal morbidity and neonatal morbidity and mortality.

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Methods

This was a prospective comparative study done in the Department of Obstetrics and Gynaecology of Institute of Medicine, Tribhuvan University Teaching Hospital, Kathmandu, which is a tertiary level referral centre of Nepal with an annual 4,000 deliveries. Of these nearly 50% are nulliparous women. The cesarean section rate is about 25%. The study was conducted over a period of one year starting from 15th February 2006 to 14th February 2007

Sampling of nulliparous women was done purposefully. Women meeting the inclusion criteria were taken from the antenatal clinic. The women were recruited into two groups - in group I, the women underwent clinical pelvimetry during their antenatal visit, at term but prior to onset of labour and in group II, pelvimetry was done at active phase of labour. Group II consisted of - (a)

included in the study. An informed consent was taken prior to carrying out the study. Clinical pelvimetry was then performed in detail after taking in-depth history and performing a detailed general and systemic examination. The clinical pelvimetry was performed by the researcher herself in all the women to overcome the interobserver bias. They were recorded in the questionnaire.

The women belonging to group I, requiring labour induction underwent pelvic assessment antenatally. The women in group II who required labour induction, had their lie and presentation confirmed and the pelvic assessment was performed once they reached active labour after induction of labour.

The pelvis was grouped as clinically adequate, borderline or inadequate based on the following table³⁻⁵.

Table 1. Classification of pelvis based on clinical pelvimetry

Pelvic Capacity	Parameters	Adequate	Borderline	Inadequate
Pelvic Inlet	Diagonal conjugate	>11.5cm	9-11.5cm	<9cm
	Sacral Promontory	not reachable	Doubtful	easily reachable
	Sacral curve	good	doubtful	straight
Pelvic Midcavity	Lateral walls	straight	doubtful	convergent
	Ischial spine	not prominent	doubtful	prominent
	interspinous diameter	>10cm	8-10cm	<8cm
Pelvic Outlet	Subpubic angle	narrow	doubtful	wide
	Intertuberous diameter	>8cm	doubtful	<8cm

Women who were planned for pelvimetry at labour during their prenatal checkups in the antenatal clinic, (b) Women who had missed pelvimetry antenatally and (c) Unbooked women coming in labour without antenatal pelvimetry. There were a total of 400 women with 200 in each group. The inclusion criteria were - (i) Nulliparous women, (ii) Term pregnancy (after 37 completed weeks of pregnancy to 42 weeks) (iii) Singleton pregnancy with cephalic presentation and (iv) height > 145cms. The exclusion criteria were - (i) malpresentations and malpositions, (ii) multiple pregnancy, (iii) obstetric complications - preeclampsia, intrauterine growth restriction, (iv) medical disorders of pregnancy, (v) antepartum haemorrhage, (vi) big baby (clinically or ultrasound estimated weight >4kg), (vii) postmaturity and (viii) precious pregnancy

The women were explained in detail about the nature of the study, procedure, advantages and disadvantages and only those women who agreed to participate were

For the pelvis to be adequate, it had to be normal at all the three levels. If one of the measurements in any of the levels were deemed borderline or inadequate, then the pelvis was considered borderline or inadequate.

Women whose pelvis was considered inadequate underwent elective cesarean section at an appropriate date in group I. If she went into labour before the time of elective cesarean delivery, then an emergency cesarean section was done. In Group II emergency cesarean section was done in active phase of labour if pelvis was found to be inadequate. The women with borderline pelvis underwent trial of labour and those with adequate pelvis were allowed for vaginal delivery. Labour was monitored with partograph and was managed according to the labour room protocol of the institute. Mothers and the babies were followed up in the postnatal wards and the neonates were also followed up and any complication that supervened was noted.

Maternal outcome variables studied were - (i) mode of delivery, (ii) duration of labour, (iii) perineal injuries (third degree tears and complete perineal tears), (iv) postpartum haemorrhage, (v) febrile morbidity (>38°C after 24 hours of delivery). The neonatal outcome variables were - (i) birth weight, (ii) Apgar score at 1 and 5 minutes (iii) injuries to neonate (iv) neonatal admissions and (v) neonatal mortality.

Data were analysed using Statistical Package for Social Studies (SPSS) version 11.5. A p-value less than 0.05 were considered to indicate significant difference.

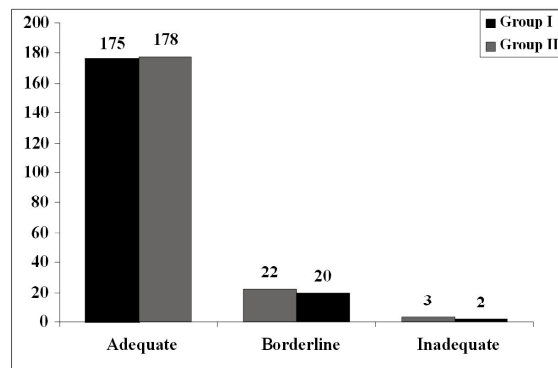


Fig 1. Findings of Clinical Pelvimetry

Results

Table 2. Demographic and obstetric parameters

Parameters	Group I (%)	Group II (%)	P-value
Age (yrs)	22.5	22.7	0.363
Ethnic Groups			
Brahmin	37.5	42.0	0.405
Chettri	22.0	24.5	
Newar	15.0	12.5	
Mongolian	11.0	14.0	
Others	14.5	7.0	
Gravidity of Women			
Primigravida	92.5	93.0	0.564
G2P0+1	7.5	7.0	
Gestational Age (weeks)			
37 – 37 ⁺⁶	3.5	8.5	0.035
38 – 38 ⁺⁶	11.0	25.5	0.0002
39 – 39 ⁺⁶	26.5	26.0	0.906
40 – 40 ⁺⁶	38.5	26.0	0.008
41 – 41 ⁺⁶	20.5	13.5	0.062
42	-	0.5	1.0
Height (cm)	153.0	153.2	0.679
Weight (kg)	60.5	60.4	0.838

Maternal Outcomes

Delivery details of the two groups are presented in the following table.

Larger number of women with adequate pelvis delivered vaginally in group II (90%), compared to group I (81%) the difference being statistically

Table 3. Clinical pelvic assessment and the mode of delivery

	Adequate (%)			Borderline (%)			Inadequate (%)		
	GI	GII	P-value	GI	GII	P-value	GI	GII	P-value
Vaginal	81.1	90.4	0.012	68.2	55.0	0.380	-	-	
Instrum	-	1.2	0.499	-	10.0	0.22	-	-	
LSCS	18.9	8.4	0.004	31.8	35.0	0.820	100	100	

significant ($p = 0.012$). The cesarean section rate was low (8%) in group II compared to group I (19%) with significant p-value of 0.004. However vaginal delivery was almost similar in two groups in women with borderline pelvis and so was the rate of cesarean section. All the women who had inadequate pelvis on clinical pelvimetry underwent cesarean section. Amongst three women in group I, one had inadequate outlet and midcavity while the other two had inadequate outlet. Two women in group II with CPD underwent emergency

cesarean section as they were assessed at labour only. Both of these women had inadequate outlet.

The mean birth weight of the neonates delivered by various routes in women with all three types of pelvis was comparable with their respective groups thus indicating no role of the birth weight on the mode of delivery.

The mean durations of first and second stage of labour in women with adequate pelvis was similar. Same was

Table 4. Details of vaginal delivery

	Adequate (%)			Borderline (%)		
	GI	GII	P-value	GI	GII	P-value
Duration of labour						
1st stage (hrs)	7.3	7.4	0.86	6.4	6.9	0.800
2nd stage (mins)	32.9	35.8	0.36	43.4	45.6	0.009
Complications at vaginal delivery						
Cervical tear	3.5	4.9	0.550	1	-	0.464
Vaginal tear	-	4.9	0.008	6.7	15.4	0.583
Vulval hematoma	-	-		6.7	-	1.0
3rd degree tear	0.7	3.7	0.127	-	7.7	0.464
Primary PPH	0.7	1.8	0.646	-	-	
Postpartum Complications of Vaginal Delivery						
Vulval Edema	1.4	-	0.216			
Infection of Epi	-	0.6	1.0			
Secondary PPH	0.7	0.6	1.0			
Puerperal pyrexia	0.7	0.6	1.0			

Table 5. Details of Cesarean Delivery

	Adequate (%)			Borderline (%)		
	GI	GII	P-value	GI	GII	P-value
Indications of LSCS						
Failed induction	3.0	-	1.0	-	-	
MSL	48.5	33.3	0.327	28.6	14.3	1.0
Fetal distress	18.2	20.0	1.0	-	-	
NPOL	30.3	26.7	1.0	57.4	42.9	1.0
DTA	-	6.7	0.313	14.3	28.6	1.0
Pro 2nd SOL	-	13.3	0.093	-	-	
Failed vacuum	-	-	-	-	14.3	1.0
Intra-operative and Post operative Complications						
Extension to Cx	3.0	6.7	1.0	14.3	14.3	1.0
Primary PPH	-	-		14.3	-	1.0
Wound infection	-	6.7	-	-	-	-
Puerperal pyrexia	-	6.7	-	-	14.3	-

the case in borderline pelvis. Significantly larger number of complications was noted in women undergoing vaginal delivery in Group II compared to group I.

Among women assessed as having borderline pelvis who delivered vaginally there were three cases each with intrapartum complications in both the groups (20% in group I and 23% in group II). One woman in group I had serious complication of vulval haematoma with primary postpartum haemorrhage and a third degree tear which was detected later at the time of drainage of haematoma.

There were not many postpartum complications following vaginal delivery in the present study. In group II, all three cases were infective morbidity like infection of episiotomy wound, puerperal pyrexia and secondary postpartum haemorrhage while there were two cases of infective morbidity in group I. None of the women with borderline pelvis who delivered vaginally developed postpartum complication.

Larger proportion of women with adequate pelvis in group II (46%) compared to group I (30%) underwent cesarean section for indications attributable to pelvic capacity (non progress of labour, deep transverse arrest, prolonged second stage of labour and failed vacuum delivery). Cesarean delivery in second stage of labour was done in 20 % women in group II and none in group I. But the p value was not found to be statistically significant.

case of mothers with borderline pelvis, there were only 75% of neonates in group II and 72.7% of neonates in group I with Apgar score more than 7. All neonates born by emergency or elective cesarean section of mothers with inadequate pelvis had Apgar score of 7 at one minute.

More than 95% of neonates of both groups of mothers with adequate pelvis had Apgar score at five minutes > 7. The mean Apgar score at five minutes appeared marginally better in group I compared to group II. More than 90% of neonates of both groups of mothers with borderline pelvis had Apgar score at five minutes > 7. The mean Apgar score at five minutes was better in group II compared to group I. But this small difference in Apgar score at five minutes in neonates born to mothers with adequate and borderline pelvis was not statistically significant.

Neonatal sepsis was the major cause of neonatal admission in case of neonates born to mothers with adequate pelvis. All the three neonatal admissions for birth asphyxia in women with adequate pelvis were in group II. However, the difference was not found significant.

In neonates born to mothers with borderline pelvis, there was only one admission for sepsis in group II. There was one neonatal admission each for birth asphyxia in group I and II.

Table 6. Indications of neonatal admission

	Adequate (%)			Borderline (%)		
	GI	GII	P-value	GI	GII	P-value
Neonatal sepsis	6.3	3.9	0.315	-	5.0	0.470
Meconium Apiration	2.3	1.1	0.440	4.5	5.0	1.0
RDS	1.7	0.6	0.36	-	-	-
Birth asphyxia	-	1.7	0.24	4.5	5.0	1.0
Neonatal jaundice	-	0.6	1.0	4.5	-	0.470

Among women with borderline pelvis, 86% of cesarean deliveries were for indications related to pelvis such as non progress of labour, deep transverse arrest and failed vacuum delivery in group II, compared to 71% in group I. But the difference was not statistically significant.

Neonatal Outcome

In case of mothers with adequate pelvis, more than 80% of neonates in both groups had Apgar > 7 showing that there was no intra-partum asphyxia. However in

None of the neonates of mothers with inadequate pelvis in both the groups required admission in nursery.

There were no cases of severe neonatal injury in this study. None of the neonates born by cesarean section in mothers with inadequate pelvis sustained injury. Two cases of cephalhaematoma were seen, one in group II with adequate pelvis and another in group I with borderline pelvis.

Two neonatal deaths occurred, both in case of adequate pelvis, one in group I was due to severe birth asphyxia

following placental abruption and the other in group II due to meconium aspiration syndrome.

Discussion

Improvements in nutrition and life style have made the absolute discrepancy of pelvis a rare observation in the current practice. With belief that the fetal head takes up the role of a pelvimeter, value of antenatal pelvimetry has been questioned. The previous practice of evaluating pelvis by x-ray pelvimetry has now become a rare event and so has the role of clinical pelvimetry in uncomplicated pregnancies. The norm has been to give all women with cephalic presentation a trial of labour and perform pelvimetry only at labour. Nevertheless, the advantages of detecting those few cases of absolute discrepancy antenatally cannot be disregarded. Especially in countries like ours with many low resource setting and no facilities for performing cesarean section, it is prudent to detect cases of cephalopelvic disproportion before giving labour trials. Additionally, the unnecessary and protracted trials of labour may cause delay in timely referral of patients from rural setups to centres catering operative facilities.

One of the main aims of performing pelvimetry at labour is to overcome the minor degrees of disproportion of the pelvis with the effects of uterine contraction (power) and further with flexion and moulding of the fetal head, thus making disproportion no more obvious. However, the observations made in the present study failed to show results accordingly. The number of cases of adequate, borderline and inadequate pelvis diagnosed were almost same whether the pelvimetry was performed antenatally or at labour (p-value = 0.852). Relaxation of pelvic soft tissue, ligaments and joints towards the end of pregnancy almost to the same extent as at the start of labour could be the reason behind similar findings noted at pelvimetry.

The incidence of CPD in the present study was 2.5%. Likewise; borderline pelvis was diagnosed clinically in 21% cases; 11% during antenatal pelvimetry and 10% at labour. Incidence was similar to those shown by various studies where pelvic assessment was done clinically⁶⁻⁹. Slightly lower incidence of cephalopelvic disproportion in the present study could be because of exclusion of cases at high risk of having disproportion such as short stature below 145 cm which is a known risk factor of cephalopelvic disproportion^{1,10-14}. Other studies which found higher incidence of cephalopelvic disproportion varying from 4 to 15% in nulliparous women in developing and developed countries^{1,15-17} could be due to different criteria used retrospectively for the diagnosis of cephalopelvic disproportion unlike the present study where pelvic assessment was solely responsible for the diagnosis of absolute and relative discrepancy of pelvis to the fetus. Cephalopelvic

disproportion was defined when cesarean section would be performed for failure to progress, if the labour were prolonged, instrumental delivery would be performed or in presence of intrapartum still birth.^{1,12,18,19}

When a woman is assessed to have adequate pelvis at pelvic assessment, vaginal delivery is expected with minimal morbidity to the mother and her baby. Greater accuracy in pelvic assessment is likely when the pelvimetry is performed at labour. In the present study, vaginal delivery was successful in significantly larger number of women with adequate pelvis in group I compared to group II (P-value 0.012) verifying that at labour all the three forces, passage, passenger and power come into play together to accomplish vaginal delivery³. Studies with radiological pelvimetry have shown similar results where antenatal diagnosis of inadequate pelvis precluded vaginal delivery of many cases^{20,21}. Success of trial of labour in case of women with borderline pelvis, however showed different observation with, 68% cases of group I and 65% cases of group II delivering vaginally though the difference was statistically insignificant.

Undiagnosed cephalopelvic disproportion can lead to prolonged labour. However mean durations of first and second stage of labour in women with adequate and borderline pelvis were almost similar, with no statistically significant difference. This result was comparable to that shown by Sule and Matawal who also found no significant association between the labour duration in those who had adequate pelvis on antenatal pelvimetry and those without antenatal pelvimetry⁷. Thus, there is no advantage in improved detection of cephalopelvic disproportion when pelvis is assessed at labour or prior to labour.

Though the duration of labour was similar in both the groups, the complications during vaginal delivery were significantly higher (p=0.003) in women with adequate pelvis diagnosed during labour compared to those diagnosed by antenatal pelvimetry. Extensive vaginal wall tears, third degree tears, PPH were more common in Group I. Therefore, it could also be suggested that probably greater number of women with milder forms of pelvic disproportion seemed adequate when pelvimetry was performed at labour than when it was performed before labour due to greater relaxation of pelvic muscles, ligaments and joints at labour. Hence, higher number of vaginal delivery achieved in group II, they occurred at the expense of increased morbidity to the mother.

Morbidity related to genital tract trauma is expected in women with borderline pelvis, but lack of statistical difference between the occurrence and nature

suggested that pelvimetry before or at labour, had no advantage or disadvantage in terms of morbidity related to genital tract trauma.

The cesarean delivery rate was almost double in group I compared to group II, the difference being significant statistically. In studies where pelvimetry had been performed radiologically, similar results with increasing trend of cesarean delivery was seen in patients undergoing antenatal pelvimetry^{20,21}.

Studies on clinical pelvimetry showed results in favour of antenatal pelvimetry^{7,9}. But the comparison of the present study with these studies is not justified as in these studies, pelvis assessed to be adequate at antenatal pelvimetry was compared to those that had not at all been assessed.

To see whether the increased rate was related to timing of pelvimetry, indications for cesarean sections were reviewed in the two groups. Large number of cesarean section in group I were for indications unrelated to pelvic assessment (fetal distress and meconium stained liquor), where labour had to be interrupted by cesarean section and the test of pelvic adequacy could not be found out. So, it could not be commented whether pelvimetry done before labour increased the cesarean rate due to unsuspected CPD. Larger number of women with gestational age equal to 40 weeks or above (59%) in group I compared to group II (40%) is the cause for the disparity. Cesarean section for indications attributable to cephalopelvic disproportion like non progress of labour, deep transverse arrest, prolonged second stage were performed in group II compared to Group I (30% vs 46%). Hence, it is likely that some cases of disproportion had probably been incorrectly diagnosed to have adequate pelvis in both the groups during clinical pelvic assessment which is a subjective judgment, more cases in group II compared to group I, indicating laxity of pelvis and uterine contraction during labour probably gave false notion of adequacy of pelvis. Therefore, contrary to the belief that pelvimetry at labour was more accurate than antenatal pelvimetry in terms of accuracy of diagnosing the capacity of pelvis was not observed in the current study. The intraoperative complication at cesarean section for obstructed labour like extension of uterine incision was more in women in group II (6.7%) compared to group I (3%). However, in borderline pelvis, cesarean section attributable to pelvic inadequacy was more in Group I compared to Group II but the difference was statistically not significant.

Therefore, clinical pelvimetry at labour did not possess any benefit over antenatal pelvimetry in terms of decreasing the cesarean delivery rate and its complications in this study.

In terms of neonatal outcome, in all groups whether pelvic assessment was performed antenatally or at term, no difference was noted. However, one of the previous studies showed a significant difference in favour of antenatal pelvimetry in terms of Apgar score at one and five minutes^{7,9}. No serious neonatal injuries were noted in the study. However, the number of neonates requiring admission in group I was higher than in group II, but the difference was statistically insignificant. Neonatal sepsis was more common in group I compared to group II but the difference was statistically insignificant. Inclusion of few cases of premature rupture of membrane in group I could be the reason. However, birth asphyxia was seen in neonates born to women of group II while none were seen in group I though the difference is statistically insignificant. Similar result was shown by Crichton and team.²²

A neonatal mortality observed in group I was due to placental abruption and in group II was due to meconium aspiration. There was no neonatal mortality attributable to clinical pelvic assessment in both groups of women with adequate pelvis.

All women with inadequate pelvis underwent cesarean delivery including those who had pelvic assessment at labour. Even in women who had pelvic assessment at labour, diagnosis was made in early labour and prompt cesarean delivery instituted and thus good outcome with regard to maternal and neonatal outcome in this group.

Conclusion

Clinical pelvic assessment performed routinely in antenatal clinics on non-labouring women at term was found to be better than the one done in labour; the latter being unable to make the proper diagnoses of milder or borderline forms of pelvic disproportion that often resulted in maternal trauma as indicated by this study.

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