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## Original Article

# Perinatal outcome of 50 cases of abnormal umbilical artery Doppler ultrasound study

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**Abstract :**

**Objective :** The main objective of this study was proper detection of the compromised fetus to allow for timely intervention and to reduce perinatal morbidity and mortality.

**Materials and Methods**

This is a cross sectional descriptive type of study which was conducted in the department of Obstetrics and Gynaecology in DNMCH from January 2006 to December 2006.

**Results :**

In this study gestational age was determined by clinical examination, LMP and USG. There was a high incidence of caesarean section in this study. The reason of this high incidence was due to obstetrics indications like severe preeclampsia, severe PIH, Oligohydramnios, indications of emergency caesarean section was (58.97%). High risk cases were decided to terminate by Umbillical artery Doppler study. In the present study in most cases delivery occurs within 3-4 days of the last test. The prevalence of perinatal death in fetuses with absent or reversed end diastolic flow velocity was 40%. 5 minute Apgar score<7 was 8% and admission into NICU was 32%. Timely intervention dictated by Umbilical Artery Doppler Study results may be the reason for such variation.

**Conclusion :**

UADS as an antepartum surveillance technique is highly sensitive, non-invasive, convenient technique, less time consuming to perform it and from legal point there is a record. UADS may be used as supplementary test which may improve perinatal outcome. Hence the use of Doppler provides information that is not readily obtained from more conventional test of fetal well being. It is therefore has an important role to play in the management of compromised fetus.

**Keyword:** UADS (Umbilical Artery Doppler Study), Prinatal outcome, Highrisk pregnancy

**Introduction :**

Advances in perinatal care in the last 20 years have resulted in a dramatic decrease in perinatal mortality. These advances include improvements in the technological aspects of antenatal fetal surveillance and neonatal intensive care.[1] In most centers nearly one third to one half of the perinatal deaths occur in the antenatal period. Some may be unavoidable and unexpected but many of them may be avoidable by close fetal monitoring. With the introduction of USCD imaging and most recently computerized fetal assessment more specific and direct examination of the fetus in utero has become a reality. Modern obstetrics consider the fetus as patient.

Perinatal death ratio is an acceptable measure of effectiveness of maternity and neonatal services.[2] Perinatal mortality rate (PNMR) has been defined as all babies born dead from 24 weeks of pregnancy (stillbirths) and all live born babies that die in the 1st week of life regardless of gestational age at births[3]. Obstetricians have long been looking for antenatal tests that would identify the fetus at risk of intrauterine asphyxia and death. Ideally, such a test should not only be reliable but can be performed easily, repeatedly and also which is non invasive. The result should be available immediately.

Doppler ultrasonography is a preferable method of antepartum fetal surveillance because of the convenience, highly sensitive, non invasive,[4] reliable result which is very much helpful in clinical decision-making. In the course of Doppler testing fetal and maternal vessels are examined with ultrasound waves. These waves are reflected by red cells moving inside the blood vessels. There are several methods of analyzing the waveform, The most commonly and simplest method is the measurement of the ratio between the peak systolic and diastolic frequencies of the waveforms (S/D ratio). The other index are resistive index -RI which is calculated as (S-D)/S and pulsatility index (S-D)/mean. An increase in the ratio of peak systolic to end diastolic shifted frequencies correlates well with pregnancy

complications associated with reduced placental function and is three times more sensitive a predictor of perinatal morbidity than a non-reactive fetal heart rate[3]. Doppler velocimetry can be applied to evaluate the condition of feto-placental circulation in high risk pregnancies. This will help in reduction of perinatal mortality. In normal pregnancy as the placental growth continues S/D, RI and PI decrease with advancing gestation in umbilical artery. But in certain pregnancy complications such as PIH, preeclampsia, IUGR babies at first, there is decreased diastolic flow in the umbilical artery due to increase in the resistance that occurs in small arteries and arterioles of the tertiary villi. This raises the S/D ration; PI and RI of umbilical artery. As the placental insufficiency worsens, the diastolic flow decreases, then becomes absent and later reverses.

**Material and Methods :**

This is a cross sectional descriptive type of study. The methods were explained to the patients and only those who were volunteered finally selected for the study. Prior to interview informed consent was taken from every person.

**Study subjects :**

Study subjects were the patients who were admitted during study period in DNMCH at or after 28 weeks of pregnancy.

**Study period :** January 2006 to December 2006.

**Materials :**

A questionnaire had been used to collect information on age, education, occupation, socio-economic status, history of past and present illness, obstetric history, abdominal and vaginal examination reports had been recorded. Detailed information of USG, Doppler findings, mode of delivery, baby note and patients discharge note had been also recorded.

**Inclusion Criteria :**

Both singletone and multiple pregnancy with high risk group (hypertension. Preeclampsia, IUGR, oligohydramnios, diabetes) of gestational age of 28 weeks or more of indoor cases.

**Exclusion Criteria :**

Pregnancy with heart disease, gynaecological disorder, major fetal congenital or chromosomal abnormalities before 28 weeks.

**Results :**

In this study 50 cases of high risk pregnancy of different gestational age ranging from 29 to 40 weeks were selected. All the cases were managed by Umbilical Artery Doppler Study.

**Table–1 Demographic and obstetric characteristics of study subjects (n=50)**

| Variables | Mean ±SD |
|---|---|
| Maternal age (years) | 24.47±5.03 |
| Parity | 0.47±0.79 |
| Gravidity | 1.84±1.23 |
| Gestational age(weeks) | 35.53±2.50 |
| Birth weight (kg) | 2.66±0.65 |

**Table-1** shows mean ±SD maternal age was 24.47±5.03, parity 0.47±0.79, gravidity 1.84±1.23, and birth weight 2.66±0.65 kg.

**Table-2 Determination of gestational age of pregnant women in study population (n=50)**

| Criteria | Number of patients | Percentage |
|---|---|---|
| Date of LMP and clinical examination | 11 | 22 |
| LMP, Clinical examination and early Ultra sonogram | 39 | 78 |

**Table –2** shows that in 11 cases gestational age was determined by clinical examination and LMP. In 39 cases gestational ages was determined by all the three parameters (LMP, clinical examination and early ultrasonography).

**Table-3 Indications for Umbilical Arterial Doppler Study of the study population**

| Major high risk factors | Numbers | (%) | No with reduced fetal movement (%) |
|---|---|---|---|
| Pregnancy Induced Hypertension (PIH) Essential hypertension. | 25 05 | 50 | 15(30) |
| Preeclamsia | 09 | 18 | 02(04) |
| Eclampsia | 02 | 04 | 02(04) |
| Diabetes mellitus | 02 | 04 | 0(0) |
| Twin pregnancy | 02 | 04 | 02(04) |
| Intrauterine growth restriction (IUGR) | 10 | 20 | 05(10) |

**Table –3** Shows that pregnancy induced hypertension was the most common indication for testing (50%).

**Table-4 Incidence of abnormal umbilical artery Doppler findings in study subjects**

| Types of abnormalities | Number of patients | % |
|---|---|---|
| Slightly raised feto-placental circulation | 13 | **26** |
| High resistive feto-placental circulation | 33 | **66** |
| High resistive feto-placental circulation with reduced diastolic flow | 02 | 04 |
| High resistive feto-placental circulation with absent diastolic flow | 01 | 02 |
| High resistive feto-placental circulation with reversed diastolic flow | 01 | 02 |

**Table–4** shows that high resistive feto placental circulation(66%) and slightly raised feto-placental circulation (26%) were the most common abnormalities.

**Table-5 Mode of delivery in the study population (n = 50)**

| Mode of delivery | Number of patients | % |
|---|---|---|
| Delivery by LSCS | 39 | 78 |
| Elective | 16 | |
| Emergency | 23 | |
| Normal vaginal delivery | 11 | 22 |
| Induction | 6 | |
| Spontaneous | 5 | |

**Table-5** shows that a percentage of mode of delivery in study group. Most of the cases (78%) were delivered by Caesarean section. Only 22 % cases had vaginal delivery.

**Table-6 Indication of Caesarean delivery in the study population (n = 39)**

| Indications | Number of patients | % |
|---|---|---|
| Severe PIH, Preeclampsia | 16 | 41.02 |
| Eclampsia | 2 | 5.13 |
| IUGR | 7 | 17.95 |
| Diabetes mellitus | 2 | 5.13 |
| Bad obstetric history | 1 | 2.56 |
| Intrapartum fetal distress | 7 | 17.95 |
| Previous history of three caesarean section | 1 | 2.56 |
| Twin pregnancy | 2 | 5.13 |
| Severe oligo hydramnious | 1 | 2.56 |

**Table–6** shows indication for Caesarean deliveries. Severe PIH, Preeclampsia, IUGR and Intrapartrum fetal distress were the most common indications.

**Table-7 Evaluation of fetal assessment by Umbilical Artery Doppler Study (UADS)**

| Outcome | Abnormal Doppler findings(n=50) | |
|---|---|---|
| | Yes | No |
| Overall abnormal outcome (n=50 ) | 20 | 30 |
| Low 1- minute Apgar score (n=50) | 14 | 36 |
| Low 5- minute Apgar score (n=50) | 4 | 46 |
| Small for gestational age (n=50) | 13 | 37 |
| Admission into NICU (n=50) | 16 | 34 |
| Perinatal mortality (n=50) | 6 | 44 |

Evaluation of fetal assessment by antepartrum UADS has been shown in Table –7 Of the 50 patients, 30 patients had normal and 20 patients had abnormal outcome.

Low 1-minute Apgar score observed on 14 occasions during 50 abnormal UADS whereas low 5-minute Apgar score reduce to 4 occasions during 50 abnormal UADS.

**Discussion :**

Antepartrum fetal surveillance is used to identify potential jeopardy. Typically the UADS, Antepartrum cardiotocograph (NST) and biophysical profile (BPP) are used in office or hospital settings. The introduction of fetal surveillance programmes have regularly resulted in dramatic lowering of still birth rates. The rate of fetal demise in unmonitored high risk pregnancies is 10-30 per 1000; with antepartrum surveillance, this rate is reduced to 1-3 per 1000, which is lower than the rate for unmonitored low risk pregnancies (2-4 per 1000)[5]. The present study was carried out to see the perinatal outcome of abnormal UADS. One excellent means of determination of gestational age of woman is by the date of last menstrual period (LMP),clinical examination and ultrasonography.[6] In this study most of the cases (78%) gestational age was determined by clinical examination, LMP and early USG. Selection of in this study was similar to many published studies such as Ritchie[7].

In respect to the mode of delivery there was a high incidence of caesarean section in this study. The reason for high incidence of caesarean section in this study was due to obstetrics indications like severe preeclampsia, severe PIH, Oligohydramnios, IUGR. Most of the severe IUGR cases with abnormal test results (DS) were delivered by elective caesarean section.

Among the indications of emergency caesarean section (58.97%) uncontrolled PIH and Intrapartrum fetal distress were more significant. Only 41.03 % were elective of which Preeclampsia and IUGR were more significant. However, high risk cases like diabetes mellitus, IUGR, Severe PIH, Preeclampsia**,** Bad obstetric history, Previous history of three caesarean sections carry well known fetal risk. So these cases were terminate when Umbilical artery Doppler showed abnormal findings. One of the aim of this study was to find out the suitable time of delivery the high risk pregnancy cases. Here it is evident that Umbillical artery Doppler findings guided good clinical decisions help in timely interventions. High risk cases like prolonged pregnancy, reduced fetal movement, pregnancy induced hypertension (PIH) with good fetal movement where fetal risk were less consistent, vaginal delivery were allowed. Induction also given in some selected cases but some of these labour ended in emergency caesarean section. The shorter the test to delivery interval, the more prognostic are the test results in predicting fetal outcome. In the present study in most cases delivery occurs within 3-4

days of the last test. The prevalence of perinatal death in fetuses with absent or reversed end diastolic flow velocity is reported to be 40%[8] . Yoon et al[9] demonstrated in their study that absent umbilical artery waveform is a strong and independent predictor of adverse perinatal outcome.

In the analysis of overall abnormal perinatal outcome results of KW Fong et al.[10] can be compared with this result. Comparison of abnormal test result in respect to low 5 minute Apgar score was done.

In this study low 5 minute Apgar score<7 was 8% but in the study of Lakhar BN et al.[11] it was 6.8%, admission into NICU was 32%. In the study of Lakhar BN et al[11] it was 66% which shows significant difference. The perinatal mortality rate was 120 per 1000 total birth which is lower than reported by Lakhar BN et al[11]. Timely intervention dictated by Umbilical Artery Doppler Study results may be the reason for such variation.

**Conclusion :**

The introduction of Doppler Technology has provided the first opportunity for repetitive non invasive haemodynamic monitoring in human pregnancy. There is ample evidence that Doppler Indices from the feto-placental circulation can reliably predict adverse perinatal outcome in an obstetric patients with a high prevalence of complication such as fetal growth restriction, PIH, preeclampsia. Compare to other methods of fetal monitoring UADS has proved to be more sensitive in detecting fetal compromises early and aids in the appropriate timing of delivery. The evaluation of UADS as a primary fetal surveillance in the present study showed that abnormal test result is almost accurately diagnosed a compromised fetus as indicated by its 100% sensitivity. Therefore UADS as an antepartum surveillance technique for the fetus should be continued to be performed because it is highly sensitive, non-invasive, convenient technique, less time consuming to perform it and from legal point there is a record. It may be used as supplementary test which may improve perinatal outcome. Hence the use of Doppler provides information that is not readily obtained from more conventional test of fetal well being. It therefore has an important role to play in the management of compromised fetus. As the present study includes small sample size further randomized study with larger sample size may further confirm the result of the present study.

**Recommendation :**

UADS should be available in every institute for assessment of fetal placental circulation in pregnant women with suspected severe placental insufficiency.

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