INTRODUCTION

The accurate knowledge of gestational age is a keystone in an obstetrician’s ability to successfully manage the antepartum care of a patient and is of critical importance in ante-natal tests and successful planning of appropriate therapy or intervention. Failure can result in iatrogenic prematurity which is associated with increased perinatal morbidity and mortality. Ultrasonography of fetal measurements are highly reliable in the first and second trimester of pregnancy but reliability of any ultrasound method greatly diminishes as gestation advances. In third trimester, reliability of any single ultrasound parameter is poor. Many pregnant women in Pakistan come for their first antenatal check-up in third trimester who are unsure of dates and do not possess early dating scan. Management decisions become particularly difficult in conditions where there is growth restriction or growth acceleration. Since the last decade, ultrasound parameter ‘transcerebellar diameter (TCD)’ is considered a reliable predictor for gestational age in third trimester. Size of cerebellum is less affected by deviation in fetal growth restriction or growth acceleration. The predicted gestational age by TCD between 22 – 28 weeks is within 0-2 days, between 29 – 36 weeks is within 0.5 days and at 37 week is 0.9 days of actual gestation. TCD normogram predicts gestational age with accuracy of 94% in the third trimester. This parameter is particularly useful in prediction of gestational age in patients who are unsure of dates or suspected of having IUGR and it is a standard against which other parameters can be compared. Minimal local data are available which examine relationship between BPD and TCD in late pregnancy. Such study will have great potential for clinical significance for both development of alternative pregnancy dating system to BPD in late pregnancy.

The objective of this study was to determine the frequency of correct assessment by transcerebellar diameter (TCD) versus biparietal diameter (BPD) for gestational age measurement at 36 weeks of pregnancy using first day of last menstrual period (LMP) for actual period of gestation.

ABSTRACT

Objective: To determine the frequency of correct assessment by transcerebellar diameter (TCD) versus biparietal diameter (BPD) for gestational age measurement at 36 weeks of pregnancy using first day of last menstrual period (LMP) for actual period of gestation.

Study Design: Quasi experimental.

Place and Duration of Study: Department of Obstetrics and Gynaecology, Bahawal Victoria Hospital, Bahawalpur from May to November 2010.

Methodology: This study was performed on 228 patients at 36 weeks of pregnancy fulfilling the inclusion criteria. Ultrasonography of TCD and BPD was made and compared with LMP. Collected data was analyzed by SPSS version 10. Proportion of correct diagnosis by each measurement was determined and compared using chi-square test with significance at p < 0.05.

Results: Out of 228 patients, TCD was found to give correct assessment in 209 patients (91.7%; p = 0.001) corresponding to the gestational age by LMP i.e 36 weeks. BPD was found to give correct assessment corresponding to the gestational age by LMP in 176 patients (77.2%).

Conclusion: Although both BPD and TCD are accurate biometric parameters at 36 weeks of gestation, transcerebellar diameter is more reliable method of gestational age determination in third trimester of pregnancy than biparietal diameter. TCD can be used as a tool to assist in the assessment of gestational age in third trimester.

Key words: Cerebellum. Transcerebellar diameter. Gestational age. Biparietal diameter. Third trimester.
METHODOLOGY
This study was conducted at Department of Obstetrics and Gynaecology, Bahawal Victoria Hospital, Bahawalpur over a period of 6 months from May to November 2010. Approval from the Hospital Ethics Committee was taken prior to conducting the study. Non-probability consecutive sampling was employed to select 228 patients. These ultrasound parameters were made by author directly supervised by certified gynaecologists (Professor and Assistant Professor) and a radiologist (Assistant Professor of radiology department) to exclude bias.

Pregnant women aged 20-30 years, parity up to 02 with singleton uncomplicated pregnancy who were sure of dates at 36 weeks of gestation calculated by first day of last menstrual periods were included. Patients who were unsure of dates, with anomalous fetuses, intrauterine death (IUD), multiple gestation and medical disorders like diabetes, hypertension were excluded.

Ultrasound measurements were made with commercially available real time ultrasound equipment (Toshiba Nemio-10 Model 2009, Transducer frequency 50/60 Hz W/VA 1350W/1500VA). Transcerebellar diameter were measured by transverse view of fetal intracranial anatomy through the posterior fossa that included visualization of midline thalamus, cerebellar hemisphere and cisterna magna. Measurements were obtained by placing on screen calipers of ultrasound machines at the outer margins of cerebellum.

Biparietal diameter was measured in transverse plane at the level of thalami from the outer table of proximal skull to the inner table of distal skull corresponding to the leading edge to edge measurement.

All the data collected was entered in the Statistical Package for Social Sciences (SPSS) version 10 and analyzed through its statistical program. Study variables included TCD and BPD measurements in mm. Frequency was run and tables were formed. Percentage was calculated to know the statistical significance of difference between two variables. Chi-square test was applied to compare the proportion of correct assessment between two groups. P-value ≤ 0.05 was taken as significant.

RESULTS
Majority of the patients belong to age group 21 – 25 years (64%) followed by age group 26-30 years (20.6%) and < 20 years (10.1%). Only 5.3% had the age group > 30 years (Table I). Regarding the parity status, 135 patients (59.2%) were primigravida and 93 patients (40.8%) were second/third gravida.

Table II shows the frequency and percentage of correct assessment by TCD at 36 completed weeks of gestation. Out of 228 patients, in 209 patients (91.7%) TCD was found to give correct assessment correspon-


**DISCUSSION**

Due to socioeconomic reasons many patients in our setup come for their first antenatal visits in third trimester. Most of them are uneducated. Some being lactating mothers are unsure of LMP or having irregular cycles. Because of non-availability of any dating scan or earlier ultrasound and uncertainty in LMP, it becomes very difficult to calculate their due dates. In third trimester, various ultrasound parameters including BPD which is most commonly used shows margin of error of 3 – 4 weeks from actual gestation.\(^5\) This is because of large biological variations in fetal skull shape and size. Management decisions become particularly difficult in conditions where there is growth restriction or growth acceleration and in planning induction for postdate pregnancy.

Transcerebellar diameter (TCD) represents an independent biometric parameter as shown in this study. The fetal cerebellum visualized as early as 10 – 20 postmenstrual weeks.\(^{12,13}\) It grows in a linear pattern in the second trimester but the curve flattens in third trimester.\(^{12,13}\) Cerebellum is not liable to change in form and size because of dense surrounding petrous ridges and occipital bone.\(^{13}\) Due to this, TCD can be used where it is difficult to measure BPD or in cases where there are variations in size and shape of head. TCD in millimeters has been shown to correlate with gestational age in weeks upto 24 weeks. Normograms have been established for TCD and gestational age throughout pregnancy.\(^{6,14}\)

Many studies reported the better correlation of TCD with gestational age in second and third trimester, its usefulness as growth assessing parameter in comparison with other routine ultrasound parameters. In this study, BPD was used for comparison with TCD. The BPD is most commonly used ultrasound parameter and standard method against which other parameters of gestational age assessment are compared.

This comparative study of TCD and BPD in third trimester provides validation of the performance of a retrospectively established TCD normogram regarding gestational age. Very few studies are available to assess the variability in gestational age determination from TCD in third trimester in which it is considered an accurate predictor of gestational age. Most of the studies compared TCD with composite gestational age. No comparative study could be found which examined the relationship between BPD and TCD in late third trimester.

Reece et al. investigated the posterior cranial fossa of the fetus and confirmed the capability of the ultrasound to demonstrate the anatomy of the fetal posterior cranial fossa.\(^{15}\) The vermis and cisterna magna as well as the cerebellar hemispheres could be demonstrated easily. They also proposed a systematic approach to prenatal ultrasound examination of the posterior fossa. They suggested that the use of fetal transcerebellar diameter *in utero* between 17 and 40 weeks of gestation is a useful indicator of accurate gestational age. In this study TCD is also shown as a useful indicator of accurate gestational age in third trimester of pregnancy.

Montenegro performed several biometric measurements in normal pregnant women at 17 – 24 weeks and stated that TCD seems to be good marker for gestational age calculation compared to other clinical and biometric parameters.\(^{16}\)

Mikovic et al. studied the growth of fetal cerebellum in normal pregnancy between 20 and 40 weeks and proposed that TCD can be practically applied in cases where it is difficult or impossible to measure BPD or in cases where it is unsuitable because of the moulding of the head.\(^{17}\) It was found that there was a good correlation between the multiple growth parameters and TCD.\(^{17}\)

Hashimoto classified the ultrasonic appearance of fetal cerebellum and classified it as Grade-I = hypoechoic eyeblass shape, Grade-II = intermediate echogenicity, dumbbell outline and Grade-III = hyperechoic, fan shaped respectively.\(^{18}\) The median GA and TCD respectively were 22 weeks and 22 mm for grade-I, 29 weeks and 35 mm for grade-II and 36 weeks and 46 mm for grade-III.\(^{18}\) In this study, Grade-III (fan shaped appearance) of fetal cerebellum was taken as standard.

Goldstein reported cerebellar measurements as a method of evaluating fetal growth serve as a basis for further studies in which pregnancies at risk for congenital malformations or growth alterations can be assessed.\(^{19}\) IUGR is such a condition which requires serial USG from 24 weeks to term. In this study, a single parameter (BPD) was taken for comparison at 36 weeks. To implement it in the evaluation of IUGR serial USG and TCD, comparison with other growth parameters especially AC are needed.

Malik et al. assessed the usefulness of TCD as an independent parameter for gestational age in third trimester of pregnancy in 135 patients between 26 – 38 weeks.\(^{22}\) They compared the results of predicted gestational age by BPD, FL and AC with actual gestation. They observed that gestational age measured by TCD was consistently correlated with that measured by BPD, FL and AC. This correlation has also been observed in this study between TCD and BPD.

In this study, the relationship was established between TCD and gestational age at one specific 36 completed weeks of third trimester in patients with singletons non-anomalous fetuses. BPD was measured using Hadlock parameter at 36 weeks of 8.8 cm.\(^{20}\) TCD was measured as widest diameter across both hemispheres taking 4.9 cm at 36 completed weeks.\(^{9,21}\)

TCD measurements at 36 weeks i.e 4.9 cm. Chaves and Ananth were the first to show the clinical importance regarding the accuracy of TCD measurements in third trimester.\(^{324}\)
trimester. They demonstrated the predicted gestational age within 5 – 7 days of actual gestation in third trimester and same has been proved in this study supporting the accuracy of TCD measurements in third trimester.

A study was conducted by Malik et al. in India between 16 – 40 weeks in 100 patients. TCD was found to be an accurate parameter with accuracy of 92% which also supports this study for TCD validation in third trimester.

One limitation of this study was that LMP was used to estimate the 36 weeks of gestation for comparison between the two parameters. To obtain incontrovertible dating, only pregnancies resulting from in vitro fertilization should be included. However, all those women were excluded from this study who were uncertain of the date of LMP, had irregular menstrual cycle or were using oral contraceptives within 3 months before conception. Therefore, the reference to LMP is not likely to undermine significantly the validity of the present results. The results can be made certain even more if early dating scan was available.

CONCLUSION
Transcerebellar diameter is a more reliable method of gestational age determination in third trimester of pregnancy than biparietal diameter. It can be used as a tool to assist in the assessment of gestational age in third trimester.

Editor’s note: Another limitation of this study is the lack of comparison of data with femoral length (FL). FL is the fetal biometric parametric used for evaluation of gestational age in the third trimester of gestation. The main idea is that fetal head starts to mould as it engages and descends in preparation for birth so that both the BPD and the head circumference (HC) may measure less than they should. Since the fetal thigh does not mould, FL remains unaffected. Hence, in late gestation, FL is the standard biometric parameter to ascertain and establish fetal age, not BPD.

REFERENCES