



Correlation of Gestational age Assessed By L.M.P.,Third Trimester Ultrasound and Ballard's Score with Actual Birth Weight at Delivery

* Dr Razia Sultana

Assistant Professor, Department of Obstetrics & Gynaecology, R.D Medical College & associated Hospitals, Ujjain (M.P.).

* Corresponding Author

Dr. Neena Singh

Ex. Resident, Department of Obstetrics & Gynaecology, R.D Medical College & associated Hospitals, Ujjain (M.P.)

Dr P.K. Roy

Professor Department of Obstetrics & Gynaecology, R.D Medical College & associated Hospitals, Ujjain (M.P.).

ABSTRACT

Objectives To study the correlation of third trimester ultrasound assessed gestational age and gestational age assessed by Ballard's score with birth weight in patients admitted with labour pain

Methodology A total number of 199 patients in labour, who knew their LMP and were having third trimester ultrasonography were recruited. Ultrasonography examination was carried out and assessed gestational age were recorded. After the delivery of the baby, the birth weight, APGAR score at 1min were noted. Postnatal gestational age assessments were derived from New Ballard Scoring System. Gestational age(GA) extrapolated from the standardised Ballard scoring chart

Results. New Ballard's Score had a sensitivity of 75.55%, specificity 33.76%, PPV 25%, NPV 82.5% and accuracy of 43.2%. Significant associations were found in between New Ballard's Score (NBS) and Birth-weight and insignificant associations were found in between NBS, USG and APGAR Score.

Conclusion Significant associations were found in between antenatal assessed GA, New Ballard's Score (NBS) and Birth-weight and insignificant associations were found in between NBS, USG and APGAR Score

KEYWORDS : Gestational age ,Ballards score ,Third trimester ultrasound

INTRODUCTION

Estimation of gestational age and fetal maturity is one of the corner stones of prenatal care. When only history and physical examination are considered, it has been clearly demonstrated that the estimation of gestational age suffers from lack of precision. Inability of the patients to recall the date of last menstrual period, as often happens in our country due to low level of literacy, conception during lactation, hinders the estimation of gestational age.[1] Other conditions like obesity, presence of uterine leiomyoma, the common necessity of having different physicians examine the patient at different gestational age and the subjective nature of maternal reporting of quickening, all confuse the clinician's estimate of fetal age.[2] Because of these problems with clinical estimation of gestational age (GA), it is not surprising that early measurement of fetus using diagnostic ultrasonography (USG) has been looked as a way of objectively confirming fetal age. viability in premature labour and in post-dated deliveries [3].

The advent of ultrasound has allowed a more direct evaluation of the fetus. Measurements of a wide variety of parameters have been devised to establish gestational age. It is not necessary to measure every undentifiable fetal parameters, each establishing a gestational age, frequently leads to confusion. The biparietal diameter (BPD) is the most discussed and documented obstetric ultrasound measurement. The most appropriate method of analysing gestational age for each biparietal diameter is with a table encompassing both the mean gestational age and range of gestational ages [4,5].

Gestational age assessed soon after delivery. The principal method used to estimate gestational age is the New Ballard score, which combines physical and neurologic criteria. The Dubowitz method was used widely before the development of the New Ballard score. The Dubowitz scoring system incorporates 21 physical and neurologic assessments [6]. The Ballard system shortened the Dubowitz method to depend upon six physical and six neurologic criteria [7]. The examination is most reliable when it is performed between 30 and 42 hours of age.

The Ballard system was modified as the New Ballard score (NBS) to

improve assessment of infants as premature as 20 weeks. This method expands the description of physical and neurologic features and was tested in infants from 20 to 44 weeks gestation. The neonates were examined within 48 hours after birth and the total score of these 12 criteria were plotted against the graph giving the postnatal gestational age in weeks..

The accurate dating of pregnancy is important for pregnancy management from the first trimester to delivery, and is particularly necessary for determining viability in premature labour and in post-dated deliveries [3]. Ultrasound gave clinicians a method to measure the fetus and therefore to estimate gestational age.

However, in a resource-poor country like India, periodic ultrasound is often not available. This study is, with the view that in a situation where only limited ultrasound scan or only one-scan in third trimester has been done, then, will be able reassure the worried mothers of a good pregnancy outcome. A third trimester scan gives gestational age which may be in wide variation to the actual gestational age. Hence, this study also incorporates the clinical assessment with ultrasound assessment in high-risk fetuses in order to apply clinical intervention, which will decrease infant morbidity and mortality.

METHODOLOGY

This study was carried out in Department of Obstetrics & Gynaecology, R.D Medical College & associated Hospitals, Ujjain (M.P.).. The institute is a high profile institute with average monthly obstetrics and gynaecology OPD of approximately 5000 patients,. The present study has a social background mostly relevant to neonatal outcome and infant mortality. Women are socio-economically backward, illiterate. With this study we aim to compare the gestational age estimation by ultrasonography in third trimester, Ballard's score, Birth weight and neonatal outcome.

Study Design

This was a descriptive observational study conducted on 199 women, who were in labour, with known LMP and having a third trimester ultrasound admitted to IPD of Department of Obstetrics and Gynaecology, R. D. Gardi Medical College, Ujjain. The study was conducted

from September 2013 to July 2015. All those subjects who fulfilled the eligibility criteria were examined and delivered and after delivery, New Ballard Scoring of the baby was done within 24 hours.

Inclusion Criteria

Women attending the Labour room of Department of Obstetrics and Gynaecology , R.D .Gardi Medical College.

Women with known LMP.

Women with a third trimester ultrasonography.

Exclusion Criteria

Women who do not know their LMP

Women who have not had at third trimester ultrasonography

Multiple gestation

IUFD (Intrauterine Fetal Death)

Congenital anomalies

Ethical approval: The study was started after obtaining ethical approval from the Institutional Ethic Committee, R.D. Gardi Medical College, Ujjain,

While the date of the LMP is accepted as the most accurate assessment of GA, provided that the mother is certain of her dates and has a regular cycle, this information is not always available, besides the low literacy rate in our country further reduces the rate of reliability of the dates of LMP. Quite a few pregnant women remembers the date of the LMP in relation to some festival. Those women who were sure of their dates were taken for the purpose of this study.

Calculation of EDD:

Using Naegele’s rule the expected date of delivery was calculated. Cases where LMP was followed by ovulation induction were excluded from the study..

Ultrasound examination:

Ultrasound examination was done during their antenatal visit in third trimester to assess the GA by recording multiple parameters viz. BPD, HC, AC and FL. A total number of 199 patients in labour, who knew their LMP and were having third trimester ultrasonography were recruited in the study. Cases were selected from outdoor and indoor.

A detailed clinical profile of all the subjects was obtained and recorded in a predesigned proforma . Routine blood investigations were done for Haemoglobin estimation, also platelet count, TLC, DLC, Blood grouping and Rh typing, Blood sugar, HIV, HBsAg, VDRL screening & Urine routine examination were done. A detailed history with reference to parity, period of gestation, ultrasound findings any other associated medical or surgical illness and symptoms is taken. In general physical examination – blood pressure, pulse, respiratory rate, pallor, edema, icterus and cyanosis is noted. Systemic examination is carried out for respiratory system and cardiovascular system. Obstetric examination, presence of fetal heart sound and pelvic examination done to assess the mode of delivery. After obtaining informed consent and following the procedure of PND Act, ultrasonography examination was carried out & BPD, HC, AC, FL and assessed gestational age were recorded. After the delivery of the baby, the birth weight, sex, APGAR score at 1min and 5 min and need for NICU admission were documented.

Postnatal gestational age assessments were derived from New Ballard Scoring System, using the parameters of physical criteria viz. – skin appearance, presence of lanugo hair, plantar creases, breast tissue, ear formation and external genital formation and neuromuscular criteria viz. – posture, square window, arm recoil, popliteal angle, scarf sign and heel to ear. Gestational age(GA) extrapolated from the standardised Ballard scoring chart. Gestational age(GA) by ultrasonography was derived from multiple fetal parameters eg. Biparietal diameter (BPD), Femur length (FL), Head circumference (HC) and Abdominal circumference(AC) measurements at > 28 weeks gestation. Women who presented < 28 weeks gestation were not dated using ultrasonography.

GA by LMP was calculated from the dates given by pregnant women at booking or by Anganwadi cards. Neonates were classified as term (>= 37 weeks) or preterm(< 37 weeks).

RESULT

There were 19 patients who were below 20yrs.(9.5%), 132 patients between 20-25 yrs.(66.3%), 38 patients between 26-30 yrs.(19.1%) and 10 patients more than 30 yrs.(5.0%). Hence, the maximum no. of ANC patients are in between 20-25yrs.

58 patients were primigravida (29.1%), 97 patients were gravida 2 (48.7%) and 44 patients were gravida 3 (22.1%). Thus, major bulk of ANC patients were gravida 2. 145 patients (72.9%) delivered normally, had no abortions, 2 patients(1.0%) had instrumental delivery and 52 patients(26.1%) underwent L.S.C.S.

Table 1 : Distribution of patients according to (LMP)

Period of amenorrhoea (weeks)	Number (n=199)	Percentage (%)
< 37	19	9.5
37-40	160	80.4
>40	20	10.1

Table 2: Distribution of babies according Postnatal age

Postnatal age (weeks)	Number (n=199)	Percentage (%)
< 37	79	39.7
37-40	118	59.3
>40	2	1.0

Table 3 : Distribution of babies according to APGAR score

Apgar(1min)	Number (n=199)	Percentage (%)
≤ 7	79	39.7
>7	120	60.3

120 babies (60.3%) with an apgar score ≤7 and, 79 babies (39.7%) born with an apgar score of > 7

Table 4: Assessed gestational age (USG) and Ballard’s score of the neonate

Assessed gestational age(USG) weeks	Ballard’s score	Chi-square value	p
>34	≤32	2.581	0.120
	>32		
≤34	60		
	45		
Total	45		
	51		
	105		
	94		

Table 5 : Birth weight and Ballard’s score of the neonate

Birth weight (kg)	Ballard’s	Score	Chi-square value	p
	≤32	>32	5.567	0.25
≤2.5	76	53		
>2.5	29	51		
Total	105	94		

Table 6: Postnatal assessed gestational age and Ballard's score of the

Postnatal assessed gest. age (Ballard's score)	Ballard's	Score	Chi-square value	P
	≤32	>32	90.953	0.00
≤2.5	103	33		
>2.5	02	61		
Total	105	94		

Postnatal assessed gestational age vis Ballard's score of the neonate the Chi-square value was 90.953 and 'p'= 0.000.(significant)

Table 7 : Ballard's score and APGAR score of the neonate

Ballard's score	Apgar score (1 min.)		Chi-square value	P
	≤7	>7	1.569	0.246
≤32	46	59		
>32	33	61		
Total	79	120		

Table 8 : Antenatal assessed gestational age(USG) and APGAR score (1 min.)

Antenatal assessed gest. age (USG)	APGAR score (1 min.)		Chi-square value	P
	≤7	>7	2.625	0.140
≤34	44	59		
>34	35	61		
Total	79	120		

Data Compilation and Analysis :

Data so collected was entered simultaneously into "Statistical Package for Social Scientists" (SPSS) software version 16 and coded appropriately. The data was analyzed using appropriate statistical tests keeping in view the aim and objectives of the study. Advice of the statistician was taken throughout the period of preparation of questionnaire, collection of data and analysis.

Following statistical methods were applied in present study:

Percentage and proportions

Chi-square tests

Linear regression analysis

'T' test

Results presented in the form of tables, pie-chart, bar diagrams and graphs. Findings were compared against the standards and/or findings from similar studies, and discussed.

DISCUSSION

The knowledge of gestational age is important for Obstetricians and Neonatologists and it is routinely estimated both prenatally and postnatally [8,9]. The development of some neonatal problems during and immediately after birth is known to be dependent, to a large extent, on gestational age rather than birth [10-14].

The determination of gestational age is important in planning appropriate treatment for the fetus or infant and may modify details of their care [15,16]. Gestational age can be estimated in the prenatal and postnatal periods. Prenatally, the date of the Last Menstrual Period (LMP) and abdominal ultrasound scan are commonly used.

Antenatally, gestational age is usually calculated from the first day of the last menstrual period (LMP) [8,17,12] based on the mother's report. According to Naegele's Rule [17,18] the standard definition for term gestation is 266 days from conception. This is also defined as 280 days or 40 weeks from the first day of the mother's last menstrual period. This definition assumes that the mother ovulates on day 14 of a 28 day menstrual cycle. The formula used to calculate the date is [LMP + 7 days] - 3 months = Expected date of delivery [17,18]. This definition is based on observations first reported by Franz Naegele in 1812. He believed that pregnancy lasted 10 lunar months from the first day of the LMP and was not based on empirical data[18].

With real time ultrasound, all the fetal long bones can be adequately examined and measured. The femur is the largest of the long bones, least movable and easiest to image. A large number of tables have been published evaluating the growth of this bone, correlating it with either the gestational age or the BPD measurements. Hadlock and coworkers found that the accuracy of predicting a fetal age near term using the BPD was ± four weeks [4]. The use of BPD and multiple fetal parameters had an accuracy of ± 2.3 weeks to ± 2.4 weeks after 30 weeks of gestation [4]. Till 1950's, antepartum surveillance was limited to per abdomen fundal height assessment and fetal heart monitoring. Now with the introduction of ultrasonics in obstetrics, evaluation of fetal health has become easier, better and fairly accurate.

Several studies have tried to validate LMP- based gestational age with that derived using early ultrasonic measurements[18,19]. Gardosi et al [19] in their study found that menstrual dates systematically over-estimated gestational age at term when compared with ultrasound dates. They recommended that the proportion of pregnancies considered post term can be considerably reduced by a dating policy which ignores menstrual date and establishes expected date of delivery [EDD] on the basis of ultrasound dates alone.

Campbell et al. demonstrated that 45% of pregnant women are uncertain of menstrual dates as a result of poor recall, irregular cycles, bleeding in early pregnancy, or oral contraceptives use within 2 months of contraception [20].

A single third trimester ultrasonography assessed gestational age can be taken as significant to plan management of labor and delivery, in a low resource situation.

Irrespective of having a single ultrasonography scan in the third trimester, there was a good pregnancy outcome with 90.5% term deliveries and 68.4% babies with appropriate for gestational age.

Positive relationship was found between period of amenorrhoea and antenatal assessed GA in all the percentile groups as well as in between postnatal assessed GA, birth-weight and New Ballard's Score.

Using New Ballard's scoring system, 60% neonates delivered at term with 60.3% babies having Apgar score >7 at 1 min

CONCLUSION:-

Significant correlations were found between:

- the period of amenorrhoea (LMP) and antenatal assessed gestational age(USG) with $p < 0.01$.
- between LMP and postnatal assessed gestational age (NBS) with $p < 0.0001$.
- between antenatal assessed gestational age and postnatal assessed gestational age with $p < 0.0001$.

Significant associations were found in between antenatal assessed GA, New Ballard's Score (NBS) and Birth-weight and insignificant associations were found in between NBS, USG and APGAR Score at 1 min. and 5 min.

New Ballard's Score had a sensitivity of 75.55%, specificity 33.76%, PPV 25%, NPV 82.5% and accuracy of 43.2%.

SUMMARY

When we do not have an exact assessment of gestational age through an established LMP and ultrasonography of first trimester and we are faced with the situation where only a single third trimester USG is available and patient has come in pre-labor or with complaints where decision to postpone labour needs to be taken then a single third trimester USG can be taken as significant to plan management.[21,22]

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