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SONOGRAPHIC EVALUATION OF THE FETAL CAVUM SEPTI PELLUCIDI DIMENSION AMONG ANTENATAL WOMEN IN KANO METROPOLIS, NIGERIA

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ABSTRACT

Background: Observation of a normal cavum septi pellucidi (CSP) is an important landmark in the second and third trimester prenatal ultrasound evaluation of the fetal brain, and its visualization provides reassurance of normal central forebrain development.

Aims: This study was aimed at evaluating the fetal CSP dimension among normal women attending antenatal clinic in Kano metropolis, Nigeria. This could assist in the prenatal diagnosis of fetal central nervous system abnormalities

Methods: This study design was a prospective and cross sectional conducted at New Age Diabetics Clinic from November 2018 to December 2019. A convenient sampling method was employed and a sample size of 235 participants was used. Sonograms of the foetuses of the antenatal women which fulfilled the inclusion criteria were taken and measurements were made on the trans-ventricular plane. SPSS version 22.0 was used for the data analysis.

Results: A visualisation rate of 86.6% was observed at gestational age of 14 to 20 weeks and 100% at 21 weeks to 40 weeks. Gestational age between 14 and 40 weeks revealed CSP mean±SD of 5.20±1.88 (1.35mm-9.30mm). Estimated fetal weight was between 0.1Kg to 4.2Kg and also showed CSP range of 1.84mm-9.50mm. A strong positive correlation was observed between CSP width with gestational age and estimated fetal weight (r=0.897; p=0.000 and r=0.885; p=0.000) respectively.

Conclusion: This present study has established values for CSP for the locality with a high percentage of visualization rates between 20 to 40 weeks gestational age. A strong positive correlation was observed between CSP widths with gestational age and estimated fetal weight.

INTRODUCTION

Observation of a normal cavum septi pellucidi (CSP) is an important landmark in the second and third trimester prenatal ultrasound evaluation of the fetal brain, and its visualisation provides reassurance of normal central forebrain development [1]. Ultrasound is a useful modality, particularly in the developing countries of the world, which aids in antenatal women's health care [2]. Routine anomaly ultrasound scan is necessary to depict complications or abnormalities of the fetus with careful assessment of the fetal anatomy [3]. Obstetric ultrasound images obtained during CSP evaluation are taken in three (3) essential views of the fetal head [4]. The standard description of the CSP is an anechoic rectangular box between two hyperechoic lines represented by the septum pellucidum [5]. It is sometimes described as the fifth ventricle, seen as a slit-like fluid collection in the middle of the two leaflets of the septum pellucidum [6]. There is almost always an underlying factor or cause of CSP non-visualisation, malformations of prosencephalic development which is basically the most associated factor or cause, these include agenesis/dysgenesis of corpus callosum (CC), schizencephaly, septo-optic dysplasia (SOD) and spectrum of holoprosencephaly (HPE) [7]. Also, in severe chronic hydrocephalus and acquired fetal brain injury, non-visualisation of the CSP is seen as a result of disruptive process caused by prolonged ischaemia, leading to necrotic disruption of the septum pellucidum [8]. On the other hand, transabdominal ultrasound survey of CSP is expected to be visualized between 18 and 37 weeks, as such, non-visualisation of the CSP prior to 16 weeks or later than 37 weeks can be regarded as a normal finding [9]. The significance of observing the CSP permits the ascertainment of crucial but sometimes eluded way of making cogent diagnosis of very important abnormalities [10]

Evaluation of fetal cavum septi pellucidi dimension in the fetal brain during obstetric sonography has been considered part of the required elements of a standard examination of fetal morphology in guidelines developed by multiple specialty societies. The study aims to provide a baseline reference data by evaluating the fetal cavum septi pellucidi among normal women attending antenatal clinic in order to provide better diagnosis and care for patients in this locality.

MATERIALS AND METHODS

This prospective study was carried out at New Age Diabetics Clinic, located in Kano Metropolis, Nigeria, from December 2018 to November 2019. The human research and ethics committee of the New Age Diabetics Clinic has approved this study. A convenient sampling method was employed and a total of 235 antenatal women sonograms were used. Using a 3.5- 5MHz transabdominal probe (Sonoscape S20, Guangdong, China) the examinations were performed by a sonographer with special interest in fetal ultrasonography, with minimum of 5 years of experience. Pregnant women with a live singleton pregnancy, on current antenatal care adequate amniotic fluid volume and adequate fetal heart rate were included in the study. Those that made the exclusion criteria were pregnant women in their first trimester, twin or multiple pregnancy, history of recent excessive bleeding, suspected intra-uterine growth retardation and suspected intra-uterine fetal death or missed abortion. The fetal anatomy was evaluated in all cases following the recommendations of the international guidelines [9]. The fetal head was examined as per said guidelines. Nevertheless, the guidelines propose that with transabdominal ultrasound, failure to demonstrate the CSP prior to 16 weeks or later than 37 weeks can be regarded as a normal finding.

Keeping this in mind, patients were not kept unnecessarily long to visualize the CSP when no other underlying cause or disorder was found. Measurement of CSP was undertaken as described by Falco *et al*. [11]. Frozen images of the CSPat the axial transventricular plane with the aid of digital caliper was used, CSP was measured by placing the intersection of the caliper markers on the inner borders of proximal and distal boundary, respectively (Inner-to-Inner). To reduce inter-observer and intra-observer variability, a single researcher, with 10 years' experience, took all the measurements with average of three repeated measurements taken to increase accuracy. Data analysis was performed using a statistical software package SPSS, version 20 for Windows. Statistical significance was set at $P<0.05$.

Plate I: Sonograph Showing Measurement of Cavum Septi Pellucidi (Inner-to-Inner) (Present Study)

RESULTS

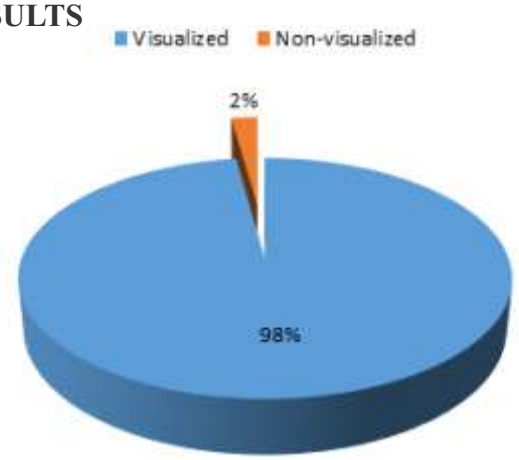

Figure 1: Visualization of CSP

The study showed a total of 228 (98%) visualised CSP and 5 (2%) non-visualised CSP (Figure 1). Different gestational weeks showed different visualization rate. The study showed the visualised CSP and non-visualised CSP at different gestational weeks (Table 2).

Table 2: Visualization rate of CSP at Different Gestational Weeks

GESTATIONAL WEEKS	NUMBER OF CASES	VISUALISED FREQUENCY	NON-VISUALISED FREQUENCY	VISUALISED PERCENTAGE	NON-VISUALISED PERCENTAGE
14	2	2	0	100	0
15	8	6	2	75	25
16	4	3	1	75	25
17	3	2	1	66.7	33.3
18	3	3	0	100	0
19	9	9	0	100	0
20	9	8	1	88.9	11.1
21	8	8	0	100	0
22	5	5	0	100	0
23	7	7	0	100	0
24	6	6	0	100	0
25	5	5	0	100	0
26	8	8	0	100	0
27	17	17	0	100	0
28	10	10	0	100	0
29	15	15	0	100	0
30	15	15	0	100	0
31	12	12	0	100	0
32	11	11	0	100	0
33	7	7	0	100	0
34	19	19	0	100	0
35	16	16	0	100	0
36	11	11	0	100	0
37	5	5	0	100	0
38	12	12	0	100	0
39	4	4	0	100	0
40	2	2	0	100	0

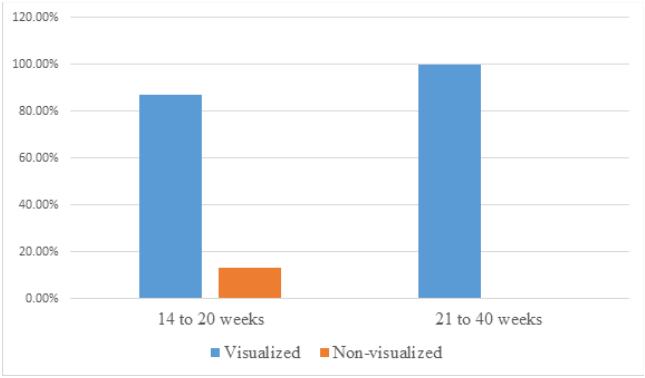

Figure 1: Chart of visualization distribution between 14 to 20 weeks and 21 to 40 week.

There exist no marked visualisation rate variations seen at individual weeks of less than 20 weeks. However, a general view of 14 to 20 weeks showed a good percentage of non-visualized CSP as compared to 21 to 40 weeks (Figure 1).

In the present study, the mean size of CSP value at different gestational weeks with minimum and maximum values was noted (Table 3).

Table 3: Size of the Cavum Septum Pellucidum at Different Gestational Weeks.

GESTATIONAL WEEKS	NUMBER OF CASES	MEAN±SD CSP (mm)	MINIMUM (mm)	MAXIMUM (mm)
14	2	1.35 ±0.35	1.10	1.60
15	6	2.00±0.99	1.70	2.80
16	3	2.13±1.09	1.90	2.40
17	2	2.30±1.32	2.30	2.30
18	3	2.43±0.46	1.90	2.70
19	9	2.69±0.32	2.20	3.30
20	8	3.07±1.05	2.60	3.40
21	8	2.90±0.45	2.50	3.70
22	5	3.20±0.29	2.90	3.60
23	7	4.13±0.54	3.40	4.70
24	6	4.30±0.79	3.30	5.10
25	5	4.80±0.71	4.00	5.60
26	8	5.56±0.47	4.60	6.60
27	17	4.94±0.68	3.40	5.90
28	10	5.43±0.47	4.80	6.40
29	15	5.51±0.75	3.90	7.40
30	15	5.72±0.72	4.00	6.50
31	12	5.89±0.27	5.40	6.30
32	11	6.04±0.53	5.50	6.90
33	7	6.22±0.42	5.60	6.80
34	19	6.15±0.68	4.90	7.10
35	16	6.50±0.61	5.60	7.60
36	11	7.11±0.81	6.00	8.60
37	5	7.86±0.45	7.30	8.50
38	12	7.30±1.21	5.30	8.80
39	4	8.55±0.51	7.80	8.90
40	2	9.30±0.28	9.10	9.50

The mean size of CSP value at different Estimated Fetal Weight with minimum and maximum values was noted(Table 4).

Table 4: Size of the CSP at Different Estimated Fetal Weight.

EFW	FREQUENCY	MEAN±SDCSP(mm)	MINIMUM (mm)	MAXIMUM (mm)
0.1	7	1.84±0.99	1.1000	2.8000
0.2	7	2.18±0.84	1.8000	2.7000
0.3	18	2.74±0.73	2.2000	3.3000
0.4	13	3.18±1.24	2.5000	3.7000
0.5	6	3.83±1.36	3.1000	4.7000
0.6	2	4.15±1.42	3.8000	4.5000
0.7	6	4.41±1.46	3.3000	5.1000
0.8	7	4.88±1.58	4.0000	5.6000
0.9	12	5.15±1.62	4.2000	6.0000
1.0	12	5.41±1.82	4.5000	6.4000
1.1	11	5.23±1.70	3.4000	6.0000
1.2	11	5.43±1.90	3.9000	6.3000
1.3	4	5.52±1.91	4.0000	6.1000
1.4	21	5.83±1.95	4.5000	7.4000
1.5	4	5.77±1.98	5.4000	6.1000
1.6	3	5.93±2.01	5.5000	6.3000
1.8	2	5.90±2.00	5.8000	6.0000
1.9	7	6.42±2.21	5.5000	6.9000
2.0	2	5.63±1.87	5.6000	5.6000
2.1	7	6.21±2.14	5.6000	7.1000
2.2	9	6.29±2.10	5.7000	7.1000
2.3	4	5.82±1.93	5.3000	6.1000
2.4	7	6.51±2.30	5.8000	7.6000
2.5	10	6.77±1.89	4.9000	8.6000
2.6	5	6.32±1.77	5.6000	7.2000
2.8	1	6.30 -	6.3000	6.3000
2.9	4	7.42±2.53	6.8000	7.8000
3.0	5	7.18±2.41	6.0000	8.0000
3.1	3	6.76±1.80	5.3000	8.3000
3.2	1	6.10 ±2.61	6.1000	6.1000
3.3	2	7.39±2.46	5.9000	8.7000
3.4	6	7.95±2.64	6.8000	8.8000
3.5	4	7.82±2.49	6.2000	8.9000
3.6	2	7.95±2.61	7.2000	8.7000
3.7	1	8.80 ±2.46	8.8000	8.8000
3.9	1	9.10 ±2.46	9.1000	9.1000
4.2	1	9.50 ±2.61	9.5000	9.5000

The Spearman correlation (non-parametric test) was used to check the correlation of CSP with GA. As a result, a significant correlation was established as the p-value was <0.05 (Table 5). Also, the Spearman correlation (non-parametric test) was used to check the correlation of CSP with EFW. Likewise, a significant correlation was established as the p-value was <0.05 (Table 5)

Table 5: Spearman Correlations of CSP with Gestational Age and Estimated Fetal Weight

VARIABLE	CORRELATION COEFFICIENT	SIGNIFICANCE
Gestational Age	0.897	0.000
Estimated Fetal Weight	0.885	0.000

P-value <0.05 are statistically significant

DISCUSSION

The present study used 235 sonograms of antenatal women that attended clinic in Kano metropolis. The study showed a total of 228 (97.9%) visualised CSP and 5 (2.1%) non-visualised CSP. Visualisation was between 14weeks to 40weeks with a mean CSP range of 1.35mm-9.30mm. The estimated fetal weight was between 0.1Kg to 4.2Kg and also showed a mean CSP range of 1.84mm-9.50mm.

The present study was able to record the CSP measurement of some fetus less than 20 weeks gestational age. Depicting the visualization of CSP before 20 weeks gestational age is regarded as uncommon[12]. However, it has been reported that the cavum septi pellucidi can be seen in 40% of fetuses as early as 15 weeks, in 82% from 16 to 17 weeks[11]. The findings of which are in agreement with the present study.

Some studies have reported 100% CSP visualization rate between 18 to 37 weeks gestational age which disagrees with the present study, for which the revealed lower percentages between 37 to 41 weeks gestational age which is also contrary to the present's study 100% visualization rate of the said gestational weeks [13][11].This could be described as a result of difference in geographical vicinity and populace used in both studies. Alternatively, another study reported 100% visualization rate between 25 to 39 weeks gestational age [14]which agrees with the present study. This similarity could be as a result of similar methodology adopted in both studies.

Association with gestational age, and CSP ranges have been established with a positive correlation[13]and [11]. The present study has also established this trend and agrees with the aforementioned findings. However, a similar study with similar methodology [14]showed no significant correlation.

The present study has established the relationship between CSP measurements and estimated fetal weight. It determined a positive correlation between the two. Otherwise, we were unable to find other studies to compare with the present study.

Some of the dissimilarities of literature with the present study showcases the possibility of having misdiagnoses due to adoption of reference level that do not categorically reflect the accurate standards of this locality. Having an accurate data of fetal CSP that is reflective of the local populace will aid in better diagnoses and care of antenatal women. Going by the findings of this study, the tendency of having persistent CSP in infants is likely to be higher in this locality. This means that further studies are needed to showcase the likelihood of persistent CSP in infants.

CONCLUSION

This present study has highlighted values for CSP for the locality. In our study, a high percentage of visualization was revealed. A strong positive correlation was observed between CSP widths with gestational age and estimated fetal weight.

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