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Evaluation of Embryonic Cardiac Activity, Heart Dimension, Chest Dimension and Some Fetal Movements during 8th – 16th Weeks of Pregnancy Using Ultrasound

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Abstract: ***The high resolution, safety and ease performance make ultrasound (U/S) the procedure of choice for routine ultrasonography, in the first half of pregnancy as a standard of obstetric care. The aims of this study were to evaluate the activity of the heart muscle (HR), heart dimension (HD), chest dimension (CD), as well as to assess some of the embryonic movements of the fetuses from 8 weeks – 16 weeks of pregnancy. This descriptive cross section study was performed in the ultrasound departments in five big Khartoum State hospitals during September 2007 till October 2009. 522 early pregnant mothers (aged 19 - 30years) who were chosen randomly were interviewed by the investigators, and data was collected by using a well prepared questionnaire. In addition, every participant was examined with U/S, which was supplied with the Doppler mode, and recording of Crown Rump Length (CRL), Heart Rate (HR), (CD), (HD) of the fetus was performed. Moreover, some movements of the fetuses were also recorded (punching, kicking, and rolling over of fetuses). This study highlighted the strong correlation between heart beats of the fetuses and (HD) (particularly in fetuses with (HR) above normal), CD, Gestational Age (GA) in weeks, and different fetal movements within the uterus. Also, the study showed that there was a relationship between the high abnormal heart activity and abortion in pregnant mothers. In addition, depressed mood of the mother had an increased effect on fetal heart rate. The study recommended that Color Doppler ultrasound should be an integral part of the routine fetal heart rate for helping to short the scanning time and improve reliability or exclude abnormalities. Sonographers should increase their knowledge of various genetic and environmental factors (as maternal depression) that may disturb normal development of the embryo. They also should be suff*** Analysis Sp ***racterization of multiple pregnancies, early diagnosis of lethal abnormalities, and screening of chromosomal***

Keywords: embryonic, cardiac, activity, ultrasonography, early pregnancy

1. Introduction

The high resolution, safety and ease of performance make ultrasound the procedure of choice for routine ultrasonography in the first half of pregnancy as a standard of obstetric care (Yigiter, 2011)[1]. Modern ultrasound technology (especially abdominal and transvaginal techniques) has revolutionized the diagnosis and management of early pregnancy development (Papaioannou et al. 2010)[2]. Currently, first trimester ultrasonography indications are to confirm the presence of an intrauterine pregnancy, to estimate gestational age, to evaluate a suspected ectopic pregnancy, to define the cause of vaginal bleeding, to evaluate pelvic pain, to diagnose or evaluate multiple gestations, to confirm cardiac activity, as an adjunct to chorionic villus sampling, embryo transfer, or localization and removal of an intrauterine device, to evaluate maternal pelvic masses or uterine abnormalities and to evaluate suspected hydatidiform mole (Yigiter, 2011)[1]. In addition, there are obvious benefits for intrauterine procedures such as fetal surgery (Hemadi, & Torocsik, 1997)[3]. The use of diagnostic ultrasound during pregnancy is considered to be safe for both mother and fetus. Even in critical periods of development and using high-frequency transvaginal transducers, no adverse bioeffects have been demonstrated (Lausin, et al. 2009)[4].

Sensitive biochemical assays and high-resolution ultrasonography now make the diagnosis of pregnancy highly sensitive and specific (Cohen, 2004)[5]. Furthermore, recent introduction of three-dimensional and four-dimensional ultrasounds combined with the transvaginal approach has produced more objective and accurate information on embryonic and early fetal development and made it possible to visualize fascinating aspects of embryonic differentiation (Yigiter, 2011)[1]. Three-dimensional diagnostic ultrasound technique is changing our understanding tremendously. The opportunity to observe the volumetric morphology of the embryo from the very beginning of gestation is clearly of immense importance in understanding the events taking place in this key period of human development (Lopez et al. , 2006)[6].

Transvaginal sonography was introduced in the late 1980s, and it provides superior images owing to the proximity to the pelvic organs. Additionally, Transvaginal ultrasound can detect pregnancies earlier compared with abdominal ultrasound, patients reassured by showing normal development, accurate gestational age determination, sufficiently early characterization of multiple pregnancy, early diagnosis of lethal anomalies and screening of chromosomal defects can be done with first trimester ultrasonography (Papaioannou et al, 2010)[2]. Moreover, it gives clearer images and can be performed instantly, as the

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patient needs an empty bladder. There are, however, some limitations regarding its practical use; some women may feel it is an intrusion or may be concerned in case the pregnancy is harmed. Some women will refuse a transvaginal scan. Transabdominal ultrasonography is still widely used in this period of gestation for cultural and practical reasons (Papaioannou et al, 2010[2] ; Pennel et al, 1991)[7]

The occurrence of positive qualitative evidence of pregnancy occurs shortly after implantation at about 23 to 28 days (menstrual). The first ultrasound evidence of pregnancy occurs at about 32 to 35 days (Kupesic et al, 2002)[8]. Routine ultrasonography during the first trimester is used for accurate pregnancy dating, early diagnosis of major malformations, characterization of multiple pregnancy and screening of chromosomal anomalies (Cohen, 2004)[5]. Ultrasound visualizing, heart beating of the embryo on 5 weeks pregnancy, and fetal movements, which begins about 7. 5 weeks after conception. (Asghar. and Fatima, 2011)[9]. Failure to understand the limitations of diagnostic ultrasound or inadequate training of physicians in this technique can result in grave complications for the patient and liability for health care providers (Cohen, 2004)[5].

Risk factors affecting developing of early pregnancy are mainly related to Intrauterine Growth Restriction (IUGR) (Timor-Tritsch et al. , 1992)[10]. IUGR refers to poor growth of a baby during pregnancy. The causes can be maternal factors, fetal factors, or placental factors, but most often involve poor maternal nutrition or lack of adequate oxygen supply to the fetus. A maternal factor associated with IUGR may be poor nutrition, trans placental infections as toxoplasmosis, rubella,. . ect, a hypertensive disease, smoking (Rafael (1989)[11], collagen vascular disease, alcohol, uterine factors e. g. fibroids, Muller ion anomaly (bicornate uterus). Placental factors associated with IUGR, is placental hemorrhage. The majority of IUGR cases (2/3) are due to chronic placental insufficiency (Rafael (1989)[11]. The fetal factors associated with (IUGR) are: Chromosome abnormalities, fetal infection (Cytomeylovirus) (CMV).

Fetuses tend to be very responsive to their mothers' emotional (depression and anxiety) and physical state, both of which can sometimes play a part in activity and movement. When a pregnant woman is stressed, the baby may respond by moving less or lying still. The same is often true in women who are dehydrated or who have skipped meals. Enhanced levels of depression and anxiety symptoms during pregnancy contribute independently of other biomedical risk factors to adverse obstetric, fetal and neonatal outcome (Allister et al, 2001)[12].

Unfortunately, there is a gap in knowledge about using U/S in determine the embryonic cardiac activity, HD, CD, accurate gestational age by using CRL rather than LMP among Sudanic early pregnant mothers. To the best of our knowledge no similar studies were done before in Khartoum governorate.

2. Objectives

The study has been conducted to determine, the embryonic cardiac activity, accurate gestational age, heart dimension, chest dimension at age 8-16 weeks gestation. Also, to assess different movements of fetuses (hand motion, legs motion, and rolling over of fetus) at age 8-16 weeks gestation. In addition, to investigate the relation between maternal stress and embryonic cardiac activity. Moreover, to determine the outcome of embryonic high level heart rates.

3. Material and Methods

Study design: Descriptive cross section study.
Study Settings:

This study was performed in the ultrasound departments in Khartoum state hospitals, Khartoum North hospital, El Ribat University Hospital, Alzaiem Al Azhari University Ultrasound Clinic, El Salam Hospital (Hajj Yousif Sharg Al Nil, & Atbara Hospital). The investigation was undergone between September 2007 – October 2009.

Population of the Study

A total of 647- early pregnant mothers (aged 19-30 years) presented to Obstetric-Ultrasound departments for scan, in previous settings, were randomly included during study duration. However, 125 pregnant mothers were excluded due to having heart diseases (genetically or acquired) in their pregnancy, or history of chronic renal failure running in family, hypertension, diabetes mellitus, chromosomal abnormality, or sickle cell anemia, or had a history of repeated abortions (spontaneous miscarriages), or those mothers with fetuses with lower heart beats than the normal rates **,**or mothers older than 30 years, or mothers who refused to participate. Accordingly, 522 early pregnant mothers were included, 58 pregnant mothers at each gestational age at 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th weeks of pregnancy.

Data Collection

After taking administrative agreement from Ministry of Health, Khartoum Governorate, data was collected by well-prepared pre-tested questionnaire included personal data, past history of abortion (miscarriage), and any history of chromosomal abnormality, date of starting kicking movement, and the mode of the mother during the scan was measured by asking ten questions about stresses in both her family and work, with Likert scale with high score meaning high stress and low score meaning low stress. Objectives of the study were told to early pregnant mothers, and take their verbal consent to follow them up from week 8-16 weeks of pregnancy with free care.

The Scans were performed by Ultrasound machine with a real – time – two dimension-with color Doppler, 3D dimension for delineation of congenital anomalies. The probe 3.5 MHz convex was used. Gestational age was diagnosed mainly on the use of CRL rather than LMP (last menstrual period). Heart activity was diagnosed by locate

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the heart, and using M-mode to gets the heart signal using the Doppler to see the forward flow of Blood through the umbilical cord (repeat the square 2-3 times). Heart dimension was diagnosed by measuring fetal heart chambers diameter. Also, the Diameter of the chest was measured at the same time of measuring the heart dimension.

Statistical Analysis

Data were coded, entered, and analyzed using SPSS for windows version 16. 0 (SPSS Inc. version 16. 1, Chicago, Illinois). Frequency and percentages were presented in tables. Pearson correlation analysis was performed for the selected variables of the study. All tests were two-sided and $p < 0.05$ was considered statistically significant.

4. Results

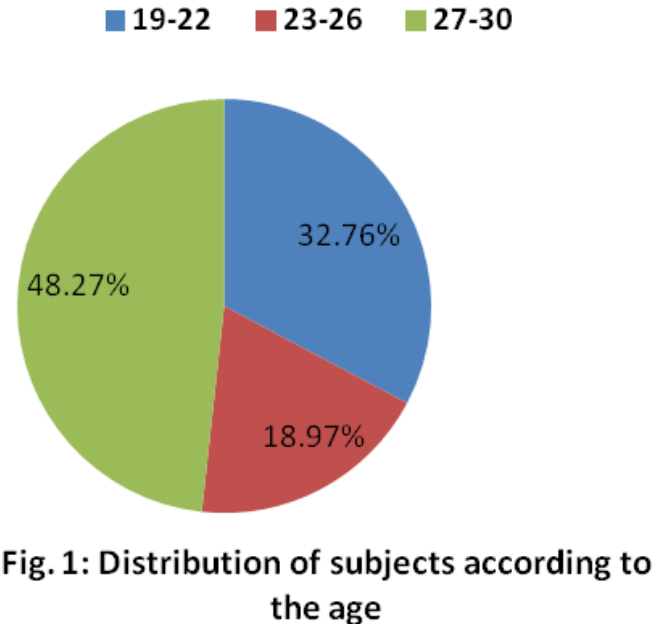

Figure 1: Majority of pregnant mothers were in age group 27-30 years (48. 27%)

Table 1: Distribution of studied sample by the number of current pregnancy

Pregnancy	*Frequency*	
	N0.	%
First	198	37. 9
Second	180	34. 5
Third	72	13. 8
Fourth	36	6. 9
6th	36	6. 9
Total	522	100%

The number of mothers, whom they get present for the first time, was 198 mothers 37. 9%, 180 mothers in their 2nd pregnancy 34.5%, 72 on their 3rd pregnancy 13.8%, and 36 mothers were on each 4th and 6th pregnancies 6.9% for each.

Table 2: Distribution of subjects according to embryos' heart rate and gestational age

H. R (mm)	8th		9th		10th		11th		12th		13th		14th		15th		16th		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
≤ 150	21	4. 02	13	2. 49	11	2. 11	8	1. 53	10	1. 92	5	0. 96	2	0. 38	-	-	6	1. 15	76	14. 6
151-160	16	3. 06	23	4. 41	18	3. 45	14	5. 55	29	5. 55	5	0. 96	3	0. 57	2	0. 38	3	0. 57	113	21. 6
161-170	3	0. 57	3	0. 57	4	0. 77	7	1. 34	4	0. 77	1	0. 19	2	0. 38	1	0. 19	2	0. 38	27	5. 2
171-180	6	1. 15	5	0. 96	6	1. 15	2	0. 38	3	0. 57	13	2. 49	1	0. 19	4	0. 77	2	0. 38	42	8. 0
181-190	4	0. 77	6	1. 15	10	1. 92	8	1. 53	5	0. 96	2	0. 38	10	1. 92	7	1. 34	7	1. 34	59	11. 3
191-200	2	0. 38	1	0. 19	3	0. 57	4	0. 77	5	0. 96	4	0. 77	9	1. 72	12	0. 38	13	2. 49	53	10. 2
>200	6	1. 15	7	1. 34	6	1. 15	15	2. 87	2	0. 38	28	5. 36	31	5. 94	32	6. 13	25	4. 79	152	29. 1
Total	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**522**	**100**

Table 2 illustrates the results of measurement of embryos heart rate (b/min)as follows, 76 embryos (from week 8-16+) their heart rate was less than or equal to 150b/min. , equal 14. 6%, 113 embryos 21. 6% their heart rate between (151-160 b/min.), fig (1). 27 (5. 2%) embryos and fetuses their heart rate between (161-170), fig (2), 42 their heart between 171-180. 59 their heart rate (181-190), 53 their heart rate between (191-200), and the last 152 their heart rate > 200 b/min. All studied embryos gestational age were (8-16) week of pregnancy.

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Table 3: Embryos with above normal range of heart rate (b/m) in (8^{th} to 12^{th} weeks of gestational age)

H. R (b/min)	Gestational age (weeks)										Total	
	8^{th}		9^{th}		10^{th}		11^{th}		12^{th}			
	No.	%	No.	%	No.	%	No.	%	No.	%	N0.	%
Above normal range	12	2. 3%	8	1. 53%	9	1. 72%	19	3. 64%	19	3. 64%	67	12. 8%
Median Value of high HR	192 beats/min.		327 beats/min		320 beats/min		210 beats/min		210 beats/min		260 beats/min	
***Normal HR range**	148-172		155-195		155-190		155-190		120-160			
Follow up	**No abortion**		**Two abortions**		**no abortions**		**Two abortions**		**no abortions**		**Four abortions (0. 77%)**	

67 embryos out of 522 showed HR above normal range with 12. 8%. The heart activity of the fetuses in 8, 9, 10, 11 & 12 weeks demonstrated above normal levels in the following percentages: 2. 3%, 1. 53%, 1. 72%, 3. 64, and 3. 64% respectively. By close follow up of mothers whom had fetuses of high level heart beats than normal, it was found that, 4 experienced abortions in the 9^{th} and 11^{th} weeks with percentage 0. 77%. The investigation concluded that there was a relationship between the high abnormal heart activity and abortion in early pregnant Sudanic mothers. *According to Doubilet et al, 2000[13].

Table 4: Distribution of subjects according to embryo's heart dimension

HD (mm)	8^{th}		9^{th}		10^{th}		11^{th}		12^{th}		13^{th}		14^{th}		15^{th}		16^{th}		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
≤15	33	6. 32	29	5. 56	29	5. 56	29	5. 56	29	5. 56	28	5. 36	28	5. 36	15	2. 87	13	2. 49	233	44. 64
16-20	17	3. 26	7	1. 34	-	-	-	-	-	-	1	0. 19	1	0. 19	14	2. 68	13	2. 49	53	10. 15
21-25	4	0. 77	2	0. 39	-	-	-	-	-	-	-	-	-	-	-	-	4	0. 77	10	1. 92
>25	4	0. 77	20	3. 83	29	5. 56	29	5. 56	29	5. 56	29	5. 56	29	5. 56	29	5. 56	28	5. 36	226	43. 30
Total	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**522**	**100**

Table (4) shows measurements of the 522 embryos heart dimensions: 233fetuses (age-8-16weeks) 44. 64% their heart dimension (heart chambers) ≤15mm. (16-20)mm heart dimension concerning 17 embryos at week 8, (3. 26%), 7 at week 9, (1. 34%) 1 at week 13 and week 14, (0. 19% for each). 14 fetuses at age 15w. (2. 69%), and 13 fetuses at age 16w, (2. 49%). Fetuses with heart dimension of (21-25mm) were 4 fetuses at age 8weeks, 2 at age 9weeks and 4 at age 16weeks. Heart dimension for (4) fetuses at age 8 weeks was, >25mm, 20 fetuses at age 9weeks, 29 fetuses at age 10, 11, 12, 13, 14, 15 weeks and 28 fetuses at weeks 16.

Table 5: Distribution of subjects according to embryo's' chest dimension

C. D	8^{th}		9^{th}		10^{th}		11^{th}		12^{th}		13^{th}		14^{th}		15^{th}		16^{th}		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<40	35	6. 70	31	5. 94	29	5. 56	29	5. 56	28	5. 36	28	5. 36	27	5. 17	26	4. 98	21	4. 02	254	48. 66
41-45	13	2. 49	6	1. 15	-	-	-	-	1	0. 19	-	-	1	0. 19	1	0. 19	5	0. 96	27	5. 17
46-50	7	1. 34	7	1. 34	-	-	-	-	-	-	-	-	-	-	1	0. 19	1	0. 19	16	3. 07
>50	3	0. 57	14	2. 68	29	5. 56	29	5. 56	29	5. 56	30	5. 75	30	5. 75	30	5. 75	31	5. 94	225	43. 10
Total	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**58**	**11. 11**	**522**	**100**

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35 fetuses at age 8 weeks, 31 at age 9, 29, at age 10& 11weeks, 28, at age 12-13 weeks, 27 at age 14, 26, at age 15 and 21 fetuses at age 16 weeks their chest dimension was <40mm.

CD (>50mm) for 31 fetuses at age 16 weeks, 30 fetuses at age 15, 14, 13 weeks 29 fetuses at age 12, 11, 10 weeks 14fetuses at age 9 weeks and 3 fetus on age 8 weeks.

Table 6: Distribution of subjects according to embryos starting kicking movement and gestational age

K. M	8th		9th		10th		11th		12th		13th		14th		15th		16th		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes <15	-	-	-	-	-	-	-	-	19	3. 64	30	5. 75	38	7. 28	38	7. 28	39	7. 47	164	**31. 40**
No	58	11. 11	58	11. 11	58	11. 11	58	11. 11	39	7. 47	28	5. 36	20	3. 83	20	3. 83	19	3. 64	358	**68. 60**
Total	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	522	**100**

Table (6) shows the distribution of subjects according to embryos starting kicking movements. The embryos, (at the start of kicking movement) 19 of them, started at week 12, 30 at week 13, 38, at 14, 15 week of age, and 39 fetuses at week 16.

Table 7: Distribution of subjects according to embryos rolling movement and gestational age

R. M	8th		9th		10th		11th		12th		13th		14th		15th		16th		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<15 Yes	45	8. 62	49	9. 39	53	10. 15	47	9. 00	41	7. 85	24	4. 60	13	2. 49	18	3. 49	22	4. 21	312	59. 77
No	13	2. 49	9	1. 72	5	0. 96	11	2. 11	17	3. 26	34	6. 51	45	8. 62	40	7. 62	36	6. 90	210	40. 23
Total	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	522	100

Table (7) illustrates the rolling movement, recorded for 45 fetuses at age 8 weeks, for 49 one at age 9 weeks, for 53 at age 10 weeks, for 47 fetuses at age 11 weeks, for 41 fetuses at age 12 weeks for 24 at age 13 weeks, 13 at age 14 weeks. For 18 at age 15 weeks and for 22 fetuses at age 16 weeks.

Table 8: Distribution of subjects according to embryos punching movement and gestational age

P. M	8th		9th		10th		11th		12th		13th		14th		15th		16th		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	-	-	-	-	-	-	-	-	13	2. 49	19	3. 64	24	4. 60	19	3. 64	31	5. 94	106	20. 31
No	58	11. 11	58	11. 11	58	11. 11	58	11. 11	45	8. 62	39	7. 47	34	6. 51	39	7. 47	27	5. 17	416	79. 69
Total	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	58	11. 11	522	100

This table shows the punching movement of 13 embryos at age 12 weeks, 19, fetuses at age 13 weeks, 24 one at age 14weeks, 19 at age 15, and 31 fetuses at age 16 weeks.

- The correlation of the heart dimension and the age of the embryos, were higher (r= 0. 91), It means a significant relation between growing of the heart dimension (relatively more pumping, more activity of the heart rate) on a period of time 8-16 weeks of age.
- Also the table revealed the good correlation between the chest dimension and the heart rate (increasing & decreasing) (r=0. 61).
- The table also highlighted the correlation of the fetuses heart rate above normal with the HD (r=0. 80).
- There is a significant relation between the heart rate and the different movements of the embryos inside mother's uteruses.
- There is no relationship between the number of pregnancies and increasing or decreasing of the heart rate (r=0. 48).
- The results above show a correlation between increased heart rate of the fetus and the mood of the mother (r= 0. 72).

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Table 9: Pearson correlation coefficient (r) for the selected variables of the study

Variable	*Correlation results*	
	R	Sig.
HR/age	0. 87	**
HR/HD	0. 59	*
High HR/ HD	0. 80	**
HR/DCXR	0. 61	*
HR/kicking	0. 86	**
HR/rolling	0. 83	**
HR/punching	0. 87	**
Age/kicking (13-16W)	0. 74	*
Age/rolling (8-13W)	0. 83	*
Age/punching (14-16W)	0. 76	*
Age/HD	0. 91	**
HR / score maternal stress	0. 72	**
No. of preg. /HD	0. 48	w. r

Key:
w. r = weak relationship
* = strong significant relationship
** = very strong significant relationship
Table (9) demonstrated the following results:

- A strong relationship was recorded between the age of the fetuses and the heart rate, correlation coefficient (0. 87).

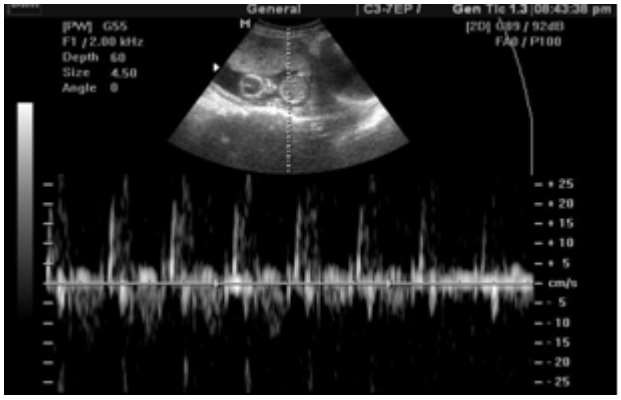

Figure 1: Normal heart rate 154

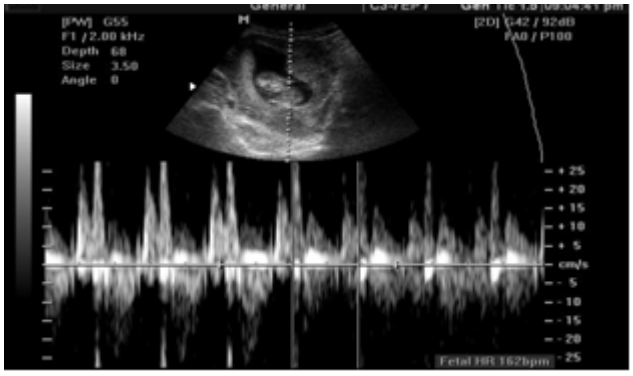

Figure 2: Normal HR 162/b pm

5. Discussion

This study of a large number of normal early Sudanic pregnancies has evaluated HR, HD, CD and some of the embryonic movements at 8–16 weeks of gestation. The study has depended mainly on the use of CRL rather than LMP for the assessment of GA which provide further support for the recommendation provide by (Papaioannou et al, 2010)[2] who reported that pregnancy dating should be based on CRL rather than LMP.

The study selected young pregnant mothers (19 -30 years), for recording their embryos and fetuses heart beat/mm, while moving and resting because they are noted with their umbilical cords, which appears like tether at early first trimester. The movements, include, the rolling movement, kicking by lower limbs, punching by hands and arms.

In our study, one of the main reasons of excluded early pregnant mothers was that their fetuses records, a low heart rate, for example at age 8 weeks-recorded heart pulse <75 heart/min. This point agrees with Doubilet & Benson, 2005[14]. They determined that the low fetal heart rate is correlated with embryonic loss, and is often used as a predictor for risk of spontaneous miscarriage. The majority of fetal heart rate researches articles focus on this aspect as an indicator "when a slow embryonic heart rate is detected at 6 -7 week, the likelihood of subsequent first trimester denies remains elevated approximately 25% even if the heart rate is normal at follow up in such pregnancies. At least one follow up scan in late first trimester is warranted (Doubilet& Benson, 2005)[14].

Data concerning the heart rate, of the embryos, which were above normal range, (fig. 3) of the embryonic heart rate were: At age 8weeks there was 12embryos (2. 3%) from the total of whom their heart rate above the normal range (184-172), and 8 individuals at age 9 weeks (1. 53%), 9 in week 10 (1. 72%), and 19 (3. 63%) in each week 11 and 12 were above the normal range of the heart beat. This result agreed with the study done by (Mongiovi et. al. , 2008)[15]. "The normal fetal cardiac rhythm is characterized by a regular heart rate ranging 100-160-180 heart/min (1st trimester) with normal arterioventricular electrometrical relationship, during each cardiac cycle. However, (Papaioannou et al. 2010)[2], reported that the embryonic HR increased with gestation from a mean of about 110 bpm at 6 weeks to a maximum of about 175 bpm at 9 weeks and decreased thereafter. The early increase in HR coincides with the morphological development of the heart, and the subsequent decrease may be the result of functional maturation of the parasympathetic system (Wisser &, Dirscheld, 1994)[16]. This decrease continues throughout pregnancy and during the first 10 years of postnatal life (Wisser &, Dirscheld, 1994)[16]. However, an earlier study, done by Doubilet et. al. , 2000) [13], reported that in week 9th the fetal heart rate will increase by 3. 3 beat per day, so the fetal heart rate will be in the range of 155-195 beats per/min. Visualizing a normally heart beating using ultrasound on 7-9 weeks can offer reassurance, although not a guarantee, that the developing fetus is healthy (Timor-Tritsch et al, 1991) [17].

The heart beat in motion, was correlated with normal range of embryos heart dimension. This finding illustrated the presence of the heart activity and evaluated, this activity, even those it was a mechanical action, of their uncompleted hearts parts in early stage of their ages (8-16 week gestation). Our study agreed with (Devtres et al, 1985)[18], who didn't separate the motion of the heart and

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activity of the chambers, he just described the motion as follows, "after three weeks of conception, the first dramatic motion, is the one that symbolize like itself (the first heart beats) and this rhythmic activities continuous, while valves, chambers are under construction, he added this illustrating important fact about the developmental parts; pressed into service as they become available. Furthermore, while between 6-10 weeks gestation, the fetal bodies burst into motion, achieving a graceful, stretching, and rotational movements of the, head, fig (4), arms, legs, hand to hand, hand to face, fig (5), hand to mouth, movement- mouth closing and opening by 14weeks.

Our study confirmed the positive significant relation between increasing of the fetal heart rates and embryonic movements. The rolling gives high significant correlation (r=0. 83) with gestational age 8-13 weeks (Table 9), also the kicking movement gives high correlation (r = 0. 74) at age 13-16 weeks of gestation (Table 9). Punching movement (kicking), fig (6), gives higher score at age (14-16) weeks ratio 0. 76. In addition, the previous three movements has a significant relation with increasing of the embryos and fetuses heart beats (Table9). There was a significant correlation between size of the chambers and the heart beats, during the growing of the fetus and also the chest dimension.

The prediction role of gender on heart rate of the embryos and fetuses, was unexpected by the researcher to have an effect on the rhythm of the heart. However, the old wives insisted that the fetal heart rate above 140 beat/min is a sure sign to be a girl, if the fetal heart rate below 140b/min means it's a boy. This theory is based on the fact that girls have higher metabolisms than boys. Unfortunately there is no satisfactory evidence indicates that there is a relationship between heart rate and sex (Marwan et al., 2009)[19]. In addition, agreed with our finding is a study done in university of Arkansas in which, among 2500 pregnant mothers showed that this old wives tales was not true (Druzin et al, 1986)[20].

This study demonstrated a positive significant correlation between the stress- related changes in mode of early pregnant mother and increased heart rate of her developing fetus. The stressed mothers who came for the scan recorded higher pulse rate by their fetuses, and that happens by seeing a lot of jerking movement, during scanning even after repeating the scan twice. Questionniering the mothers about their stress, and the reasons lead to uncomfortable condition to the pregnant mother. Chronic anxiety affecting the developing fetuses and ongoing of pregnancy. This finding agreed with (Alisters et al, 2001)[12], who reported that the depressed or stressed mother, are not aware and unable to control their reactivity to stimulation she added, they should care of themselves, physically and emotionally, because the stress and depression as the result of arranging problems, between work, their homes, and abusive husbands.

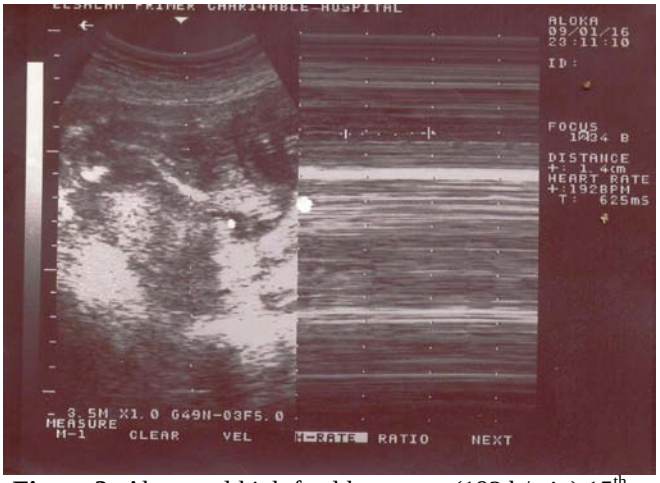

Figure 3: Abnormal high fetal heart rate (192 b/min) 15th week of age

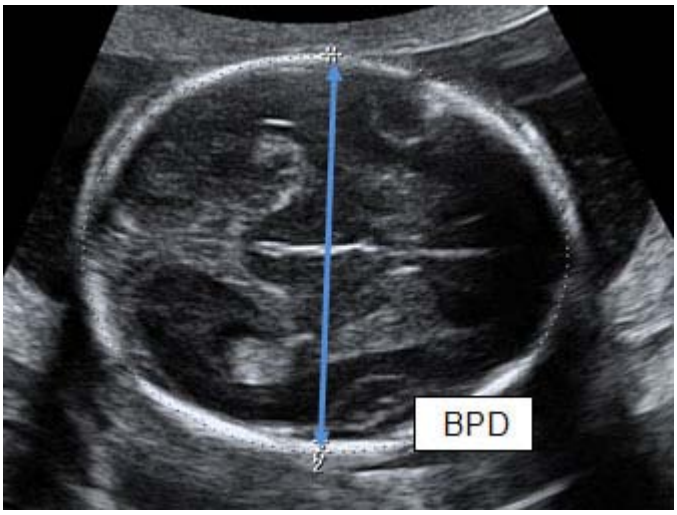

Figure 4: Fetal head (BPD) ultrasound image

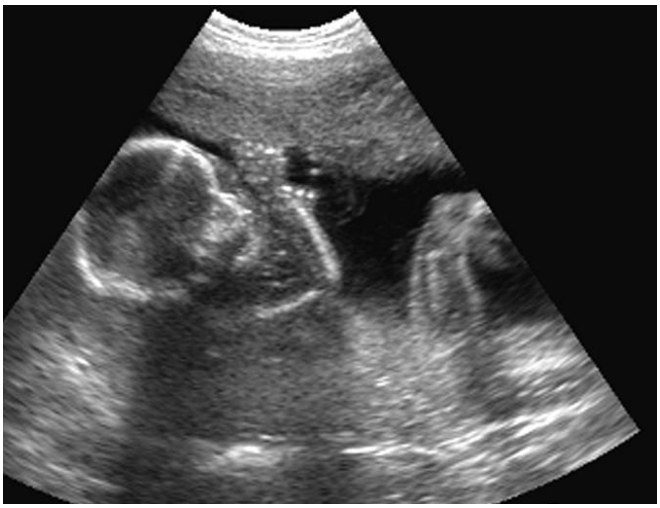

Figure 5: Fetal hand & head ultrasound image

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Figure 6: Fetal movement (kicking) ultrasound image

6. Conclusions

This study highlighted the strong correlation between heart beats of the fetuses and HD (particularly in fetuses with HR above normal), CD, GA (in weeks), and different fetal movements within the uterus. Also, the study showed that there was a relationship between the high abnormal heart activity and abortion in pregnant mothers. In addition, depressed mood of the mother had an increased effect on fetal heart rate. The correlation of the heart dimension and the age of the embryos, was high (r = 0. 91). On the other hand, there is no relationship between the number of pregnancies and increasing or decreasing of the heart rate.

7. Recommendations

According to this study results we recommended that Doppler scan must be done for the pregnant mother between (11-14) weeks to pick any abnormality (like twisted or knotted umbilical cord, at this period of time). In addition, pregnant mothers should be aware of themselves, by keeping away their problems, these advices, can be introduced, when they come to the U/S scan, and tell them, the effect of their anxiety, may affect their pregnancy. Moreover, fetal echocardiogram, should be one of the priority, given to the fetus whom they recorded higher heart rate than normal, according to their ages. Also, for the fetus whom they get disturbance of cardiac rhythms, before 15 weeks of pregnancy should be closely followed up by the cardiologist, parents should be told by the real fact of the great risk of pregnancy. The study also recommended that color Doppler ultrasound should be an integral part of the routine fetal heart rate for helping to short the scanning time and improve reliability or exclude abnormalities. Also sonographers should increase their knowledge of various genetic and environmental factors that disturbed normal development of the embryo. In addition, they should be sufficiently trained on early characterization of multiple pregnancies, early diagnosis of lethal abnormalities, and screening of chromosomal defects.

References

[1] Yigiter A. B. (2011): Early Normal and Abnormal Pregnancy. Donald School Journal of Ultrasound in Obstetrics and Gynecology, October-December 2011;5 (4):385-404.

[2] Papaioannou G. I. , Syngelaki, A. , Leona C. Y. , Jackie A. P, Nicolaides R. K. H. (2010): Normal Ranges of Embryonic Length, Embryonic Heart Rate, Gestational Sac Diameter and Yolk Sac Diameter at 6–10 Weeks. Fetal Diagn Ther 2010; 28:207–219 DOI: 10. 1159/000319589.

[3] Hemadi L, Torocsik M. (1997): Screening for fetal anomalies in the 12th week of pregnancy by transvaginal sonography in an unsetected population. Prenat Diagn 1997; 17:753 9.

[4] Lausin, I, Kurjak A, Pooh R., Azumenti G, Mazoda K (2009): Advanced in visualization of the early human development. Curr Opin Obstet. Gynecol. 2009; 7:493-504.

[5] Cohen L. (2004): Diagnostic ultrasound in the first trimester of pregnancy. In Gynecology and Obstetrics: Lippincott, Williams and Wilkins 2004;2 chapter 4.

[6] Lopez RM, Cortes LM, Salazar JC, Lopez LC (2006): Contribution of 3 D Ultrasonography to the study of embryonic development. In Kurjak A (Eds): Textbook of Perinatal Medicine, India. Jypee Brothers Medical Publishers, 2006; 12:1307-14.

[7] Pennel RG, Needleman L, Pajak T (1991): Prospective comparison of vaginal and abdominal sonography in normal early pregnancy. J Ultrasound Med 1991; 10:63-67.

[8] Kupesic S., Hadner T, Bjelos D (2002): Events from ovulation to implementation studied by three – dimensial ultrasound. J Perinatal. Med 2002; 30:84 - 98. 4

[9] Asghar M. and Fatima Y (2011): ROLE OF ULTRASONOGRAPHY IN THE ASSESSMENT OF EARLY REGNANCY. Gomal Journal of Medical Sciences July-December 2011, Vol. 9, No. 2 170-173.

[10] Timor-Tritsch IE, Monteagudo A, Peisner DB. (1992): High-frequency transvaginal sonographic examination for the potential malformation assessment of the 9-week to 14-week fetus. J Clin Ultrasound 1992; 20 (4):231- 8.

[11] Rafael Z. (1989): Fetal intracranial anatomy in the first trimester of pregnancy: transvaginal ultrasonographic evaluation. Neuroradiology 1989; 31:222- 5.

[12] Allister L1, Lester BM, Carr S, Liu J. (2001): The effects of maternal depression on fetal heart rate response to vibroacoustic stimulation. Dev Neuropsychol. 2001; 20 (3):639-51.

[13] Doubilet P. M., C. B. Benson and J. S. Chow, A. M. J. Roentagenal (2000): Outcome of pregnancies with Rapid embryonic heart rates in the early first trimester. American Journal of Radiolog. July, 2000, 69: 1754- 67.

[14] Doubilet Pm, Benson CB (2005): at u/s Radiology Aug 2005 236 (2). 643-6.

[15] Mongiovi M. P. Petone S. Currphan, Des. 2008 14 (8) 736-42

[16] Wisser J, Dirscheld P (1994): Embryonic heart rate in human dated embryos. Early Hum Dev 1994; 37: 107–115.

[17] Timor-Tritsch IE, Monteagudo A, Warren WB. (1991): Transvaginal sonographic definition of the

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central nervous system in the first and early second trimesters. Am J Obstet Gynecol 1991; 164:497 503.
[18] Devtres, J. I. P. Verma, G. H. A. and Prechtl, H. F. K. (1985). The emergences of fetal 13 ehavior quantitive aspect, early human development 12-99-120.
[19] Marwan O.; Vitali G.; Kais. M,; Ella, O; Bornstein, J (2009): "Sonographic Fetal Sex Determination". Obstetrical & Gynecological Survey 64: 50. doi: 10. 1097 /OGX. 0b 013 e 318193299b.
[20] Druzin ML, Hutson JM, & Edersheim TG. (1986): Relationship of baseline fetal heart rate to gestational age and fetal sex. Am J Obstet Gynecol. 1986 May; 154 (5):1102-3

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