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ORIGINAL RESEARCH

Comparative study on ECG & Cardiovascular pattern in different trimesters among pregnant women

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ABSTRACT

Background: In Pregnancy changes in ECG pattern and cardiovascular events are recorded. It was also reported that changes in both during pregnancy can produce severe complications. It is very important to manage the complications in different trimesters to reduce mortality. **Methodology:** Total 300 study subjects were enrolled in the study. 150 were non pregnant and 150 were pregnant of different trimesters. Subjects were investigated for ECG, blood pressure, heart rate, pulse rate, mean systolic blood pressure, mean diastolic blood pressure, and mean arterial pressure. All the readings were recorded. **Results:** This was observed that pulse rate, mean systolic blood pressure and mean arterial blood pressure was raised in pregnant women in different trimesters when compared with non-pregnant. In ECG findings short PR interval was significantly more according to the trimesters than non-pregnant women ($p<0.05$). **Conclusion:** This can be concluded that in pregnancy both cardiovascular changes as well as changes in ECG pattern can be recorded in different trimesters that can help to manage the complications during pregnancy.

Key words: Cardiovascular, Electrocardiogram, Pregnancy, Trimesters.

INTRODUCTION

Pregnancy is the process by which the life of a baby begins in the mother's womb and progresses up to the stage when it is safe to expose the baby to the external world.[1] Maternal cardiovascular health during pregnancy may have long-term offspring consequences. Maternal gestational hypertensive disorders are associated with increased risks of delivering preterm and small size for gestational age infants.[2]

The changes which occur in the cardiovascular system during pregnancy and the underlying mechanisms for these changes help to understand a more novel risk factor for cardiovascular disease.[3] In pregnancy the cardiac output, stroke volume, plasma volume and heart rate (HR) increase while the total peripheral vascular resistance (TPVR) and haemoglobin (Hb) decrease with an initial fall in blood pressure (BP) which increases towards term.[4] Some studies show no significant changes in BP-looking at systolic blood pressure (SBP), diastolic blood pressure (DBP) or mean arterial pressure (MAP) during the course of pregnancy, the majority show a slight decrease initially with the trough during the second trimester and a slight increase during the third trimester.[5] The total peripheral vascular resistance, calculated from the MAP and cardiac output falls by 40-70% initially, reaching a nadir in the second trimester and then leveling off or slightly increasing in the latter half.[6] Some studies show an increase in systolic function or no change in the function, several studies also show a small but significant decline in the systolic function and studies which have assessed diastolic function, generally describe a mild impairment during the later stages of pregnancy.[7]

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The HR is significantly increased as early as 5 weeks after the last menstrual period (LMP) and the peak is at around 32 weeks, with the maximal slope of the increase during the 1st and 3rd trimesters.[8] This increase in HR seems related to hormonal factors in early stages of pregnancy and later to increased left atrial diameter and sympathetic activation (sinus-node remodeling).[9]

This study is designed to interpret the ECG & Cardiovascular changes in different trimesters of pregnant women to manage and reduce the complications during pregnancy.

MATERIAL & METHODS

The present study is design to determine cardiovascular and electrocardiographic changes in different trimesters of pregnant women. 150 pregnant ante-natal women & 150 healthy non-pregnant women, those were attending OPDs of Obstetrics & Gynecology (OBGY) was enrolled on the basis of inclusion and exclusion criteria. Inclusion criteria include age group of 18 – 45 years, Pregnant women of first, second and third trimester. Women had past history of cardio-respiratory disease, hypertension, diabetes mellitus, ischemic heart disease, thyroid disorders, anaemia, or any condition likely to affect the cardiovascular system are excluded. Approval from Institutional Ethics Committee was obtained. Pre-structured questionnaire was used to obtain information on socio-demographic status and information about trimesters of pregnancy. Past obstetric history, past medical history and laboratory investigations are recorded.

ECG was done on BPL CARDIART 7108 ECG machine and blood pressure was measured and recorded by Sphygmomanometer (Diamond deluxe mercurial B.P. apparatus– IEAP, Pune, India).

Statistical analyses

Statistical analysis was done by SPSS software. Data were expressed as mean ± SD. Comparison of data was done statistically by using one way analysis of variance (ANOVA). p- Value of less than 0.05 indicates a significant difference.

RESULTS

Table no. 1 shows the distribution of pregnant women according to trimester of pregnancy. Out of 150 pregnant women the majority of pregnant women were in 2nd trimester (46.67%) followed by 1st trimester (28%) also represented in Chart 1.

Table 1: Distribution of patients according to trimester among pregnant women:

Trimester	Group P	Percentage (%)
1st trimester	42	28.00
2nd trimester	70	46.67
3rd trimester	38	25.33
Total	150	100

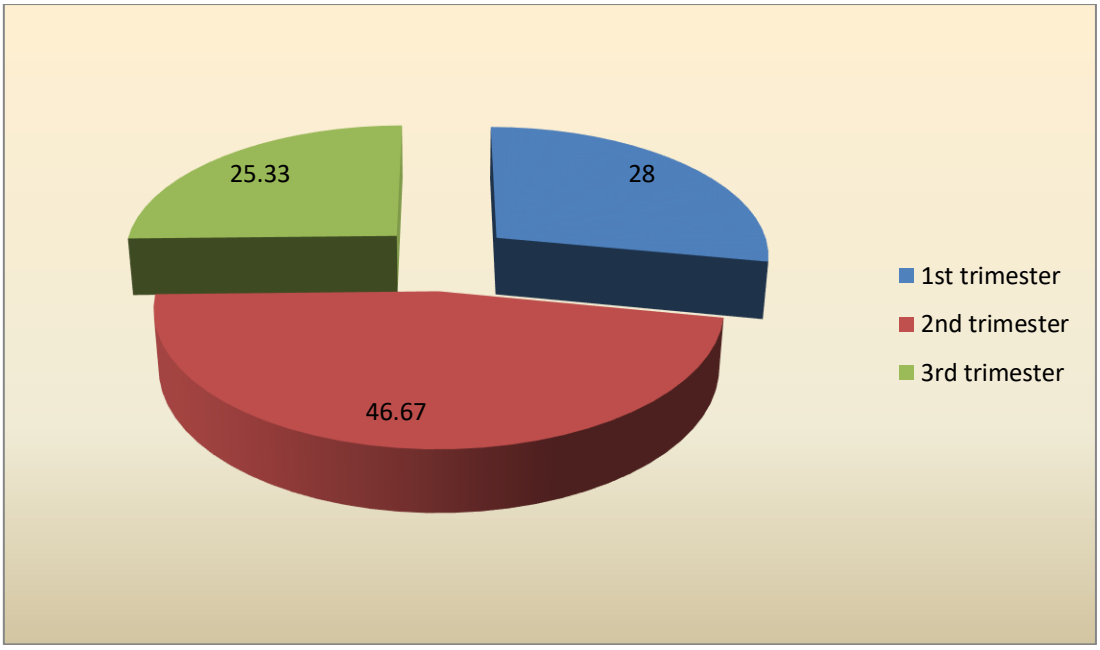

Chart 1: Distribution of patients according to trimester among pregnant women:

Table 2 shows the mean value of ECG characteristics in different trimesters of pregnant women. Mean value of Heart rate and PR interval of Pregnant women in second trimester is found greater than third trimester followed by first trimester and the difference when compared with controls was statistically

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significant (p<0.05). QT interval and QTc was observed highest in third trimester then second trimester and least in first trimester and the difference was statistically non-significant for QT interval (p>0.05) and significant for QTc (p<0.05).

Table 2: Distribution of patients according to ECG characteristics in different Trimesters:

ECG changes	Group C Non-Pregnant (n=150)	Group P - Pregnant (n=150) (Trimesters)			P value
		1st	2nd	3rd	
Heart rate (bpm)	74.87 ± 6.73	84.5±11.7	87.7±13.9	86.5±14.6	<0.05*
PR interval (sec)	0.14 ±0.01	0.11±0.01	0.13±0.01	0.12 ± 0.01	<0.05*
QT interval (sec)	33.3±15.98	43.3±16.83	48.67±11.80	49.13±13.78	>0.05
QTc (ms)	402.9±27.61	410.3±27.16	431.3±15.98	453.1±20.43	<0.05*

(P<0.05 statistically significant)

Table 3 shows the mean value of cardiovascular parameters in different trimesters of pregnant women. Pulse rate was found more in second and third trimester than first trimester and the difference was statistically significant when compared with controls (p<0.05). Mean difference of systolic blood pressure, diastolic blood pressure and mean arterial pressure (MAP) was statistically non-significant (p>0.05) shown in table 3.

Table 3: Distribution of patients according to cardiovascular parameters in different Trimesters:

Cardiovascular characteristics	Group C Non-Pregnant (n=150)	Group P - Pregnant (n=150) (Trimesters)			P value
		1st	2nd	3rd	
Pulse rate (/min)	70.83 ± 10.89	84.33±12.11	86.12±11.29	86.5±14.6	<0.05*
SBP (mmHg)	122.58 ± 07.19	119.23 ± 11.81	124.45 ± 12.73	129.24 ± 13.72	>0.05
DBP (mmHg)	76.16 ± 10.31	71.31±7.93	70.34±6.21	69.76 ±8.05	>0.05
MAP (mmHg)	91.63±7.93	88.13±6.54	89.78±7.12	91.32±6.78	>0.05

(P<0.05 statistically significant)

DISCUSSION

The distribution of pregnant women according to trimester of pregnancy showed that the majority of pregnant women were in 2nd trimester (46.67%) followed by 1st trimester (28%)

In a study done by ParthasarathyS et al[10] to study electrocardiographic changes in normal pregnant women observed that among 200 pregnant women the average gestational age of 29.11 weeks. Cardiac output increases 30% to 50% from 4 L to 6 L/min, particularly during the first two trimesters. This increase is primarily a result of a 20% to 50% increase in stroke volume. Furthermore an estrogen-mediated increase in myocardial alpha-receptors produces an increase in heart rate of about 10 to 20 beats/min. The peaking in heart rate mainly during third trimester of pregnancy compensates for the fall in the stroke volume resulting from caval compression and there by maintaining the cardiac output. [11]

The mean ECG characteristics in different trimesters of pregnant women and controls showed that Pregnant women had slightly higher heart rate in all trimesters as compared to controls with statistically significant (p<0.05) by ANOVA test.

Sharad Kole et al**.** [12] studied the intervals of Electrocardiogram (ECG) in pregnant women. A total of 223 females fulfilling the inclusion criteria were recruited for the study. They were divided into four groups – non pregnant/control group (n=30), 1st trimester (n=36), 2nd trimester (n=64) and 3rd trimester (n= 93). An increase in heart rate and QTc interval and decrease in PR interval was observed in pregnant women when compared with the heart rate of non pregnant females. This was statistically insignificant when compared between controls and 1st trimester however a significant change was observed between control group and 2nd/3rd trimester groups. Carruth JE et al.[9] in their study found a slightly shorter mean PR interval in the third trimester compared to first and second trimester

In present study, the mean cardiovascular characteristics in different trimesters of pregnant women are analysed. Pregnant women had slightly higher pulse rate in all trimesters as compared to controls with statistically significant (p<0.05). Pregnant women also had variable diastolic blood pressure and mean arterial pressure in all trimesters of pregnancy when compared with non-pregnant females insignificantly (p>0.05).

CONCLUSION

Pregnant women had slightly higher QT interval, slightly higher QTc, slightly higher pulse rate, slightly higher systolic blood pressure, variable diastolic blood pressure & variable mean arterial pressure in all trimesters as compared to Non pregnant females. This indicates the significance of ECG patterns and Cardio vascular changes to be analyzed during pregnancy in order to reduce the complications of pregnancy that can occur in different trimesters.

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