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CASE CONTROL STUDY OF ELECTROCARDIOGRAPHIC CHANGES IN PREGNANT WOMEN.

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Pregnancy causes significant haemodynamic changes and imposes stress on the cardiovascular system. Many healthy women develop signs and symptoms of cardiovascular overload during pregnancy. Knowledge of established normal changes in EKG during normal pregnancy is important. The aim of our study was to detect any early damage to myocardium during pregnancy with the help of electrocardiography. Total of 20 pregnant and 20 non pregnant women were studied. The most significant change observed in ECG was T wave inversion with odds ratio 7.43 (95%, CI = 1.49 to 41.00, P= 0.005). Stratified analysis showed that there was no confounding role of age in the relationship of T wave inversion and ECG findings.

Moreover, a significant relationship between anaemia and T wave inversion was also observed. (CI=1.74 - 1101.06; P= 0.007).

INTRODUCTION

Knowledge of normal electrocardiographic changes during pregnancy helps to detect any abnormalities in ECG during pregnancy.

It has been previously observed, as pregnancy advances, QRS axis shifts towards left side, due to the elevation of the diaphragm by the developing foetus. But in the last trimester of pregnancy (38th-40th weeks onwards) the QRS axis shift back towards right side probably due to the continued descent of the foetus into the pelvic cavity. Inversion of T wave has been reported in 70% of the cases of pregnancy studied by Misra *et al.*.

In view of the above reports we planned to study the electrocardiographic changes in normal pregnancy.

MATERIAL AND METHODS

The present study was carried out on 20 pregnant women in 2nd-3rd trimester of pregnancy and 20 non-pregnant controls attending the Queen Marry's Hospital, Lucknow. First of all socio-demographic history, height, weight, pulse rate and blood pressure of each subject were recorded. Then a standard 12 leads ECG was recorded in supine position at different gestational age (12, 16, 20, 24, 28, 32, 36 & 40 wks) by a compact-light and portable ECG machine after 5-10 minutes of rest. The voltage calibration used for ECG was 10 mm/mv and paper speed 25 mm/sec,[2, 3]. Their Hb content of blood was also determined by Sahle's method.

OBSERVATIONS

The data analysis was done using the student 't' test to compare the continuous variables and chi-square test was used for dichotomous data. The stratified analysis was performed using Mantel-Haenszel test to see for the confounders.

A significant changes in pulse rate (P>0.05) and

Table 1:

Analysis of continuous variables

Variables	Cases	Controls	P Value
Age (un years)	23.07± 2.87	21.9 3.58	>0.05 (ns)
Pulse (per mt)	103.32 13.90	86.5 6.32	>0.05 (s)
Blood Pressure			
Systolic (mmHg)	106.78 8.5	111.9 5.55	>0.05 (s)
Diastolic (mmHg)	70.78 6.12	71.5 4.33	>0.05 (n)

ns : not significant, **s: significant**

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systoic blood pressure (P>0.05) were observed in Table I. Where as insignificant changes were observed in diastolic blood pressure (p > 0.05).

It was seen in Table II that shift of QRS axis had least association with pregnancy and it was found insignificant, the odds ratio (OR) being less than 0.5 (95% CL being 0.01 to 10.02) and Fisher's exact (p 0.05).

It was observed that T-wave inversion (in Lead III) had very strong association with pregnancy and was found

Table 2:

Association of QRS axisshft with pregnancy

QRS axis shift	Cases	Controls
Present	1	2
Absent	19	18
Total	**20**	**20**

(OR = 0.47 (95% Cl = 0.01.02), Fisher's exact p= 0.25

Table 3:

Association of T-wave with pregnancy

T-wave inversion	Cases	Controls
Present	16	7
Absent	4	13
Total	**20**	**20**

(OR = 7.43 (95% CL = 1.49 - 41.00), Fisher's exact p = 0.005

Table 4:

Association of staratified Age and T wave with pregnancy

Stratified -1 (Age ≤ 25)

T-wave inversion	Cases	Controls
Present	8	5
Absent	3	12
Total	**11**	**17**

(OR = 6.40 (95% Cl = 0.93 - 50.46)

Stratified -2 (Age > 25)

T-wave inversion	Cases	Controls
Present	8	1
Absent	1	2
Total	**9**	**3**

(OR = 4, (95% CL= 0.03 - 352.33) Fisher's exact p = 0.45

Woolf's test : OR 9Crude) 7.43, OR Mantel Haenszel = 5.83

(95% CL for OR (M=H) = 1.05 - 31.17)

Mantel Haenszel Summary Chi Square = 4.06, P<0.04.

to be significant, odds ratio being 7.43 (95% CL = 1.49 to 41.00) and Fisher's exact p = 0.005).

The relation of age and T-wave in vension with pregnancy has been shown in table IV.

It was observed from the table that the association between T-wave inversion with pregnancy was found to be strongly associated in both the stratum i.c. Age L 25 years and age>25 years but it was not significant. This indicates that there is no confounding role of age in this relationship. Other confounding variable such as BP, maternal pulse, gestational age, maternal weight had no effect over ECG in pregnancy. All women in this study were non smokers. Mantel - Haenszel stratified analysis indicated that as against a crukde OR of 7.43, the Mantel - Haenszel adjusted OR was 5.83 (95% CL of adjusted estimate = 1.05 to 31.17).

An association of Hb content with T-wave inversion in pregnancy has been shown. in Table V From the table II revealed that after the categorization of Hb in 2 groups (10.5 gm % and 10.5 gm%), it was found that for Hb the association with T-wave inversion was very strong, odds ratio being 22.75 which is statistically ;significant (p = 0.007) but not for HB 10.5 (odds ratio = 2.8).

The ECG findings showed no difference in P wave, PR interval and ST segment between pregnant and non pregnant women.

DISCUSSION

The main findings in our work were a shift of QRS axis to left during pregnancy (18 wks - 37 wks) and a shift of QRS axis to right during pregnancy (38-40) wks and T wave inversion (in Lead III) in 80% of pregnant women. The shift in axis was not statistically significant (p>0.05) but T wave inversion was statisticall very significant. (Fischer's exact p=0.005).

The similar findings were reported by Misra et al[1]. and they explained the shift of Qrs axis to left side being due to elevation of diaphragm by the developing foetus and shift of QRS axis to right side due to descent of foetus in pelvic cavity during advanced pregnancy, and T-wave inversion due to increased work lead to heart.

In our opinion another contributory factory causing shift of QRS axis to left side could be the increased blood volume which causes increased left ventricular load.

Table 5:

Association of HB T-wave

Hb $\leq$ 5 gm%

T-wave inversion	Cases	Controls
Present	13	1
Absent	4	7
Total	**17**	**8**

(OR = 22.45 (95% CL = 1.74 - 1101.06), Fischer's exact p = 0.007

Hb

T-wave inversion	Cases	Controls
Present	2	5
Absent	1	7
Total	**3**	**12**

(OR = 2.8, (95% CL= 0.11 - 188.36) Fisher's exact p = 0.56

The causes contributing, singly or in combinations or collectively to T-wave inversion in EKG could be : the blood supply of the heart itself is not able to cope up with the increased work load, due to increase in blood volume; reduction of the thoracic volume by Gravid uterus pushing the diaphragm up, which leads to decreased blood supply to heart; additional load on the heart for providing foetal circulation; and anaemia

produced by increased haemodilution (CL=1.74 - 1101.06; P=0.001)[4,5].

The increase in pulse rate was 13-25 pwe minukrw in present study which was also significant (P<0.05). It is suggested that it is a physiological change or may be because of less of vagal tone secondary to hypervoluemia which appears to be due to the increased demand of blood and new vessels formation in the uterus.

The changes in BP during pregnancy were insignificant in early pregnancy. However, there was insignificant decreased of DBP and a significant decrease in systolic blood pressure during late pregnancy. The decrease in blood pressure during early pregnancy seems to be a part of normal physiology and the late fall of systolic blood pressure could be due to the decrease in stroke volume leading to fall of cardiac output due to the decreased venous return to the heart because of pressure of gravid uterus on the inferior vena cava.

Another possible aspect for further study whether T-wave inversion could be decreased by intervention like rest in left lateral position should be evaluated.

CONCLUSION

It is concluded that, presence of T wave inversion in EKG of 80% of the pregnant women makes it an important finding. It is suggested that other evaluate its significance, in diagnosing possible myocardial damage during pregnancy. More patients of pre-eclamptic toxiaemia should be studied for seeing the changes in ECG findings in relation to pre-eclampsia. Further study is needed.

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