



ELECTROCARDIOGRAPHY: AS PREDICTOR FOR VENTRICULAR DYSFUNCTION AMONG PRE-ECLAMPTIC WOMEN

Physiology

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ABSTRACT

Pre-eclampsia is a hypertensive disorder of pregnancy that is associated with maternal risk of cardiovascular disease. According to AHA, women with pre-eclampsia had an increased risk of left ventricular hypertrophy one month after delivery compared to pregnant women without pre-eclampsia. This has prompted the need of this study with an objective to increase the awareness of complication of pre-eclamptic pregnancy. In this cross sectional study, 57 pregnant women (gestational age >20 weeks) with pre-eclampsia in the range of 18 to 45 years of age were recruited and compared with the equal number of age matched normotensive pregnant women. Sokolow-Lyon index was calculated from ECG record. The data were then analysed using SPSS software. The results of the study shows that pre-eclamptic women had higher Sokolow-Lyon index than normotensive pregnancy (2.01)

KEYWORDS

Pre-eclampsia, ECG, Sokolow-Lyon index

INTRODUCTION

Pre-eclampsia is known to be a leading cause of maternal and neonatal death worldwide. Pre-eclampsia is a pregnancy-specific multi-organ syndrome that affects 2% to 8% of pregnancy [1]. It is characterized by development of hypertension to the extent of 140/90 mm Hg or more with proteinuria after the 20th week of gestation in a previously normotensive and non-proteinuric patient [2]. The clinical features usually develop in the latter part of the third trimester i.e. close to term (near 38-40th weeks of gestation) and progress until delivery. This disorder is unique to human pregnancy in which numerous genetic, immunological and environmental factors interact [3]. Pre-eclampsia is associated with high maternal mortality and fetal complication. It is not only a short term risk but also has an increased maternal cardiovascular risk later on. According to AHA, women with pre-eclampsia had an increased risk of left ventricular hypertrophy one month after delivery compared to pregnant women without pre-eclampsia. It was hypothesized that abnormal perfusion of the uterine arteries and linked feedback mechanisms of the fetoplacental unit are associated with increased stress on the maternal heart which in turn effect maternal ventricular repolarization [4]. Electrocardiographic (ECG) changes in pre-eclampsia have been documented in some studies. ECG recently emerged as a useful tool to evaluate cardiovascular complications during and after pregnancy. Though Echocardiography existed as main diagnostic tool to evaluate cardiovascular dysfunction, ECG emerges as affordable routine investigation to evaluate cardiovascular complication for people of developing country like India. While the physiological changes in the ECG during pregnancy have been documented, the pattern of ECG in hypertensive disorders of pregnancy has not yet adequately been studied in India. This has prompted the need of this study with an objective to increase the awareness of long term complication of pre-eclamptic pregnancy.

MATERIALS AND METHODS

This cross sectional study was carried out in the Department of Physiology in collaboration with Department of Obstetrics & Gynecology, Regional Institute of Medical Sciences (RIMS), Imphal. The study was done with the approval of the Research Ethics Board, RIMS, Imphal (Ref No. A/206/REB-comm(SP)/RIMS/2015/140/8/2016) following ICMR guidelines and informed consent was taken from each subject. 57 pregnant women (gestational age >20 weeks) with pre-eclampsia in the range of 18 to 45 years of age were recruited as cases and compared with the controls of equal number of age matched normotensive pregnant women. Those

with history of chronic hypertension, thyroid dysfunction, cardiovascular disease, diabetes mellitus, other systemic diseases and history of intake of any medication that might effect cardiovascular functions were excluded from the study. To avoid interference with the reliability of the electrocardiography test all subjects were asked to avoid all caffeine containing edible items (tea/coffee/chocolate) 4 hours prior to the test. Blood pressure was measured in right arm via sphygmomanometer. A portable electrocardiograph — Cardiart 108T/MK (BPL limited, India) was used to record ECG. Sokolow-Lyon index was calculated from ECG record. Sokolow-Lyon index is a criteria used to diagnose left ventricular hypertrophy via electrocardiography and is calculated as S in V1 + R in V5 or V6 (whichever is larger) ≥ 35 mm (≥ 7 large squares). Mean values of the studied parameters in both cases and controls were calculated and using independent-t test the parameters of pre-eclamptic women were compared with those of normotensive pregnant women. The data were then analysed using SPSS software version 21 (IBM SPSS, Chicago, USA).

RESULTS

The mean values of BP and Sokolow-Lyon index were compared between the case and the control groups using independent sample t-test as shown in the Table 1. The preeclamptic pregnancy and normotensive pregnant women had mean systolic blood pressure of 153

Parameters	Case(n=57) Mean	Control(n=57) Mean	p-value
Systolic BP(mmHg)	153.14.70	115.96	0.000**
Diastolic BP(mmHg)	98.42	75.095.04	0.000**
Sokolow index(mvolt)	2.01	1.96	0.606

** $p \leq 0.001$: Highly significant

$p > 0.05$: Not significant

The results of the study shows that pre-eclamptic women had higher Sokolow Lyon index than normotensive pregnancy (2.01 ± 0.44 mV vs 1.96 ± 0.53 mV) but the difference were not significant.

Zangeneh M et al [5] compared left ventricular mass in pre-eclamptic group and normal pregnant women and observed that pre-eclamptic group had more left ventricular mass but difference were not

significant which support our study with pre-eclamptic women having higher Sokolow Lyon index. High maternal total vascular resistance in pre-eclampsia increased relative wall thickness of the left ventricle and development of left ventricular hypertrophy[6].

Lisa A. Simmons et al [7] suggested that women with preeclampsia, which complicates 5–10% of all pregnancies, imposes an abnormal pressure load on the heart that may result in the worsening of ventricular function. In their study using echocardiography, concluded that among women with preeclampsia, hypertension is associated with exaggerated ventricular hypertrophy, but LV systolic function is unchanged. These changes in cardiac geometry are rapidly reversible within 3 month postpartum in normotensive women, but resolution remains incomplete in preeclamptic women.

Approximately 20% of patients with preeclampsia at term have more evident myocardial damage. Some studies also observed more frequently diastolic dysfunction and increased cardiac work and left ventricular mass indices in preeclampsia which suggest left ventricular remodeling was an adaptive response to maintain myocardial contractility with preeclampsia at term. Diastolic dysfunction usually precedes systolic dysfunction in the evolution of ischemic or hypertensive cardiac diseases and is of prognostic value in the prediction of long-term cardiovascular morbidity[8]. Therefore ECG findings may have significant implications for the acute medical management of preeclampsia.

Two separate longitudinal studies of patients who had echocardiograms during a preeclamptic pregnancy showed persistent LV geometric changes (concentric remodeling, eccentric and concentric hypertrophy) and diastolic dysfunction at one year postpartum [9,10]. This persistence of LV geometric changes seems to herald the development of hypertension. Ghossein-Doha et al. demonstrated that increased LV mass and left atrial dimension at 10 months postpartum were predictors of the development of hypertension in women whose blood pressure had normalized after a preeclamptic pregnancy [11]. This finding is paralleled by other observations of the predictive value of LV mass in initially normotensive adults [12].

CONCLUSION

To our knowledge, this is the first study to demonstrate association of preeclamptic pregnancy with left ventricular hypertrophy using mean Sokolow-Lyon index. Even though the difference of mean Sokolow-Lyon index between pre-eclampsia and normotensive pregnant women are not significant in our study, mean Sokolow-Lyon index is more among pre-eclamptic women than normotensive pregnant women, which shows that pre-eclamptic women may be at increased risk of ventricular dysfunction. Further research with more sample size as well as post natal follow up study is required to predict and prevent ventricular dysfunction. Hence ECG emerges as affordable investigation to predict ventricular dysfunction among pre-eclamptic women of developing country like India.

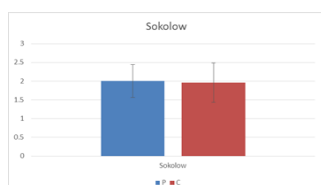
DISCUSSION

The results of the study shows that pre-eclamptic women had higher Sokolow Lyon index than normotensive pregnancy (2.01

Figure 1. Comparison of Mean Systolic and Diastolic Blood Pressure among case and control.



Figure 2 : Comparison of mean Sokolow-Lyon index among case and control.



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