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STUDY OF BLOOD PRESSURE RESPONSE TO STANDING IN NORMAL PREGNANCY

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ABSTRACT

Background and Objectives: Several important changes in maternal hemodynamics take place during pregnancy and the action of autonomic nervous system is essential for these changes. The present study was designed with the objective to study the blood pressure response to standing during normal pregnancy. **Material and methods:** The present study comprised of pregnant women attending Rural Hospital, Loni in Maharashtra for antenatal care. Total 300 women containing 150 normal pregnant women and 150 age-matched, non-pregnant normal women were recruited for the study. The Blood pressure response to standing were done using "CANWIN". **Results**: Blood pressure response to standing shows a significant difference in pregnant women as compared to non-pregnant women ($P<0.05$). **Conclusion**: From present study, we may conclude that, blunted blood pressure responses may reflect impaired adaptive capacity of maternal cardiovascular system during pregnancy. According to the findings of the present study the fall in blood pressure in response in pregnant women imply that the cardiovascular system was incompletely adapted during the pregnancy.

KEYWORDS: Blood pressure, Maternal hemodynamics, Pregnancy.

INTRODUCTION

Systemic vascular resistance is decreased in response to hemodynamic changes during pregnancy.[1,2] Arterial blood pressure shows a progressive fall in the first and middle trimesters, whereas cardiac output and heart rate gradually increase to a plateau by the end of the second trimester.[3,4] As pregnancy advances, aortocaval compression from the gravid uterus gradually becomes evident, which may cause supine hypotensive syndrome in late

pregnancy. It has been noted that cardiovascular autonomic nervous activity tends to lower vagal and increases sympathetic modulation in late pregnancy.[5] Aortocaval compression was suggested to be the main factor responsible for this change. This theory was supported by observations that moving to an upright position could lead to lessening of sympathetic activation[6] and that delivery of the fetus leads to return of normal cardiovascular autonomic nervous activity within the three months.[7]

During the early stages of pregnancy, cardiovascular autonomic nervous activity may be expectedto vary little from that of the non-pregnant woman because aortocaval compression is absent. All these adaptations are associated with autonomic nervous system changes that produce alteration in cardiac autonomic modulation. Failure of these adaptations may result in pregnancy related complications such as pregnancy induced hypertension, preeclampsia and eclampsia.[9] As the cardiovascular autonomic nervous system plays an important role in adaptation of the maternal body to nurturing fetus, it is important to understand the sequential changes in cardiovascular autonomic nervous activity at various stages of pregnancy.[8,9] The events in pregnancy elicit one of the best examples of selective anatomical, physiological and biochemical adaptations that occurin the body.

MATERIALS AND METHODS

The present observational study was conducted in department of Physiology at Rural Medical College Loni. Maharashtra.

The study was approved by the Institutional Ethics Committee of Pravara Institute of Medical Sciences (DU), Loni. The study was performed as per the Ethical Guidelines for Biomedical Research on Human participants (ICMR October 2006).

Non-probability purposive sampling was used for present study. The study Participants were taken from rural areas of Loni. A total of 300 women aged from 20 to 35 years without any recent historyof cardiac diseases were selected 150 were in the Pregnant and 150 were in the non-pregnant. Blood pressure response to standing was measured in normal pregnant and non-pregnant women.

Inclusion & Exclusion Criteria

Healthy Non-pregnant Women & Pregnant Women.

Inclusion Criteria

1. Age group between 20 to 35 years
2. Pregnant women visiting the Rural Hospital, Loni hospital for routine ANC checkup.
3. Free from any systemic illness which can affect sympathetic function test.

Exclusion Criteria

1. H/O cardiovascular disorders.
2. Healthy females with history of addiction to tobacco, mishri, alcohol.

Data collection method

Parameters: Data comprising of Anthropometric data (name, age, height, and weight), Hb, were obtained and recorded from all pregnant and non-pregnant women. Estimation of Hemoglobin was done by Sahli's Method (Acid Haematin Method). Blood pressure to standing was done using Canwin (cardiac autonomic neuropathy (CAN) analysis system).

Blood pressure response to standing

Procedure: The participant was relaxed, lying down comfortably. Blood pressure was recorded in supine position. The participant was asked to stand up quickly and the blood pressure recorded immediately after standing. Then the blood pressure was recorded again at the end of one minuteafter standing. The test ends automatically and the result was displayed immediately.[9]

RESULTS AND ANALYSIS

The tests of different parameters were expressed in Mean and ± Standard Deviation (SD). The age,height, weight and Hemoglobin (Hb) of subjects and blood pressure response to standing are shown in following tables.

Table 1: Anthropometric parameters.

Parameters	Non-pregnant	Pregnant
	Mean ± SD	Mean ± SD
Age(year)	21.81 ± 3.37	21.10 ± 2.69
Hight (CM)	152.90 ±3.81	152.49 ± 6.05
Weight (Kg)	50.06 ± 4.66	58.76 ±4.72*
Hb (gm/dl)	12.07 ± 0.68	11.84 ± 0.4
*Statistically significant difference P< 0.05		

Table no.1 Shows comparison of anthropometric parameters results between non-pregnant and Pregnant. There was no statistical significant difference in the parameters age, height and

Hb (P>0.05). Weight showed statistically significant difference between pregnant and non-pregnant women (P < 0.05*).

Table 2: Blood Pressure response to standing.		
Parameters	**Non-pregnant**	**Pregnant**
	Mean ± SD	**Mean ± SD**
B. P. response to standing	5.6±3.386	7.4±3.074*
*Statistically significant difference P< 0.05		

DISCUSSION

The cardiovascular autonomic activity has an important role in overall cardiovascular homeostasis.Blood pressure response to standing test have been widely used for studying the autonomic nervous control of heart and circulation. In our study all the above variable were assessed to find out changes in cardiovascular autonomic activity during the pregnancy. Blood pressure response to standing was evaluated in the pregnant and non-pregnant women. Systolic Blood pressure response to standing shows a statistically significant difference in pregnant women as compared to non-pregnant. The hemodynamic response may be due to a decrease in the baroreceptor sensitivity, which may develop in early pregnancy. The fall in SBP to orthostatic stress occurringin the early pregnancy imply that the cardiovascular system is incompletely adapted to pregnancy. The increased blood volume seems to improve hemodynamic stability, especially during the second half of pregnancy.[5] The present study corroborates the findings of several earlier studies. Thomas R E and Barbara C studied the hemodynamic effect of orthostatic stress during pregnancyin 15 non-pregnant women and 14 pregnant women each. In the early pregnancy, there was significant fall in SBP in response to postural change when compared to non-pregnant women. However, result in Late pregnancy was not significant.[10] Del Bene R, Barletta G studied effects of posture on cardiovascular function in pregnancy. They concluded that cardiac output increased during pregnancy in supine posture also in active orthostatic position. However, the decrease in cardiac output associated with early standing attenuated significantly at the early 2nd trimester andwas absent at mid-3rd trimester.[11] Pyorola T evaluated cardiovascular response to upright positionduring pregnancy. He found that head up tilt caused a similar fall in SBP at 5 to 8 months of pregnancy as in non-pregnant women.[12] Avery et al. found in the orthostatic test; the sustenance of tachycardia is by virtue of sympathetic stimulation. The duration of pregnancy seems to influence the heart rate difference between supine and standing posture. There was no difference in systolic blood pressure response between the pregnant and non-pregnant groups.

In the non-pregnant women there was a fall in the central venous filling pressure, stroke volume and cardiac output caused by the pooling of blood from the thorax into the veins in the legs on standing up from supine position.[13] Ewing et al. found that when cardiopulmonary receptors are unloaded by orthostatic stress, sympathetic outflow rises. This leads to increase in total peripheral resistance, and in the orthostatic test there is immediate vagal withdrawal on standing from the lying down position which reflexively increases the heart rate, therefore, the shortest R-R intervalis observed at the 15th beat, thereafter, there is a gradual lengthening of the R-R interval exhibitingthe minimum heart rate at the 30th beat due to spontaneous vagal reactivation.[14] Jayawardana observed that decreased stimulation of the high pressure baroreceptors as the arterial pressure falls and decreased stimulation of cardiopulmonary receptors because of diminished right ventricular filling pressure leads to reflex vasoconstriction and recovery of the diastolic blood pressure. Reloading of the arterial baroreceptors causes an increase in blood pressure.[15]

CONCLUSION

From present study, we may conclude that, blunted blood pressure responses may reflect impairedadaptive capacity of maternal cardiovascular system during pregnancy. According to the findings of the present study the fall in blood pressure in response to standing in early pregnancy imply thatthe cardiovascular system was incompletely adapted during the first half of pregnancy.

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