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Cardiovascular Changes During Pregnancy, Labour and Puerperium

Medical Science

KEYWORDS : Cardiac output, Diastolic Blood pressure, Labour, Pregnancy, Puerperium, Stroke volume.

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ABSTRACT

Background & Objectives: Maternal physiology undergoes many changes during pregnancy which are largely secondary to the effects of progesterone and estrogen which are produced predominantly by the ovary in the first 12 weeks of pregnancy and thereafter, produced by the placenta. These changes enable the fetus and placenta to grow and prepare the mother and baby for childbirth.

Materials & Methods: This is a longitudinal study conducted among 30 female subjects in age group 18 to 30 years. Heart rate, Blood pressure (SBP, DBP, and MABP) was measured. SV and CO were calculated using Echocardiography.

Results: In our study, we observed an increase in heart rate, SBP, SV and CO with a decrease in hematocrit during the three trimesters of pregnancy.

Conclusion: We observed a gradual increase in SBP with a peak value during labour and also found an increase in SBP in puerperium. The DBP and mean arterial BP decreased to maximum during second trimester and an increase in DBP and mean arterial BP was observed from labour till day 1 of puerperium.DBP decreased during first and second week of puerperium with a slight increase in mean arterial BP. SV and CO gradually increased and reached a maximum during labour and continued to increase during puerperium.

Summary: The cardiovascular physiological adaptations of pregnancy represent an efficient oxygen carrying capacity state which delivers adequate oxygen and nutrients for both the mother and fetus. Cardiovascular disorders remain an important cause of maternal morbidity and mortality and of adverse fetal outcomes. Hypertensive disorders account for a significant proportion of this group of pregnancy-associated complications. Understanding the normal cardiovascular changes in pregnancy is essential to caring for patients with cardiovascular disease.

Introduction:

Physiological changes during pregnancy facilitate the cardiovascular system to the increased metabolic needs of the mother, enabling adequate delivery of oxygenated blood to peripheral tissues and the fetus. Changes occur in circulating blood volume (affecting preload), peripheral vascular compliance and resistance (affecting after load), myocardial function and contractility, heart rate.

Hemodynamic changes during pregnancy include increased blood volume, cardiac output (CO) and maternal heart rate; decreased arterial blood pressure; decreased systemic vascular resistance. CO increases up to 30% in the first stage of labor, primarily because of increased stroke volume; maternal pushing efforts in the second stage of labor can increase CO by as much as 50%.

CO is calculated as the product of stroke volume and heart rate (HR), and can be considered a measure of the functional capacity of the heart. Numerous studies have shown that CO increases as much as 50% in pregnancy. [1-12] CO begin to increase during the first trimester, and peaks between 25 and 35 weeks' gestation. [6-12] The increase in CO early in pregnancy is mostly caused by stroke volume .[7] As pregnancy advances, HR increases and becomes a more dominant factor in increasing CO. Stroke volume increases gradually until the end of the second trimester and then remains constant.[7, 9]

Arterial blood pressure (BP) decreases as early as 7 weeks' gestation.[7, 9, 13, 14-17] The decrease in BP reaches a nadir by mid pregnancy, when the BP starts a gradual increase, returning to or exceeding pre pregnancy levels by term.[9, 12]

A significant decrease in systemic vascular resistance (SVR) occurs during pregnancy, with concomitant decrease in BP (primarily the diastolic component) and a widened pulse pressure. These changes begin as early as 5 weeks' gestation, and result from a variety of factors including the vasodilatory effects of progesterone and prostaglandin, as well as the contribution of the low resistance flow of the utero-placental unit. [18, 19-21] An approximate 10% decrease in SVR has been shown to occur in the first trimester, with a nadir of about 35% less than baseline at 20 weeks' gestation. Thereafter, SVR remains constant until around 32 weeks, with a small increase noted from week 32 to term. [6,7 ,12] As SVR decreases, vascular compliance increases. [22]

Materials & Methods:

The study was conducted by selecting 30 healthy females who were in the age group between 18 and 30 years, about same height and weight, socioeconomic condition, not working i.e., house wives and non pregnant with regular periods.

Each of the subject was medically examined and their past medical history has been carefully evaluated with an aim to exclude those individuals with cardiac diseases or pulmonary diseases hypertension, diabetes mellitus and any other disease. There were no trained athletes in them.

Prior to the study, each subject was informed in detail about the objectives and the aim of the research protocol and the methods to be adopted during the study. Their consent was obtained and they were well educated and motivated so as to extend the best cooperation at various levels of the study protocol. The subjects were informed to intimate immediately when they missed their period. The study was approved by Institutional Ethical Committee.

Experimental Protocol: During pre- pregnancy condition:

Twenty four hours before the study commenced, subjects were abstained from caffeine containing beverages. No attempt was made to limit the food or the other liquid intake. Before the actual procedure is given the individual is subjected to a preceding period of rest ranging from half an hour to one hour. When the subject is ready to participate in the study protocol, her height in centimeters, weight in kilograms, the heart rate and the blood pressure are recorded. The heart rate is recorded by counting the pulse rate by palpating the radial pulse, and then the blood pressures both systolic and diastolic are recorded by using sphygmomanometer and the stethoscope. The heart rate

and the blood pressure recordings are made while the subject is made to lie on the table near the Echocardiograph.

For estimating the packed cell volume, blood is drawn under aseptic conditions from antecubital vein into the haematocrit tube after adding anticoagulant in the tube. The anticoagulated blood is centrifuged for 30 minutes at 3000rpm and the PCV is read from the graduation mark on the haematocrit tube.

The stroke volume was calculated from left ventricular dimensions with subjects in the left lateral position with the help of echocardiograph. Now the cardiac output was calculated by the multiplication of the heart rate with the stroke volume

Once the subjects had intimated about their missed periods and their doubt of conception, they were subjected to urine pregnancy test with in the stipulated time and confirmed the pregnancy. Out of 30 subjects, 25 subjects got their pregnancy confirmed and the experimental protocol at complete 12 weeks, 24 weeks, 36 weeks of gestation was repeated. During labour, after the rupture of membrane i.e., first stages of labour, the PCV, heart rate, blood pressure were recorded as before. The stroke volume was calculated from the echocardiograph by making the subject to lie in the left lateral position and accordingly the cardiac output was also calculated.

Twenty four hours after the delivery, all these parameters were once again recorded in all the subjects. Again, all the above parameters were recorded at the end of first day, first week, and second week of puerperium.

Echocardiography: As echocardiography provides specific and sensitive information about the anatomy and physiology of the heart non invasively, the instrument is used to calculate the stroke volume by using the formula LVOT c/s area x VTI, where LVOT is Left Ventricular outflow tract, VTI is Velocity Time Integral. The Cardiac output is calculated by multiplying stroke volume with heart rate.

Statistical Analysis: Statistical Analysis was done using Graph pad 6 software. Un- paired t test was used and P value < 0.05 was considered significant.

Results: The mean heart rate of the I trimester (Table II (80.6 ± 3.2) when compared with mean heart rate of pre- pregnancy (Table I) (73.0 ± 2.2) showed a higher heart rate about 9.4%.The mean systolic blood pressure of I Trimester (Table II) (106.8 ± 3.4) has shown as increase of about 2% when compared with that of Pre – Pregnancy (Table I) (104.6 ± 2.4) level of mean systolic blood pressure. The mean diastolic blood pressure of the I trimester (Table II) (71.5 ± 2.0) when compared with mean diastolic blood pressure of Pre –Pregnancy (Table I) (77.6 ± 2.0) showed a decrease by about 8.5%.The mean arterial blood pressure of the I trimester (table II) (83.2 ± 2.1) has shown 3.9% decrease when compared with the Pre –Pregnancy (Table I) (86.5 ± 1.6) level. There is 5.5 % decrease observed in the I trimester (Table II) (36 ± 1) mean packed cell volume when compared with the Pre-Pregnant (Table I) (38.1 ± 1.7) packed cell volume.

The mean stroke volume of the I trimester (Table II) (54.2 ± 3) showed an increase by about 2.7% when compared with Pre – Pregnancy (Table I) (52.7 ± 1.6) level. There is 11.6% increase in the cardiac output observed in the I trimester (Table II (4.3 ± 0.3) when compared with the mean volume of the Pre –Pregnancy level (Table I) (3.8 ± 0.1).

The mean heart rate of II trimester (Table III) (86.5 ± 2.7) when compared with Pre Pregnancy (Table I) (73.0 ± 2.4) value has shown an increase of 18.4%.There is 7% increase in the mean systolic blood pressure in the II trimester (Table III) (112.8 ± 2.4) when compared with Pre-Pregnancy (Table I) (104.64 ± 2.9) .The mean diastolic pressure in the II trimester (Table III) (66.64 ± 1.9) when compared with Pre Pregnancy level (Table I) (77.6 ± 2.08) is about 12.9% more. The mean arterial blood pressure of II trimester (Table III) (81.75 ± 1.66) has shown decrease of about 5.5% when compared with the Pre Pregnancy level (Table I) (86.56 ± 1.60). Mean packed cell volume has shown a decrease by about 15.8% in II trimester (Table III) (32.12 ± 1.7) when compared with pre pregnancy value (Table I) (38.1 ± 1.74).

About 38.8 % increase in the mean stroke volume is observed in II trimester (Table III) (73.25 ± 4.02) when compared with pre pregnancy value (Table I) (52.78 ± 1.64) .The mean cardiac output of the II trimester (Table III) (6.28 ± 0.36) has shown an increase by about 50% when compared with the pre pregnancy value (Table I) (3.80 ± 0.18).

The mean heart rate of III trimester (Table IV) (89.68 ± 2.73) when compared with the pre pregnancy value (Table I) (73.08 ± 2.23) has shown an increase by about 22.7%.There is about 14% increase in the mean value of the III trimester (Table IV) (119.36 ± 2.05) systolic blood pressure observed when compared with the pre pregnant value (Table I) (104.64 ± 2.43). The mean diastolic blood pressure of the II trimester (Table IV) (76.24± 2.47) has shown about 1.8% decreases when compared to the pre pregnancy value (Table I) (77.6 ± 2.08). The mean arterial blood pressure, has shown an increase of about 4.6% during III trimester (Table IV) (99.99 ± 2.17) when compared with that of the pre –pregnancy value (Table I) (86.56 ± 1.60).The mean packed cell volume of the III trimester (Table IV) (30.24 ± 1.64) showed about 20.7% decrease when compared with that of the pre-Pregnant value (table I) (38.16 ± 1.74)

The stroke volume has shown about 42.5% increase in the III trimester (Table IV) (75.24 ± 4.4) when compared with the mean value of Pre –pregnancy state (Table I) (52.78 ± 1.64). The mean cardiac output of the III trimester (Table IV) (6.69 ± 0.42) when compared with the pre-pregnant value (Table I) (3.80 ±0.18) there is an increase of about 76%.

The mean heart rate during labour (Table IV) (99.4 ± 2.66) has shown an increase of 36% when compared with that of the pregnancy value (Table I) (73.08 ± 2.23).The mean systolic blood pressure during labour (Table IV) (132.4 ± 2.44) has shown an increase of about 26.5% when compares with that of pre-pregnancy level (Table I) (104.64 ± 2.43).There is about 7.9% increase in the mean diastolic blood pressure during labour (Table IV) (83.84± 2.70) when compared with the pre-pregnant observation (Table I) (77.6±3.22).There is about 15.4% increase in the mean arterial blood pressure during labour (Table IV) (99.99 ± 2.1) when compared with the pre-pregnant level (Table I) (86.56 ±1.60) .There is decrease of about 17% packed cell volume during labour (Table IV) (31.64 ± 1.60) when compared to that of the pre-pregnant value (Table I) (38.16 ± 1.74) .

There is about 48% increase in the stroke volume during labour (Table IV) (78.16 ± 4.4) when compared with that of the pre-pregnancy value (Table I) (52.78 ± 1.64).The cardiac output has increased by about 100% during labour (Table IV) (7.71 ±0.4) in comparison with the pre-pregnant value (Table I) (3.80 ± 0.18).

The mean heart rate of 1st day puerperium (Table V) (80.64 ± 1.89) has shown as increase of 7.2% when compared to that of the pre-pregnant value (Table I) (73.08 ± 2.23).There is an increase of about 5.7% mean systolic blood pressure during 1st day of puerperium (Table V) (120.40 ± 2.76) when compared to that of the pre-pregnant value (Table I) (104.64 ± 2.43).

There is about 8.1% decrease in the diastolic blood pressure during 1st day of puerperium (Table V) (71.36 ± 3.03) when com-

pared to that of the pre – pregnant state (Table I) (77.6 ± 2.08). The mean arterial pressure has decreased by about 1.3% by 1st day of puerpeurium (Table V) (87.6 ± 2.6) when compared to that of the pre-pregnant value (Table I) (86.56 ± 1.60).The mean packed cell volume has decreased by about 23% on 1st day of puerperium (Table V) (29.04 ± 0.97) when compared to that of the pre-pregnant value (Table I) (38.06 ± 1.74).

There is an increase of 34% increase of mean stroke volume in (Table V) (70.38 ± 3.27) 1st day puerperium in comparison with that of the pre-pregnant value (Table I) (52.78 ± 1.64). There is an increase of about 47% mean cardiac output during 1st day of puerperium (Table V) (5.66 ± 0.30) when compared to that of the pre-pregnant state (Table I) (3.80 ± 0.18).

There is an increase of 7.2% increase of mean heart rate during I week puerperium (Table VI) (80.64 ± 1.89|) when compared to that of pre-pregnant value (Table I) (73.08 ± 2.23).The mean systolic blood pressure increased by 7.6% in I week puerperium (Table VI) (112.16 ± 2.51) when compared to that of the pre-pregnant value (Table I) (104.64 ± 2.43).There is about 3.89% decrease in mean diastolic blood pressure in I week puerperium (Table II) (74.40 ±2.82) when compared to that of pre pregnant value (Table I) (77.6 ± 2.08).There is about 0.5% increase in mean arterial blood pressure during I week puerperium (Table VI) (86.94 ± 2.44) when compared to that of pre-pregnant value (Table I) (86.56 ± 1.60).About 15.7% decrease in mean packed cell volume is observed during I week puerperium (Table VI) (32.12 ± 1.12) when compared to that of the pre-pregnant level (Table I) (38.16 ± 1.74).

There is an increase of 34% mean stroke volume during I week puerperium (Table VI) (70.83 ± 3.2) when compared to that of the pre-pregnant value (Table I) (52.78 ± 7.83).The cardiac output is increased by about 50% during I week puerperium (Table VI) (5.66 ± 0.30) when compared to that of pre pregnant value (Table I) (3.80 ±0.18).

There is an increase of about 8.2% mean heart rate during II week puerperium (Table VII) (79.68 ± 2.41) when compared to that of the pre-pregnant value (Table I) (73.08 ± 2.23).About 17% increase in systolic blood pressure persists in II week puerperium (Table VII) (110.64 ± 2.62) when compared to that of the pre-pregnant value (Table I) (104.64 ±2.43).About 5.1% increase in mean diastolic blood pressure is observed in II week puerperium (Table VII) (81.36 ± 2.56) when compared to that of pre pregnant value (Table I) (77.6 ± 2.08).There is about 10.4% increase in mean arterial blood pressure during II week puerperium (Table VII) (90.45 ± 20.14) when compared to that of pre-pregnant value (Table I) (86.56 ± 1.60).There is about 1.5% decrease in mean packed cell volume during II week puerperium (Table VII) (34.36 ± 1.35) when compared to that of pre-pregnancy level (Table I) (38.16 ± 1.74).

About 32% increase mean stroke volume is observed in II week puerperium (Table VII) (69.93 ± 2.63) when compared to that of the pre-pregnancy value (Table I) (52.78 ± 1.64).There is about 50% increase of mean cardiac output during II week puerperium (Table VII) (5.52 ± 0.24) when compared to that of the pre pregnant value (Table I) (3.80 ±0.18).

Discussion:

The demand on the cardiovascular system progressively increases during pregnancy and parturition; these changes appear in the first trimester, continue into the second and peak in the late second and early third trimester. The cardiovascular adaptations usually persist up to 2–3 weeks postpartum but may not completely resolve until 12 weeks after delivery. In our study, we observed an increase in heart rate, SBP, SV and CO with a decrease in hematocrit during the three trimesters of pregnancy which is in accordance with the studies of Goodlyn RC, Dobbry CA et al [23]; Capeless EL, Clapp JF [11] ; Robson SC, Hunter S et al [26] .

The decrease in the mean arterial BP along with decrease in DBP till the third trimester of pregnancy may be due to the effect of gestational hormones, circulating prostaglandins, heat produced by the fetus and the low resistance placental bed. We observed a gradual increase in SBP which reached peak value during labour and also found an increase in SBP in peurperium when compared with non pregnant women. The DBP and mean arterial BP decreased to a maximum during second trimester and an increase in DBP and mean arterial BP was observed from labour till day 1 of puerperium.DBP decreased during first and second week of puerperium with a slight increase in mean arterial BP. PCV decreased gradually during the three trimesters of pregnancy and a maximum decrease was observed on first day puerpurium.SV and CO gradually increased and reached a maximum during labour and continued to increase during puerperium. During labour, pain, apprehension, increase in circulating catecholamines along with uterine contractions increase the SV and CO to a maximum. After delivery of the baby, caval compression is relieved and after the placenta is delivered, auto transfusion occurs from the placental sinusoids into the maternal circulation leading to increase in SV and CO.

The increase in heart rate, stroke volume and cardiac output observed in our study is in agreement with the study of Douard DAE, Pamner BM et al. [24] Duvekot JJ, Peteers LL [25] concluded that CO increase as a result of increased HR followed by increased SV until mid pregnancy and remains stable. BP and CO increase during labour. There is an increase in HR, CO and decrease in hematocrit through out pregnancy and also, in labour with a fall in these hemodynamic value's gradually after 24 hours after delivery and after 1 week and 2nd week (Robson SC, Boys RS et al) [26] .

Hytten F [27] observed an increase in plasma volume during first trimester with a maximum rise at 34-36 weeks. The decreased PCV observed in our study is consistent with the above study. Moll W [28] studied about the physiological cardiovascular adaptation in pregnancy and found an increase in stroke volume, heart rate, plasma volume and cardiac output. The increase in heart rate during labour observed in our study is in accordance with the study of Maruta S et al. [29] Klein HH et al [30] observed an increase in cardiac output during third trimester and labour. Also, they observed a decrease in DBP and hematocrit during pregnancy. The increase in mean arterial BP observed in our study during labour and peurperium correlates with the work done by Mellville GK [31]; Kent Ueland et al [32]; Clark SL et al [6]. Kristianson P et al [33] observed a decrease in mean arterial blood pressure during first two trimesters of pregnancy. The decrease in DBP and increase in HR & CO observed from our study correlates with the findings of Klien HH et al. [30]

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Source of Study: Nil

Conflicts of Interest: None.

TABLE'S:

Table -I

COMPARISION OF CARDIOVASCULAR PARAMETERS OF PRE-PREGNANT AND I TRIMESTER SUBJECTS

	PRE-PREGNANT		FIRST TRIMESTER		t-Value	P-Value	%inc↑ or dec↓
	MEAN	SD	MEAN	SD			
HR bpm	73.08	2.23	80.6	3.22	-9.63	< 0.001	9.4 ↑
SBP mm Hg	104.64	2.43	106.8	3.41	-2.57	< 0.01	2 ↑
DBP mm Hg	77.6	2.08	71.52	2.2	10.03	< 0.0001	8.5 ↓
MAP mm Hg	86.56	1.6	83.24	2.11	6.26	< 0.001	3.9 ↓
PCV %	38.16	1.74	36	1.84	4.26	< 0.01	5.5 ↓
SV ml/beat	52.78	1.64	54.29	3.06	-2.17	< 0.05	2.7 ↑
CO L/min	3.8	0.18	4.34	0.3	-7.72	< 0.001	11.6 ↑

Table - 2

COMPARISION OF CARDIOVASCULAR PARAMETERS OF PRE-PREGNANT AND II TRIMESTER SUBJECTS

	PRE-PREGNANT		SECOND TRIMESTER		t-Value	P-Value	%inc↑ or dec↓
	MEAN	SD	MEAN	SD			
HR bpm	73.08	2.23	86.56	2.75	-19	< 0.0001	18.4 ↑
SBP mm Hg	104.64	2.43	112.08	2.48	10.69	< 0.0001	7.07 ↑
DBP mm Hg	77.6	2.08	66.6	1.97	19.17	< 0.0001	12.9 ↓
MAP mm Hg	86.56	1.6	81.75	1.66	10.41	< 0.0001	5.5 ↓
PCV %	38.16	1.74	32.12	1.73	12.28	< 0.0001	15.8 ↓
SV ml/beat	52.78	1.64	73.25	4.02	-23.54	< 0.0001	38.8 ↑
CO L/min	3.8	0.18	6.28	0.36	-30.76	< 0.0001	50.0 ↑

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Table - 3

COMPARISION OF CARDIOVASCULAR PARAMETERS OF PRE-PREGNANT AND III TRIMESTER SUBJECTS

	PRE-PREGNANT		THIRD TRIMESTER		t-Value	P-Value	%inc↑ or dec↓
	MEAN	SD	MEAN	SD			
HR bpm	73.08	2.23	89.68	2.73	-23.53	< 0.0001	22.7 ↑
SBP mm Hg	104.64	2.43	119.36	2.05	-23.11	< 0.0001	14.06 ↑
DBP mm Hg	77.6	2.08	76.24	2.47	2.1	< 0.01	1.8 ↓
MAP mm Hg	86.56	1.6	90.58	1.89	-8.1089	< 0.001	4.6 ↓
PCV %	38.16	1.74	30.24	1.64	16.536	< 0.0001	20.7 ↓
SV ml/beat	52.78	1.64	75.24	4.48	-23.5	< 0.0001	42.5 ↑
CO L/min	3.8	0.18	6.69	0.42	-31.57	< 0.0001	76 ↑

Table - 4

COMPARISION OF CARDIOVASCULAR PARAMETERS OF PRE-PREGNANT AND LABOUR SUBJECTS

	PRE-PREGNANT		LABOUR		t-Value	P-Value	%inc↑ or dec↓
	MEAN	SD	MEAN	SD			
HR bpm	73.08	2.23	99.4	2.66	-37.92	< 0.0001	36.1↑
SBP mm Hg	104.64	2.43	132.4	2.44	-40.2	< 0.0001	26.5↑
DBP mm Hg	77.6	2.08	83.84	2.7	-7.14	< 0.0001	7.9↑
MAP mm Hg	86.56	1.6	99.99	2.17	-24.8	< 0.0001	15.4 ↑
PCV %	38.16	1.74	31.64	1.6	13.77	< 0.0001	17↓
SV ml/beat	52.78	1.64	78.16	4.45	-26.72	< 0.0001	48↑
CO L/min	3.8	0.18	7.71	0.45	-40.28	< 0.0001	100 ↑

Table - 5

COMPARISION OF CARDIOVASCULAR PARAMETERS OF PRE-PREGNANT AND 1ST DAY PUERPERIUM SUBJECTS

	PRE-PREGNANT		PUERPERIUM DAY-1		t-Value	P-Value	%inc↑ or dec↓
	MEAN	SD	MEAN	SD			
HR bpm	73.08	2.23	80.64	1.89	-12.91	< 0.0001	7.2↑
SBP mm Hg	104.64	2.43	120.4	2.76	-21.4	< 0.0001	15.38↑
DBP mm Hg	77.6	2.08	71.36	3.03	8.47	< 0.0001	8.11↓
MAP mm Hg	86.56	1.6	87.66	2.69	-2	< 0.0001	1.16 ↑
PCV %	38.16	1.74	29.04	0.97	22.85	< 0.0001	23↓
SV ml/beat	52.78	1.64	70.83	3.27	-24.63	< 0.0001	34.3↑
CO L/min	3.8	0.18	5.66	0.3	-26.55	< 0.0001	47.3 ↑

Table - 6

COMPARISION OF CARDIOVASCULAR PARAMETERS OF PRE-PREGNANT AND PUERPERIUM 1 WEEK SUBJECTS

	PRE-PREGNANT		PUERPERIUM WEEK-1		t-Value	P-Value	%inc↑ or dec↓
	MEAN	SD	MEAN	SD			
HR bpm	73.08	2.23	8.64	1.89	-12.91	< 0.0001	7.2↑
SBP mm Hg	104.64	2.43	112.16	2.51	-10.74	< 0.0001	7.6↑
DBP mm Hg	77.6	2.08	74.4	2.82	4.56	< 0.0001	3.89↓
MAP mm Hg	86.56	1.6	86.94	2.44	-0.65	< 0.0001	0.5 ↑
PCV %	38.16	1.74	32.12	1.12	14.57	< 0.0001	15.7↓
SV ml/beat	52.78	1.64	70.83	3.27	-24.6	< 0.0001	34↑
CO L/min	3.8	0.18	5.66	0.3	-26.54	< 0.0001	50 ↑

Table - 7

COMPARISION OF CARDIOVASCULAR PARAMETERS OF PRE-PREGNANT AND PUERPERIUM II WEEK SUBJECTS

	PRE-PREGNANT		PUERPERIUM WEEK-2		t-Value	P-Value	%inc↑ or dec↓
	MEAN	SD	MEAN	SD			
HR bpm	73.08	2.23	79.68	1.67	-11.83	< 0.0001	8.2↑
SBP mm Hg	104.64	2.43	110.64	2.62	-8.4	< 0.0001	5.76↑
DBP mm Hg	77.6	2.08	80.36	2.56	-5.69	< 0.0001	5.1↓
MAP mm Hg	86.56	1.6	90.75	2.14	-7.86	< 0.0001	4.65 ↑
PCV %	38.16	1.74	34.36	1.35	8.62	< 0.0001	10.5↓
SV ml/beat	52.78	1.64	69.93	2.63	-27.6	< 0.0001	32↑
CO L/min	3.8	0.18	5.52	0.25	-27.8	< 0.0001	50 ↑

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