

# Profound Anatomical and Physiological Changes During Trimesters of Pregnancy. A Clinical Study

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## ABSTRACT

**Aims and objectives:** Current study was conducted from February 2022 to June 2022 in different Gynecological and medical institutes of Pakistan. The aims and objectives of study were to observe the anatomical and Physiological changes during Pregnancy in women.

### Materials and Methods:

**Sample size:** 100 pregnant women were selected for this study and their age was in between 25-35 years. It was first pregnancy of all women how were considered in study.

**Parameters:** Cardiac changes, renal vasculature, renal vasodilatation, renal plasma flow and glomerular filtration rate (GFR), respiratory changes, water metabolism, changes in alimentary tract, thyroid changes, blood glucose levels, systolic and diastolic blood pressure.

**Bio-statistical presentation:** Raw data were presented by bio-statistically with the application of SPSS regression model 2020 in which compression was operated through mean standard deviation and significant ( $P < 0.05$ ) variations.

**Results:** It was seen that during pregnancy the demand of oxygen showed a significant ( $P < 0.05$ ) increase ( $95.0 \pm 0.01$ ), this is brought by a 20% rise in oxygen intake and 15% increase in metabolic rate and similarly Systolic blood pressure, Diastolic blood pressure, Random blood glucose levels, Intra-gastric pressure, Heart rate and BMI ( $152.0 \pm 0.03$ ,  $92.1 \pm 0.01$ ,  $156.0 \pm 0.01$ ,  $95.0 \pm 0.00$ ,  $9.0 \pm 0.02$ ,  $93.0 \pm 0.01$ ,  $35.01 \pm 0.01$ ) in pregnant women also showed a significant ( $P < 0.05$ ) changes than the normal levels respectively.

**Conclusion:** Pregnancy brings about physiological and anatomical changes that support the growing fetus and get the mother ready for labor and delivery. It's critical to distinguish between pathology associated with disease and typical physiological changes.

**Keywords:** physiological, Anatomical, Trimester, vasodilatation, Intra-gastric pressure

## INTRODUCTION

Anatomical and physiological changes occur throughout pregnancy to satisfy the increased metabolic needs, to allow for proper fetal growth and to prepare the mother body for normal childbirth [3]. Hormonal changes, an increase in total blood volume, weight gain, and an increase in fetus size are all variables that cause these alterations. These changes created very remarkable effects on the physiological and musculoskeletal system of pregnant women. Different researchers concluded in their studies that gastrointestinal, reproductive, endocrine and respiratory system in pregnant women showed variable changes. Full mature delivery time is about 40 weeks [5].

In eighth week of pregnancy, peripheral vasodilation and a decrease in systemic vascular resistance (SVR) are initiated as a result of higher levels of estrogen and progesterone [2]. When pregnancy reached in 6 to 8 weeks blood volume increases about 21%. In third trimester especially pregnancy induced hypertension become at top because of aortocaval compression [6]. Capillary engorgement of the nasal, oropharyngeal, and laryngeal mucosa occurs as a result of the effects of estrogen [1]. Anteroposterior and transverse diameters of the chest wall grow by 2 cm each, resulting in a 5–7 cm rise in circumference. Furthermore, progesterone causes the lower esophageal sphincter to relax. These anatomic and hormonal changes result in a decrease in lower esophageal sphincter tone, which manifests as pregnancy-related gastro-esophageal reflux illness [4]. The majority of pregnant women about eight percent experience nausea and vomiting, within 1–2 days after delivery, the alterations in the GI system return to normal [7].

Cerebral blood flow is boosted as cerebrovascular resistance is reduced. The blood brain barrier becomes more permeable. Increased levels of plasma endorphins and progesterone cause an increase in pain threshold at full term

and during labor [8]. Dilatation of the epidural venous plexus develops due to compression of the inferior vena cava by the gravid uterus. Renal blood flow and glomerular filtration rate improve, while histology and the number of nephrons remain unchanged. Renal pelvis and calyces are dilated as a result of progesterone and mechanical ureter compression [9]. During pregnancy, normal plasma osmolality decreases, along with a proportionate reduction in plasma sodium content. Increase in weight and hormonal changes showed number of musculoskeletal consequences [10].

The lumbar lordosis is accentuated with anterior neck flexion and downward shoulder movement to compensate for the change in center of gravity. Joint laxity is enhanced during pregnancy as a result of relaxin, progesterone, and mechanical impacts [11]. Several changes occur in the skin during pregnancy, most of which are assumed to be caused by hormonal changes. In women taking anticonvulsant medicines for epilepsy control, the increased need for folate during pregnancy causes a rapid drop in red cell folate and a high prevalence of megaloblastic anemia. The sort of incision for an appendectomy is determined by the gestation and position of the appendix [13].

## MATERIALS AND METHODS

**Study design:** Current study was conducted from February 2022 to June 2022 in different Gynecological and medical institutes of Pakistan. The aims and objectives of study were to observe the anatomical and Physiological changes during Pregnancy in women.

**Sample size:** 100 pregnant women were selected for this study and their age was in between 25-35 years. It was first pregnancy of all women how were considered in study.

**Parameters:** Systolic blood pressure, Diastolic blood pressure, Blood glucose levels, Oxygen Saturation levels, Heart rate, intra-gastric pressure, BMI Cardiac changes, renal vasculature, renal

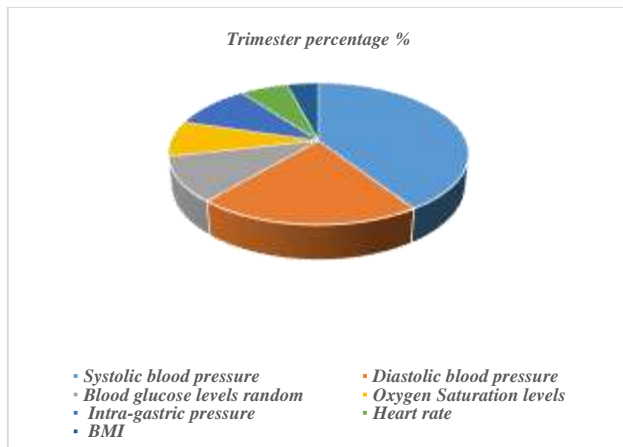
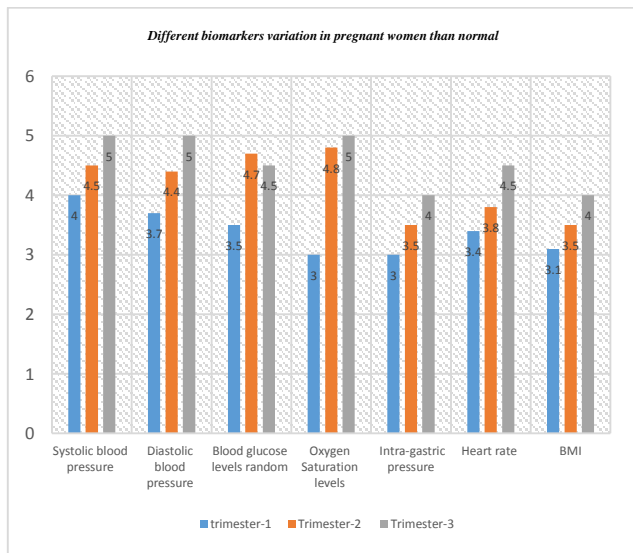
vasodilatation, renal plasma flow and glomerular filtration rate (GFR), respiratory changes, water metabolism, changes in alimentary tract, thyroid changes, blood glucose levels, systolic and diastolic blood pressure.

**Bio-statistical presentation:** Raw data were presented by bio-statistically with the application of SPSS regression model 2020 in which compression was operated through mean standard deviation and significant (P<0.05) variations.

**RESULTS**

Table 1: Different biomarkers variation in pregnant women than normal

Variables	Units	Mean ± SD	P<0.05
Systolic blood pressure	mmHg	152.0±0.03	0.03
Diastolic blood pressure	mmHg	92.1±0.01	0.01
Blood glucose levels random	mg/dl	156.0±0.01	0.01
Oxygen Saturation levels	Percentage	95.0±0.00	0.00
Intra-gastric pressure	mmHg	9.0±0.02	0.02
Heart rate	Beats/minute	93.0±0.01	0.01
BMI	kg/m <sup>2</sup>	35.01±0.01	0.01



It was the finding that during pregnancy the demand of oxygen showed a significant (P<0.05) increase (95.0±0.01), this is brought by a 20% rise in oxygen intake and 15% increase in metabolic rate and similarly Systolic blood pressure, Diastolic blood pressure, Random blood glucose levels, Intra-gastric pressure, Heart rate and BMI (152.0±0.03, 92.1±0.01, 156.0±0.01, 95.0±0.00, 9.0±0.02, 93.0±0.01, 35.01±0.01) in pregnant women

also showed a significant (P<0.05) changes than the normal levels.

**DISCUSSION**

Throughout Pregnancy dramatic anatomical and physiological changes occurred in the biological system of a female. Major changes which were noted by different researchers are respiratory, intestinal, cardiovascular and abdominal [19]. By eight weeks' gestation, the cardiac output had already risen by 20%. During pregnancy, relaxin, a peptide hormone generated by the corpus luteum, decidua, and placenta, is crucial in controlling water and hemodynamic metabolism [12]. Serum levels of relaxin, which were already high during the luteal phase of the menstrual cycle, increase after conception, reaching a peak at the end of the first trimester and toughing out at an intermediate level for the duration of the second and third trimesters [7]. By the late third trimester, plasma volume has increased by more than 50–60%, with red blood cell mass increasing by a lesser amount. As a result, plasma osmolality has decreased by 10 mosmol/kg.

In addition to a subjective experience of being short of breath without hypoxia, pregnancy may also cause it [13]. It starts at any point throughout pregnancy and is physiological, with the third trimester being the most likely period for it to occur. The breathlessness typically occurs at rest or when speaking, and it may paradoxically get better after light exertion. Instead of an increase in respiratory rate, there is a 40–50% increase in minute ventilation that is mostly caused by an increase in tidal volume [15]. Thyroxine (T4) and tri-iodothyronine levels rise as a result of an increase in the liver's synthesis of thyroxine-binding globulin (TBG) (T3). Although there is a modest change in serum free T4 and free T3 levels, these changes are often not clinically significant. However, there is a modest decline in free T3 and T4 levels and a narrowing of the normal ranges in the second and third trimesters of pregnancy [16].

The adrenal glands create three different types of steroids: mineralocorticoids, glucocorticoids, and sex steroids. Reduced vascular resistance and blood pressure activate the RAA system, which raises aldosterone levels by three times in the first trimester and ten times in the third trimester [17]. As a diabetogenic condition, pregnancy allows for the shunting of glucose to the fetus to aid in growth while preserving appropriate nourishment for the mother. Early in pregnancy, insulin production and insulin sensitivity are boosted by the process of insulin-secreting pancreatic beta-cell hyperplasia, which is followed by growing insulin resistance [18]. The second trimester is when maternal insulin resistance starts, and the third trimester is when it peaks. Increased release of hormones that cause diabetes, such as human placental lactogen, growth hormone, progesterone, cortisol, and prolactin, is the cause of this. About 30 g of calcium are needed on average by the fetus to sustain its physiological functions. The majority of this calcium comes from the mother's enhanced food intake and is passed to the fetus throughout the third trimester [19].

Present study has closed correlation with the previous studies. A significant (P<0.05) anatomical and physiological changes were measured in pregnant women during three trimesters. All these changes have similarities with different studies by number of researchers. The Systolic blood pressure, Diastolic blood pressure, Random blood glucose levels, Intra-gastric pressure, Heart rate and BMI (152.0±0.03, 92.1±0.01, 156.0±0.01, 95.0±0.00, 9.0±0.02, 93.0±0.01, 35.01±0.01) of all women showed reparable changes respectively. Further research work is required on this topic for better health awareness to the public.

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