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Document heading **doi: 10.21276/apjhs.2017.4.1.11** **Research Article**

Comparison Of Respiratory Rate And Tidal Volume In The Three Trimesters Of Pregnancy

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ABSTRACT

Objectives: (1) To measure Respiratory Rate and Tidal Volume in normal pregnant women. (2) To compare the changes in these parameters during the course of pregnancy. **Materials and methods:** The study group comprised of 90 subjects (pregnant mothers) in all the three trimesters of pregnancy attending a tertiary care hospital. They were divided into three groups as per the trimesters, 30 subjects in each. Respiratory rate & Tidal volume were recorded using a spirometer. **Results:** The results tabulated and statistically analyzed by Two-way ANOVA and multiple comparisons to compare the values between groups. The respiratory rate was not increased in the different trimesters whereas, Tidal volume was found to be elevated throughout. **Conclusion:** Pregnancy is associated with respiratory changes of which changes in Tidal Volume has significant association with the different trimesters of pregnancy.

Keywords: Progesterone, Respiratory rate, Spirometer, Tidal Volume

Introduction

Reproduction is part of the Grant Plan of Nature for the perpetuation of the mankind apart from perpetuation of all species. Pregnancy is a normal but altered physiologic state that results in significant hormonal, mechanical, and circulatory changes [1].It is fascinating to review the various protective as well as compensatory mechanisms[2] built into the mother for actualization of this purpose. Protective mechanisms for physical and immunological protection of both mother and the progeny include, elevation of the total leukocyte count, cervical plug formation after fertilization and prevention of autoimmune response to the fetus. The compensatory mechanisms include oxygen supply through the placenta, thoraco-abdominal type of respiration, respiratory changes in pregnancy like changes in tidal volume, respiratory rate so on and so forth[3].It is well known that the respiratory parameters undergo specific changes during the course of pregnancy[4,5]. Of these, Respiratory Rate and Tidal Volume are some of the parameters which can be studied non- invasively. In this study Respiratory rate and tidal volume were compared in each of the three trimesters of pregnancy. The findings revealed the wonders of nature which underlie our duty as healers to supplement and compliment the Great Plan of Nature.

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Aims and Objectives

1. To measure Respiratory Rate and Tidal Volume in normal pregnant women
2. To compare the changes occurring in these parameters during the course of pregnancy.

Materials and Methods

After obtaining written informed consent and ethical committee clearance, 90 normal pregnant mothers attending the antenatal clinic of a tertiary care hospital were randomly selected. Those having any chronic respiratory illness or chest deformity were excluded. They were divided into three groups of 30 in each trimester. Spirometry studies were performed in all the three groups using Power Lab of AD Instruments. Respiratory rate and Tidal volume were measured and the data were statistically analyzed using Two-way ANOVA and multiple comparisons.

Results

The data of both the Respiratory rate and Tidal volume of the three groups were tabulated in excel. Multiple comparisons (by paired sample test) and Two way ANOVA were done to compare the values between the groups.

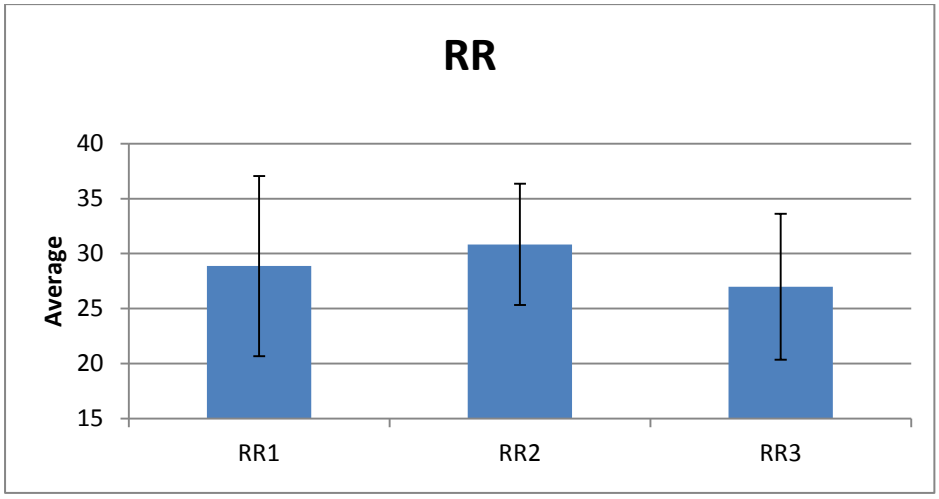


Fig 1: Graphical representation of average Respiratory Rate in three groups

Table 1: ANOVA data of Respiratory rate in the three study groups

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	220.4666667	2	110.2333333	2.340448552	0.102319246	3.101295757
Within Groups	4097.633333	87	47.09923372			
Total	4318.1	89				

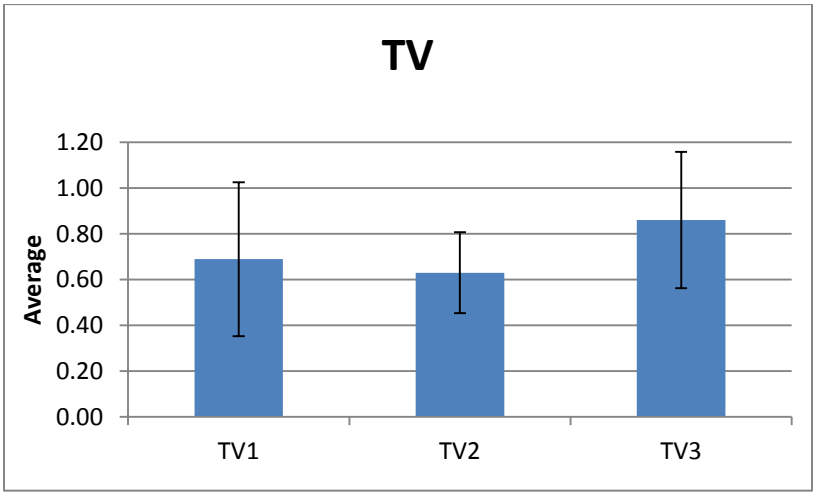
Groups	***Average***	***SD***
RR1	28.87	8.18
RR2	30.83	5.51
RR3	27.00	6.63

SUMMARY				
Groups	*Count*	*Sum*	*Average*	*Variance*
RR1	30	866	28.86666667	66.94712644
RR2	30	925	30.83333333	30.35057471
RR3	30	810	27	44

Table 2: Respiratory rate in the three study groups

Resp. Rate [N=90]	Mean ± SD	*p* value
1st Trimester	28.87± 8.18	**0.1023**
2nd Trimester	30.83± 5.51	
3rd Trimester	27± 6.63	

Fig 2: Graphical representation of average Tidal volume in 3 groups



Summary

Anova: single factor

Table 3: Tidal volume in the three study groups

Groups	*Count*	*Sum*	*Average*	*Variance*
TV1	30	20.67	0.689	0.112913
TV2	30	18.9	0.63	0.031276
TV3	30	25.8	0.86	0.0886

Groups	*Average*	*SD*
TV1	0.689	0.336025
TV2	0.63	0.17685
TV3	0.86	0.297658

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.85622	2	0.42811	5.517151	0.005548	3.101296
Within Groups	6.75087	87	0.077596			
Total	7.60709	89				

Table 4: Tidal volume in the three study groups

Tidal Volume [N=60]	Mean ± SD	*p* value
1st Trimester	0.689± 0.34	
2nd Trimester	0.63± 0.18	
3rd Trimester	0.86± 0.29	**0.005**

The Mean ±SD of the Tidal Volume was (0.689± 0.34), (0.63± 0.18), (0.86± 0.29), in the first, second and third trimester respectively. After running Two-way ANOVA and multiple comparisons tests, an increase in the mean Tidal Volume was observed in all the groups with a p value of 0.005. The degree of freedom (df) was 89. This indicates that there is a statistically significant increase in the Tidal Volume, associated with all the three trimesters of pregnancy. The p value on analysis of the mean respiratory rate in the three groups was 0.1023 indicating that the association was not statistically significant.

Discussion

Survival of species reigns supreme in the grant plan of nature. This is brought about in ways manifold[2]. Different mechanisms occur that favour survival of the mother & offspring. These adaptations associated with pregnancy include Anatomical, Endocrine& Chemical modifications [6]. Anatomical changes includes the systematic& sequential enlargement of the uterus which becomes an abdominal organ from its pelvic nest [1,7]. Chemical adjustments include respiratory and cardiovascular adjustments which bring about improved oxygenation to ensure proper growth& development of the foetus[3]. Endocrine mechanisms are mostly by the maternal hormones of which progesterone scores high [1]. As we are aware, neuro-humoral mechanisms are intractably co-ordinated to bring about the biochemical homeostasis. Pregnant mothers often feel short of breath which may be mistaken for pathology [8]. This is due to the physiological changes of pregnancy and the respiratory rate remains more or less the same [1]. The tidal volume increases in early pregnancy itself and continues to remain high. The minute ventilation which is the product of respiratory rate and the tidal volume, also increases, which is perceived as shortness of breath by the pregnant mother. It is also attributed to the increase in respiratory drive [8], hemodilution and nasal congestion [1]. This physiological dyspnoea will not hamper the daily activities and it disappears after delivery [2].The increases in progesterone and estrogen associated with pregnancy contribute to vascular and central nervous system effects, modulations in the respiratory system and connective tissues[1,2]. Cardiac output, pulmonary blood flow, and blood volume are increased due to increased metabolic demand. Having a good understanding of the normal physiologic changes of pregnancy help the clinicians accurately diagnose and treat respiratory pathology in pregnant patients[8,12].

Conclusion

Pregnancy is associated with respiratory changes of which increase in Tidal Volume has significant association with all trimesters of pregnancy. Since these compensations can mimic disease, clinicians should have a thorough understanding of the physiological changes in respiration.

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