

A comparative study of relation of PEFR and anemia in pregnant and non-pregnant females

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Received: 23rd October, 2018

Accepted: 15th November, 2018

Abstract

Introduction: Anemia is commonly present among women in India and more so in the pregnant females. Anemia has potential adverse effects on the mother and the fetus.

Objectives: to study the physiological responses of PEFR and Hb levels in pregnant and non-pregnant females.

Materials and Methods: 100 female subjects were selected for the present study out of which 50 were pregnant women in different trimesters of pregnancy and 50 controls of the same age group. A new European Union Peak flow meter was used for determining the PEFR. Data was analyzed using unpaired student's t-test.

Results: PEFR as well as Hb was found to be significantly lower among the pregnant females compared to non-pregnant controls (p=0.00).

Conclusion: PEFR is decreased in pregnancy as the changes in pulmonary function are attributed to the mechanical pressure of enlarging gravid uterus elevating the diaphragm and restricting the movements of the lungs. The changes in Hemoglobin levels are attributed to the physiological demands of hemoglobin during pregnancy.

Keywords: Hemoglobin, PEFR peak expiratory flow rate, Anemia.

Introduction

Anemia is a commonly occurring problem in many parts of the world but more so in India. Finding of the new global nutritional report 2017 has shown that 51% of the fairer sex in the reproductive age group is suffering from anemia. Anemia can become a silent killer among women in India.¹ The major cause of anemia among women is imbalanced diet, malnutrition, menstruation, pregnancy, lactation and improper sanitation and above all illiteracy.² Due to large families and poor economic status many girls are anemic and this gets aggravated once they get pregnant as the demand for iron during pregnancy and lactation is more.¹ The adverse effects of anemia include dyspnea on mild exertion, lethargy, easy fatigability leading to reduced working capability of an individual.¹ Moderate to severe anemia affects the pulmonary function and can complicate pregnancy.³

There is a reduction in the FRC and ERV due to the effects of anemia on pregnancy.⁴ This is due to the cause that as the uterus gets enlarged the abdominal pressure increases leading to a decrease in the compliance of the lungs. Many respiratory changes occur during the pregnancy as the gestation advances, as there is an increase in the oestrogen and progesterone levels.⁵

Many women have difficulty in breathing during pregnancy complicated with anemia due to reduction in hemoglobin levels, this will cause the decreased availability of oxygen which is compensated by increased ventilation.⁶ As pregnancy and gestation advances there occurs many physiological changes in the ventilatory function.^{7,8} Although these changes can be tolerated by the pregnant mother, in the interest of the wellbeing of both mother and fetus prompt

recognition and treatment of the cause should be the first criteria for the betterment of the mother and the fetus.⁵

Peak expiratory flow rate is the maximum of airflow which is achieved during a forced expiration after a maximal inspiration.^{9,10} PEFR is dependent on the expiratory muscle effort, elastic recoil of the lung and airway size.¹¹ Many modified instruments were devised to assess the pulmonary function, but of them all the most portable and economical instrument is the peak flow meter which gives a good picture of lung function. The simple test such as PEFR would enable us to assess the airway obstruction in pregnancy.

As there are many adverse effects of anemia on pregnancy on both the expectant mother and the fetus, and in South India not many studies were done so this study was undertaken. The present study was carried out to evaluate the changes in the pulmonary functions of the women in pregnancy and compare them with healthy non-pregnant age matched controls.

Materials and Methods

This is a cross sectional study was done at Dr. VRK Women's medical college teaching hospital and RHTC field practice area of Dr. VRK Women's medical college. One hundred female subjects were included in this study by convenience sampling. Fifty pregnant women were selected as study group and fifty healthy non-pregnant females of the same age group were selected as controls.

Inclusion Criteria:

1. Pregnant women and non-pregnant women between 20-35 years of age.
2. The subjects willing to participate and given written consent.

Exclusion Criteria:

1. The individuals not willing to participate in the study.
2. Those who were suffering from tuberculosis, hypertension, asthma, congestive heart failure or with family history of any of these ailments were excluded from this study.

Study Tools: Pretested semi structured questionnaire was used which included the past history, the present history, and the economic status of the family. The various parameters like age, height, weight and blood pressure were measured. Hemoglobin percentage measured by Sahli's Acid Hematin method and PEFr was recorded using Peak flow meter.

Study Procedure: The subjects were explained about the experimental procedure and informed consent was taken prior to the investigation. The Institutional Ethical Committee clearance was taken prior to the study. A New European Union peak flow meter was used in the study. The mouth piece of the instrument was sterilized between each use by subjects using a dilute 10% solution of potassium permanganate solution and cotton wool. The subject was asked to take a deep breath as much as she can hold the mouth piece tightly and blow out forcefully into peak flow meter.

The subject was carefully watched to ensure that no leaks occur between the mouth piece and the lips. After each reading the scale was brought to zero, the subject was given a rest period of about 5 minutes after each reading. Three readings were recorded by the instrument in the sitting posture by the individuals and the maximum value of the three was taken as the standard reading. The hemoglobin was measured using the Sahli's Acid Hematin method. The hemoglobin percentage was measured for assessment of anemia and PEFr measurement was done to assess the lung function.

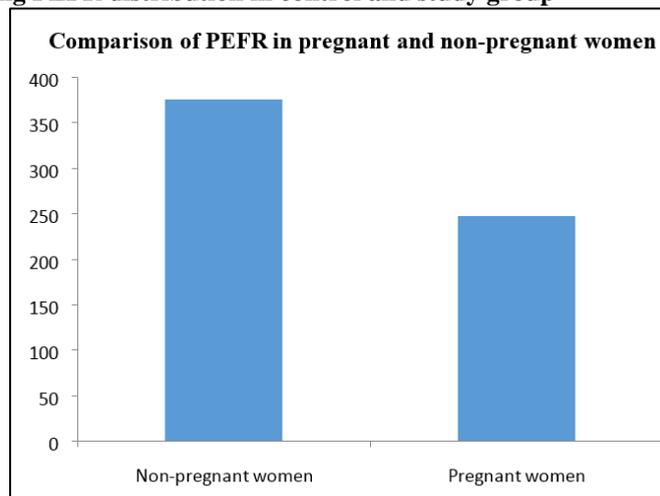
Statistical Analysis

The results were expressed as mean and standard deviation. Data obtained was analyzed using SPSS version 21.0. Unpaired student's t test was used to compare the mean PEFr as well as Hb levels for pregnant (study group) and non-pregnant women (control) at $p < 0.05$.

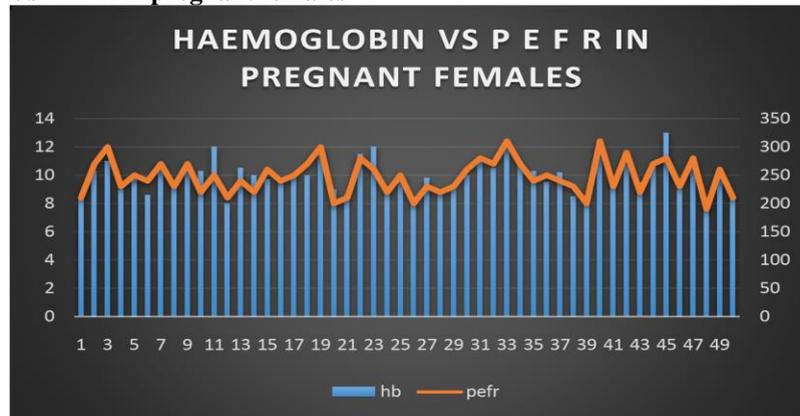
Results**Table 1: Hb & PEFr in pregnant and non-pregnant subjects**

Parameters	Non-pregnant females (control) (n=50)	Pregnant females (Study subjects) (n=50)	t- Test significance ($p < 0.05$)
Hb	12.29±0.90	9.98±1.18	p=0.00 highly significant
PEFR	375.09±49.89	247±30.45	p=0.00 highly significant

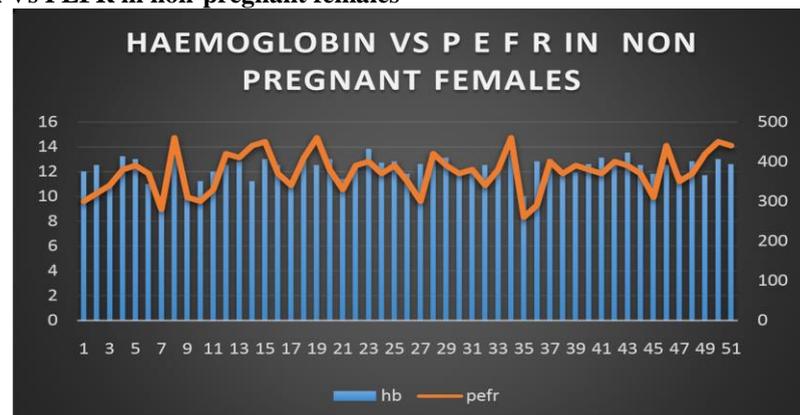
In Table 1, Hb% as well as PEFr were found to be lower in pregnant females compared to nonpregnant females and the results were found to be statistically significant ($p=0.00$).

Graph 1: Bar diagram showing PEFr distribution in control and study group

In graph 1, PEFr is more in non-pregnant females (controls) when compared to pregnant females (study group)

Graph 2: Haemoglobin Vs PEFr in pregnant females

In graph 2, the hemoglobin and PEFr was compared for pregnant females. With an increase in Hb levels PEFr is increased and with decrease in Hb levels PEFr is decreased among the subjects.

Graph 3: Haemoglobin Vs PEFr in non-pregnant females

In graph 3, the hemoglobin and PEFr was compared in non-pregnant females. PEFr is greater in subjects with greater Hb percentage and lesser in subjects with lesser Hb.

Discussion

In the present study there was a significant decrease in the PEFr values in the pregnant women when compared to the non-pregnant females. This study findings are similar with the other studies that were conducted. Study done by Sunyal DK et al¹² shows that the PEFr during all the trimesters of pregnancy is lower than the non-pregnant women and shows a significant p value < 0.05. In another study done by Monika et al¹³ the PEFr values were lower in pregnant women when compared to controls where there is a significant difference between the groups. Similar findings were observed in another study conducted by Aruna Shanuganathan et al,¹⁴ PEFr in controls was higher when compared to pregnant women interpreting that PEFr is less in pregnant than the non-pregnant females.

In the present study PEFr values were lower in anemic individuals among pregnant women as well as non-pregnant females. L Gupta et al¹⁵ have studied the relation of PEFr and Anemia in young adults and they have conducted their studies in anemic young adults and controls and in their study

the mean PEFr values were lower in anemic adults than controls. Puranik et al¹⁶ have mentioned in their work that the anemic pregnant women showed lower PEFr when compared with PEFr of non-anemic pregnant women.

In the present study when anemia was assessed between the two groups pregnant and non-pregnant, a significant difference was observed among the two groups. Anemia was more in the pregnant women compared to the non-pregnant females. In the study conducted by Monika et al¹³ also showed lower hemoglobin levels among pregnant females compared to non-pregnant group. The present study as well as the other studies clearly indicates that anemia is more prevalent among pregnant females compared to the non-pregnant women.

In the present scenario women's health in India is facing a severe nutritional challenge, due to a number of factors like poor food quality, high cost of health care facilities and low status of women in India. Iron deficiency anemia is a common problem among women, primarily due to poor intake of food sources which are rich in iron, and due to blood loss during menstrual cycles and also during pregnancy.¹⁷ Women in India derive iron mostly from non-heme sources like grains, cereals, lentils and vegetables and a small amount from iron supplements. As women become anemic they

become more susceptible to infections as their immunity is decreased, they become weak and are unable to carry out the daily chores properly and this may lead to various types of conflicts in their families. Proper measures should be taken to prevent anemia and the family members should be given counseling and explained about the importance of health of women.

Limitations

Many studies have been done with Wrights peak flow meter but not much work is done with New European Union peak flow meter and also comparative studies related to PEFR and anemia are few. Hence there is a need that more extensive work be done in this field. The sample size is less in the present study so future studies can be conducted with a larger sample size and a larger setting.

Conclusion

In the present study it was noticed that there is a significant decrease in the PEFR in the pregnant females when compared to the non-pregnant females. It was also observed that most of the pregnant women are anemic when compared to the non-pregnant women. PEFR was lower in anemic individuals in both the groups. In order to prevent the effects of anemia on the pregnancy and its adverse outcomes on the expectant mother proper counseling of the family members is very important as well as providing iron supplements. In addition to iron and folic acid supplements it is recommended that the young women should take proper care of their diet and should include foods which are high in vitamin C so that iron absorption is more. Though many types of anemia's can't be prevented a diet rich in nutrients and vitamins such as green leafy vegetables, dairy products, iron fortified cereals, pulses, beans, soy products, peanuts and dried fruits can prevent iron deficiency anemia to a large extent. Prevention of anemia becomes easy if proper dietary changes are made and also when it is detected at an early stage.

Ethical Approval: Ethical clearance taken from Institutional Ethical Committee, Dr. VRK Women's Medical College Teaching Hospital & Research Centre.

Conflict of Interest: None.

Source of Funding: None.

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How to cite this article: Tayyab A, Kumar KA, Kumari KA. A comparative study of relation of PEFR and anemia in pregnant and non-pregnant females. *Indian J Clin Anat Physiol* 2019;6(1):45-48.