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Review Article

Air Pollution Impacts on Pulmonary Function Test during Pregnancy–A Review

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Abstract: Air pollution has a decrement effect on Pulmonary function parameters. Mothers exposed to high pollution during pregnancy are at higher risk of adverse birth outcomes, including low birth weight, small for gestational age, prematurity, and heart defects at birth. Development of strategies to reduce air pollution and prevent exposure to harmful levels of air pollution during pregnancy.
Keywords: Pollution, Pregnancy, and Pulmonary function tests.

INTRODUCTION

Air pollution is one of the serious problems faced by the peoples in the developing countries like India. Generally in urban centers the residential areas are located along the roadside. The populations of such areas are continuously exposed to vehicular pollution. The major causes of increased emission of pollutants include the use of poor quality fuel, traffic congestion and badly maintained motor vehicles. The effect of air pollution includes breathing and respiratory problems, aggravations of existing respiratory and cardiovascular diseases, and alterations in the body defense system against foreign materials and damage to lung tissue and carcinogenesis[1]. Young children, pregnant women and elderly people often suffer more from the effects of air pollution. Road traffic is a major factor in ambient air pollution in industrialized countries, contributing pollutants including fine particulate matter, carbon monoxide, ozone, sulfur dioxide, hydrocarbons and oxides of nitrogen. Lungs are target for adverse effects of noxious gases due to air pollution. Lung function parameters will affected by both pregnancy and pollution. Indoor air pollution is a major causal factor for acute respiratory deaths in rural and urban areas of developing countries.

POLLUTION AND PREGNANCY

In pregnancy profound alterations in the functioning of all the systems metabolic, digestive, renal, endocrine, behavioral and cardiopulmonary of the mother occur to accommodate the needs of the developing fetus [2]. Pregnancy is associated with significant changes in respiratory functions even in healthy women. Increasing size of the fetus impedes the normal process of ventilation in the mother. So, it would be logical to expect an increase in the respiratory function because the fetus depends on the mother's lungs for oxygenation and any impairment in the mother may result in fetal distress [3]. The course of pregnancy is accompanied by structural changes to the ribcage and abdominal compartments as a consequence of the hormonal changes and the enlarged uterus.

Air pollution exposure during early pregnancy may interfere with placental development and subsequent oxygen and nutrient delivery to the fetus throughout pregnancy, while the last trimester is important for fetal weight gain. Compared to the inhalation of cigarette smoke during active or passive smoking, the gases and particles in ambient air pollution are relatively diluted, resulting in relatively small risk increases for reproductive and children's health outcomes. Increased risks for pregnancy outcomes in more polluted versus less polluted areas range from 10 to 30 % for preterm birth and low birth weight, and between 5 and 20 % for infant mortality. Certain vulnerable population segment the poorest and most exposed may experience much higher risks [4].

PREGNANCY AND PULMONARY FUNCTION TESTS

Pulmonary Function Tests, provide an accurate knowledge of the physiological changes in the pulmonary functions occurring during pregnancy. Moreover their precise knowledge allows the clinician to verify the extent of the adaptation in pregnant women

and helps to avoid unnecessary treatment of physiological changes misinterpreted as pathological changes in reference to pre-pregnancy standards.

POLLUTION, PREGNANCY AND PULMONARY FUNCTION TESTS

The most important source of the air pollutants is vehicle exhaust, which is a complex mix of many gases and particles. Air pollution exposure during early pregnancy may interfere with placental development and subsequent oxygen and nutrient delivery to the fetus throughout pregnancy, while the last trimester is important for fetal weight gain. Exposure to air pollution during specific pregnancy periods may also trigger inflammation and lead to preterm birth [4]. Increased traffic exposures have been associated with reduced levels of lung function, a more objective measure of respiratory health [5]. There is a strong association between the duration of exposure to air pollutants and lung function changes or air way obstruction.

A recent community-based study in the United States showed that increased traffic density and distance to major roadways were associated with reduced FVC and FEV_1 among women [6]. To estimate traffic exposure, studies generally have relied on measures of traffic density and residence distance from roadway. Black carbon was associated with a 1.1% decrease in FEV_1, a 0.6% decrease in FVC, and a 3.0% decrease in ($FEF_{25–75\,\%}$) [7].

Although there are reports of changes in pulmonary function tests during pregnancy and pulmonary function tests in pollution studied by various scientist. But not much work has been documented on study of pulmonary function test in females during three different trimesters residing in polluted areas, Since pollution of atmosphere is greatly influencing lung functions.

In 1967 Gee [8] observed that a decrease in airway resistance was the major factor for reduction of total pulmonary resistance during pregnancy in normal women. As pregnancy advanced gradual decreased in pulmonary Function Tests was observed by Liu CT [9] Decline in FVC and FEV_1 due to mechanical pressure of enlarging gravid uterus, elevating the diaphragm and restricting movements of lungs, and thus hampering the forceful expiration [9].

Whereas in some studies no change were observed in FEV_1 seen in pregnancy, may be due to broncho constrict effect of decreased alveolar PCO_2 on the bronchial smooth muscles [10].

According to Robin A. [11] VC in late pregnancy was significantly lower, this reduced VC during pregnancy was due to a decrease in the ERV. Similarly MVV decrease during pregnancy indicating of a mechanical inhibition of chest. PEFR, FEV_1/FVC% gradually decreases throughout pregnancy from 1st to 3rd trimester [12]. The anemic women not only show lower PEFR but also show a similar declining trend throughout pregnancy.

Progressively decline in mean values of PEFR, MVV, FVC and FEV_1 during different trimesters of pregnancy. Due to mechanical pressure of enlarging gravid uterus, elevating the diaphragm and restricting movements of lungs, hampering the forceful expiration [13].

No literature is yet available regarding effect of pollution on different trimester. We may be among first few workers on this ground.

CONCLUSION

Pregnancy is most delicate, pleasurable period in the life of a woman since it provides ‘motherhood,’ Lot of hormonal, glandular psychological changes are influencing this period & thus affecting total physiology of the body. We just threw light on pollution and respiratory changes during pregnancy but this work also opens new window of knowledge for successive workers to resolve this dilemma.

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