

Comparative characteristics of healthy pregnant women and non-healthy pregnant women

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Abstract

We carried out a systematic search by using a literature about the issue of our interest in the PubMed and Scopus search databases. We systematically searched the literature published from December 1, 2019 to July 30, 2021 across multiple databases including PubMed, Web of Science, Google Scholar and the WHO COVID-19 database using the following keywords: “COVID-19” and “pregnancy”. Filter by date: March 1, 2020-until March 1, 2021. We have made a review of the literature on the issue of our interest in the PubMed and Scopus search databases. Based on our understanding, we want to present a small literary review. Changes in the cardiorespiratory and immune systems during pregnancy increase woman's susceptibility to severe infection and hypoxic compromise, but at the same time they may also delay diagnosis and source control in those who have only mild upper respiratory



symptoms such as sore throat and nasal congestion; the latter are observed in 5% of patients with COVID-19. With gestational rhinitis, it should also be noted that in pregnant women the content of estrogen, β -estradiol increases, which increases the reactivity of the immune system. Therefore, the intensity of seizures during gestation can increase significantly. However, a high concentration of estrogen disrupts vascular motility, causing vasomotor rhinitis during pregnancy, usually affects a fifth of healthy women in late pregnancy and leads to severe nasal congestion and rhinorrhea; these signs can mask the symptoms of COVID-19, leading to uncontrolled viral shedding and transmission. Dyspnea occurs in 18% of patients with COVID-19.

KEYWORDS: COVID-19; pregnant; rheology

Introduction

For the past two years scientific world and the research development strategy are aiming at studying the effects of COVID-19 on various physiological and pathophysiological mechanisms of the body.

Research in the direction of rheology has also been modified, and at this stage, along with other problems, it is mainly studying the effects of covid19 on blood flow.

The direction of gynecology and obstetrics is no exception. Most relevant is the separation of the flows of healthy pregnant women and pregnant women with a new coronavirus infection, as well as the impact of COVID-19 on the health of the mother and fetus before and after childbirth. The experience of the obstetrics and gynecological service during pandemic is very important not only for planning and improving the strategy, but also in terms of scientific approaches.

According to WHO experts, pregnant women are susceptible to coronavirus infection due to changes in the body (primarily in the organs of the respiratory and immune systems).

The purpose of our study was to review the latest scientific literature related to this issue.



Materials and Methods

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Discussion

We have made a review of the literature on the issue of our interest in the PubMed and Scopus search databases. Based on our understanding, we want to present a small literary review.

Changes in the cardiorespiratory and immune systems during pregnancy increase women susceptibility to severe infection and hypoxic compromise, but at the same time they may also delay diagnosis and source control in those who have only mild upper respiratory symptoms such as sore throat and nasal congestion; the latter are observed in 5% of patients with COVID-19 [1]. With gestational rhinitis, it should also be noted that in pregnant women the content of estrogen, β -estradiol increases, which increases the reactivity of the immune system. Therefore, the intensity of seizures during gestation can increase significantly. However, a high concentration of estrogen disrupts vascular motility, causing vasomotor rhinitis during pregnancy, usually affects a fifth of healthy women in late pregnancy and leads to severe nasal congestion and rhinorrhea; these signs can mask the symptoms of COVID-19, leading to uncontrolled viral shedding and transmission. Dyspnea occurs in 18% of patients with COVID-19 [2]. However, physiologic dyspnea due to increased maternal oxygen demand, increased metabolism, gestational anemia, and fetal oxygen consumption is common during pregnancy [3]. At the same time, it should be noted that the work of the pulmonary respiratory apparatus from the second half of gestation is hampered by the high standing of the diaphragm resulting from the growth of the pregnant uterus, and the need to enhance lung function due to an increase of the body's need for oxygen [4]. This is relevant as COVID-19 pneumonia rapidly progresses from focal to diffuse



bilateral consolidation of the lung parenchyma, which in the context of the pulmonary changes described above, will more rapidly predispose to hypoxemic respiratory failure during pregnancy [5].

While what protects pregnant women from developing severe COVID-19 remains a mystery, the difference in immunological response may partly explain the difference in the severity of maternal illness. Activation of Th1 immunity is characteristically and preferentially showed, in patients where atypical cov-2 has been developed, leading to a significant increase in pro-inflammatory cytokines (IFN γ , IL-1 β , IL-6 and IL-12), leading to extensive lung damage [6]. That is, unilateral activation of Th1 immunity may give a chance for the dominance of pro-inflammatory cytokines over anti-inflammatory cytokines and cells, which leads to the so-called “cytokine storm”.

However, from our – rheologists’ point of view, the process can be explained in terms of disturbances that are caused at the level of blood flow.

On the one hand, regardless of various factors, rheology is a separate system that is leading in connection with blood circulation, but on the other hand, it plays a special role in microcirculation. It is because rheology is mainly regulated by formed elements, in particular RBC.

In order to avoid obstacles for penetration into the microvessels, it is necessary to cram the elasticity, normal aggregation and other factors, as RBC often have larger sizes than the capillaries themselves. In our studies and in studies of other rheologist we detained the fact that for any disease with COVID-19 the rheological status is violated due to a strong change in the aggregation of erythrocytes [8,9,10].

Recent studies have shown no difference in plasma viscosity in the presence of markedly lower hematocrits well as increased RBC aggregation in women at term compared to non-pregnant women. Little is known about the outcome of blood rheological parameters and red blood cell (RBC) deformability particularly in the course of normal pregnancy [11].

The virus can get in to macrocirculation in the following ways, either the virus enters the large vessel from the smaller vessel, which is at an acute angle, with great force, or it is pushed for a long time due to its roughness and non-elasticity and is thus ejected in to the blood stream, or the virus enters the laminar blood stream at right angles. All other cases are a mathematical approximation and the vector sum of these cases.

Some types of movement come down to rotary, oscillating, linear and reciprocating, irregular motion. Each one moves in a slightly different way. Any circulation of the virus can be determined by a combination of different types of movements, and as a result it causes violations of the velocity vector of red blood cells, their impulses and angular momentum. The above mentioned is due to a collision with the virus, or the fact that red blood cells have to accelerate and move along the “pathbroken by the virus”. This



causes an unexpected collision of RBC in the plasma, which, in turn, moves with glides at different times near the parietal layer of blood vessels.

This contributes the bonding, monetization and mostly to aggregation of RBC. Thus, the presence of a new coronavirus promo test he formation of aggregates not only immediately during erythropoiesis in the microvasculature, but also in macrocirculation. All this causes an explosion of rheological disturbances in COVID-19. In terms of blood circulation, the rheological system is completely self-sufficient. Thus in regard to turn over, fusion and interaction of rheological and coagulation/anticoagulation are necessary here. It should be emphasized that the coagulation and anticoagulation systems usually balance each other being mutually exclusive and interconnected at the same time. But even with physiological processes, the anticoagulation system is depleted faster than the coagulation's system. This imbalance is enhanced in parallel with the consumption of the adaptive energy of the body, despite this physiological process (for example, pregnancy) or pathophysiological (inflammation and any disease). As for the rheological system of the body, there is no antipode, which for example (reduced aggregation, increased deformability, etc.). There is no so-called "anti-rheological" compensatory reactions.

Although the immunity of pregnant women is weaker than that of non-pregnant women, the epidemiological curves are similar. This has been a topic of discussion for the last two years.

Our approach that provides the importance of the rheological properties of blood, advocates that the highest risk group for developing severe forms of COVID-19 are pregnant women with somatic diseases. The above mentioned includes chronic lung diseases, including moderate and severe bronchial asthma; diseases of the cardiovascular system, arterial hypertension, diabetes, immunosuppression, including the treatment process of oncological diseases, obesity, chronic kidney disease, liver disease, and systemic disease.

There are relatively few data showing how coronavirus infection affects the course of pregnancy and the health of the embryo [12,13].

All of the above mentioned emphasizes the relevance of the topic and the need for experimental prolonged studies. Only after that, we will be able to get real results of the impact of COVID-19 on the course of pregnancy.

The continuation of research in this direction is very important from the point of view of fundamental science and applied gynaecology and obstetrics





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