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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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COVID-19 INFECTION IN THIRD TRIMESTER OF PREGNANCY AND OBSTETRIC OUTCOMES

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Abstract.

Currently, in relation to the effect of this pandemic on pregnancy, there are more questions than certainties about the real impact of COVID-19 on pregnant women. Studies are updated and often contradict each other. There is no evidence to suggest that pregnant women with COVID-19 have higher morbidity than affected non-pregnant women. We aimed to know whether maternal morbidities were more frequent in pregnant woman with COVID-19 compared to non-infected pregnant women. A retrospective case control study was conducted during a period of 6 months. Medical records were reviewed. A 120 files of COVID-19 infected women from Mosul city, and 95 files of non-infected pregnant women were reviewed and analyzed. We found that Infection with COVID-19 had a significant effect on pregnancy outcome, infected women were more likely to have higher incidence rates of adverse perinatal outcomes in both mothers and the newborns. Also, higher odds of complications associated with severe disease form Findings of our study came in line with previous studies in other countries, however, more medical care and support should be provided to pregnant women infected with COVID-19, particularly severe cases. Further studies with larger sample size are still needed for good understanding of the effect of virus on pregnancy outcomes.

Key words. COVID-19, Epidemiology, Pregnancy outcomes, maternal complications, neonatal complications.

Introduction.

The COVID-19 pandemic was declared by WHO on March 2020, and it is announced as a disease caused by a novel virus, in term SARS-CoV-2. Almost all the World countries have been affected with no specific treatment available yet, however, attempts to develop vaccines succeeded and now a days vaccination much reduce the daily registered cases [1].

Preliminary evidence suggests a link between wholesale seafood sales at the Wuhan market and COVID-19 [2,3]. The viruses classification international committee declared that SARS-CoV-2 virus belong to the family coronaviridae, order Nidovirales corona virus genus. It is a helical or single-stranded ribonucleic acid (RNA) called SARS-CoV-2 because it shares some genetic characteristics with other coronaviruses, mainly through its membrane protein [4,5].

According to available data, the virus has an incubation period between two to fourteen days. COVID-19 as a disease mainly occurs in people aged 30 to 79 years, less often in people younger than 20 years, and it is more frequent in males than females. Majority of infected cases can have a mild course of the disease; however, an important proportion of patients can have severe form and even reach a critical state and death [6,7].

Pregnant women are considered a uniquely vulnerable group in any outbreak of an infectious disease. However, in case of COVID-19, there is a specific predispositions and protective factors against the natural course of disease [8]. In pregnant women, physiological changes during pregnancy are known to predispose pregnant women to severe respiratory symptoms [9]. Pregnancy is considered a unique state of immunity and many immune challenges faced during pregnancy which may be a leading factor in the development of the COVID-19 infection, however, during this period, adaptive changes in the mother's immune status occur. Accordingly, balance of pro-inflammatory cytokines and anti-inflammatory cytokines creates an appropriate environment for maternal adaptation. In this population, the anti-inflammatory effect may be protective, and COVID-19 may be less severe [10-14].

Due to certain changes caused by hormones and other physiological changes during pregnancy, limited lung expansion, making a pregnant woman vulnerable to certain respiratory pathogens [15]. Although the available information is generally limited, studies have been conducted indicating that the potential danger of this disease for the pregnant woman and the fetus cannot be ignored. Pregnant women who are already have an underlying proinflammatory disease, a secondary reaction to the virus can lead to an even more severe reaction, which should be considered, especially in the first and third trimesters of pregnancy [13,16-18]

Different complications during pregnancy can be developed and linked to COVID-19. During the SARS (SARS-CoV1) and MERS (MERS-CoV) epidemics in 2003 and 2015, respectively, pregnant women were found to be at increased risk of complications such as miscarriage, fetal growth retardation and preterm birth with more admission to neonatal intensive care units [19,20].

Previous studies, also reported different complications, such as stillbirth [21], premature rupture of membranes, premature labor [22], or preeclampsia which in some cases required cesarean sections [23],

Vertical transmission of viruses considered one of the main concerns that occupied the scientific community as a whole was the possibility of vertical (intrauterine) transmission of the virus. However, the risk of vertical transmission is low, with no strong evidence in the medical literature to date [24].

Diagnosis of COVID-19 during pregnancy is usually clinical, mainly based on the manifestations and not differ than in general population. Fever and cough are the most frequent symptoms however, other symptoms are not uncommon such myalgia, fatigue, and respiratory distress, additionally, some patients complain of nasal congestion, adenophagy, and diarrhea, in the early stage of the disease, the white blood cells (WBC) count may be normal or low, and C-reactive protein may be elevated. In pregnant women, as in non-pregnant patients, the diagnosis of COVID-19 is made by detection of the virus using real-

time RT-PCR. Saliva samples should be taken with a cotton swab. From the upper respiratory tract, from the nasopharynx or oropharynx to the depth of the upper respiratory tract and, if necessary, by endotracheal aspiration or bronchopulmonary lavage. Sometimes serial tests are needed. if the patient has isolated fever, the literature recommends a full blood count and screening for SARS-CoV-2 in the presence of lymphopenia [25,26].

Serology is also performed and recommended only if RT-PCR is not possible [27].

Radiological examination performed in these patients is the same as in non-pregnant women. To rule out viral pneumonia, it is necessary to perform a chest X-ray and in some cases a CT scan of the chest [28-30].

Treatment is recommended for pregnant women with clinically or radiographically proved pneumonia, however, no specific recommended guideline for treatment of COVID 19 during pregnancy [31].

Despite many studies are conducted and updated, there still conflicting results and the studies even contradict each other in regard to the real impact of COVID-19 on outcomes of pregnancy, there still more questions than certainties and in light of the public health problems associated with this disease and the care of pregnant women, therefore, we aimed in the current study to assess the effect of COVID-19 on maternal and neonatal pregnancy outcomes among Iraqi patients.

Materials and methods.

A retrospective, case-control study conducted during a period of 6 months; January-June 2021. The study including medical records of 120 women from Mosul city who were infected with COVID-19 during pregnancy. However, after review of these medical records only 95 files were included. As inclusion criteria, we included only medical records of pregnant women aged 18-35 years with proved diagnosed COVID-19 according to positive PCR results, symptomatic, singleton pregnancy and give birth in the hospital. They all included regardless the gestational age at infection with COVID-19.

Medical records with incomplete information and missed data were excluded. Also, files of women with gestational hypertension, gestational diabetes, preeclampsia, history of abortion, premature labor or history of other complication during pregnancy such as antepartum hemorrhage, postpartum hemorrhage were excluded. Women underwent assisted reproductive procedures and those with signs and symptoms of spontaneous miscarriage or ectopic pregnancy were also excluded from the study.

As control group, a total of 95 pregnant women without COVID-19 with negative PCR tests and have no history of infection during the pandemic were included and were almost matched to study group (cases). Controls were apparently healthy with no comorbidities or complications during their pregnancy.

The data were collected by review the medical records of the patients who met the inclusion criteria. The collected data included the general characteristics, demographic data, obstetrical, medical and surgical history, previous mode of delivery, number of cesarean sections.

Maternal and neonatal outcomes and complications were reported according to the available data in the medical records. Positive diagnosis of COVID-19 according to the antibody test.

Acute infection was considered to be the coexistence of positive both IgM with IgG, and past infection when only IgG positive. The test used was the One Step test for Novel Coronavirus (2019-nCov) IgM/IgG Antibody (Colloidal Gold) manufactured by Daan Gene Co of Sun Yat-Sen University in China. Its sensitivity is greater than 91% and specificity greater than 97%, according to the list of rapid tests of the General Directorate of Public health of the Iraqi Ministry of Health

Definitions.

For purpose of this study, the following definitions were applied

Preeclampsia: Arterial hypertension associated with proteinuria, in women with more than 20 weeks of pregnancy [32]. The operational definition of the study was the diagnosis of preeclampsia established by an obstetrician-gynecologist and recorded in the clinical history.

Preterm labor: multifactorial syndrome that leads to the onset of labor between 22 to 36 weeks 6 days of gestation. For the study, its operational definition consisted of the diagnosis of preterm birth by a gynecologist with the establishment of the fact in the clinical history [33].

Caesarean section: surgical intervention performed to extract the fetus by medical indication or electively by the pregnant woman. For the study, its operational definition consisted of the programming of cesarean section for medical indication recorded in the clinical history [34].

Low Apgar score: Apgar score of the newborn below 7 at the first or 5th minutes after birth.

Data analysis

The data analyzed using the statistical package for social sciences (SPSS) version 26 program. Data were summarized according to the variable types. Appropriate statistical tests and procedures were applied accordingly considering a significance level of 5%. The strength of association between the variables was determined by calculating the odds ratio (odd ratio) with a 95% confidence interval.

Results.

A total of 95 pregnant women with COVID-19 (cases) and 95 apparently healthy pregnant women as control group were enrolled in this study, both studied groups were almost matched and not significantly different in their baseline characteristics, $P>0.05$. The mean gestational age at delivery was significantly lower in COVID-19 cases compared to controls, 36.8 ± 2.4 weeks *vs.* 38.7 ± 0.9 weeks, respectively, ($P<0.05$), (Tables 1 & 2).

Comparison of maternal pregnancy outcomes of the studied groups revealed that cesarean section mode of delivery was more frequent among COVID-19 cases than controls, 62.1% *vs.* 24.2%, respectively, ($P<0.05$). Miscarriage also more frequent in cases than controls, ($P<0.05$). Preeclampsia reported in 20.0% of cases and 9.5% of controls, maternal death occurred in 5.3% of COVID-19 cases *vs.* none among controls. The differences were statistically significance, ($P<0.05$), (Table 3).

Table 1. Baseline characteristics of the studied groups.

Variable		COVID-19 cases (n=95)		Controls (n=95)		P. value
		No.	%	No.	%	
Age (year)	18 – 20	25	26.3	28	29.5	0.767 ns
	21 – 30	54	56.8	49	51.6	
	31 – 35	16	16.8	18	18.9	
	Mean age (SD)	25.7 (4.9)		25.2 (6.1)		
BMI category	Normal	35	36.8	37	38.9	0.889 ns
	Overweight	31	32.6	32	33.7	
	Obese	29	30.5	26	27.4	
	Mean (SD) (kg/m²)	28.2 (5.4)		28.7 (5.1)		
Gravidity	1 – 2	47	49.5	50	52.6	0.893 ns
	3 – 4	35	36.8	32	33.7	
	5 – 6	13	13.7	13	13.7	
Parity	Nulliparous	32	33.7	31	32.6	0.981 ns
	1 – 2	41	43.2	41	43.2	
	≥ 3	22	23.2	23	24.2	
Previous caesarean section		20	21.1	19	20.0	0.857 ns
SD: standard deviation of mean, ns: not significant						

Table 2. Gestational age at infection and at delivery of the studied groups.

Variable	COVID-19 cases (n=95)		Controls (n=95)		P. value
	Mean	SD	Mean	SD	
Gestational age at infection	27.8	3.4	27.2	5.1	0.774 ns
Gestational age at delivery	36.8	2.4	38.7	0.9	0.001 sig
SD: standard deviation of mean, ns: not significant, sig: significant					

Table 3. Gestational age at infection and at delivery of the studied groups.

Variable		COVID-19 cases (n=95)		Controls (n=95)		P. value
		No.	%	No.	%	
Mode of delivery*	NVD	25	29.8	69	75.8	0.001 sig
	CS	59	63.0	23	24.2	
Preeclampsia	Yes	19	20.0	9	9.5	0.041 ns
	No	76	80.0	86	90.5	
Antepartum hemorrhage	Yes	11	11.6	3	3.2	0.026 sig
	No	84	88.4	92	96.8	
Maternal mortality	Survived	90	94.7	95	100.0	0.023 ns
	Died	5	5.3	0	0.0	
*Women with miscarriage (n=11 cases and 3 controls) are not entered in the calculation ns: not significant, sig: significant, CS: caesarean section						

As shown in (Table 4), generally, adverse neonatal outcomes were more frequent in COVID-19 cases than controls; fetal distress, stillbirth, preterm labor, lower Apgar score at 1 and 5 minutes and admission to neonatal intensive care unit were significantly more frequent in cases than controls, (P<0.05). Despite that neonatal mortality rate was higher in cases, 5.3%, compared to 1.1% in controls, but the difference was statistically insignificant, (P>0.05), (Table 4).

Laboratory parameters of COVID-19 cases are shown in (Table 5 and 6)

Regarding the severity , the disease was mild in 54 (56.8%) cases, moderate in 25 (26.3%) and severe in 16 cases (16.8%), (Figure 1).

Regarding the predictors of adverse maternal and neonatal outcomes, it had been found that older maternal age, infection at earlier stage of pregnancy (lower gestational age at infection), higher white blood cells (WBCs) count, COVID-19 infection and severe disease form were significantly associated with higher frequency of adverse maternal outcomes, however, more severe form of disease was the stronger predictors with an odds

Table 4. Comparison of Neonatal pregnancy outcomes of the studied groups.

Variable		COVID-19 cases (n=92)		Controls (n=92)		P. value
		No.	%	No.	%	
Fetal distress	Yes	2	2.1	0	0.0	0.017 sig
	No	93	97.9	95	100.0	
Stillbirth	Yes	10	10.5	2	2.1	0.015 sig
	No	85	89.5	93	97.9	
Preterm Labor	Yes	11	11.6	3	3.2	0.26 ns
	No	84	88.4	92	96.8	
Apgar score 1 min	> 7	68	71.6	85	89.5	0.002 sig
	< 7	27	28.4	10	10.5	
Apgar score 5 min	> 7	82	86.3	91	95.8	0.022 sig
	< 7	13	13.7	4	4.2	
Admission to NICU	Yes	17	17.9	4	4.2	0.003 sig
	No	78	82.1	91	95.8	
Neonatal mortality	Survived	90	94.7	94	98.9	0.097 ns
	Died	5	5.3	1	1.1	
ns: not significant, sig: significant, NICU: neonatal intensive care unit						

Table 5. Laboratory parameters of the studied group.

Parameter	Mean	SD	Range
WBC x 10^3 cell/ml	11.7	5.6	4.5 – 34.0
Lymphocyte x 10^3 cell/ml	3.0	1.3	1.2 – 8.2
Neutrophil x 10^3 cell/ml	8.3	4.2	3.1 – 25.3
Platelet x 10^3 platelet/ml	206.4	77.2	85 – 470
D-dimer (ng/mL)	1441.0	717.9	506.6 – 2699.8
S-ferritin (ng/mL)	259.8	38.1	107.0 – 30.9.0
SD: standard deviation of mean			

Table 6. Laboratory parameters of COVID-19 cases.

Parameter	Frequency	Percent
Leukocytosis > 11,000 cell/ml	41	43.2
Elevated NLR > 3	68	71.6
Elevated D-Dimer	37	38.9
Elevated CRP	61	64.2
Elevated Serum ferritin	31	32.6

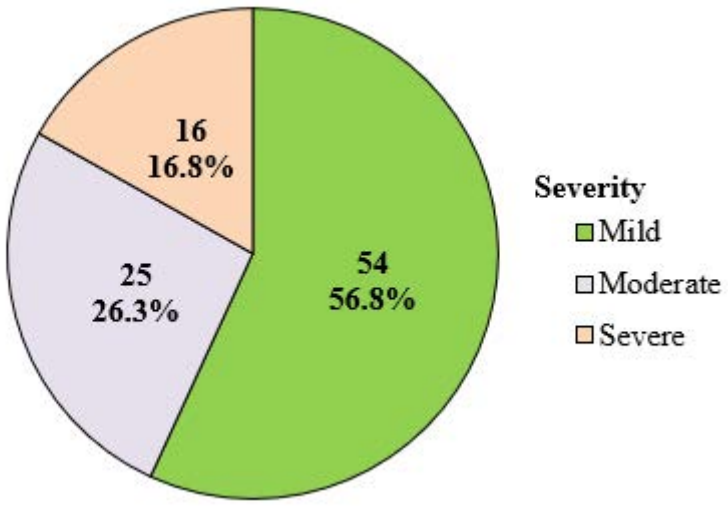

Figure.1. Distribution of cases according to severity of COVID-19.

Table 7. Predictors of adverse maternal pregnancy outcomes among COVID-19 cases.

Variable	OR	P. value
Maternal age	1.416	0.022 sig
Obesity	1.014	0.382 ns
Gravidity	0.924	0.617 ns
Parity	0.829	0.319 ns
Lower gestational age at infection	2.14	0.011 sig
Previous caesarean section	1.137	0.244 ns
WBCs count	1.932	0.037 sig
NLR	1.832	0.017 sig
Severity of disease	4.860	0.001 sig
ns: not significant, sig: significant, WBCs: white blood cells, NLR: neutrophil to lymphocyte ratio, OR: odds ratio		

Table 8. Predictors of adverse neonatal pregnancy outcomes among COVID-19 cases.

Variable	OR	P. value
Older maternal age	1.841	0.030 sig
Obesity	1.661	0.0412 sig
Gravidity	1.230	0.426 ns
Parity	1.140	0.238 ns
Lower gestational age at infection	2.542	0.007 sig
Previous caesarean section	1.031	0.483 ns
WBCs count	1.028	0.422 ns
NLR	1.174	0.222 ns
Severe disease form	3.825	0.001 sig
ns: not significant, sig: significant, WBCs: white blood cells, NLR: neutrophil to lymphocyte ratio, OR: odds ratio		

ratio (OR) of 4.860, (Table 7).

The significant predictors of adverse neonatal outcomes among COVID-19 cases were older maternal age, obesity, lower gestational age at infection and severe disease form which is the stronger predictor (OR= 3.825), (Table 8).

Discussion.

COVID-19 is a pathology of great epidemiological importance in the current context due to the rapid spread of the virus and the fact that outbreaks can grow at an exponential rate ; added to the presence of serious complications that increase morbidity and mortality [35,36]. The global spread of the virus has overwhelmed health systems and caused widespread social and economic disruption[37].Currently, in relation to the effect of this pandemic on pregnancy, there are more questions than certainties about the real impact of COVID-19 on pregnant women. Studies are updated and often contradict each other[38,39].

There is no evidence to suggest that pregnant women with COVID-19 have higher morbidity than affected non-pregnant women. However, a sufficient number of pregnant women have not yet been studied to allow appropriate inferences to be made. It is known that SARS OR MERS infection significantly increases the number of maternal deaths, but this does not seem to be true in the case of COVID-19, but it does seem to increase the rate of premature birth, preeclampsia, caesarean section and perinatal death. However, there is still not enough information to confirm that there is no vertical infection in these pregnant women [40–42]

In the present study, most of the patients aged between 21 and 35 years and almost one third of each group were nulliparous. These data are consistent with other reports such as Saenz et al [43] and Chinn et al. [44].

In the laboratory tests performed, leukocytosis, higher neutrophil to lymphocyte ratio was reported in COVID-19 cases, which differs from the study by Yan et al.[45] carried out retrospectively in 25 Chinese hospitals in 116 obstetric patients, where they obtained a lower leukocyte value of 7900/ml; This is probably due to the fact that in our study we present 95 COVID-19 patients in labor, which implies an increase in physiological leukocytes, In turn, in the retrospective study by Qiancheng et al., they evaluated pregnant women and detected leukocytosis in (35.7%) of pregnant patients with COVID-19 which is close to the 43.2% in our study[46].

We also observed an elevation of C-Reactive protein , in almost 64.2% of patients, Yan, et al. found an elevation of this parameter in 44% of the patients, it is well identified that a systemic inflammatory condition would translate into an elevation of this parameter [45].

D-dimer was found elevated in 38.9%, however, majority of studies reported elevated D-dimer among COVID-19 patients; in a study conducted by Qiancheng et al. [46]. 92.3% of pregnant patients had elevated D-dimer. This can be explained because COVID-19 is associated with micro-thrombosis, therefore, the value of D-dimer is relevant and is used as criteria of severity[47].

We documented elevated serum ferritin in 32.6% of cases, Chen et al [6] analyzed the clinical characteristics of 99 patients, in whom (63%) of patients had serum ferritin above normal levels, another study conducted by Erol et al. [48] found higher S. ferritin in pregnant women with COVID-19 compared to healthy controls, S. ferritin, is known as one of the measures of inflammatory process and its severity and also may reflect the potential impact of impaired iron metabolism in patients with COVID-19 [48].

In our study, 16.8% of patients had severe COVID-19, which is higher than the rate reported by Lokken, et al. [49] who found that 9.2% of the patients had severe disease; However, like them, our patients also presented major complications such as multiple organ failure, septic shock, severe respiratory failure requiring invasive ventilation, and renal failure that lead to death of 2 cases giving a mortality rate of 2.4% a higher value than that found by Lokken, et al. [49] who had 1.3%; However, we agree on the pathophysiology of the cause of death, since the first patient with maternal death was referred in a puerperal state from another institution where she had managed for severe preeclampsia and it is believed that the cause of death due to endothelial dysfunction associated with the hypertensive disorder of pregnancy and that generated by COVID. As Mendoza et al postulated, indicating that severe COVID can simulate processes similar to severe preeclampsia syndrome and HELLP syndrome [50].

It has not been shown that SARS-CoV-2 infection during

pregnancy is associated with an increased risk of miscarriage and spontaneous preterm birth, however, some published series describe a higher incidence of complications during pregnancy or childbirth in women. affected by COVID. Schwartz et al. [51] in a series of 38 pregnancies, describe gestational diabetes, preeclampsia, uterine rupture, gestational hypertension and hypothyroidism and in relation to childbirth, the fetus or the newborn: preterm births, fetal distress, premature rupture of membranes, alterations of the umbilical cord, placenta previa, chorioamnionitis, oligo and polyhydramnios and meconium amniotic fluid.

Although the mode of delivery is decided by the usual obstetric indications and the general condition of the patient, it is necessary to comment that such a decision should not be strictly influenced by the presence of the disease [52,53] the termination of pregnancies has been protocolized by the fastest way, including cesarean section, but mainly based on obstetric indications, in order to reduce the time of exposure of health personnel and to the aerosols that are produced in the second stage of labor. On the other hand, many patients were referred to our hospital, for termination of pregnancy, due to a history of previous cesarean sections, which contributed to the high percentages of cesarean sections (63%). Similarly higher cesarean rates reported by Zhang et al. from China [54].

Adverse neonatal outcomes reported in our study were almost close to that reported in previous studies with some differences in the reported rates of these complications, However, Zhu et al. [55] found a high rate, 60%, of preterm infants, , and this is probably due to the fact that at the beginning of the pandemic, when COVID-19 was diagnosed, it was decided to terminate gestation quickly.

Regarding the Apgar assessment, 13.7% newborns had < 7 at 5 minutes, with a diagnosis of perinatal asphyxia. Chen et al. [56] and Yu et al. [57] reported that all the newborns studied had Apgar scores at 1 minute and 5 minutes ≥7 in both studies. On the other hand, Di Mascio et al. [42] found that the rate of Apgar score <7 at 5 minutes was 4.5%, and no cases of neonatal asphyxia were reported.

It was found that 17.9% of the neonates were admitted to the NICU, with a diagnosis of sepsis, transient tachypnea of the newborn, hyaline membrane disease and other causes; 5 neonates with a 5.3% mortality rate. Zhu et al. [55] studied 10 hospitalized neonates, 10% died. Di Mascio et al. [42] in a systematic review, report a perinatal death rate of 7% including 1 stillbirth (2.4%) and one neonatal death (2.4%).

However, the exact effect of COVID-19 on maternal and neonatal pregnancy outcomes still under debate and further studies are needed for more clarification

The main limitation of the study is related to the retrospective nature of the research, which does not allow the risk of this disease in pregnant women to be measured in its acute stage, as could be done in a cohort study. Due to the characteristics of the disease and its treatment, it is not feasible to carry out this type of study. It was not possible to analyze other maternal complications due to the absence of serious positive cases, which are usually sent to more complex care centers.

Conclusions.

Infection with COVID-19 had a significant effect on pregnancy outcome, infected women were more likely to have higher incidence rates of adverse perinatal outcomes in both mothers and the newborns. Also, higher odds of complications associated with severe disease form Findings of our study came in line with previous studies in other countries, however, more medical care and support should be provided to pregnant women infected with COVID-19, particularly severe cases. Further studies with larger sample size are still needed for good understanding of the effect of virus on pregnancy outcomes.

Ethical Approval.

All approved by the authors, data were collected in accordance with World Medical Association, declaration of Helsinki, 2013 for ethical issues of researches that involve human.

Conflict of Interest. Authors declared none.

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