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EVALUATION OF THE REGIONAL PROJECT OF THE MODEL FOR PREDICTION AND PREVENTION OF PERINATAL DISORDERS IN COVID-19 IN THE MOTHER

The aim of the study – to evaluate the model for predicting and preventing adverse perinatal consequences of COVID-19 in the mother in the Ivano-Frankivsk region.

Materials and Methods. A SWOT analysis was conducted to assess the model for predicting and preventing adverse perinatal consequences of COVID-19 in the mother in the Ivano-Frankivsk region, taking into account the realities of the regional healthcare system, the stages of the pandemic, resource provision and the specifics of perinatal care. SMART analysis was used to verify and improve the project objectives.

Results and Discussion. Conducting a SWOT analysis allowed us to identify the strengths and weaknesses of the project, opportunities and threats, and to recommend for its effective implementation: strengthen integration between medical institutions; launch a pilot registry of pregnant women with COVID-19 in the region; involve local universities in statistical modeling; conduct training for doctors on perinatal risk assessment using modern scales; inform patients about the risks of perinatal complications and the benefits of their prevention. According to the results of the SMART analysis, the goal of the model is realistic, strategically justified and important for the protection of motherhood in conditions of pandemic uncertainty.

Conclusions. According to the assessment, the model for predicting and preventing adverse perinatal consequences of COVID-19 in the mother in Ivano-Frankivsk region can be recommended for implementation. The use of SWOT and SMART analysis is an effective tool for assessing and controlling the implementation of medical projects at the regional level.

Key words: pregnancy; COVID-19; perinatal disorders; perinatal care; forecasting; model; medical project assessment; SWOT and SMART analysis.

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ОЦІНКА РЕГІОНАЛЬНОГО ПРОЄКТУ МОДЕЛІ ПРОГНОЗУВАННЯ ТА ПОПЕРЕДЖЕННЯ ПЕРИНАТАЛЬНИХ РОЗЛАДІВ ПРИ COVID-19 У МАТЕРІ

Мета дослідження – оцінка моделі прогнозування та попередження несприятливих перинатальних наслідків захворювання на COVID-19 у матері в Івано-Франківській області.

Матеріали та методи. Проведено SWOT-аналіз для оцінки моделі прогнозування та попередження несприятливих перинатальних наслідків захворювання на COVID-19 у матері в Івано-Франківській області з урахуванням реалій системи охорони здоров'я регіону, етапів пандемії, ресурсного забезпечення та специфіки перинатальної допомоги. Для перевірки та вдосконалення цілей проєкту використовували SMART-аналіз.

Результати дослідження та їх обговорення. Проведення SWOT-аналізу дозволило, виявивши сильні та слабкі сторони проєкту, можливості та загрози, рекомендувати для його ефективного впровадження таке: укріпити інтеграцію між медичними закладами; запустити пілотний реєстр вагітних із COVID-19 у регіоні; залучити місцеві університети до статистичного моделювання; провести навчання для лікарів з оцінки перинатальних ризиків за сучасними шкалами; інформувати пацієнток про ризики перинатальних ускладнень та переваги їх профілактики. За результатами SMART-аналізу мета моделі є реалістичною, стратегічно обґрунтованою та важливою для охорони материнства в умовах пандемічної невизначеності.

Висновки. Згідно з оцінкою модель прогнозування та попередження несприятливих перинатальних наслідків захворювання на COVID-19 у матері в Івано-Франківській області може бути рекомендована до впровадження. Застосування SWOT- і SMART-аналізу є дієвим інструментом оцінки та контролю за реалізацією медичних проєктів на регіональному рівні.

Ключові слова: вагітність; COVID-19; перинатальні розлади; перинатальна допомога; прогнозування; модель; оцінка медичного проєкту; SWOT- і SMART-аналіз.

INTRODUCTION. At the beginning of the coronavirus disease 2019 (COVID-19) pandemic, pregnant women faced uncertain maternal and perinatal risks associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. The prevalence of SARS-CoV-2 infection among pregnant women was 3–20 %, with a wide spectrum of severity, ranging from asymptomatic to extremely severe [2].

Much of the initial clinical advice was based on extrapolation of data and experience with the treatment of other respiratory viruses. However, it was recognized that the characteristics of SARS-CoV-2 required a specific understanding of the pathophysiology and treatment approach [3]. Very quickly, from early 2020, studies began to be published, as clinicians were faced with the question of how to care for patients with COVID-19.

The management of pregnant women with coronavirus disease 2019 (COVID-19) is similar to that of non-pregnant women, and effective treatment, including antiviral therapy, dexamethasone, and prophylactic anticoagulants, should not be withheld during pregnancy [4].

Vaccination reduces the risk of COVID-19 progression to severe or critical illness and the need for hospitalization in pregnant women [5]. All international guidelines strongly recommend vaccination regardless of gestational period.

Perinatal care practices have evolved rapidly during the lockdown in response to widespread concerns about patient and healthcare worker safety. Most in-person visits have been replaced by remote monitoring and telemedicine. Researchers are retrospectively evaluating the adequacy of these modifications in healthcare [6].

Scientific observations indicate an increase in the frequency of preterm birth, preeclampsia, fetoplacental insufficiency, intrauterine growth retardation, and even perinatal mortality in pregnant women with COVID-19 [7–9]. However, even after the end of the pandemic in 2023, there are no definitive conclusions about the perinatal consequences of COVID-19. Further studies and observations are recommended to assess the long-term impact of COVID-19 on pregnancy and vital parameters of the newborn [10]. A separate important topic is the impact of the pandemic on perinatal care and the course of pregnancy in uninfected women. In this regard, Zheng et al. reported in a systematic review that the COVID-19 pandemic has disrupted reproductive plans and routine care for pregnant women. Since the availability and quality of maternal care play a crucial role in the consequences for the mother and fetus, it is proposed that the government and health care providers balance restrictions and access to maternal care during future pandemics [11].

Therefore, the prevention of obstetric complications of COVID-19 in pregnant women is an important direction of perinatal medicine since 2020. As of 2024–2025, a fairly clear system of scientifically based approaches has been formed. The modern scientific paradigm, formed according to scientific recommendations and consensuses of world societies and organizations, considers the prevention of complications of COVID-19 in pregnant women as a multidisciplinary task.

Against the background of limited resources of the medical system in Ukraine, it is important to adapt these international approaches to the realities of the national model of perinatal care, because Ukraine currently lacks universal prognostic tools that cover the full range of clinical data, diagnostic features and preventive capabilities [12].

Therefore, the task of developing a model for predicting and preventing adverse perinatal outcomes in women with COVID-19 is relevant. Such a model should provide an effective clinical solution taking into account individual and regional characteristics, which will contribute to reducing maternal and perinatal morbidity and mortality.

THE AIM OF THE STUDY – evaluation of the model for predicting and preventing adverse perinatal outcomes of COVID-19 in mothers in the Ivano-Frankivsk region.

MATERIALS AND METHODS. The proposed model for predicting and preventing adverse perinatal outcomes in women with COVID-19 [13, 14] includes the following components that correspond to the levels of perinatal care.

I. Screening stage (at the primary level)

Goal: Early identification of pregnant women at risk.

Parameters:

• Gestational period
• Presence of COVID-19/suspicion (history, PCR/Ag test)
• Comorbidity (diabetes, obesity, hypertension)
• Vaccination status
• SpO2 saturation (<95 %)
• Temperature >37.8 °C and
• those that will be additionally proposed

Tool: Development of a risk assessment scale, moderate and high risk – hospitalization to a level II–III institution.

II. Prediction stage (secondary level)

Goal: Predict adverse outcomes.

Methodology:

• Retrospective analysis of cases of complications among pregnant women with COVID-19 in 2020–2023 in the region.
• Application of mathematical methods to build a prediction scale:
• Modeling of defined perinatal risks:
– premature birth,
– antenatal fetal death,
– neonatal hypoxia/asphyxia,
– cesarean section for urgent indications.

Platform: Specialized software integrated into the existing one (based on the regional health department or perinatology department).

III. Response stage (tertiary level)

Goal: Determining the patient's route and preventing complications.

Measures:

• Routing of high-risk pregnant women to level III institutions (Ivano-Frankivsk Regional Perinatal Center).
• Prescribing preventive drugs (anticoagulants, oxygen therapy).
• Active fetal monitoring (CTG, ultrasound, Doppler).
• Early involvement of a multidisciplinary team.

Information support and monitoring

• Electronic registry of pregnant women with COVID-19 (based on the medical information systems of the region)
• Analytical panel with indicators (number of cases, mortality, premature births, SpO2 level, etc.)
• Quarterly audit of results to assess the effectiveness of the model

A SWOT analysis was conducted to assess the model of forecasting and preventing adverse perinatal consequences of COVID-19 in the mother in the Ivano-Frankivsk region, taking into account the realities of the regional healthcare system, stages of the pandemic, resource provision and the specifics of perinatal care.

SWOT analysis is a strategic planning method that allows you to assess internal and external factors affecting a certain object (organization, project, system, etc.). SWOT is an abbreviation of four English words: S – “Strengths” (what are the strengths of the project? what are the advantages?); W – “Weaknesses” (what are the internal shortcomings or limitations?); O – “Opportunities” (what are the external opportunities for growth, improvement or expansion?); T – “Threats” (what are the external factors that could harm or prevent the achievement of the objectives?).

SMART analysis was used to review and improve the project objectives. Its main purpose is to ensure effective management of resources and time, avoid vague or unrealistic objectives, and promote a systematic approach to project planning.

SMART decoding: S – “Specific” (the goal should be clearly formulated, not general, not abstract, for example “Increase the vaccination rate to 95 %”), M – “Measurable” (should contain quantitative or qualitative success criteria, for example “10 % more than in the previous year”), A – “Achievable” (realistic considering resources, time, opportunities, for example “By expanding the network of vaccination points”), R – “Relevant” (important for the overall strategy,

has significance in the context of the activity, for example "Aimed at reducing the level of complications"), T – "Time-bound" (should have a clear deadline for achievement, for example "By the end of 2025").

SWOT helps to identify risks in advance and think about how to avoid them. SMART helps to clearly formulate tasks for which you can report. Both methods are tools for self-assessment and project improvement. SWOT and SMART analysis are two different but complementary techniques that are often used together when planning or evaluating a project.

RESULTS AND DISCUSSION. A SWOT analysis was conducted to assess the model for predicting and preventing adverse perinatal consequences of COVID-19 in mothers in the Ivano-Frankivsk region (Table) taking into account the realities of the regional healthcare system, the stages of the pandemic, resource provision and the specifics of perinatal care.

Recommendations based on the analysis:

1. Strengthen integration between medical institutions (primary ↔ inpatient ↔ laboratories).

2. Launch a pilot registry of pregnant women with COVID-19 in the region.

3. Involve local universities in statistical modeling (prediction of complications).

4. Conduct training for doctors on perinatal risk assessment using modern scales.

5. Inform patients about the risks of perinatal complications and the benefits of their prevention.

An analysis of the model for predicting and preventing adverse perinatal consequences of COVID-19 in mothers in the Ivano-Frankivsk region was also conducted using the SMART-goals method.

SMART-analysis. Purpose of implementing the model.

Overall goal: To introduce an effective model for predicting and preventing adverse perinatal consequences in pregnant women with COVID-19 in Ivano-Frankivsk region in order to reduce perinatal morbidity and mortality.

S – Specific

What exactly needs to be achieved? Implement a model that will allow identifying pregnant women at high risk of perinatal complications, ensure their early observation and timely delivery.

Specific tools: clinical scales, monitoring, laboratory markers, Dopplerometry, telemedical control.

M – Measurable

How to measure the achievement of the goal?

– Reducing the frequency of perinatal complications by 10 % during the year

– The share of pregnant women included in the monitoring system – at least 95 %

– Increasing the accuracy of the prediction of complications – up to 90 % (based on statistical models)

– Number of doctors trained – >100

– Introduction of a local electronic registry of pregnant women with COVID-19

A – Achievable

Is it possible to implement this in the region?

Yes, the model is achievable due to:

– availability of trained personnel,

– existing routes for COVID-patients,

– experience of past pandemic waves,

– willingness of local medical institutions to cooperate

However, it requires resources and informational support.

R – Relevant

Why is it important right now?

– COVID-19 continues to circulate in the population

– Pregnant women are a vulnerable group with an increased risk of complications

– The need to reduce perinatal mortality in accordance with national and WHO guidelines

– The lack of a single effective mechanism for identifying high risk in the region

T – Time-bound

Table. **Results of the SWOT analysis to assess the model for predicting and preventing adverse perinatal consequences of COVID-19 in mothers in the Ivano-Frankivsk region**

Strengths (S)	Weaknesses (W)
- Availability of a network of antenatal clinics and maternity hospitals in the region - Qualified obstetricians, neonatologists, epidemiologists - Availability of a system for monitoring the condition of pregnant women with COVID-19 (through routing and orders of the Ministry of Health) - Experience in implementing clinical protocols during previous waves of the pandemic - Elements of telemedicine (online consultations) have been implemented	- Limited number of specialized level III centers (perinatal centers) - Insufficient level of automation of clinical and epidemiological data collection - Lack of a single regional registry of pregnant women with COVID-19 - Limited capabilities of Doppler ultrasound, CTG in outpatient settings - Weak integration between primary care, hospitals and laboratories
Opportunities (O)	Threats (T)
- Possibility of implementing an artificial intelligence system for risk analysis (based on case histories) - Attracting international grants and government programs (e. g., USAID, U-LEAD) for digitalization - Cooperation with universities (Ivano-Frankivsk National Medical University) for scientific and methodological support of the model - Conducting trainings for doctors on early diagnosis of placental insufficiency - Creating a single digital platform for obstetric data	- Emergence of new variants of SARS-CoV-2 with a more complicated course in pregnant women Limited budget financing of maternity care in crisis conditions - Risk of repeated epidemic outbreaks, which complicates forecasting and overloads the healthcare system - High level of emigration of medical personnel from the region - Public distrust of preventive interventions (vaccination, hospitalization, telemedicine)

What is the timeframe?

– Model development: up to 3 months

– Pilot implementation: 6–9 months

– Evaluation of effectiveness and expansion to all ATCs of the region: up to 12 months

– Full integration of the model into the practice of obstetric services – by the end of the next calendar year

Conclusion of the SMART analysis: the goal is realistic, strategically justified and important for maternity protection in conditions of pandemic uncertainty. The SMART structure allows for effective implementation and control of the model.

CONCLUSIONS. Conducting a SWOT analysis to assess the model for predicting and preventing adverse perinatal consequences of COVID-19 in the mother in the Ivano-Frankivsk region allowed identifying the strengths and weaknesses of the project, opportunities and threats, and recommending for its effective implementation: strengthen integration between medical institutions; launch a pilot registry of pregnant women with COVID-19 in the region; involve local universities in statistical modeling; conduct training for doctors on assessing perinatal risks using modern scales; inform patients about the risks of perinatal complications and the benefits of their prevention.

According to the results of the SMART analysis, the goal of the model for predicting and preventing adverse perinatal consequences of COVID-19 in the mother in the Ivano-Frankivsk region is realistic, strategically justified and important for the protection of motherhood in conditions of pandemic uncertainty.

The use of SWOT and SMART analysis is an effective tool for assessing and monitoring the implementation of medical projects at the regional level.

PROSPECTS FOR FURTHER RESEARCH. Further research should focus on analyzing the results of implementing a model for predicting and preventing adverse perinatal outcomes of COVID-19 in the mothers of the Ivano-Frankivsk region based on quarterly audit data and dynamic model correction. A promising direction is the development of models for predicting and preventing perinatal disorders in maternal infectious diseases.

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Contribution of each author according to the CRediT taxonomy. Savchuk Ruslan – conceptualization, validation, formal analysis, data curation. Kolomiichenko Tetiana – methodology, investigation, software, writing – original draft, visualization. Zhdanovych Rozaliia – resources, supervision, writing – review & editing, project administration.

Conflict of interest. The authors declare no conflict of interest.

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