# ABSTRACT

**Thesis for the PhD Doctor's Degree in the educational program: 8D10101 - Public Health Zhansaya Zhanadilkyzy Nurgaliyeva**

**“The state and improvement of the organization of medical care for pregnant women with coronavirus infection”**


**Relevance of the Research Topic:** The coronavirus infection (COVID-19), declared a global pandemic by the World Health Organization (WHO) in March 2020, had a significant impact on the healthcare system of the Republic of Kazakhstan, including the field of reproductive health. Due to physiological and immunological changes, pregnant women represent a vulnerable group susceptible to more severe disease progression and increased risks of adverse maternal and perinatal outcomes (Jamieson et al., 2006; Rasmussen et al., 2019). Studies have shown an increase in the frequency of preterm births, cesarean deliveries, admissions to intensive care units, and complications such as acute respiratory distress syndrome (Vizheh et al., 2021; DeBolt et al., 2020).

The problem of maternal mortality remains relevant in Kazakhstan, especially in certain regions where rates exceed the national average. The pandemic exacerbated the situation, revealing insufficient preparedness of primary healthcare to manage pregnant women with COVID-19, a lack of specialized algorithms, and limited resources for timely care. The high incidence of acute respiratory infections in the 2023–2024 epidemic season (NCHE, 2024) further increased the epidemiological burden among contact groups, including pregnant women.

Under conditions of uncertainty, limited clinical data, and restricted access to specialized care, there emerged a need to develop an organizational model ensuring effective referral, inter-level coordination, telemedicine monitoring, and psychosocial support. The relevance of this research is determined by the necessity of a systematic analysis of the pandemic experience and the scientific substantiation of a set of measures aimed at improving medical care for pregnant women with COVID-19 in the Republic of Kazakhstan.

**Purpose:** To develop a scientifically grounded set of measures to improve the organization of medical care for pregnant women with coronavirus infection aimed at reducing adverse outcomes.

**Objectives:**

To conduct a content analysis of international and national clinical guidelines and protocols for the diagnosis and treatment of COVID-19.

To analyze the clinical and epidemiological features of COVID-19 in pregnant women and identify risk factors for severe disease.

To study the referral pathway of pregnant women with COVID-19 within healthcare organizations, including outpatient and inpatient stages, and identify barriers to accessing and providing medical care.

To develop and validate an evidence-based set of organizational and practical measures for improving medical care for pregnant women with COVID-19.

**Study design:**

For the first objective – content analysis of international and national clinical guidelines and protocols for the management of pregnant women with COVID-19.

For the second objective – epidemiological study (assessment of clinical and epidemiological characteristics and risk factors for severe COVID-19 in pregnant women).

For the third objective – descriptive and analytical study (qualitative analysis of referral processes, in-depth interviews, identification of organizational barriers).

For the fourth objective – applied (experimental) research focused on the development and testing of an organizational and practical framework (SOPs and questionnaire).

**Objects of the study:** The research drew upon a diverse range of study objects to ensure a comprehensive understanding of the problem:

International and National Guidelines: Official documents from global health bodies (WHO, RCOG, ACOG, SMFM) and national protocols (Kazakhstan Ministry of Healthcare Nos. 82, 90, 106, 124, 151, 166) served as primary sources for the content analysis.

Hospital Medical Records: Anonymized patient data from hospital records provided the empirical basis for the epidemiological study, offering insights into clinical presentations, treatments, and outcomes.

Healthcare Professionals: A cohort of obstetricians-gynecologists, general practitioners, infectious disease specialists, and nurses constituted the subjects for qualitative interviews, providing firsthand accounts of challenges and experiences.

Pregnant Women or Postpartum Patients: Data pertaining to pregnant women or those in the postpartum period who had experienced COVID-19 were central to understanding patient-level

**Subject of the study:** The structure, organizational components, and management algorithms for pregnant women with COVID-19, as defined in protocols; the timeline and differences between international and national recommendations. Clinical and laboratory parameters (CRP, procalcitonin, ferritin, $SpO_2$, etc.), demographic characteristics, comorbidities (obesity, hypertension, diabetes mellitus), and maternal and perinatal outcomes (preterm birth, cesarean section, death). The actual referral pathway of pregnant women (outpatient, hospital, telemedicine follow-up), adherence to clinical protocols, and organizational barriers (late presentation, refusal of hospitalization, vaccine hesitancy), as well as factors of trust and psychological support.

**Main Provisions for Defense:**

Clinical protocols of recent revisions lacked clear algorithms for outpatient physicians managing this vulnerable category of patients.

Pregnant women represent a high-risk group for severe COVID-19. Key predictors of severe disease include disease severity, arterial hypertension, arrhythmia, hypotension, elevated procalcitonin levels, CT stage, bronchodilator use, and overweight.

Low awareness of specialized protocols among medical personnel, delayed medical visits, refusal of hospitalization, and lack of self-monitoring contributed to inadequate referral and management of pregnant women with COVID-19.

The proposed set of measures to improve the organization of medical care for pregnant women with COVID-19 has been shown to increase healthcare workers' knowledge and highlights the importance of continuous training on referral and management of pregnant women with airborne infections, including COVID-19.

**Scientific novelty:** For the first time, a comprehensive analysis of international and national clinical protocols for managing pregnant women with coronavirus infection was carried out, revealing discrepancies in approaches to organizing medical care for this category of patients. Key clinical and epidemiological risk factors for severe disease and mortality were identified, including elevated BMI, arterial hypertension, hyperglycemia, and inflammatory markers. For the first time, the actual referral system for pregnant women with COVID-19 in Kazakhstan's healthcare system was studied, identifying critical issues at both outpatient and inpatient levels. Based on these findings, an evidence-based set of organizational and practical interventions was developed, including standard operating procedures (SOPs), referral algorithms, and tools to assess healthcare workers' knowledge.

**Theoretical significance:** The methodology for assessing healthcare workers' knowledge on the referral of pregnant women with airborne infections, including COVID-19, using a validated author's questionnaire (copyright certified), expands existing scientific approaches and has been integrated into undergraduate training programs. Results of the qualitative analysis of organizational barriers and factors influencing effective referral during the pandemic enhance understanding of practical experiences and are used in the training of public health and healthcare management professionals (copyright certified). Additionally, data on clinical and epidemiological risk factors for severe COVID-19 among pregnant women can be incorporated into professional development programs for obstetricians and general practitioners, providing a theoretical basis for improving clinical and organizational decisions in healthcare.

**Practical significance:** Based on the research results, standard operating procedures (SOPs) were developed and implemented:

"Functions of the filter physician when a pregnant woman with signs of airborne infection, including COVID-19, presents to the outpatient triage area";

"Functions of medical personnel when managing pregnant women with symptoms of airborne infection and COVID-19 at home."

These SOPs were implemented at the Alatau City Hospital and LS Clinic Medical Center in Almaty (implementation certificates available).
A validated questionnaire to assess healthcare workers' knowledge on referral of pregnant women with airborne infections, including COVID-19, was also developed, tested, and implemented in practice. Findings from the qualitative analysis on organizational barriers and determinants of successful referral during the pandemic were integrated into the "Organization and Management of Healthcare" course syllabus for master's students in the Public Health program (implementation certificate – Department of Epidemiology, Biostatistics, and Evidence-Based Medicine).

**Author's personal contribution:** The successful completion of this doctoral dissertation is a testament to the comprehensive and dedicated efforts of the author, Zhansaya Zhanadilkyzy Nurgaliyeva, who undertook a multifaceted role throughout

the entire research process. Her personal contribution was instrumental in every stage, from conceptualization to dissemination of findings:

Content Analysis and Literature Review: The author meticulously conducted the extensive content analysis of both international and national clinical guidelines and protocols. This involved a critical review, synthesis, and comparative evaluation of a vast body of literature, forming the foundational understanding of existing practices and identifying key gaps.

Data Collection and Processing: She was solely responsible for the rigorous process of data collection, which included abstracting anonymized clinical data from hospital medical records. This required careful attention to detail, adherence to ethical guidelines, and systematic organization of complex patient information. Following collection, the author personally undertook the processing and cleaning of this raw data, preparing it for subsequent statistical analysis.

Organization and Implementation of In-depth Interviews: The author designed, organized, and personally conducted the in-depth qualitative interviews with a diverse group of healthcare professionals. This involved developing interview protocols, establishing rapport with participants, conducting the interviews, and meticulously transcribing and coding the qualitative data to extract meaningful insights into referral pathways and organizational barriers.

Statistical Analysis: A significant portion of the research involved quantitative analysis. The author performed all statistical analyses, utilizing appropriate statistical software and methodologies to identify epidemiological trends, risk factors, and the effectiveness of interventions. This required a strong grasp of biostatistics and the ability to interpret complex statistical outputs.

Development of Questionnaire and SOPs: A core practical output of the dissertation was the development of the validated knowledge assessment questionnaire and the two critical Standard Operating Procedures (SOPs). The author conceptualized, drafted, refined, and finalized these tools, ensuring their scientific rigor, practical applicability, and alignment with the research objectives.

Formulation of the Intervention Package: Based on the comprehensive analysis and findings, the author was responsible for synthesizing the various components into a cohesive and actionable intervention package. This involved strategic thinking to integrate theoretical insights with practical solutions.

Writing and Interpretation of Dissertation Sections: Finally, the author undertook the monumental task of writing and interpreting all sections of the dissertation. This included drafting the introduction, methodology, results, discussion, and conclusion chapters, ensuring logical flow, academic rigor, and clear articulation of the research's contributions. Her intellectual ownership and comprehensive involvement at every step underscore the depth of her personal contribution to this significant body of work.

**Conclusions Based on the Research Results:**

1. At the early stage of the pandemic, clinical protocols in Kazakhstan did not account for the specifics of managing pregnant women with COVID-19, resulting in their supervision under general protocols for over 11 months. Some versions included referral algorithms, while most did not. Gradual harmonization with international standards was observed, reflected in the introduction of outpatient monitoring,

differentiated medication use, and infection control measures, including safe breastfeeding.

2. Major predictors of severe COVID-19 in pregnant women were identified: disease severity (OR: 58.57; 95% CI: 13.10–261.79; p<0.001), hypertension (OR: 7.27; 95% CI: 2.47–21.39; p<0.001), arrhythmia (OR: 14.4; 95% CI: 4.15–50.01; p<0.001), hypotension (OR: 7.38; 95% CI: 2.08–26.11; p=0.002), elevated procalcitonin (OR: 4.33; 95% CI: 2.00–9.41; p<0.001), CT stage (OR: 4.66; 95% CI: 2.51–8.66; p<0.001), and bronchodilator use (OR: 6.52; 95% CI: 1.61–26.48; p=0.009). Overweight was statistically associated with maternal mortality (p=0.013).

3. The main problems in referral of pregnant women with COVID-19 included insufficient knowledge of specialized protocols among healthcare workers (56%), delayed healthcare seeking (56%), high rates of hospitalization refusal (77%), and lack of awareness about maintaining a self-monitoring diary (100%).

4. The effectiveness of the implemented intervention package was demonstrated: after training on two SOPs regulating referral of pregnant women with airborne infections (including COVID-19), healthcare workers' knowledge significantly improved across key domains — correct responses regarding outpatient management increased from 38.7% to 83.9% (p<0.001), mild-case management from 45.2% to 90.3% (p<0.001), self-monitoring from 51.6% to 87.1% (p=0.017), recognition of hospitalization refusal cases from 35.5% to 80.6% (p=0.003), and action algorithm during refusal from 41.9% to 85.0% (p<0.001).

**Publications on the Dissertation Topic:** Two scientific articles related to the dissertation topic were published in journals indexed in the international database Scopus: "Association of Pre-Pregnancy Obesity and COVID-19 with Poor Pregnancy Outcome" — Journal of Clinical Medicine, 2023 Apr; 12(8):2936. doi: 10.3390/jcm12082936. "A Multicentric Study on Adverse COVID-19 Outcomes Among Pregnant and Nonpregnant Women in Multidisciplinary Hospitals of Kazakhstan" — Diagnostics (MDPI), 2025 Apr; 15(7):900. doi: 10.3390/diagnostics15070900.

**Volume and structure of the dissertation:** The dissertation consists of 151 pages and includes an introduction, four chapters, a conclusion, findings, and practical recommendations. The work is illustrated with 29 tables and 11 figures. The reference list comprises 212 sources.