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ANALYSIS OF CASES OF MATERNAL NEAR-MISS IN THE RUSSIAN FEDERATION FOR 2021–2023 ACCORDING TO THE MATERNAL NEAR-MISS REGISTER

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ABSTRACT. The maternal near-miss Register (MNM Register) has been a source of personalized and aggregated data on obstetric "near-miss" cases in Russia since 2021. Purposes and tasks: to analyze obstetric "near-miss" cases in Russia from 2021 to 2023. For the analysis, data from the analytical block of the MNM Register on cases for 2021-2023 were used. The MNM Register started with 8,249 cases in 2021. At the peak of the COVID-19 pandemic, up to 230 patients were monitored daily. The frequency of mechanical ventilation and especially extracorporeal membrane oxygenation decreased sharply after the change of the SARS-CoV-2 Delta to Omicron (early 2022). Changes in the characteristics of obstetric "near-miss" cases are associated with the end of the pandemic — in 2023, there were practically no obstetric «near-miss» cases caused by COVID-19. There has been a twofold increase in telemedicine consultations with the Federal State Budgetary Institution "NMIC AGP named after V.I. Kulakov" of the Ministry of Health of Russia on obstetric "near-miss" cases issues for 2021–2023, associated with an overall increase in consultations and an increase in discipline for their registration in the MNM Register. Changes in 2023 compared to 2021 and 2022 in the general statistics and characteristics of obstetric "near-miss" cases are associated with the end of the COVID-19 pandemic, the end of the formation of obstetric "near-miss" cases notification system, the adjustment of the work of regional obstetric remote consultation centers and telemedicine centers.

KEYWORDS: maternal near-miss, severe maternal morbidity, maternal mortality, digital medicine, VIMIS "AKiNEO"

АНАЛИЗ СЛУЧАЕВ КРИТИЧЕСКИХ АКУШЕРСКИХ СОСТОЯНИЙ В РОССИЙСКОЙ ФЕДЕРАЦИИ ЗА 2021–2023 ГОДЫ ПО ДАННЫМ РЕГИСТРА КРИТИЧЕСКИХ АКУШЕРСКИХ СОСТОЯНИЙ

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РЕЗЮМЕ. Регистр критических акушерских состояний (далее — Регистр КАС) является источником персонифицированных и агрегированных данных по случаям КАС в Российской Федерации с 2021 года. Цель работы — проведение анализа случаев КАС в Российской Федерации с 2021 по 2023 годы. Для анализа использовались данные аналитического блока регистра КАС по случаям за 2021–2023 годы. Регистр КАС стартовал с 8249 случаев КАС в 2021 году. На пике пандемии COVID-19 под наблюдением ежедневно находились до 230 пациенток. Частота применения искусственной вентиляции легких и особенно экстракорпоральной мембранной оксигенации резко снизилась после смены штамма вируса дельта-варианта SARS-CoV-2 на омикрон (начало 2022 года). Изменения в характеристиках случаев КАС связаны с окончанием пандемии: в 2023 году практически не регистрировались случаи КАС, вызванные COVID-19. Отмечается двукратный рост телемедицинских консультаций с ФГБУ «НМИЦ АГП им. В.И. Кулакова» Минздрава России по вопросам КАС за 2021–2023 годы, связанный как с общим увеличением консультаций, так и повышением дисциплины по их фиксации в Регистре КАС. Изменения в 2023 году по сравнению с 2021 и 2022 годами в общей статистике и характеристике случаев КАС связаны с окончанием пандемии COVID-19, окончанием формирования полноценной системы оповещения о случае КАС, настройкой работы акушерских дистанционных консультативных центров и центров телемедицины.

КЛЮЧЕВЫЕ СЛОВА: критические акушерские состояния, материнская смертность, цифровая медицина, ВИМИС «АКиНЕО»

INTRODUCTION

Maternal near-miss events (MNM) are diseases, syndromes and symptoms that require resuscitation and intensive care interventions for women during pregnancy and for 42 days postpartum. The COVID-19 pandemic required non-standard solutions in monitoring the condition of obstetric patients with life-threatening conditions. In February 2021, the nationwide maternal near-miss Register (MNM Register) was created on the basis of the vertically integrated medical information system for the profiles of medical care “obstetrics and gynecology” and “neonatology” (hereinafter — VIMIS “AKiNEO” System). The MNM Registry allows receiving information about all patients with MNM from specialists of obstetric remote consultation centers of the subjects of the Russian Federation (hereinafter referred to as ORCCs) in a 24-hour mode [1]. Monitoring is carried out by leading specialists in obstetrics and gynecology, as well as anesthesiology and resuscitation (for pregnant women) of the Federal State Budget Institution “V.I. Kulakov National Medical Center of Obstetrics and Gynecology” of the Ministry of Health of Russia (hereinafter referred to as the NMC OG). According to Regulations for MNM Monitoring (hereinafter referred to as the Regulations), employees of ORCC should send information concerning MNM to VIMIS “AKiNEO” System within 24 hours from the moment a medical organization have sent a medical record about the case [2]. The staff of NMC OG (a separate service has been created) gets acquainted with MNM data in a round-the-clock mode and, if necessary, corrects the current therapy by means of telemedicine consultations (hereinafter — TMC).

The MNM Register makes it possible to record information about 192 case attributes (patient’s passport data, diagnosis, clinical and laboratory examination data, etc.), 60 attributes must be filled in (the obligatory nature is embedded in the format control of the System). The analytical block of the MNM Register allows to obtain aggregated information on patients with life-threatening conditions in the profile “obstetrics” in various sections — 48 widgets and analytical panels characterizing cases of critical obstetric conditions in the Russian Federation are implemented. A report builder of the MNM analytical block allows to make analytical reports on cases with any combination of their attributes [3].

AIM

The aim of the research is to analyze MNM cases in the Russian Federation from 2021 to 2023 by total number of cases, average number of cases monitored per day, and case characteristics. It is also important to identify changes in implementing stages of the System (2021) during the peak of the COVID-19 pandemic (2021–2022) and post-pandemic (2023).

MATERIALS AND METHODS

Overall number of cases and average number of cases monitored per day were obtained from relevant widgets of a MNM Registry analytical unit. The frequency of MNM cases was calculated using the formula: number of MNM (data from the analytical block of the MNM Registry) / number of births (data from the statistical reporting form No. 32 "Information on localization of obstetric and perinatal care in maternity hospitals (departments) and perinatal centers") × 1000.

Case characterization data for 2021, 2022, and 2023 were obtained by combining the following attributes in the MNM Registry report builder: leading MNM criterion, principal diagnosis according to the International Classification of Diseases 10th Revision (hereafter referred to as ICD-10), mean case duration, administration of artificial ventilation (hereafter referred to as ventilatory support), administration of extracorporeal membrane oxygenation (hereafter referred to as ECMO), obstetric status at the beginning and end of a case, a medical organization level of the beginning and end of the case, and administration of online remote consultations.

RESULTS

In total, 24,144 cases of critical obstetric conditions were entered into the MNM Registry from 2021 to 2023. The total and average number and frequency of MNM cases in 2021–2023 are summarized in Table 1.

Table 1

Obstetric "near-miss" cases in Russia 2021–2023

Таблица 1

Случаи критических акушерских состояний в Российской Федерации в 2021–2023 годах

Показатель / Indicator	Год		
	2021	2022	2023
Общее количество случаев критических акушерских состояний (КАС) (абс.) / Total number of obstetric "near-miss" cases (abs.)	8249	7580	8315
Среднее количество случаев КАС, находящихся на мониторинге в сутки (абс.) / Average number of obstetric "near-miss" cases monitored per day (abs.)	144	79	96
Частота случаев КАС (на 1000 родов) / Frequency of obstetric "near-miss" cases (per 1000 deliveries)	6,1	6,0	6,8

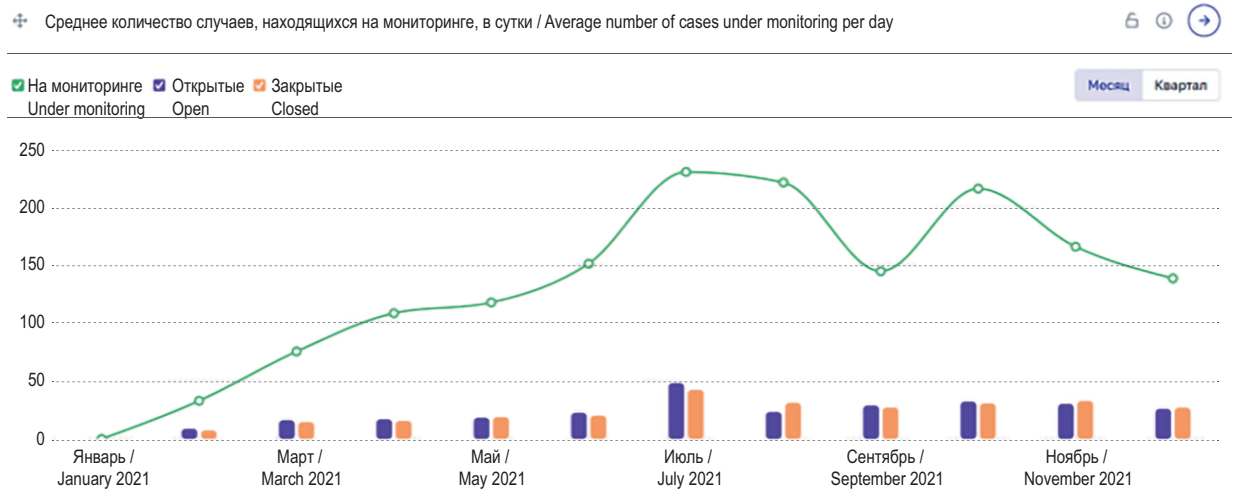

Fig. 1. Average number of obstetric "near-miss" cases monitored per day in 2021

Рис. 1. Среднее количество случаев критических акушерский состояний, находящихся на мониторинге, в сутки в 2021 году

In February 2021 (the MNM Registry was established), on average, 32 MNM cases were monitored per day. On July 2021, an exponential growth occurred and amounted to 230 MNM cases per day, which was the highest value for the entire period of MNM Registry's operation (Fig. 1).

This growth was caused by the "adjustment" of regional obstetric remote centers to work with the MNM Registry and the spread of a highly pathogenic strain of SARS-CoV-2 delta virus in the Russian Federation. According to results of the MNM Registry operation during the first year (2021), the incidence of SARS in the Russian Federation has almost reached the predicted incidence (7.5 per 1,000 births) which had been obtained when a concept for the Registry was accepted [4].

Table 2

Obstetric "near-miss" characteristic in 2021–2023*

Таблица 2

Характеристика случаев критических акушерских состояний в 2021–2023 годах*

Показатель / Indicator	Год		
	2021	2022	2023
Ведущий критерий критических акушерских состояний (КАС) / Leading criteria of obstetric "near-miss" case	• Тяжелая преэклампсия/ Severe preeclampsia — 2362 (28,6%). • Кровопотеря более 1000 мл и/или продолжающееся кровотечение / Blood loss of more than 1000 ml and/or ongoing bleeding — 1893 (23%). • Одышка более 25 в мин / Shortness of breath more than 25 per minute — 597 (7,2%). • Декомпенсированная соматическая патология, не классифицированная в других рубриках / Decompensated pathology, not classified in other categories — 588 (7,1%). • Острый респираторный дистресс-синдром / Acute respiratory distress syndrome — 367 (4,5%). • Другое / Other — 2442 (29,6%)	• Тяжелая преэклампсия / Severe preeclampsia — 2875 (37,9%). • Кровопотеря более 1000 мл и/или продолжающееся кровотечение / Blood loss of more than 1000 ml and/or ongoing bleeding — 2444 (32,2%). • Декомпенсированная соматическая патология, не классифицированная в других рубриках / Decompensated pathology, not classified in other categories — 324 (4,3%). • Гистерэктомия (любые показания) / Hysterectomy (any indication) — 195 (2,6%). • Госпитализация в отделение анестезиологии-реаниматологии (любые показания) / ICU admission (any indications) — 189 (2,5%). • Другое / Other — 1553 (20,5%)	• Тяжелая преэклампсия / Severe preeclampsia — 3551 (42,7%). • Кровопотеря более 1000 мл и/или продолжающееся кровотечение / Blood loss of more than 1000 ml and/or ongoing bleeding — 2495 (30,1%). • Декомпенсированная соматическая патология, не классифицированная в других рубриках / Decompensated pathology, not classified in other categories — 342 (4,1%). • Гистерэктомия (любые показания) / Hysterectomy (any indication) — 299 (3,6%). • Госпитализация в отделение анестезиологии-реаниматологии (любые показания) / ICU admission (any indications) — 169 (2,0%). • Другое / Other — 1459 (17,5%)
Диагнозы по МКБ-10 / Diagnosis (ICD-10)	• O10–O16 — 2914 (28,5%). • O30–O48 — 2252 (22,1%). • U00–U049 — 1878 (18,4%). • O94–O99 — 727 (7,1%). • O80–O84 — 391 (3,8%). • Другое / Other — 2050 (20,1%). • Всего / Total — 10 212	• O10–O16 — 3463 (36,3%). • O30–O48 — 2726 (28,5%). • O94–O99 — 705 (7,3%). • O80–O84 — 459 (4,8%). • U00–U049 — 302 (3,1%). • Другое / Other — 1898 (20,0%). • Всего / Total — 9553	• O10–O16 — 4102 (36,6%). • O30–O48 — 3272 (29,2%). • O94–O99 — 1148 (10,2%). • O60–O75 — 650 (5,8%). • O20–O29 — 611 (5,5%). • Другое / Other — 14 235 (12,7%). • Всего / Total — 11 208
Средняя длительность случая (дней) / Average duration of the case (days)	7	4	4
ИВЛ / Artificial ventilator	1277 (15,5%)	846 (11,2%)	736 (8,8%)

Ending of the table 2 / Окончание табл. 2

Показатель / Indicator	Год		
	2021	2022	2023
Проведение ЭКМО / Conducting ECMO	82 (1,0%)	17 (0,2%)	4 (0,0%)
Акушерский статус в начале случая / Obstetric status at the beginning of the case	• Родильница / New mother — 5821 (70,6%). • Беременная / Pregnant — 2064 (25,0%). • Аборт / Abortion — 180 (2,2%). • Внематочная беременность / Ectopic pregnancy — 95 (1,2%). • Роженица / Woman in childbirth — 89 (1,0%)	• Родильница / New mother — 5946 (78,4%) • Беременная / Pregnant — 1291 (17%). • Аборт / Abortion — 141 (1,9%). • Внематочная беременность / Ectopic pregnancy — 126 (1,7%). • Роженица / Woman in childbirth — 76 (1,0%)	• Родильница / New mother — 6853 (82,4%). • Беременная / Pregnant — 1135 (13,7%). • Аборт / Abortion — 156 (1,9%). • Внематочная беременность / Ectopic pregnancy — 101 (1,2%). • Роженица / Woman in childbirth — 70 (0,8%)
Уровень МО начала случая КАС / Hospital level in the beginning of the MNM case	• I уровень / I level — 269 (3,2%). • II уровень / II level — 1209 (14,7%). • III уровень / III level — 6661 (80,7%). • Вне МО / Outside the hospital — 21 (0,3%). • Иное / Other — 89 (1,1%)	• I уровень / I level — 208 (2,7%). • II уровень / II level — 1119 (14,8%). • III уровень / III level — 6221 (82,1%). • Вне МО / Outside the hospital — 23 (0,3%). • Иное / Other — 9 (0,1%).	• I уровень / I level — 177 (2,1%). • II уровень / II level — 1200 (14,4%). • III уровень / III level — 6921 (83,3%). • Вне МО / Outside the hospital — 15 (0,2%). • Иное / Other —— 2 (0,0%).
Уровень МО окончания случая КАС / Hospital level in the end of the MNM case	• I уровень / I level — 206 (2,5%). • II уровень / II level —— 1052 (12,7%). • III уровень / III level — 6878 (83,4%). • Вне МО / Outside the hospital — 17 (0,2%). • Иное / Other — 96 (1,2%)	• I уровень / I level — 155 (2,0%). • II уровень / II level — 983 (13,0%). • III уровень / III level — 6415 (84,6%). • Вне МО / Outside the hospital — 21 (0,3%) • Иное / Other — 6 (0,1%)	• I уровень / I level — 122 (1,5%). • II уровень / II level — 1097 (13,1%). • III уровень / III level — 7080 (85,1%). • Вне МО / Outside the hospital — 15 (0,2%). • Иное / Other — 1 (0,0%)
Проведено телемедицинских консультаций (в случаях КАС) / Telemedicine consultations (in MNM cases)	• Выполнена в срок / Completed on time — 375 (4,5%) • Выполнена с опозданием / Completed late —— 332 (4,0%)	• Выполнена в срок / Completed on time — 693 (9,1%) • Выполнена с опозданием / Completed late — 158 (2,1%)	• Выполнена в срок / Completed on time — 1144 (13,8%) • Выполнена с опозданием / Completed late — 256 (3,1%)

* MNM Register data. / По данным Регистра КАС.

Note: ALV — artificial lung ventilation; MO — membrane oxygenation; ECMO — extracorporeal membrane oxygenation of blood.
Примечание: ИВЛ — искусственная вентиляция легких; МО — мембранная оксигенация; ЭКМО — экстракорпоральная мембранная оксигенация крови.

Only after SARS-CoV-2 Delta strain was replaced by Omicron (beginning of 2022), there was a 45% decrease in the average number of cases monitored per day. The number of cases registered per year, respectively, decreased by 8%, the frequency of cases remained practically unchanged. Such dynamics was caused by a decrease in the proportion of "extra severe" cases (on ventilator, with ECMO) and, consequently, by a decrease in the average duration of a case (Table 2).

Major changes relate to the end of the COVID-19 pandemic in 2023: the number of leading MNM criteria and diagnoses associated with COVID-19 decreased dramatically, in particular U07 in 2023 is out of the top 5 diagnoses in MNM. Preeclampsia-related MNM (diagnosis group O10–O16) and diagnoses related to fetal, amniotic cavity, and delivery difficulties (diagnosis group O30–O48) decreased, primarily due to bleeding for placenta ingrowth and placenta previa.

Changes in the distribution of patients by obstetric status (increase in the proportion of obstetric causes) are associated with changes in MNM causes — a decrease in the proportion of COVID-19 and an increase in the proportion of obstetric causes.

CONCLUSION

As MNM Registry had been introduced, it triggered an improvement of routing obstetric patients: over 3 years, there have been trends in the reduction of the absolute number and proportion of MNM cases in level I medical organizations, growth at level III, and a stable number at level II. Ensuring transparency of routing at the level of ORCC (subject of the Russian Federation) and at the level of the specialized NMC OG (Russian Federation) made it possible to adjust the routing of patients with MNM according to the Procedure for the provision of medical care in the profile of "obstetrics and gynecology" throughout the country [5]. There was a significant decrease in the number of medical organizations with unspecified level of medical care (group "other") in the federal register of medical and pharmaceutical organizations of the Unified State Information System in the sphere of health care (hereinafter — FRMO). This change is associated with the absence of a medical organization level when reviewing MNM cases when using MNM Registry both by NMC OG and by specialists of a constituent entity of the Russian Federation.

The number of patients with MNM consulted by specialists of NMC OG through telemedicine consultations increased from 8.5% in 2021 to 16.9% in 2023 (data from the MNM Registry). Such dynamics is associated both with an overall increase in the number of TMCs conducted, and an improvement in recording consultations in the System. At the same time, the incidence of late withdrawal for TMC has sharply decreased from 47.1% in 2021 to 18.3% in 2023. Thus far, there is a reserve for improving MNM outcomes by timely reaching out for TMC with specialists at NMC OG.

FINDINGS

Introduction of the MNM Registry into large-scale functioning was rapid — 5 months after the start, peak values of an average daily number of monitored cases were recorded. When the waves of SARS-CoV-2 delta variant virus strain finished, and a number of cases decreased, the frequency of cases over 3 years did not decrease, on the contrary, a slight increase was observed. The COVID-19 pandemic had a strong impact on MNM characteristics. Once the pandemic ended, the "classical" obstetric causes of MNM returned to the top 3 (pre-eclampsia, hemorrhage, decompensated somatic pathology), the proportion of extragenital pathology decreased significantly, and the number and proportion of the most "severe" and difficult-to-survive cases of MNM decreased. The Registry's operation was a trigger both for improving the routing of obstetric cases (the number of cases in level I MOs has significantly decreased), and for improving the quality of management in system-related registry such as the FRMO. The MNM Registry continues to provide direct assistance to health care professionals in preserving the life and health of pregnant women and mothers.

The introduction of MNM Registry has led to a multiplicative effect on developing the obstetric and gynecological service in terms of MNM supervision in constituent entities of the Russian Federation. The Ministry of Health of the Russian Federation and the National Medical Center of Obstetrics and Gynecology have strengthened control over provision and development of ORCCs and telemedicine technologies, improved interaction between obstetric and multidisciplinary hospitals, as well as enhanced the digital health circuit of the country.

ADDITIONAL INFORMATION

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