

**MAIN CAUSES AND RISK FACTORS OF MATERNAL AND INFANT
MORTALITY: THE CASE OF SIRDARYA REGION**

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Annotation. This article analyzes the main causes and risk factors of maternal and infant mortality using the example of the Sirdarya region. The study explores the medical, socio-economic, and environmental determinants that influence mortality rates, based on statistical data, healthcare reports, and comparative analysis. The findings indicate that the leading causes of maternal mortality include obstetric hemorrhage, hypertensive disorders, infections, and complications during childbirth, while infant mortality is mainly associated with preterm birth, low birth weight, neonatal infections, and congenital anomalies. Additionally, limited access to quality healthcare services, insufficient prenatal and postnatal care, low levels of maternal education, and unfavorable living conditions significantly increase risks. The research emphasizes that most maternal and infant deaths are preventable through timely medical intervention, improved healthcare infrastructure, and enhanced public awareness. The study provides practical recommendations aimed at reducing mortality rates and strengthening maternal and child healthcare systems in the region.

Key words: maternal mortality, infant mortality, risk factors, prenatal care, neonatal health, public health, healthcare system, Sirdarya region, obstetric complications, socio-economic factors, child survival, maternal health, epidemiology.

Introduction. Maternal and infant mortality remain among the most sensitive and significant indicators of a country's public health system, reflecting not only the effectiveness of healthcare services but also the broader socio-economic conditions, educational level, and quality of life of the population. Despite substantial global progress in reducing mortality rates over the past decades, maternal and infant deaths continue to pose serious challenges, particularly in developing and transition economies.

According to international health assessments, a considerable proportion of maternal and infant deaths are preventable through timely access to quality healthcare services, appropriate medical interventions, and improved living conditions. Nevertheless, disparities between urban and rural populations, differences in access to medical infrastructure, and variations in socio-economic status contribute to uneven health outcomes within countries.

In recent years, the Republic of Uzbekistan has implemented large-scale healthcare reforms aimed at improving maternal and child health, including the modernization of perinatal centers, expansion of primary healthcare services, and strengthening of preventive medicine. These reforms have contributed to a gradual decline in maternal and infant mortality rates nationwide. However, regional differences remain evident, necessitating focused research on specific areas such as the Sirdarya region.

The Sirdarya region presents a unique context for studying maternal and infant mortality due to its demographic structure, predominantly rural population, and economic specialization in agriculture. Factors such as environmental conditions, including water quality and soil salinity, as well as limited access to specialized healthcare services in remote areas, may influence health outcomes. Additionally, socio-economic challenges, including income disparities and varying levels of maternal education, play a critical role in shaping maternal and child health indicators.

Maternal mortality is most commonly associated with complications arising during pregnancy, childbirth, or the postpartum period, including hemorrhage, hypertensive disorders, and infections. Infant mortality, particularly neonatal mortality, is closely linked to maternal health, prenatal care, and conditions surrounding childbirth. Issues such as preterm birth, low birth weight, and inadequate neonatal care significantly increase the risk of infant death.

The complexity of maternal and infant mortality requires a comprehensive and multidisciplinary approach that considers not only medical factors but also social, economic, and environmental determinants. Understanding the interaction between these factors is essential for developing effective interventions and public health strategies.

The purpose of this study is to identify and analyze the main causes and risk factors of maternal and infant mortality in the Sirdarya region. The research aims to evaluate the current state of healthcare services, determine the key determinants influencing mortality rates, and propose evidence-based recommendations for improving maternal and child health outcomes. The scientific novelty of the study lies in its regional focus and integrated approach, combining statistical analysis with socio-economic and environmental assessment. The practical significance of the research is reflected in its potential to inform healthcare policy, optimize resource allocation, and enhance the effectiveness of maternal and child health programs at both regional and national levels.

Literature Review. Maternal and infant mortality have been extensively studied within the fields of public health, epidemiology, and healthcare management. The existing body of literature highlights that these indicators are not only medical issues but also complex socio-economic phenomena influenced by a wide range of interrelated factors.

Global Perspectives on Maternal Mortality. According to the World Health Organization (WHO), maternal mortality is primarily caused by complications occurring during pregnancy, childbirth, or within the postpartum period. The most commonly cited causes include severe bleeding (postpartum hemorrhage), hypertensive disorders such as preeclampsia and eclampsia, infections (sepsis), unsafe abortions, and obstructed labor. Seminal research by Say et al. (2014) demonstrates that approximately 75% of maternal deaths worldwide are due to these direct obstetric causes. Furthermore, the study emphasizes that the majority of these deaths occur in low- and middle-income countries, where access to skilled birth attendants and emergency obstetric care is limited. Campbell and Graham (2006) also underline the importance of strengthening health systems, particularly through the provision of skilled care during childbirth and timely referral mechanisms. In addition to direct medical causes, indirect factors such as anemia, malnutrition, and pre-existing chronic conditions significantly increase maternal mortality risk. These findings indicate that maternal health must be addressed through a comprehensive healthcare approach that includes preventive, curative, and rehabilitative services.

Determinants of Infant Mortality. Infant mortality, especially neonatal mortality (deaths within the first 28 days of life), is closely linked to maternal health and the quality of care provided during pregnancy and delivery. Research by Black et al. (2010) identifies preterm birth complications, pneumonia, birth asphyxia, and neonatal infections as the leading causes of infant mortality globally. Studies conducted by UNICEF and other international organizations highlight that low birth weight and prematurity are among the most significant predictors of infant survival. These conditions are often associated with poor maternal nutrition, inadequate prenatal care, and maternal health complications. Moreover, congenital anomalies and genetic disorders also contribute to infant mortality, although their prevalence varies depending on regional healthcare capabilities, including prenatal screening and diagnostic services.

Studies focusing on Uzbekistan highlight several key challenges: Unequal distribution of healthcare resources, недостаточный уровень квалификации медицинского персонала в

отдалённых районах. Limited awareness of reproductive health among women. Environmental issues such as water quality and pollution In regions like Sirdarya, environmental factors such as soil salinity and water resource management may indirectly affect maternal and child health through their impact on nutrition and overall living conditions.

Despite the extensive research on maternal and infant mortality, several gaps remain. First, many studies focus on national-level data, while regional analyses are relatively limited. Second, there is insufficient integration of medical, socio-economic, and environmental factors within a single analytical framework. Third, there is a lack of up-to-date empirical studies specifically addressing smaller regions such as Sirdarya. This study aims to address these gaps by providing a comprehensive regional analysis that combines statistical data with an evaluation of healthcare services and socio-economic conditions.

Table 1. Analytical Assessment of Main Causes and Risk Factors of Maternal and Infant Mortality (Case of Sirdarya Region)

Factor Category	Specific Factors	Impact on Maternal Mortality	Impact on Infant Mortality	Level of Influence	Recommended Measures
Medical Factors	Obstetric hemorrhage	Major cause of maternal death during childbirth	Indirect (affects neonatal survival)	High	Improve emergency obstetric care, train medical staff
Medical Factors	Hypertensive disorders (preeclampsia, eclampsia)	High risk of maternal complications and death	Causes preterm birth and low birth weight	High	Early diagnosis, regular prenatal monitoring
Medical Factors	Infections (sepsis)	Leads to postpartum mortality	Causes neonatal infections and death	High	Strengthen infection control, timely treatment
Medical Factors	Lack of prenatal care	Increases undetected complications	Leads to poor fetal development	High	Expand antenatal care coverage
Socio-economic Factors	Low income level	Limits access to quality healthcare	Increases risk of malnutrition and disease	Medium-High	Financial support programs, social protection
Socio-economic Factors	Low maternal education	Delayed healthcare-seeking behavior	Poor childcare practices	High	Health education programs for women
Socio-economic Factors	Rural residence	Limited access to healthcare facilities	Delayed treatment for newborns	High	Improve rural healthcare infrastructure
Environmental Factors	Poor water quality	Increases risk of maternal	Causes gastrointestinal	Medium	Improve sanitation and

Factor Category	Specific Factors	Impact on Maternal Mortality	Impact on Infant Mortality	Level of Influence	Recommended Measures
		infections	diseases in infants		water systems
Environmental Factors	Malnutrition	Weakens maternal health	Leads to low birth weight	High	Nutritional support programs
Healthcare System Factors	Lack of qualified personnel	Inadequate management of complications	Poor neonatal care	High	Training and redistribution of specialists
Healthcare System Factors	Weak emergency services	Delays life-saving interventions	Increases neonatal mortality risk	High	Develop rapid response systems
Behavioral Factors	Late hospital admission	Increases mortality risk during labor	Complications at birth	Medium-High	Awareness campaigns, community outreach

This analytical table presents a systematic classification of the main factors influencing maternal and infant mortality in the Sirdarya region. The factors are grouped into five categories: medical, socio-economic, environmental, healthcare system, and behavioral factors. Each factor is evaluated based on its specific impact on maternal and infant mortality, the level of influence (high, medium, or low), and corresponding practical recommendations.

The table highlights that medical and healthcare system factors have the highest level of influence, particularly those related to obstetric complications and access to qualified medical care. At the same time, socio-economic and environmental conditions act as underlying determinants, indirectly increasing mortality risks. Overall, the table serves as an analytical tool for identifying priority areas for intervention and supports the development of targeted strategies to reduce maternal and infant mortality.

Discussion. The results of this study confirm that maternal and infant mortality in the Sirdarya region is a multifactorial issue shaped by the interaction of medical, socio-economic, environmental, and healthcare system determinants. The findings are consistent with global research trends, yet they also reveal region-specific characteristics that require targeted interventions.

One of the most significant observations is that the majority of maternal deaths are associated with preventable obstetric complications, particularly hemorrhage, hypertensive disorders, and infections. This aligns with global evidence suggesting that timely access to skilled birth attendance and emergency obstetric care can significantly reduce mortality. However, in the Sirdarya region, delays in accessing healthcare services remain a critical challenge. These delays are often caused by geographical barriers, inadequate transportation infrastructure, and insufficient availability of specialized medical personnel in rural areas.

The application of the “three delays model” provides a useful framework for interpreting these findings. First, delays in decision-making are often influenced by limited awareness, cultural norms, and financial constraints, which prevent women from seeking timely medical assistance. Second, delays in reaching healthcare facilities are particularly evident in remote settlements, where transportation options are limited. Third, delays in receiving adequate care

within medical institutions point to systemic issues such as shortages of trained healthcare providers, insufficient medical equipment, and gaps in clinical management practices.

Infant mortality in the region is closely linked to maternal health status and the quality of prenatal and neonatal care. The high prevalence of preterm births and low birth weight indicates underlying issues such as poor maternal nutrition, inadequate antenatal monitoring, and untreated maternal conditions. These findings are supported by international studies, which emphasize that improving maternal health is one of the most effective strategies for reducing infant mortality.

Another important aspect highlighted by the study is the role of socio-economic factors. Low income levels and limited maternal education significantly contribute to adverse health outcomes. Women with lower educational attainment are less likely to utilize healthcare services effectively, adhere to medical recommendations, or recognize early warning signs of complications. This creates a cycle of vulnerability that affects both maternal and child health.

Environmental conditions in the Sirdarya region also play a notable role. Issues such as poor water quality, soil salinity, and limited access to clean drinking water can negatively impact maternal nutrition and increase the risk of infectious diseases. Although these factors may not directly cause mortality, they exacerbate existing health risks and contribute to unfavorable outcomes.

The study also reveals systemic challenges within the healthcare system. While significant progress has been made in recent years through healthcare reforms, disparities in service quality and accessibility persist. Primary healthcare facilities often lack adequate resources, and referral systems are not always efficient. Strengthening the continuity of care—from prenatal to postnatal stages—is essential for improving outcomes.

Importantly, the findings suggest that addressing maternal and infant mortality requires an integrated approach. Medical interventions alone are insufficient without parallel improvements in education, social protection, and infrastructure. Preventive measures, including regular prenatal check-ups, nutritional support, vaccination programs, and community-based health education, are critical components of an effective strategy.

In comparison with other regions, the situation in Sirdarya reflects broader patterns observed in similar socio-economic contexts, yet it also demonstrates unique challenges related to environmental and infrastructural factors. Therefore, policy interventions must be tailored to regional needs while maintaining alignment with national healthcare strategies.

In conclusion, the discussion highlights that maternal and infant mortality in the Sirdarya region is largely preventable and can be significantly reduced through coordinated efforts across multiple sectors. Strengthening healthcare systems, improving socio-economic conditions, enhancing public awareness, and addressing environmental challenges are all essential components of a comprehensive response. The integration of these measures will not only reduce mortality rates but also contribute to the overall improvement of population health and well-being.

Conclusion. This study has examined the main causes and risk factors of maternal and infant mortality in the Sirdarya region through a comprehensive analysis of medical, socio-economic, environmental, and healthcare system determinants. The findings confirm that maternal and infant mortality remain pressing public health challenges, despite ongoing healthcare reforms and improvements in service delivery. The research demonstrates that the leading causes of maternal mortality—such as obstetric hemorrhage, hypertensive disorders, and infections—are largely preventable with timely and adequate medical intervention. Similarly, infant mortality is predominantly associated with preterm birth, low birth weight, and neonatal complications, which are closely linked to maternal health and the quality of prenatal and postnatal care. A key conclusion of the study is that healthcare accessibility and quality play a

decisive role in determining outcomes. In particular, disparities between urban and rural areas, shortages of qualified healthcare personnel, and limitations in emergency medical services significantly increase mortality risks. In addition, socio-economic factors, including low income levels and insufficient maternal education, further exacerbate these challenges by limiting healthcare utilization and awareness. The study also highlights the indirect but important influence of environmental conditions, such as water quality and nutritional deficiencies, which contribute to adverse maternal and child health outcomes. These findings underscore the need for a holistic and integrated approach that goes beyond medical interventions alone.

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