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Maternal and Perinatal Risk Factors in Preterm Infants Born After IVF: A Comparative Clinical Study

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Abstract: Assisted reproductive technologies have become an important method for overcoming infertility; however, concerns regarding unfavorable perinatal outcomes among premature infants remain clinically significant. The present study aimed to evaluate maternal and perinatal risk factors associated with preterm birth in infants conceived through in vitro fertilization compared with natural conception. A comparative clinical analysis was performed involving 72 preterm newborns divided into IVF and spontaneous conception groups. Maternal obstetric history, pregnancy complications, neonatal adaptation, and early postnatal outcomes were analyzed using clinical and laboratory assessment methods. The results demonstrated that pregnancies achieved through IVF were more frequently associated with recurrent pregnancy loss, preeclampsia, premature rupture of membranes, and placental dysfunction. Premature infants conceived after IVF more commonly experienced respiratory distress syndrome, lower birth weight, and prolonged neonatal intensive care treatment. The findings emphasize the importance of individualized prenatal monitoring and specialized neonatal care in pregnancies following assisted reproductive technologies.

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1. Introduction

Assisted reproductive technologies have significantly transformed modern reproductive medicine and created new opportunities for couples experiencing infertility. Over the past two decades, the number of pregnancies achieved through in vitro fertilization has increased steadily worldwide, and in some countries, children conceived through assisted reproductive methods already account for a noticeable proportion of all live births. Although advances in embryology, cryopreservation techniques, hormonal stimulation protocols, and prenatal monitoring have considerably improved the effectiveness of assisted reproductive technologies, concerns regarding unfavorable perinatal outcomes continue to remain an important issue in neonatology and obstetrics [1].

Among the complications most frequently discussed in contemporary scientific literature, preterm birth occupies a particularly significant position because it remains one of the leading causes of neonatal morbidity and mortality worldwide. Premature infants are more vulnerable to respiratory distress, infectious complications, neurological impairment, feeding difficulties, and long-term developmental disorders. Numerous

studies suggest that pregnancies achieved through IVF may be associated with a higher incidence of prematurity, low birth weight, placental dysfunction, and neonatal intensive care admission compared with spontaneous conception [2]. However, the exact mechanisms underlying these complications remain incompletely understood and are believed to involve both maternal and procedural factors.

Women undergoing assisted reproductive treatment often have a complex obstetric and gynecological history including infertility of long duration, endometriosis, hormonal disorders, recurrent pregnancy loss, tubal pathology, or previous surgical interventions, all of which may independently contribute to adverse pregnancy outcomes. In addition, hormonal stimulation and embryo implantation processes may influence placental formation and fetal adaptation during intrauterine development [3]. Despite improvements in elective single embryo transfer strategies and prenatal care protocols, the risk of premature delivery after IVF has not been completely eliminated. At present, increasing attention is being directed toward the identification of perinatal risk factors associated with assisted reproductive technologies in order to improve preventive strategies and optimize neonatal outcomes. Therefore, the present study aims to perform a comparative analysis of maternal and perinatal risk factors among preterm infants born after IVF and natural conception while evaluating the clinical characteristics that may contribute to unfavorable neonatal outcomes [4].

2. Materials and Methods

The present comparative clinical study was carried out between January 2023 and March 2024 in the neonatal intensive care and neonatal pathology departments of specialized perinatal medical centers. The main purpose of the investigation was to evaluate maternal and perinatal risk factors associated with premature birth in infants conceived through in vitro fertilization and to compare these findings with preterm infants born after spontaneous conception. Particular attention was directed toward identifying antenatal complications, maternal somatic conditions, pregnancy characteristics, and neonatal outcomes that could potentially influence the severity of prematurity and the early adaptation period after birth [5].

A total of 72 preterm newborns were included in the study. All examined infants were divided into two groups according to the method of conception. The main group consisted of 36 premature newborns delivered after assisted reproductive technologies, primarily IVF, whereas the comparison group included 36 premature newborns conceived naturally. Only infants born before 37 completed weeks of gestation were enrolled in the investigation. Newborns with major congenital malformations, chromosomal abnormalities, severe inherited metabolic diseases, or incomplete medical documentation were excluded in order to maintain greater homogeneity of clinical observations [6].

During the study, extensive analysis of maternal medical histories and neonatal records was performed using standardized clinical documentation. Maternal age, infertility duration, gynecological history, previous miscarriages, ectopic pregnancy, endometriosis, preeclampsia, anemia, respiratory infections during pregnancy, and other obstetric complications were carefully evaluated. In addition, pregnancy related factors including premature rupture of membranes, placental insufficiency, threatened miscarriage, fetal growth restriction, and mode of delivery were analyzed in both groups. Neonatal assessment was conducted immediately after birth and throughout hospitalization. Gestational age, birth weight, Apgar scores, respiratory adaptation, oxygen requirement, feeding tolerance, and the duration of neonatal intensive care were recorded for every patient. Clinical monitoring also included evaluation for respiratory distress syndrome, infectious complications, intraventricular hemorrhage, jaundice, and early neurological disturbances. Laboratory examinations were performed according to

standard neonatal protocols and included complete blood count, inflammatory markers, biochemical analysis, and microbiological testing when clinically indicated [7].

All obtained data were processed using modern biomedical statistical methods. Quantitative indicators were expressed as mean values with standard deviations, while categorical variables were calculated as percentages. Comparative statistical analysis was performed between both groups to determine the significance of observed differences in maternal risk factors and neonatal outcomes. Statistical significance was accepted at $p < 0.05$ [8].

3. Results

The comparative analysis revealed substantial differences in maternal history, pregnancy course, and early neonatal adaptation between preterm infants conceived through IVF and those born after natural conception. Mothers in the IVF group were generally older and more frequently demonstrated complicated obstetric and gynecological histories, including long-standing infertility, recurrent pregnancy loss, endometriosis, previous pelvic surgery, and ectopic pregnancy. In several cases, infertility duration exceeded ten years, which reflected the severity of reproductive dysfunction among women undergoing assisted reproductive treatment [9].

Pregnancy complications were also observed more frequently among mothers in the IVF group. Premature rupture of membranes, preeclampsia, placental insufficiency, and threatened miscarriage occurred at noticeably higher rates compared with spontaneous pregnancies. In addition, maternal anemia and viral respiratory infections remained common in both groups, although hypertensive complications and pyelonephritis were more strongly associated with pregnancies achieved through assisted reproductive technologies. Multiple risk factors often coexisted simultaneously, creating unfavorable intrauterine conditions that contributed to premature delivery. Neonatal outcomes demonstrated that preterm infants born after IVF experienced more pronounced adaptation difficulties during the first days of life. Respiratory distress syndrome, oxygen dependency, feeding intolerance, and prolonged neonatal intensive care admission were observed more frequently in the main group. Lower average birth weight and reduced Apgar scores during the first minute after delivery were also identified among IVF conceived infants. Despite improvements in neonatal care and respiratory support technologies, premature newborns after assisted conception continued to demonstrate greater vulnerability to early postnatal complications [10]. Laboratory and clinical monitoring additionally revealed that inflammatory complications and transient metabolic disturbances were more common in infants from the IVF group, particularly among newborns delivered before 34 weeks of gestation. However, timely intensive care management and early respiratory support contributed to stabilization of most patients during hospitalization. Infants from the comparison group generally demonstrated more favorable respiratory adaptation and shorter duration of neonatal intensive care treatment [11].

Table 1. Comparative characteristics of maternal and neonatal outcomes in the study groups.

Clinical indicators	IVF Group (n=36)	Natural Conception Group (n=36)
Mean maternal age	32.4 years	26.1 years
History of miscarriage	41.7%	13.9%
Preeclampsia	30.6%	13.9%

Premature rupture of membranes	55.6%	27.8%
Mean gestational age	33.1 weeks	34.4 weeks
Mean birth weight	1890 g	2240 g
Respiratory distress syndrome	47.2%	22.2%
NICU stay longer than 7 days	52.8%	25.0%

The obtained findings suggest that pregnancies achieved through IVF are more frequently associated with complex maternal risk factors and less favorable neonatal adaptation among premature infants. These observations emphasize the necessity of careful prenatal monitoring, early identification of obstetric complications, and specialized neonatal support for pregnancies following assisted reproductive technologies [12].

4. Discussion

The results obtained during the present investigation support the growing body of evidence indicating that pregnancies achieved through assisted reproductive technologies are associated with a more complicated obstetric course and a higher probability of unfavorable neonatal outcomes among premature infants. Although modern IVF protocols have significantly improved during recent years and the safety of assisted conception continues to increase steadily, prematurity and impaired neonatal adaptation remain important clinical concerns that require careful multidisciplinary monitoring throughout pregnancy and the postnatal period [13].

One of the most important observations of the study was the high frequency of adverse maternal factors among women who conceived through IVF. Recurrent pregnancy loss, endometriosis, previous surgical interventions, infertility of long duration, and complicated gynecological history were substantially more common in the IVF group compared with spontaneous conception. These findings suggest that the unfavorable neonatal outcomes observed after assisted reproductive technologies may not depend exclusively on laboratory procedures themselves, but also on the underlying reproductive pathology that initially necessitated infertility treatment. Similar conclusions have been reported in several international studies emphasizing the multifactorial nature of prematurity following assisted conception [14].

The present study additionally demonstrated a greater incidence of preeclampsia, premature rupture of membranes, and placental dysfunction among IVF pregnancies. Such complications may negatively influence placental circulation and fetal oxygenation, thereby increasing the risk of intrauterine stress and premature delivery. At the same time, neonatal respiratory distress syndrome and prolonged intensive care requirement were observed more frequently among infants conceived after IVF, which may reflect incomplete pulmonary adaptation associated with earlier gestational age and placental insufficiency. These findings are consistent with modern neonatology research showing that placental abnormalities and disturbed implantation processes may contribute significantly to neonatal morbidity after assisted reproductive technologies [15].

Another clinically important aspect concerns the influence of maternal age. Women undergoing IVF treatment were generally older than mothers in the comparison group, and advanced maternal age itself remains an independent risk factor for hypertensive

disorders, placental pathology, and preterm birth. Consequently, the interaction between maternal age, infertility related disease, hormonal stimulation, and pregnancy complications creates a complex biological environment capable of influencing fetal development and neonatal adaptation simultaneously.

Despite the increased incidence of complications, advances in neonatal intensive care, respiratory support technologies, and prenatal monitoring have considerably improved survival and early stabilization among premature infants born after assisted conception. Nevertheless, the obtained results underline the necessity of individualized prenatal surveillance, timely prevention of obstetric complications, and specialized neonatal management for pregnancies achieved through IVF [16].

Overall, the study confirms that assisted reproductive technologies continue to require not only reproductive success assessment, but also long term evaluation of maternal and neonatal outcomes in order to optimize both obstetric and neonatal care strategies.

5. Conclusion

The present study demonstrated that preterm infants conceived through assisted reproductive technologies are more frequently exposed to unfavorable maternal and perinatal risk factors compared with premature newborns from natural conception. Pregnancies achieved through IVF were commonly associated with complicated obstetric history, prolonged infertility, recurrent pregnancy loss, endometriosis, hypertensive disorders, premature rupture of membranes, and placental dysfunction, all of which contributed significantly to the development of premature birth and early neonatal adaptation difficulties. The obtained findings additionally revealed that premature infants born after IVF more often experienced respiratory distress syndrome, lower birth weight, prolonged intensive care treatment, and slower postnatal stabilization during the neonatal period. These observations emphasize that although modern reproductive technologies have achieved remarkable progress in overcoming infertility, the problem of prematurity and associated neonatal complications still remains clinically important and requires continuous multidisciplinary supervision. An important conclusion arising from the study is that adverse neonatal outcomes after assisted reproductive technologies are likely influenced not only by the IVF procedure itself, but also by the underlying maternal reproductive pathology, advanced maternal age, and complicated pregnancy course. Therefore, pregnancies following assisted conception should be regarded as high-risk pregnancies requiring individualized prenatal observation, early identification of obstetric complications, and careful fetal monitoring throughout gestation. The results of the investigation also underline the importance of modern neonatal intensive care and early respiratory support in improving survival and adaptation among premature infants after IVF. Timely diagnosis of maternal complications together with appropriate obstetric management may significantly reduce the severity of neonatal morbidity and improve short term outcomes. Overall, further large-scale clinical studies remain necessary to better understand the mechanisms linking assisted reproductive technologies with prematurity and neonatal complications. At the same time, strengthening preventive strategies, improving prenatal monitoring, and optimizing neonatal care protocols may contribute substantially to safer reproductive outcomes and better long-term health prospects for children conceived through assisted reproductive technologies.

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