Progress in Research on the Management of High-Risk Pregnancies in China

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ABSTRACT

Background: The threat of high-risk pregnancy to the life safety of the mother and fetus has brought significant challenges to obstetricians and gynaecologists. With the adjustment of China's birth policy, the incidence of high-risk pregnancy has increased significantly. This has dramatically compromised the safety of both mothers and infants. **Methods:** Literature on high-risk pregnancy management was retrieved from Chinese and English databases, and its contents were extracted to analyse the current status of high-risk pregnancy and high-risk pregnancy management in China and propose strategies for it. **Results:** Increased incidence of high-risk pregnancies. High-risk pregnancy has caused a severe impact on pregnant women's physical, psychological, and mental health. Managing high-risk pregnancy has achieved remarkable results but also faces many difficulties. **Conclusion:** The adjustment of fertility policies has resulted in an increasing number of high-risk pregnancies. Therefore, it is essential to fully understand and analyse the current situation of high-risk pregnancies and how they are managed, along with making suggestions and improvements that deal with the current problems in managing high-risk pregnancies, which leads to new ways to protect the health of mothers and children.

1.0 INTRODUCTION

A high-risk pregnancy (HRP) refers to a pregnancy that involves unfavourable personal or socioeconomic circumstances, as well as specific complications or comorbidities that pose a potential threat to the pregnant woman, the baby, and the newborn or may result in obstructed labour (Majella et al., 2019). There are some differences in the incidence of high-risk pregnancies between different regions in China. A survey of pregnant women in Beijing in 2022 by Zhang Zhimin (Zhimin et al., 2023) showed that 664 high-risk pregnancies occurred among 1227 pregnant women, with a positive rate of 45.89 %. Li Xiaoling et al. (Xiaoling, 2020) survey of the Qingdao area showed that the incidence of high-risk pregnancy was 39.78 %. Wang Jianying et al. (Jianying et al., 2019) surveyed 6,472 pregnant women in Zhongshan, Guangzhou, of which 1,610 were high-risk pregnancies, with 24.89 %

high-risk pregnancies； Ji Li et al. (Li et al., 2024) studied the incidence of high-risk

pregnancies in a region of Shandong, which was 26.76 %. Pregnant women with high-risk pregnancies are more likely to have adverse pregnancy outcomes than the average pregnant woman, and the main factors contributing to adverse outcomes are age, pregnancy risk class, history of miscarriage, antepartum haemorrhage, and placenta praevia related (Aiqin et al., 2021). Worldwide, 20 million women suffer from high-risk pregnancies (Holness, 2018) and Eight million women die every day from perinatal conditions (Organization, 2019). The main factors that contribute to high-risk pregnancies include advanced maternal age, hypertension, diabetes mellitus, and previous cesarean sections (Jones et al., 2023; Khadivzadeh et al., 2023). These characteristics, with a high chance of occurrence, can lead to a range of difficulties, negatively impacting the results for both mothers and infants and, in difficult situations, posing a threat to their lives (Tambvekar et al., 2023). This trend substantially influences the safety of both mothers and infants (Aiping et al., 2019). High-risk pregnancy or risk management entails replacing anecdotal ways with evidence-based procedures and prioritizing decisions based on scientific research (Morlando et al., 2020). Healthcare risk management entails delivering healthcare services to mitigate various levels of risk. Healthcare services are provided to those who are most vulnerable, ensuring everyone has access to the healthcare services they need. Risk management maximizes the efficient use of limited resources and avoids unnecessary procedures, thereby preserving resources. Hazard management is especially well-suited for maternal health care since it explicitly caters to the needs of two vulnerable populations: mothers and newborns. Efficient management of high-risk pregnancies can significantly reduce the occurrence of adverse pregnancy outcomes and improve expectant mothers' overall well-being (Mirzakhani et al., 2020). This encompasses mitigating the likelihood of perinatal fatalities as well as effectively addressing prevalent illnesses, such as gestational diabetes mellitus and hypertension, in pregnancies with a high-risk factor. By implementing effective management strategies, it is possible to reduce blood glucose and blood pressure

levels in these individuals and facilitate their physical recovery (Liang, 2020).

2.0 METHODS
2.1 Literature Search Strategies
We searched the Chinese and English databases from January 2016 to March 2024. English databases: The Cochrane Library, PubMed, Web of Science, Scopus, EMBASE, PsycINFO; Chinese databases: China Biomedical Literature Service System (SinoMed), China Periodicals Full Text Database (CNKI), Wan Fang Data Knowledge Service Platform, China cqvip database. Search terms in Chinese and English: ① (high-risk pregnancy) AND (management); ② (high-risk pregnancy or pregnancy, high risk, high-risk pregnancy or high-risk pregnancies or pregnancies, high-risk) and (postpartum or delivery) and (management).

2.2 Literature inclusion and exclusion criteria
Inclusion criteria for the article: The period from January 2016 to March 2024 was chosen to reflect the latest literature in this particular field. The article includes the following contents: ①current status and factors affecting high-risk pregnancies, ② management measures for high-risk pregnancies, ③ high-risk pregnancy screening, ④problems in managing high-risk pregnancies,⑤ high-risk pregnancy management strategies.
Article exclusion criteria: incomplete reports/texts subscripted, not targeted to the target population. Duplicate publications, conferences, reviews, guidelines and opinions. Written and published before January 2016 and after March 2024.

3. RESULTS AND DISCUSSION
3.1 Chinese high-risk pregnancy rate increases after comprehensive two-child policy
Since the implementation of the comprehensive two-child policy in 2016, the incidence of high-risk pregnancies in China has been on the rise year by year, with an incidence rate greater than 30% (Man et al., 2023). A survey study in Kunming City showed that the detection rate of high-risk pregnancies was 34.03% before and 40.40% after the policy implementation (Min et al., 2019). There was a significant increase in the detection rate of high-risk pregnancies. In Beijing, the incidence of high-risk pregnancies rose from 30.71 % to 36.06 % (Fuzhen et al., 2019). A survey in Sanming City showed that the incidence of high-risk pregnancies rose from 29.9 % to 38.3 % before and after the implementation of the comprehensive two-child policy (Fengxiang, 2019). Mothers with high-risk pregnancies are prone to a variety of clinically adverse pregnancy outcomes. For example, amniotic fluid embolism, placental abruption, postpartum haemorrhage, fetal distress, neonatal death, and neonatal and maternal complications, which are very unfavourable to the pregnancy outcome (Correa-de-Araujo et al., 2021; Sugai et al., 2023; Zhou et al., 2023). Studies have shown that the risk factors for adverse pregnancy outcomes include advanced

maternal age, pre-pregnancy BMI, poor maternal history, pregnancy complications, and complications during pregnancy (Kuppusamy et al., 2023; Zhou et al., 2023). Clinically, high-risk pregnancies need to be closely monitored to assess the risk factors for adverse pregnancy outcomes (Fan et al., 2024) . Therefore, screening and management of risk factors for high-risk pregnancies are essential

3.2 Policy on the management of high-risk pregnancies

In 2016, the NHSC implemented the Five Strategies for Maternal and Newborn Safety (FSMNS). The FSMNS consists of five components: ①pregnancy risk screening and assessment strategy. Among the five strategies, screening and assessing high-risk pregnancies is the foundation of quality perinatal care. Pregnancy risk screening is done on the first visit to a healthcare facility. A pregnancy risk assessment is carried out in secondary or tertiary care facilities using midwifery services, and pregnancy risks are categorised according to the severity of the risk. Medical records are marked with five colours: green (low risk), yellow (medium risk), orange (high risk), red (highest risk) and purple (infectious disease) to facilitate classification and management. Pregnant women marked with yellow, orange, red and purple are instructed to seek maternal health services and hospital delivery at secondary or tertiary care facilities. ②case-by-case management strategy for high-risk pregnancies, referring pregnant women with different risk levels to different types of maternal and child healthcare institutions for perinatal care and delivery, treating pregnant women with higher risk levels (orange, red and purple) as a key population group, implementing case-by-case management, and implementing whole process management The Government has been implementing case-by-case management, implementing complete management, dynamic supervision and centralised treatment to ensure that every high-risk pregnant woman can be screened, registered, reported, managed and treated. ③ Referral and treatment strategy for critically ill pregnant women and newborns, establishing a nationwide referral and treatment network for critically ill pregnant women and newborns, setting up multidisciplinary maternal and newborn intensive care expert groups in each county and district, and setting up maternal and newborn intensive care Centres have been set up in each county and district to undertake the task of intensive care for pregnant women and newborns in designated areas. Green channels for the referral of critically ill patients (rapid referral networks) have been opened. ④ Reporting strategy for maternal deaths, establishing orange and red case statistics to guide the effective management and treatment of high-risk pregnant women. China launched a direct reporting system for maternal death cases on 1 October 2017 for the first time. Health institutions are required to report each case of maternal death to a designated county-level maternal and child healthcare institution within two hours of the occurrence of the maternal death. After verifying the situation, the county-level maternal and child healthcare institution's designated staff reports the death details through the National Maternal and Child Health Annual Web-based Direct Reporting Information System by the 10th day of

each month. After reviewing the situation of maternal deaths, the relevant health institutions should take measures to rectify the problem. ⑤ Accountability strategy for the reduction of the maternal mortality rate of outstanding achievements in the work of the region should be summarised promptly to promote practical experience by the National Health Commission to be commended on the maternal mortality rate of the upward trend of the region, should be the timely organised expert group to carry out training, targeted guidance; on the reduction of the maternal mortality rate of the implementation of the work of the region is not in place The National Health Commission will notify and criticise those areas where the work of reducing maternal mortality has not been adequately implemented. Hospitals, where maternal deaths have occurred consecutively, should seriously hold hospital directors accountable.

3.3. Implementation of high-risk pregnancy management
China adopted a universal two-child policy in 2016. In 2021, couples will be allowed to have three children in China. There has been a rise in the number of pregnant women who are older and at a higher risk (Wang et al., 2020). As a result, the new "five-colour classification" management technique has been officially implemented. Jiangsu Province and other provinces have heeded the national call and implemented this approach to handle high-risk pregnancies. They have established a management model that involves primary screening, standardised referral, exceptional case management, and comprehensive tracking (Xu et al., 2020). Due to the rapid advancement of the Internet, managing high-risk pregnancies has started utilising online platforms. This shift moves the risk assessment process earlier in the pregnancy and offers dynamic supervision to high-risk pregnant women throughout their pregnancy. The creation of a WeChat group for high-risk pregnant women facilitates weekly reporting of high-risk indicators, allows for dynamic monitoring of high-risk progress, provides prompt health counselling, and effectively reduces the incidence of bad pregnancy outcomes.

3.4 Screening for high-risk pregnancies
High-risk pregnancies can be screened and managed using two main approaches (China, 2017). ①Prenatal screening and diagnosis for specific diseases, generally for pregnant women with certain risk factors for screening and diagnosis of specific diseases, screening requires higher technology and equipment requirements, generally suitable for second and third-tier hospitals, for example, concerning the age of the pregnant woman, height, weight, gestational weeks and other factors, such as the possibility of carrying Down syndrome high-risk pregnant women, first ultrasound and serological screening, according to the results of the screening and then genetic diagnosis(Sebire et al., 2024; Yuan et al., 2019). For example, ultrasonography and serological screening will be performed first for pregnant women who may be at high risk for Down's syndrome. Then, a genetic diagnosis will be performed based on the screening results(Bedei et al., 2021; Dungan et al., 2023). ②High-risk pregnancy

screening form, usually when pregnant women register for pregnancy, using the screening form to screen and classify pregnant women into high-risk and non-high-risk, high-risk pregnant women for further examination or referral or other treatments. This method is relatively simple and easy to carry out, involves fewer examination items and is less expensive; community institutions generally can do so. It is an important preventive measure for maternal death or foetus, and it is also an essential measure in the under-utilised population of antenatal care. It is an important measure to prevent maternal death or foetal (neonatal) death, especially in populations that are under-utilised for antenatal care.

3.5 Problems in the management of high-risk pregnancies

The care of high-risk pregnancies has demonstrated significant achievements despite encountering numerous challenges. The evolution of society, the fusion of Eastern and Western cultures, and shifts in lifestyle attitudes have resulted in a rise in unmarried and unplanned pregnancies. Consequently, there has been an artificial increase in the number of induced abortions, leading to a higher prevalence of high-risk factors (Bridwell et al., 2022). Additionally, the implementation of maternal and child healthcare service policies and measures has proven to be challenging. The rise in the transient population has complicated the process of mapping pregnancies, leading to a decrease in the rates of early pregnancy detection and organised pregnancy management. Consequently, monitoring and handling high-risk pregnancies has become challenging. The new five-colour grading method has also encountered some difficulties in its implementation; the three main areas of performance are as follows: First, it is seen in the inadequate capability of local non-midwifery organisations. Presently, most units engaged in the registration of early pregnancy in China are affiliated with township health centres and community medical institutes. They engage in additional maternal and child health care activities. However, their capacity for obstetrics clinical work is inadequate, they lack proficiency in business operations, and they struggle to establish standardised and reliable assessments of pregnancy risks in expectant mothers. Second, there is no standardisation in the management of assessment outcomes. Medical establishments conducting risk assessments have neglected to display risk labels, neglected to promptly monitor pregnant women with an "orange" risk or higher (within one week), and recorded inaccurate information in the register of pregnant women at high risk. Third, referring individuals is not standardised, and the routes via which referrals are made are inefficient. While a green channel has been established to send high-risk pregnant women, there is still a deficiency in the seamless transfer of patients between the referring hospital and the receiving hospital. A survey indicated a low rate of early pregnancy screening, with many mothers opting for health checks during mid-pregnancy. This delay in identifying high-risk pregnancies and the lack of early screening and intervention hurt the rate of successful management of high-risk pregnancies(Yu et al., 2017).

4. Strategies for managing high-risk pregnancies

China has implemented a hierarchical management system for systematic maternal health care. They have also promoted the use of systematic maternal manuals with a focus on screening, monitoring, and managing high-risk pregnancies. The goal is to reduce maternal and perinatal morbidity and improve the quality of life for mothers and children. The administration of high-risk pregnancies continues to be a crucial component of primary healthcare institutions in China (Wu et al., 2022). As medical technology advances and our understanding of high-risk pregnancy improves, we continuously refine and enhance our techniques for managing high-risk pregnancies. Enhancing the standardised oversight of high-risk pregnancies, particularly during gestation, will improve the safeguarding of maternal and neonatal well-being.

4.1 Actively improving health education for high-risk pregnancies and births

Classes have been organised to raise awareness among pregnant women about the characteristics and risks associated with high-risk pregnancies in different regions(Si Chuan, Fu Jian) (Jie et al., 2020; Xueling et al., 2023). These classes aim to educate women about the specific characteristics and dangers of high-risk pregnancies, with the ultimate goal of promoting a keen understanding of high-risk pregnancies among women during their pregnancy years (Cao, 2023). Perinatal healthcare knowledge has been extensively disseminated, resulting in an increased rate of early pregnancy screenings to identify high-risk pregnancies at an early stage. It is essential to evaluate and document the results of every pregnancy test to identify high-risk pregnancies. Efforts should be made to actively manage and reduce the risk level of these pregnancies, converting them to medium- or low-risk. Postnatal visits are conducted regularly to promptly identify and assess neonates who are at high risk, to perform essential monitoring, and to prevent and treat any postnatal problems aggressively. Simultaneously, it is imperative to effectively manage expectant women who use mobile devices, enhance antenatal care, and promote knowledge regarding antenatal care.

4.2 Standardize the system for managing high-risk pregnancies and births

Pregnant women who have been diagnosed with or are strongly suspected of having a high-risk pregnancy are assigned to a specialised team that manages their condition. Each pregnant woman is carefully documented and monitored, with regular follow-ups to assess any changes in her condition during pregnancy. The goal is to detect and treat any issues as early as possible. The scoring criteria for high-risk pregnant women assign a score to each pregnant woman based on the circumstances that make her pregnancy high-risk. The seriousness of these issues is split into different categories, ranging from the least severe to the most severe. The categorisation for the care of pregnant women is as follows: Green for average pregnant women, adoption of conventional management. Yellow is for those with a general risk score of 5 points and those who have adopted secondary or tertiary health

facilities. Those with a more excellent risk score of 10 points should adopt tertiary health facilities when possible. For those with a high-risk score of 20 points, pregnant women must go to a Maternal critical care centre at the province or city Level. Purple for pregnant women with infectious disorders is used to manage the disease according to the requirements of infectious disease prevention and control (Liu et al., 2020). To address the common occurrence of high-risk pregnancy factors in each region, a study group focused on high-risk pregnancy has been established. The group's main objective is regularly researching and sharing knowledge on high-risk pregnancy. This includes studying recent cases of high-risk pregnancies, particularly those that are complex or unique, and staying updated on advanced research developments domestically and internationally. The aim is to enhance the professional knowledge of healthcare personnel and improve their capacity to handle high-risk pregnancies.

4.3 Improvement of prenatal diagnosis

The prevalence of high-risk pregnancies contributes to a higher occurrence of congenital disabilities. In certain regions, the existing prenatal diagnosis methods only detect abnormalities in fetal development at a later stage of pregnancy, which can cause more harm to the health of the pregnant woman. Therefore, it is necessary to enhance the quality of prenatal diagnosis. The keys to enhancing the quality of the population involve intensifying the training of doctors in ultrasound diagnosis, investing in advanced screening equipment, advancing molecular screening techniques, utilising fetal cells obtained from maternal blood for prenatal diagnosis, and achieving non-invasive early screening and diagnosis (Jiang et al., 2017). Additionally, controlling the occurrence of congenital disabilities is crucial.

4.4 Good management of advanced maternal age

Medical institutions can utilise the mobile Internet to promptly report and summarise information about pregnant women of advanced age to maternal and child healthcare institutions at all levels. This allows for the implementation of follow-up services and classes to inform pregnant women about maintaining a reasonable diet and avoiding the influence of other high-risk factors (Lin, 2021; Lingyun et al., 2018). Pregnant mothers who are 40 years old or older receive specialised case care. To address the high rate of miscarriage and deformities among high-risk pregnant women, it is recommended to establish a specialised clinic for these cases. Each high-risk pregnant woman should undergo a thorough analysis, and a critical maternal rescue centre should be set up to handle potential complications (Shanshan Li et al., 2021). The attending physician must be highly skilled and dedicated to providing comprehensive care from the initial diagnosis. Regular obstetric examinations are advised, especially for women aged 40 and above (Leithner et al., 2021). Additionally, it is recommended that pregnant women undergo prenatal diagnosis for chromosomal anomalies and fetal abnormalities at an earlier stage of pregnancy, preferably at a municipal maternity and child centre. Chromosomal abnormalities and fetal deformities are identified during

the early stages of pregnancy, and the termination of the pregnancy is carried out as soon as feasible (Zhu et al., 2021).

Conclusion and Future Perspective

A high-risk pregnancy is a prevalent condition in maternal clinics, posing significant risks to both the fetus and the mother. Managers overseeing high-risk pregnancies should consistently assess the current status of such pregnancies, identify issues in their management, and suggest measures for improvement to address any shortcomings in their efforts to meet the evolving demands of maternal healthcare. The management of high-risk pregnancy is the focus and difficulty of maternal health care, and timely and effective screening of pregnant women and health education and management of pregnancy knowledge has a direct impact on the prognosis of pregnant women and perinatal infants. Active interventions and close monitoring during pregnancy are of great significance in ensuring the safety of mothers and infants in high-risk pregnancies and reducing maternal and perinatal mortality. Therefore, it is essential to implement prenatal screening and monitoring of high-risk pregnancies and pregnancy health tracking, improve the effect of maternal self-monitoring, implement the hierarchical management system, make full use of the Internet medical model, provide online and offline integrated health care services, improve the quality of management of high-risk pregnancies, and enhance the rescue and treatment capacity of patients with acute and severe diseases, to guarantee the safety of mothers and newborns. Ensuring the health and safety of mothers and newborns is an integral part of the current and future work of mothers and children.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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