Chapter 3
A Review of Pre-Pregnancy Health Risk Assessment in Women: Current Practices and Emerging Trends

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ABSTRACT

Pre-pregnancy health assessment is crucial for identifying and managing risk factors affecting maternal and fetal health. This paper reviews traditional approaches like routine medical exams, lifestyle evaluations, and basic health metrics, noting their limitations in precision and personalization, especially for diverse populations. To bridge these gaps, the paper explores advanced methods such as artificial intelligence (AI), soft computing, genetic profiling, and wearable technologies. AI-driven models and techniques like fuzzy logic show potential in improving predictive accuracy,

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while wearable devices enable real-time health monitoring for proactive care. The paper underscores the need for a holistic, personalized risk assessment framework integrating various health metrics, advocating for interdisciplinary collaboration to enhance outcomes in maternal and infant health, and providing a foundation for researchers and clinicians to advance pre-pregnancy care.

1. INTRODUCTION

In recent years, pre-pregnancy health assessment has become very popular as it is essential in identifying and avoiding risks that could negatively affect maternal and fetal outcomes (Puri et al., 2024). A pre-pregnancy assessment examines a woman's readiness for pregnancy by assessing her general health status, lifestyle, genetic predisposition, and environmental exposure before conception to find and eliminate risk factors early. This type of assessment provides a safe and supportive physiological environment for the mother and fetal during pregnancy, thereby increasing the probability of a favourable outcome. These evaluations were and continue to be necessary, as we are learning that pregnancy health is not limited to gestation but starts before conception with the health and lifestyle of the woman. The proactive nature of this approach promotes a comprehensive risk mitigation strategy, especially within a healthcare environment that is moving towards disease prevention (Raihen & Akter, 2024).

Early identification of risk factors in pre-pregnancy stages can significantly reduce the incidence of pregnancy complications. Other studies have shown that uncontrolled or undiagnosed health problems, including hypertension, diabetes, obesity, and malnutrition, can result in adverse pregnancy outcomes, including preterm birth, low birth weight, pre-eclampsia and gestational diabetes (Thakkar et al., 2024). Additionally, lifestyle factors, including smoking, alcohol consumption, and high stress, are also shown to affect not only maternal health but also fetal development. The pre-pregnancy health assessment offers an opportunity to identify these risks and potential interventions to avoid or prevent complications during pregnancy. Healthcare providers are thus early to identify risk factors and offer recommendations such as lifestyle changes, medical treatments or more advanced therapies to pave the way for a healthy pregnancy with decreased maternal morbidity and mortality (Panda & Sharma, 2024).

Early identification of risk factors in pre-pregnancy stages can reduce the incidence of pregnancy complications to a great extent. Studies have found that many health problems, like hypertension, diabetes, obesity and nutritional deficiencies, if not discovered or hounded during pregnancy, can lead to adverse pregnancy outcomes, including preterm births, low birth weight, pre-eclampsia and gestational diabetes