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Models of Maternal Behavior and Suggested Health Service Program Interventions for Prevention of High-Risk Pregnancy: A Systematic Literature Review

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Abstract. 'Baby steps' health interventions are scheduled in stages to improve birth outcomes. This intervention focuses on preventing high-risk pregnancies, including preventing excessive gestational weight gain (GWG) because it can cause risk of complications including maternal and child obesity and the risk of neural tube defects (NTD) in the fetus and etc. Objective: This study is to examine more deeply how the mother's behavior model and health service program interventions are recommended to increase the prevention of high-risk pregnancies. Methods: This systematic review was written based on PRISMA guidelines through three electronic databases, namely PubMed, Springer, and ScienceDirect with keywords of maternal behavior, high-risk pregnancy prevention and clinical trials and include 9 articles to be analyzed. Results: Cognitive health schemes related to perspectives that shape maternal behavior include believing that pregnancy is a 'fail safe' system where the baby in the womb will be fine, regardless of the mother's health. Therefore, the behavior that often occurs among the community is low prevention of obesity, low consumption of sufficient folic acid, wrong diet patterns, inadequate physical activity, stress, alcohol use and smoking. High-risk pregnancy prevention program interventions must be comprehensive and use intensive evidence-based data management. Conclusion: Low obesity prevention behavior, low consumption of sufficient folic acid, wrong dietary patterns, inadequate physical activity, stress, alcohol use and smoking can be overcome by implementing an intensive weight management program equipped with SMS reminders of a healthy lifestyle and education regarding the importance of intervention programs to prevent high-risk pregnancies.

Keywords: maternal behavior; high-risk pregnancy prevention; clinical trial

INTRODUCTION

Currently, 'baby steps' health interventions are scheduled in stages to improve birth outcomes. This intervention focuses on preventing high-risk pregnancies including excessive gestational weight gain (GWG) because it is linked to a number of complications including gestational hypertension, gestational diabetes mellitus, and caesarean section. Excessive GWG and pre-pregnancy obesity also have a possibility of causing obesity over time due to both mother and newborn child (Murray et al., 2022) . Ironically, although obesity rates have historically remained at high levels, there haven't been many studies on how to avoid obesity during pregnancy and after delivery. Most health programs have an individual outreach and are not a public health clinical policy context (Blake et al., 2020) .

This condition, which is connected to gestational diabetes mellitus (GDM), is a frequent pregnancy issue when hyperglycemia occurs and poses a serious threat to the health of both mother and child. The International Diabetes Federation (IDF) states that type 2 diabetes mellitus can appear in women with GDM five to ten years after giving birth. Exposure to hyperglycemia in the mother's womb also causes obesity in the fetus which is ultimately associated with the risk of type 2 diabetes mellitus (Sadiya et al., 2022) . His significant cases make healthy lifestyle interventions always being developed. This is related to the suppression of the expression of the melatonin receptor gene variant 1B (MTNR1B) which is a precursor to an increased risk of GDM or type 2 diabetes (Van et al., 2022).

Another case that often occurs due to low interventions to prevent high-risk pregnancies is preterm birth before 37 weeks' gestation (Zhu et al., 2021) . Unfortunately, infants who survive preterm birth are also likely to experience a variety of adverse neurodevelopmental and cardiometabolic symptoms that ultimately lead to premature death. Given that preterm delivery occurs in women with no recognized risk factors, the requirement for early detection amongst all pregnant women is becoming more essential. These factors include being associated with obesity, wrong dietary patterns, inadequate physical activity, stress, alcohol use and smoking (Kong et al., 2019; Raghavan et al., 2019; Hebert

& Sarche, 2021; Kennedy et al . , 2022). Not all women of reproductive age reach red blood cell folate level which complies with the WHO requirement of 906 nmol/L, and folic acid health measures to reduce the risk of neural tube defects (NTD) are not implemented to their full potential. Actually, if NTD has any consequences, it will result in modest physical and mental disabilities comparable to weakness, cognitive morbidity, and fetal mortality (Murphy et al., 2021; Rose et al., 2021) .

Thus, high-risk pregnancy prevention health interventions require comprehensive services to educate accurate counseling guidelines (Murray et al., 2019). Preterm birth prevention measures must consider a variety of variables through multifaceted lifestyle changes and interdisciplinary treatment. Because there are still numerous pregnancy risk factors that may be changed in time throughout pregnancy, preconception or early pregnancy preventive methods are more likely to be effective for health interventions than mid or late pregnancy (Zhu et al., 2021) . However, in its application, high-risk pregnancy prevention interventions still depend on cognitive health schemes related to perspectives that shape different behaviors according to each individual's understanding and health interests (Greenberg, 2019). Therefore, writing this article aims to examine more deeply how models of maternal behavior and recommended health service program interventions to improve public health, especially preventing high-risk pregnancies.

METHODS

This systematic review was written based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) standars.

Eligibility Criteria

This study review is based on research articles related to maternal behavior, high-risk pregnancy prevention and clinical trials are in progress. The population and sample criteria in this study are women and pregnant women.

Search Strategy

An article search was conducted in April 2023, through electronic databases namely PubMed, Springer and ScienceDirect. The publication timeframe chosen was 2016 – 2023. The search used keywords related to maternal behavior, high-risk prevention pregnancy and clinical trials, provided that they were in English. The following keywords were used in searching all the databases mentioned above: “Maternal Behavior” AND “High-Risk Prevention Pregnancy” AND “Clinical Trial”.

Article selection

The articles obtained are then selected based on their relevance to the time span and the keywords used are related maternal behavior, high-risk pregnancy prevention and clinical trials. The article selection process was based on several criteria, namely the publication period of 5 years (2019-2023), using English, research articles, full text, medicine & public health, maternal & child health, pediatrics, and those related to nursing & health professions. From the three databases, after going through the initial selection process, 44 articles were obtained (5 articles from PubMed, 18 articles from Springer, and 21 from ScienceDirect). Then the 44 articles will be re-selected based on their relevance to the objectives of this study, by reading the titles and abstracts of each article from the three databases. So that the final results obtained as many as 9 articles to be analyzed (Figure **1**).

Data extraction

The selected articles are then analyzed, the relevant information will be extracted. Relevant information includes study, year, title, method, and research results. The results obtained will then be reviewed in relation to maternal behavior, high-risk pregnancy prevention and clinical trials.

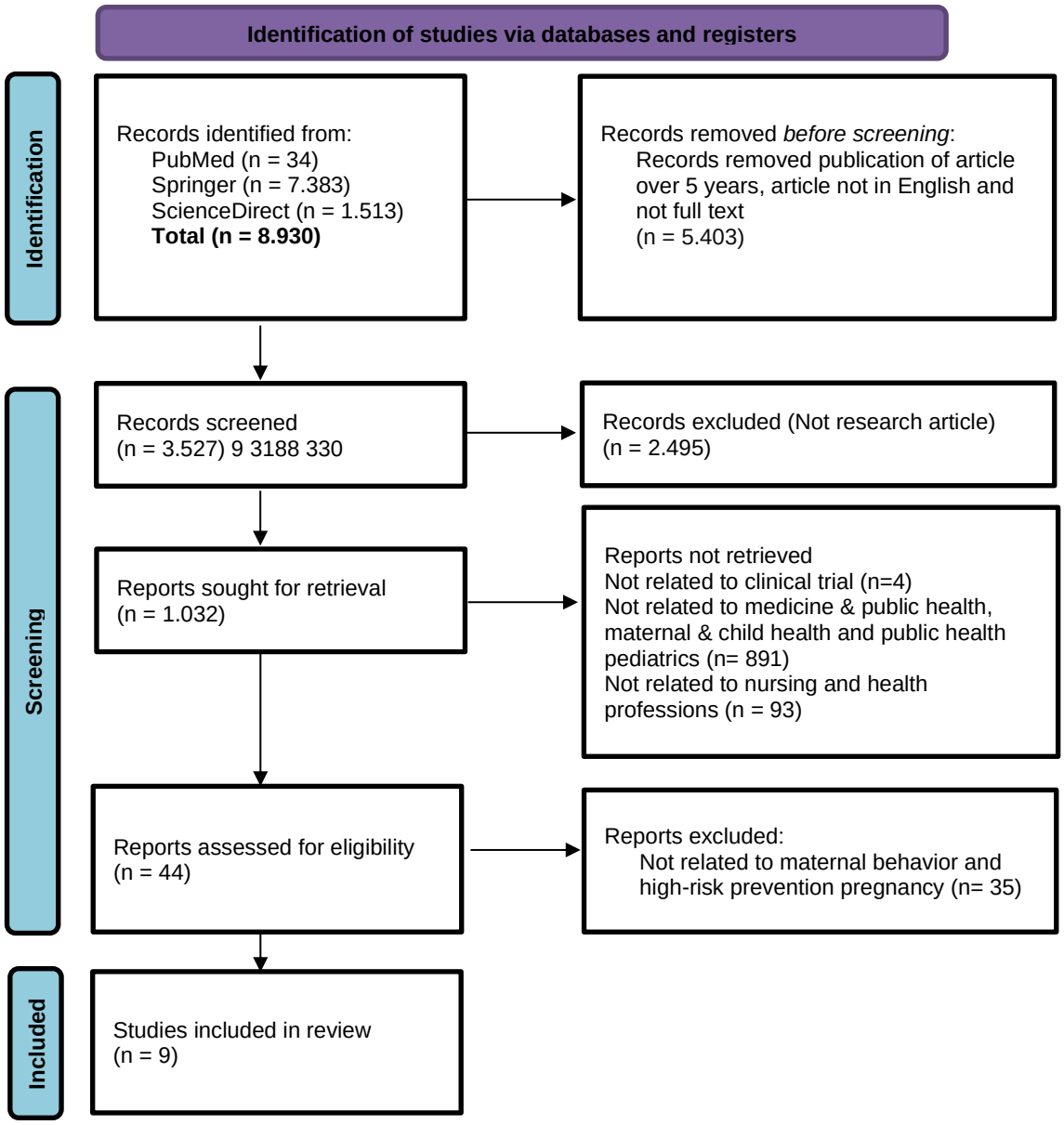

Figure 1. Study Selection Process

RESULTS AND DISCUSSION

Sadiya et al (2022) stated that the First 1,000 Days Program is effective in reducing excess weight during the prenatal period using intervention multi-component system level. First 1,000 Days implementation should be complemented by more intensive, evidence-based weight data management. Later on, Blake at al (2020) recommended diet is consumption of foods high in fiber (vegetables/fruits) low glycemic index fruits, nuts, and seeds), as well as reducing refined carbohydrates (sugar, juice). These suggestions suit the Mediterranean diet. The application of the Mediterranean diet is balanced with increased physical activity in pregnant women to reduce the possibility of developing Gestational diabetes mellitus.

The interconnection scheme highlights that unhealthy decisions or actions are considered only affects the mother's health (Murray et al, 2022). Public health education regarding the importance of paying attention to GWG (gestational weight gain) during pregnancy. Women who identify as American Indian or Alaska Native typically consume more alcohol than non-Hispanic White women. Public health education to reduce alcohol consumption because of the high risk of causing bad pregnancies (Hebert et al, 2021).

From the results of the interventions carried out, smoking cessation in pregnant women has a

statistically significant result between birth weight and age pregnancy is higher than those who are still actively smoking. The promotion of public health programs in a controlled manner directly by health services is complemented by the sending of SMS to immediately reduce smoking during pregnancy (Kennedy et al, 2022). Meanwhile, High-dose folic acid supplementation in early pregnancy increases maternal serum folate but does not increase red blood cell folate concentrations. High-dose folic acid supplementation showed that this dose is supraphysiological but without changes in 1-carbon metabolism / without any effect changes. The use of folic acid supplementation should follow the recommended dosage (Murphy et al, 2021).

The risk of GDM (gestational diabetes) rises in women who are homozygous in carrying the MTNR1B risk allele rs10830962, and more physical activity interventions more beneficial than healthy eating interventions to reduce resistance cord blood leptin, cord blood C-peptide, and maternal insulin. Increased physical activity is recommended to be done to prevent gestational diabetes, type 2 diabetes mellitus for mother and child, obesity, and fetal overgrowth (Van et al 2022). Women who give birth to premature babies are influenced by the following factors: older, were obese before pregnancy, and/or hypertension, and history of premature birth and depression Zu et al, 2021). The majority of participants in these pregnancies weren't eating enough folate during their pregnancies to meet recommendations. Nevertheless, the majority of prenatal vitamins include 1000 µg of folic acid, exceeding the advised amount while still being able to be tolerated by the body. Modification of prenatal supplement formulations to ensure that intake of folic acid is not exceeded (Rose et al, 2021).

High-risk pregnancies stem from bad lifestyles such as wrong eating patterns that cause obesity, smoking, alcohol use and others. Studies have shown that interventions can be linked to comprehensive approaches such as a quality diet, increased physical activity, and weight loss for the overweight so as to address lifestyle-related risk factors. Therefore, expanding the literature and exploring maternal behavior and preventing high-risk pregnancies is needed to become a reference for a better lifestyle (Zhu et al., 2021).

CONCLUSION

Maternal behavior that causes high-risk pregnancies includes low prevention of obesity, low consumption of sufficient folic acid, wrong diet patterns, inadequate physical activity, stress, alcohol use and smoking. This is related to their perspective that pregnancy is a 'fail safe' system where the baby in the womb will be fine, regardless of the mother's health. Another belief, with being overweight, is that they believe that it is genetic and they feel it is inherited and that their weight is entirely out of their own hands. They claim that weight shouldn't be more of a concern during pregnant. Therefore, the recommended health interventions include implementing the First 1,000 Days equipped with intensive evidence-based weight data management; the adoption of the Mediterranean diet is balanced by increased physical activity in pregnant women; intensifying e-ducation related to the importance of paying attention to GWG (gestational weight gain), the importance of consuming folic acid in the right dose, the importance of reducing alcohol and smoking consumption, the importance of increasing physical activity during pregnancy, and the importance of good stress management to reduce premature birth rates. This intervention can be complemented by sending regular SMS to patients as a reminder to adopt a healthy lifestyle.

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