



Scoping Review of Behavioral Changes in Pregnant Mothers

¹Nisser ALhroub, ²Ishraq Saraihe, RN, ³Muamar Aldalaeen, ⁴Mohammad AL-Bashtawy, ⁵Abdullah ALKhawaldeh, RN,

¹Faculty of Nursing, Jerash university, Jerash, Jordan

²BSN, MPH, Lecturer at College of Nursing in Jerash University, Jordan Degree: BSN (Bachelor of Science in Nursing), MPH (Master of Public Health)

³Assistant Professor, faculty of nursing, Philadelphia university

⁴RN, PhD Professor, princess Salma Faculty of Nursing, AL-Bayt University, Mafrag, Jordan

⁵PhD Associate Professor, Princess Salma faculty of Nursing, AL-Bayt University, Mafrag, Jordan

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ABSTRACT:

During pregnancy, a woman's body, mind, and social life all change drastically. For healthcare providers to provide effective assistance and guidance, they need to understand what factors affect behavior change during pregnancy. **Aim:** The aim of this study was to provide an overview of the effectiveness of behavior modification programs currently used during pregnancy. **Methods:** A scoping review was carried out. This covered Intervention studies, RCT studies, Systematic studies published from (May 2020) to (May 2023) in English which included behavioral change programs during pregnancy. A bibliographic search was made A search of three databases (PubMed, Google Scholar, and Cochrane) in order to locate relevant papers for the investigation. Each article's author(s), publication year, study location, study design, study objective, number of participants in the intervention and control groups, results, and conclusions were extracted and analyzed. Findings: As a result, the scoping review comprised ten investigations. According to the studies being considered, treatments emphasizing changes in a pregnant woman's lifestyle and behavior have the potential to improve her health. More research is needed to assess the efficacy of these interventions and to develop comprehensive, fact-based programs to encourage healthy behaviors during pregnancy. **Conclusions:** According to the studies being considered, treatments emphasizing changes in a pregnant woman's lifestyle and behavior have the potential to improve her health. More research is needed to assess the efficacy of these interventions and to develop comprehensive, fact-based programs to encourage healthy behaviors during pregnancy.

Behavioral Changes in Expectant Mothers

A woman's life is transformed throughout pregnancy, undergoing physical, emotional, and social changes. Healthcare providers must be aware of the factors that influence behavior change during pregnancy to offer the right support and advice. Dietary adjustments, increased physical activity, quitting smoking, and avoiding secondhand smoke are all typical behavioural changes during pregnancy. Healthcare practitioners should remove these obstacles by offering tools, information, and emotional support that are sensitive to cultural differences (Kovac, 2020).

The promotion of mother and fetal health during pregnancy depends heavily on behavior modification strategies. These interventions have typically centered on informing and counseling expectant mothers, frequently in a directed manner. Recent developments in healthcare and

research, however, have highlighted the significance of including empowerment elements that enable autonomy and woman-led decision-making. These programs are designed to provide pregnant women the power to take control of their behavior, make informed decisions, and take responsibility for their health during this life-changing time (Vanstone et al., 2020)

Empowerment-based behavior modification therapies focus on recognizing pregnant women as active participants in their own care when used in the context of pregnancy. These interventions promote a sense of autonomy and self-efficacy by recognizing the particular needs, preferences, and goals of each individual women. These treatments are intended to increase engagement, motivation, and the possibility of long-lasting behavior change by including pregnant women in decision-making



processes and respecting their choices (Staneva et al., 2019).

Behavioral modification programs for pregnant women frequently include empowerment components that cover a few essential components. First and foremost, a vital component is shared decision-making, in which healthcare professionals work with expectant women to examine and talk about potential options while respecting their values and goals and giving evidence-based information. With the help of this strategy, expectant women can make decisions that are in line with their own needs, values, and preferences (Politi et al., 2017). Another crucial element of empowerment-based therapies is goal-setting. Instead of recommending particular activities, these interventions concentrate on assisting a group's goal-setting process. Women who are expecting are urged to set their own behavior modification objectives based on their particular requirements and preferences. Pregnant women who adopt this strategy actively pursue their goals and are more motivated and accountable for doing so (Dumas et al., 2019).

Provision of education and information is also crucial in interventions with an empowerment focus. The focus is instead on giving pregnant women thorough, unbiased, and evidence-based information so they may decide for themselves what actions to take and how to care for themselves. This include clarifying any misunderstandings, going over potential dangers and advantages, and assisting women in understanding their options (Fallon et al., 2021). Importantly, empowerment-based therapies acknowledge the importance of social support and the facilitatory function of the healthcare professional. Healthcare professionals can encourage trust, open communication, and meaningful interaction with pregnant women by establishing a welcoming and judgment-free environment. This strategy promotes conversation, involvement, and the growth of a cooperative relationship, ultimately enabling women to make choices that are in line with their needs and values (Barimani, & Oxelmark, 2021).

To encourage autonomy and woman-led decision-making, contemporary behavior modification therapies for pregnant women are increasingly adding empowering components. These interventions stress the value of involving expectant women in decision-making, encouraging shared decision-making, team goal setting, and offering thorough and objective information. These treatments have the potential to increase engagement, motivation, and ultimately improve maternal and fetal health outcomes by allowing

pregnant women to actively participate in influencing their behaviors and care (Jones et al., 2020).

The main objective of this scoping review is to provide an overview of the effectiveness of behavior modification programs currently used during pregnancy.

Rational For the Review:

The rationale for conducting a scoping review on the elements of the Behavior Change Wheel addressed in intervention programs is to provide a comprehensive overview and understanding of the existing literature in this area. It aims to identify and describe the specific elements of the Behavior Change Wheel that are addressed in different intervention programs, understand the effectiveness of the interventions (Goldstein et al., 2017), identify gaps and trends (Van Dijk et al., 2016), and inform future research and practice (Saffari et al., 2015). The review can also identify emerging trends and patterns in terms of the types of interventions being implemented, the populations targeted, and the outcomes assessed.

Significance:

The study's prospective contributions to the field of behavior modification treatments and pregnancy outcomes for maternal health are what make it significant. This study offers a thorough assessment of the existing literature, identifies the gaps and trends in this field, and conducts a scoping analysis to determine the components of the Behavior Change Wheel addressed in intervention programs (Kovac, 2020).

Healthcare practitioners, policymakers, and academics must comprehend how well lifestyle and behavior change interventions can improve maternal health outcomes (Dumas et al., 2019). The results of previous study suggest that such treatments may improve mother health outcomes and promote healthy behaviors throughout pregnancy. This information can assist in the creation and execution of tailored initiatives to encourage pregnant women to adopt healthy habits and achieve optimal outcomes for both mothers and infants.

In addition, the study's discovery of knowledge gaps and new trends might direct future study and practice. This study advances knowledge and evidence-based treatments in the area of maternal health by highlighting the areas that require more research. Additionally, it emphasizes how crucial it is to take into account behavior change techniques and the Behavior Change Wheel framework when creating successful interventions for encouraging healthy habits during pregnancy (Barimani, & Oxelmark, 2021).



The value of this study ultimately resides in its potential to guide future research, clinical practice, and policy initiatives focused at enhancing maternal health outcomes and encouraging healthy habits in expectant women. This study can help to direct the development of specific interventions and contribute to the general wellbeing of pregnant women and their unborn children by synthesizing the available data and identifying knowledge gaps (Kovac, 2020).

Objective:

The major goal of this scoping review are to provide an overview of the effectiveness of behavior modification programs currently used during pregnancy.

Methods

A comprehensive scoping review was carried out in order to completely map the extensive variety of behavioral changes that occur during pregnancy and to identify all of the potential obstacles that pregnant women face when attempting to change their behavior. The end goal was to give pregnant women more agency so that they could make their own decisions. The review ensured the highest level of rigor in the process by including a PRISMA flow chart; it also adhered to the best practice principles provided by best practice standards; and it followed the rules established by Arksey and O'Malley (2005) for scope review methodology in a stringent manner.

Search Strategies

In May of 2023, a search was conducted through the online databases PubMed, Google Scholar, and Cochrane in order to locate papers that were pertinent to the investigation. According to the Cochrane database, the following words were used as search terms: intervention OR program OR training or session or education AND behavior change OR behavior change and maternity OR pregnant, NOT behavioral change programs during pregnancy for women with mental health disorders. Regarding to the PubMed database, the following words were used as search terms: "Behavioral change programs during pregnancy". Regarding to the google scholar database, the following words were used as search terms: "behavior change" during pregnancy: Intervention The scope of the search was narrowed to just include titles, abstracts and key words within the following characteristics: Intervention studies, RCT studies, Systematic studies published from (May 2020) to (May 2023), under the topic of pregnancy & child birth.

Inclusion And Exclusion Criteria

To be considered for inclusion, studies must be published in English. Articles that did not address the topic "Behavioral change programs during pregnancy" and did not include the topic in the title or abstract were excluded. Articles about behavioral change programs during pregnancy for women with mental health conditions were excluded because the treatment requirements for women with these conditions were outside the scope of this review. Articles that evaluated the effectiveness of a behavior modification strategy were considered.

Selection Process

The 1 May 2023 review search yielded 137 results. After eliminating duplicate studies, 88 remained. Following a review of the titles and abstracts, fifty studies were omitted because they did not meet the inclusion criteria. Thus, 38 studies were thoroughly evaluated for eligibility; 28 studies were excluded because they did not describe original studies or did not emphasize the efficacy of the observed interventions. Therefore, 10 investigations were included in the scoping review (See Table no. 1 and Figure no.1).

Data Extraction

A review search was conducted, all titles and abstracts were presented, inclusion and exclusion criteria were applied, reasons for inclusion and exclusion were documented, and duplicates were eliminated. Using a PRISMA flowchart, the four phases of the scope review procedure were depicted. Figure 1 depicts the flowchart for the Scope Review. The characteristics of the included studies (n = 10) were extracted and inserted into Table 1. And the summarized data was then examined. Each article's author(s), publication year, study location, study design, study objective, number of participants in the intervention and control groups, results, and conclusions were extracted and analyzed.

Results

It can be inferred from the scoping review that many therapies aimed at altering behavior and lifestyle during pregnancy have been investigated in various research. The therapies that were looked at in the evaluated studies were pedometer-based interventions, motivational interviewing, integrated maternity care services, Smarter Pregnancy programs, and health education interventions.

Overall, the results show that these interventions may have a good effect on pregnant women's health and wellbeing.



Improved eating patterns, greater vegetable consumption, increased self-efficacy in behavior changes and dental health, as well as empowerment to make healthy nutritional changes, are a few of the benefits that have been noticed. It should be highlighted that the therapies' efficacy varied across studies, and further study is required to determine their usefulness on a larger scale.

It is crucial to realize that the examined studies had several drawbacks, such as small sample sizes, a lack of information relevant to the study design, and occasionally insufficient reporting of results. These restrictions

emphasize the need for more thorough research with larger sample numbers, consistent study designs, and thorough results reporting.

In conclusion, the research under consideration indicates that treatments emphasizing changes in a pregnant woman's lifestyle and behavior have the potential to improve her health. To determine the efficacy of these interventions and to create complete, fact-based programs for encouraging healthy lifestyles during pregnancy, more study is nonetheless required.

Table 1. *Summary of selected studies*

Reference& Country	Study Type	Total number of participants (Intervention/Control)	Aim	Main Findings	Conclusion
Goldstein et al. (2021) Australia	An explanatory sequential mixed methods study design	49 women who attended the Healthy Pregnancy Service either completed questionnaire 1 or questionnaire 2 or both. Furthermore, fourteen women were interviewed.	The study aimed to explore women's experiences and perspectives in attending a healthy pregnancy service designed to optimize healthy lifestyle and support recommended gestational weight gain for women with obesity.	Prior to pregnancy, a significant number of women had gained weight and independently attempted to lose weight; they also reported being highly motivated to attain a healthy lifestyle. During pregnancy, dietary changes were reportedly simpler to implement and maintain than physical activity modifications. The level of satisfaction with the service was very high. In qualitative analysis, the following were identified as important factors: service support enabled change; motivation to change behavior; social support; barriers to making change (intrinsic, extrinsic, and clinic-related); and postpartum lifestyle	Women regarded the Healthy Pregnancy service as valuable. Barriers and enablers to the implementation of an integrated model of maternity care that promoted a healthy lifestyle and recommended weight gain during pregnancy were identified. These findings have improved the implementation and expansion of this effective service model, which integrates a healthy lifestyle into the routine prenatal care of obese women.



				and requirements.	
Van Dijk et al. (2020) Netherlands	Single Randomized Control Trial	There were 218 participants in total. The intervention group comprised 91 individuals, while the control group had 86 individuals.	The purpose of this study was to examine compliance and efficacy among women using the Smarter Pregnancy program.	After 24 weeks, the dietary risk score (DRS) of women in the intervention group decreased significantly more than those in the control group. The decrease in DRS was primarily attributable to an increase in vegetable consumption.	The study demonstrated the efficacy of the Smarter Pregnancy lifestyle intervention program in empowering women to make positive nutritional behavior adjustments, particularly with regard to increasing vegetable consumption.
Saffari et al. (2020) Iran	Randomized Control Trial (RCT)	The investigation included 112 Iranian women who were pregnant. The number of participants in the intervention group was unspecified, as was the number of participants in the control group	The purpose of this study was to examine the effectiveness of motivational interviewing (MI) as a behavior-change technique to improve pregnant women's self-efficacy and oral health.	Compared to the control group, the intervention group, which received oral health education using MI, demonstrated significant improvements in oral health behaviors, oral health self-efficacy, and general self-efficacy. In addition, the intervention group demonstrated a reduction in gingival inflammation and tooth decay, as well as an increase in the number of filled teeth.	Health education interventions employing MI techniques may enhance pregnant women's oral health-related self-efficacy and behaviors.



Darvall et al. (2020) Australia	An initial feasibility randomized controlled trial	The study included a total of 30 obese expectant women. Participants were randomly assigned to one of three groups: control (pedometer only), app(pedometer synchronized to patients' personal smartphones with self-monitoring of activity), or app-coach (pedometer plus health coach-delivered behavioral change program).	The purpose of the study was to evaluate a pedometer-based intervention designed to increase physical activity and reduce excessive gestational weight gain (GWG) in obese expectant women	The findings indicated that synching activity data with personal smartphones was feasible in the cohort of obese expectant women. Throughout the duration of the study, there were no significant differences in activity levels between the groups, and mean daily step counts remained in the sedentary or low activity categories. It was determined that compliance with activity data recording and behavioral interventions required refinement.	Although the feasibility of activity data synchronization and participant recruitment and retention rates were satisfactory, the study did not provide sufficient evidence to proceed with a definitive study in its current form. For a follow-up interventional trial targeting GWG reduction and increased activity in obese expectant women, improvements in compliance with activity data recording and behavioral interventions are required.
Balmumcu et al. (2021) Not mention	A pretest-posttest designed, randomized controlled and quasi-experimental intervention research.	50 expectant women participated in the study, with 25 assigned to the intervention group and 25 to the control group.	This study sought to develop and assess the efficacy of a Transtheoretical-Model-based and WhatsApp-text-message-supported smoking cessation program for pregnant women.	60% of pregnant women in the intervention group and 36% of pregnant women in the control group ceased smoking during the final follow-up. It was determined that the Transtheoretical-Model-based and WhatsApp-text-message-supported smoking cessation program was effective in reducing nicotine dependence scores and carbon monoxide levels in pregnant women and in assisting	The study concluded that a smoking cessation program based on the Transtheoretical Model and supported by WhatsApp text messages was effective in reducing smoking rates and nicotine dependence among expectant women.



<p>Ainscough et al. (2020) Ireland</p>	<p>Feasibility Randomized Controlled Trial (RCT)</p>	<p>Total number of participants: 565 expectant women with a body mass index (BMI) between 25 and 39.9 kg/m². The intervention group comprised 278 individuals, whereas the control group comprised 287 individuals.</p>	<p>The purpose of the study was to examine the effect of a behavioral-lifestyle intervention supported by a smartphone app on nutrient consumption, behavioral stage-of-change, and physical activity among expectant women with overweight and obesity.</p>	<p>them to cease smoking. Compared to the control group, the intervention group had superior dietary intakes, including a lower glycemic index, a lower percentage of energy from free sugars, a lower percentage of energy from fat, and a lower sodium intake. The intervention group also had greater levels of physical activity and a greater proportion of participants in the "maintenance" stage of physical activity change. App usage was associated with healthier diets, but not with physical activity.</p>	<p>The behavioral-lifestyle intervention supported by a smartphone app improved dietary intakes, physical activity levels, and exercise motivation among expectant women with obesity and excess weight.</p>
<p>Clavert et al. (2021) United Kingdom</p>	<p>Feasibility Randomized Controlled Trial (RCT)</p>	<p>103 pregnant women were enrolled in the research, and 87 of them completed it. Participants were randomly assigned to either the digital intervention group or the "treatment as usual" group.</p>	<p>The purpose of this study was to collect data needed to design and conduct a large randomized controlled trial (RCT) examining the efficacy of a digital intervention in reducing the risk of congenital cytomegalovirus (CMV) acquisition during pregnancy.</p>	<p>Women in the digital intervention group demonstrated greater CMV knowledge and reported engaging in activities that may increase the risk of CMV transmission less frequently than women in the control group. Pregnant women viewed the digital intervention as highly acceptable. Over the duration of the study, four participants seroconverted, with two from each study group.</p>	<p>The study demonstrates that it is feasible to conduct a large, multi-center RCT on CMV digital intervention in the United Kingdom. The digital educational intervention increased CMV knowledge and resulted in behavior modification that may reduce the risk of CMV acquisition during pregnancy.</p>



<p>Nguyen et al. (2021) Uttar Pradesh, India</p>	<p>Cluster-randomized trial</p>	<p>Total number of attendees: Baseline and terminal cross-sectional studies: The survey included approximately 660 expectant women and 1,800 recently delivered women. Longitudinal study with repeated measures: 400 participants.</p>	<p>The purpose of this study was to compare nutrition-intensified ANC (I-ANC) and standard ANC (S-ANC) in terms of nutrition intervention coverage and maternal nutrition practices.</p>	<p>Women in the I-ANC arm received more nutrition counseling and home visits than those in the S-ANC arm. In the I-ANC arm, both the reception and consumption of iron-folic acid and calcium supplements improved. In the I-ANC arm, exclusive breastfeeding improved, but early initiation of breastfeeding did not. Micronutrient sufficiency and maternal food group consumption remained low in both cohorts. Longitudinal analyses revealed additional effects on the intake of vitamin A-rich foods, other vegetables and fruits, and weight gain during pregnancy.</p>	<p>Despite extant improvements in service coverage, increasing nutrition services in government antenatal care enhanced maternal nutrition practices. Nonetheless, dietary variety, supplement use, and breastfeeding practices remained suboptimal. It is necessary to strengthen the delivery and utilization of maternal nutrition services integrated into antenatal care within the health system in order to achieve greater behavior change.</p>
<p>Musgrave et al. (2023) Not Mention</p>	<p>(Systematic Review and Meta-analysis), Types of studies : RCTs, quasi-RCTs, and cluster-randomized trials</p>	<p>Total number of participants: Seven studies with 3,161 participants were included in the review. Four studies included participants during the interconception interval, while only three focused on women during the preconception period.</p>	<p>The purpose of this review was to synthesize the evidence of the efficacy of mobile phone apps in promoting positive behavior changes in women of</p>	<p>71% of the included studies focused on weight loss as the outcome, whereas nutrition and dietary outcomes, blood pressure outcomes, and biochemical and marker outcomes were evaluated in fewer studies. In comparison to standard care, there</p>	<p>The review of the effectiveness of mobile phone apps in promoting positive behavior changes in women of reproductive age before pregnancy (preconception and interconception</p>



			reproductive age before they become pregnant (preconception and interconception periods), which may enhance future outcomes for mothers and babies.	were no statistically significant differences in energy intake, weight loss, body fat, glycated hemoglobin, total cholesterol, fasting lipid profiles, or blood pressure. Due to the small number of studies and low certainty of the evidence, the review was unable to draw definitive conclusions regarding the effects of mobile phone app interventions on promoting positive behavior changes in women of reproductive age during the preconception and interconception periods.	periods) concluded that due to the limited number of studies and low certainty of the evidence, no definitive conclusions can be drawn regarding the effects of mobile phone app interventions on promoting positive behavior changes during this period.
Khanal Bhattarai et al. (2022) Not Mention	Systematic review include RCTs studies	Total number of attendees: The review comprised nine randomized controlled trials involving 4,681 males.	The purpose of this study was to examine the available evidence regarding the efficacy of Behavior Change Technique (BCT) interventions on smoking cessation outcomes when offered to expectant and new fathers (child 1 year) via individual and/or couple-based interventions.	The majority of BCT interventions aimed at expectant and new fathers were found to be effective in achieving positive cessation rates. Nevertheless, the effects were modest and varied across investigations. Positive outcomes were more probable when gender-specific interventions were implemented. High heterogeneity between studies made it difficult to identify the most effective BCT strategy.	Effectiveness of BCT interventions for smoking cessation among expectant and new fathers is suggested by the review. To ascertain the most effective BCT approach for smoking cessation in this population, additional research is required due to the lack of evidence.

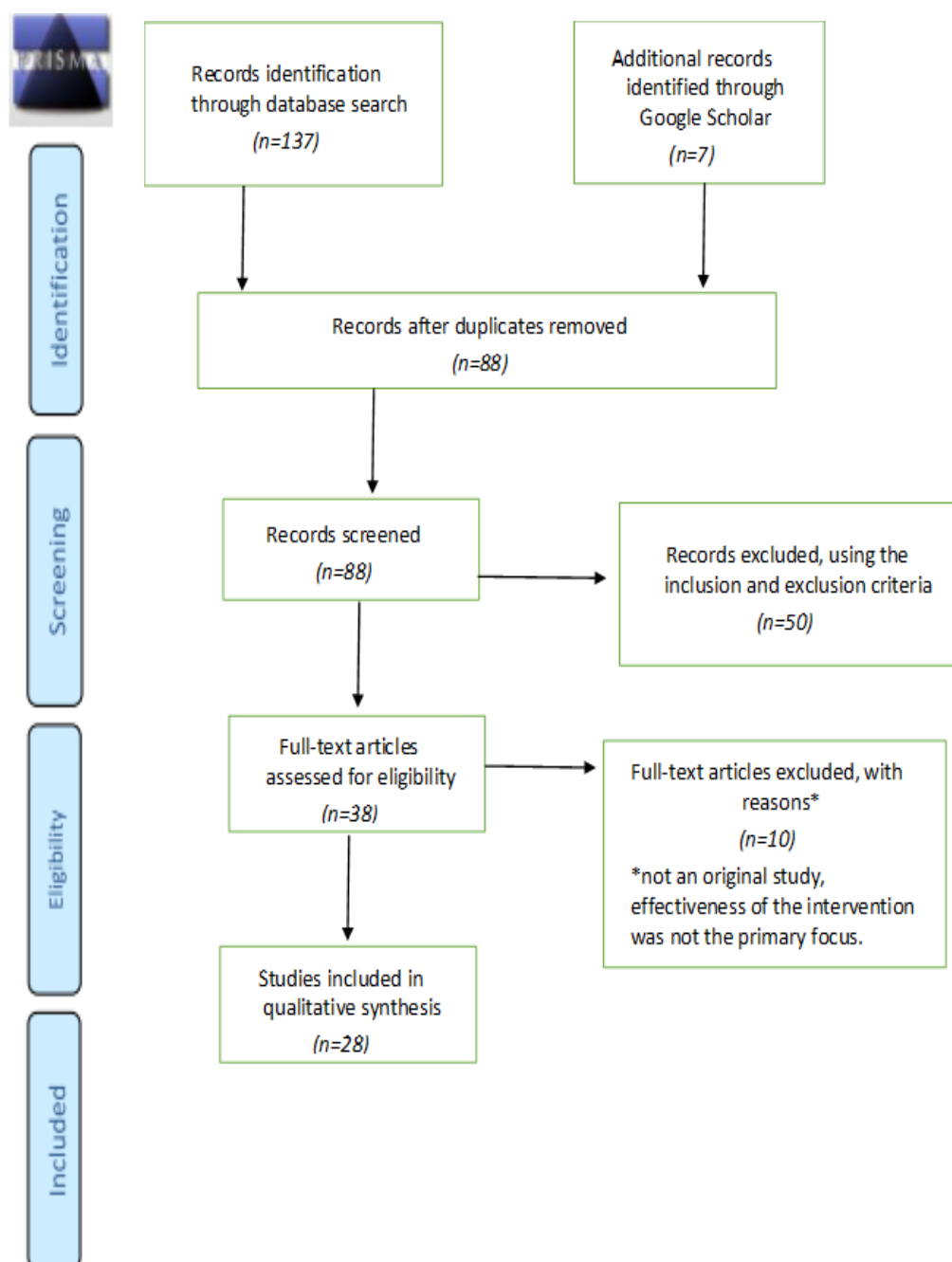


Fig. 1. PRISMA 2009 Flow Diagram

Discussion

The scoping review revealed a diverse range of interventions targeting behavior change during pregnancy. These therapies utilized a few of the Behavior Change Wheel framework's components, such as empowerment-focused tactics, social support, and education. The results imply that lifestyle and behavior change treatments have the potential to enhance maternal health outcomes and

encourage healthy habits throughout pregnancy. Such as the study conducted in Netherlands and Iran in 2020 (Van Dijk et al., 2020; Saffari et al., 2020) which were consistent to a study conducted by Rani, & Joshi, according to the study, supervised exercise is a useful method for increasing physical activity levels and lowering high PPWR in pregnant women (Rani, & Joshi., 2022). In addition to a study conducted in (2020) by Hajian et al.,



which concluded that counseling interventions for healthy living during pregnancy can help overweight pregnant women reduce weight gain, improve food habits, and increase physical activity (Hajian et al., 2020).

One A significant finding from the studies under evaluation was the significance of giving pregnant women thorough and objective information. Positive results have been linked to empowerment-focused programs that stressed well-informed decision-making and open communication between healthcare professionals and pregnant women. Healthcare professionals may support women in making educated decisions about their habits and care by highlighting potential risks and benefits, dispelling common myths, and addressing potential risks and advantages. As shown in a study conducted in UK by Clavert et al. and Musgrave et al., (Clavert et al., 2021; Musgrave et al., 2023). Also, this was consistent with the result of the study conducted by Heinonen, which showed that the future support of parents and the entire family should be viewed as relying heavily on the health promotion and positive health features. A more deliberate salutogenic approach to ANC would produce better outcomes (Heinonen, 2021).

The significance of social support was another significant aspect that was identified in the research under evaluation. It was discovered that building a trusting and nonjudgmental environment where expectant mothers feel heard and understood promotes meaningful engagement. This strategy promoted engaged involvement and group decision-making, which ultimately enabled women to make choices that reflected their beliefs and needs. Consistent to these results a study conducted by Renbarger et al., which concluded that the building of positive relationships with peers and healthcare professionals as well as the acquisition of new knowledge were made possible by social support, which contributed to a favorable prenatal health care experience. The study's conclusions can give medical professionals a framework for reviewing and improving the way they treat pregnant women and other perinatal patients (Renbarger et al., 2021). Another constant study showed that it is beneficial and effective to create a prenatal care education program based on social support and perceived self-efficacy. Making facilities and chances to increase social support and perceived self-efficacy in pregnant women is the responsibility of the health system, family, and society. This will lead to enhanced mother prenatal care (Izadirad et al., 2017). As found in this study, The therapies' efficacy differed among the studies. Some therapies produced

encouraging outcomes, including better eating patterns, greater vegetable consumption, and increased self-efficacy in regard to oral health and behavior changes. It is crucial to remember that the examined studies included flaws such small sample numbers and heterogeneity in study designs that could have impacted the results. Such as finding shown in Van Dijk et al., study, Saffari et al., study and Clavert et al., study (Clavert et al., 2021; Saffari et al., 2020; Van Dijk et al., 2020)

The results of this scoping assessment point to the necessity of additional study to confirm the effectiveness of these therapies on a bigger scale. To produce more reliable information, future studies should think about adopting standardized study designs, greater sample numbers, and rigorous evaluation techniques. To examine the sustainability and long-term impacts of the behavior change therapies during and after pregnancy, long-term follow-up studies are also required. When implementing these solutions into practice, it's also critical to take the context and cultural aspects into account. Since the research under evaluation was carried out in diverse nations, cultural variations may have an impact on the interventions' efficacy and acceptability. Interventions can be made more effective and ensure increased uptake and adherence by being specifically tailored to the requirements and preferences of the target audience. This was consistent with most of the studies mentioned in table no.1. (Clavert et al., 2021; Renbarger et al., 2021; Saffari et al., 2020; & Van Dijk et al., 2020)

The results of this scoping review, in summary, demonstrate the potential of behavior change treatments to enhance pregnancy-related maternal health outcomes. Pregnant women can be empowered by addressing their informational requirements, encouraging collaborative decision-making, and offering social support. To build on these findings and create evidence-based methods that can be successfully applied to promote healthy habits and improve maternal and fetal health outcomes, more study is required.

Strength and Limitation

Strengths of the study: The study used the Behavior Change Wheel framework to analyze and categorize interventions targeting behavior change during pregnancy and identified common themes and patterns across the included studies. It also discussed the implications of the findings for healthcare providers and policymakers.

Limitations of the study: The review included heterogeneous studies, potential publication bias, lack of



quality assessment, limited generalizability, and a lack of long-term outcomes, making it difficult to compare and generalize the findings across studies. Cultural factors and healthcare systems can influence the effectiveness and acceptability of behavior change interventions.

Recommendation

Future studies should compare the effectiveness of various interventions, include diverse populations, include a quality assessment, incorporate mixed methods approaches, conduct cost-effectiveness analyses, and explore the underlying mechanisms through which behavior change outcomes are sustained and long-term effects are produced.

Conclusion

This scoping review found that behavior change interventions for pregnant women are increasingly incorporating empowerment components, such as promoting autonomy, woman-led decision-making, and shared decision-making. The interventions employed a range of techniques, such as motivational interviewing, digital interventions, smartphone apps, and health coaching. However, the findings are limited by small sample sizes, variations in study designs, heterogeneity in outcome measures, and a lack of long-term follow-up. Further research is needed to strengthen the evidence base and determine the most effective interventions.

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