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An Integrative Review of Factors Influencing Preconception Health Behaviors among Women of Reproductive Age: A Health Promotion Model Approach

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ABSTRACT

Background & aim: Despite the recognized significance of preconception health behaviors (PCHBs) in optimizing maternal and child health outcomes, reproductive-age women often lack awareness of preconception health, leading to the practice of unhealthy behaviors before pregnancy. This study aimed to critically analyze and synthesize evidence from published studies regarding the factors influencing PCHBs among women of reproductive age, based on the health promotion model (HPM).

Methods: This integrative review followed the five-step method of Whittemore and Knafl. After problem identification, a literature search was conducted using databases such as ProQuest, PubMed, Cochrane Library, CINAHL, Ovid Medline, and ScienceDirect, searching for qualitative or quantitative articles published between June 2014 and June 2024 on preconception health behaviors among women of reproductive age (15-49 years). The QualSyst assessment tool was used for data evaluation. Data was analyzed and presented using narrative summarization and a constant comparison method.

Results: The initial search resulted in 1,490 studies after the removal of the duplicates. The articles were excluded based on pre-established criteria, and finally, 22 articles were included in this review following a quality appraisal of the full-text selections. The data from the included studies were systematically extracted and synthesized according to the constructs of the HPM. Three overarching categories of influencing factors were identified as individual factors, cognitive factors, and social factors.

Conclusion: The study highlights the significant influence of individual, cognitive, and social factors on PCHBs among women of reproductive age, emphasizing the need for tailored health promotion strategies.

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Introduction

The World Health Organization has issued guidelines declaring that preconception health should be provided to all women of reproductive age and certain behaviors should be practiced

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before conception to maximize health outcomes for both the mother and the infant (1). However, due to limited access to medical care services, poor utilization of reachable services, and lack of awareness regarding health-promoting behaviors (2-3), only 31% of Pakistani reproductive-age women have displayed health-promoting behaviors before pregnancy (4). Similar results were observed among Jordanian, Australian, and American women of reproductive age, as they were less likely to access health services and, due to their limited knowledge about preconception health behaviors (PCHBs), perform risky behaviors compared to women above 25 years old who performed health-promoting behaviors before pregnancy (5-7).

The PCHBs are defined as "adoption of healthy behaviors, such as appropriate nutrition, use of folic acid, physical activity, stress management, and avoidance of risk factors, including smoking before pregnancy by reproductive-age women" (7-8). Due to individual, cognitive, and social issues, reproductive-age women consider practicing preconception health behaviors challenging (2). Several barriers often occurred before pregnancy and were cited as reasons for unhealthy behaviors, including poor knowledge, negative attitude, lack of awareness, low self-efficacy, inadequate social support, and poor intentions, which ultimately lead to negative pregnancy outcomes both for the mother and the infant (4, 9). Specifically designed approaches targeting reproductive-age women were found to be significantly effective as they impact fertility, pregnancy, and future health outcomes. Recent literature on preconception health behaviors (PCHBs) suggests that the most effective approaches to fostering healthy practices before pregnancy are situated at the cognitive level (2). Nevertheless, a comprehensive understanding of preconception health among reproductive-age women is inherently complex and cannot be explained by cognitive aspects alone. To address this, the Health Promotion Model (HPM) provides an appropriate analytical framework, as it integrates individual, cognitive, and social factors, thereby offering a holistic perspective on the determinants that shape women's intentions to engage in healthy behaviors (10). The major essential component of PCHBs is health promotion (7); therefore, the HPM might facilitate the comprehensive ideas of individual, cognitive, and social categories to formulate suitable mediation for women of reproductive age. For instance, increasing reproductive-age women's awareness of HPM-related factors influencing PCHBs will inform them of pre-pregnancy risk factors, persuade them to commit to practicing healthy behaviors before conception, and help them access and utilize available resources (10). Moreover, when women understand the importance of PCHBs, they will set goals, make plans, and assess their capacity to plan and carry out specific health behaviors before pregnancy (8).

Currently, there is a lack of evidence regarding the integrated comprehensive knowledge about preconception health behaviors in reproductive-age women. Employing health promotion perspectives to understand this phenomenon can help design and implement programs to promote healthy behaviors among reproductive-age women before pregnancy. Therefore, this integrative review aimed to critically appraise and summarize the findings of published studies regarding the factors associated with preconception health behaviors among women of reproductive age, based on the health promotion model.

Methods

An integrative review approach was selected as it allows for the inclusion of diverse study designs, offering a comprehensive synthesis of evidence on preconception health behaviors (11). This method was particularly well-suited to the multidimensional nature of the topic, enabling the organization of findings within the Health Promotion Model while also identifying gaps to guide future research and practice (11-12). This integrative review was conducted based on the method developed by Whittemore and Knafl (2005). This method comprises five stages, including problem identification, literature search, data evaluation, data analysis, and presentation (12).

Step one: Problem identification

As mentioned, preconception health behaviors (PCHBs) are essential for promoting optimal maternal and neonatal outcomes. Despite their importance, evidence suggests that reproductive-age women often demonstrate inconsistent engagement in these behaviors, including proper nutrition, supplementation, stress management, and avoidance of risk factors (35). Research indicated that multiple factors—spanning individual characteristics, cognitive processes, and social influences affect the intentions and performance of PCHBs (40). However, the literature was fragmented, with studies employing diverse methodologies and focusing on different determinants, making it difficult to develop a comprehensive understanding. This gap hinders the design of effective health promotion interventions tailored to women of reproductive age. By applying the

Health Promotion Model (HPM) as a guiding framework, this integrative review aimed to systematically identify, categorize, and analyze the factors influencing reproductive-age women's preconception health behaviors across individual, cognitive, and social dimensions, thereby providing a holistic synthesis to inform future research, education, and practice.

Step two: Literature search

Two authors (AF and NS) conducted a search of electronic databases, including ProQuest, PubMed, Cochrane Library, CINAHL, Ovid Medline, and ScienceDirect. The primary search strategy employed a combination of keywords and Medical Subject Headings (MeSH) to identify relevant literature on preconception health behaviors, factors, and study designs (e.g., qualitative, quantitative, and mixed-methods). The search terms included reproductive-age women* factors*, (and/or) experiences*, preconception health*, preconception health behaviors*, pregnancy outcomes*, review*, (and/or) intervention*, qualitative, quantitative, (descriptive, randomized controlled trial [RCT], and quasi*). The studies published between June 2014 and June 2024 were included in the present research to ensure the most current and relevant evidence.

The inclusion criteria were structured using the PECO framework and consisted of:

The population (P) was reproductive-age women (15-49 years), regardless of marital or pregnancy status. Exposures (E) were factors influencing preconception health behaviors (PCHBs), such as nutrition, folic acid supplementation, physical activity, stress management, and avoidance of risk behaviors. Exposures included individual characteristics, cognitive processes, and social/environmental influences, as conceptualized by the Health Promotion Model. Comparison (C) groups, where applicable, included women outside the target age range, women not exposed to preconception health interventions, or differing levels of engagement in PCHBs. In qualitative studies, this may be implicit rather than explicitly defined. Outcome (O) was findings related to PCHBs and factors influencing these behaviors (knowledge, attitudes, intentions, self-efficacy, social support, etc.). Other criteria were publication between June 2014 and June 2024, English language, and Utilization of quantitative, qualitative, or mixed-methods designs, including descriptive studies, randomized controlled trials, quasi-experimental studies, or qualitative research.

Reviews, institutional reports or newsletters, corporate publications, blogs, abstracts delivered in conferences, non-full-text articles, outside the data range, and studies presented as book chapters or entire books were excluded from this review.

The initial search yielded 1,490 research articles. Afterward, the duplicate records were removed (n=515), the titles and abstracts of 975 articles were screened, and 861 articles were excluded based on the exclusion criteria. "Of 114 full-text articles evaluated, 22 met the inclusion criteria. Articles were excluded due to irrelevant population, outcomes, or study design, insufficient methodological quality, or language limitations. Reference management and screening were facilitated using [insert software, e.g., EndNote and Rayyan], which allowed for de-duplication, systematic screening, and organization of study data."

Step three: Data evaluation

Two authors (AF and NS) independently assessed the methodological quality of the included studies using the QualSyst tool (Kmet, Lee, & Cook, 2004; AHFMR version), which provided separate checklists for quantitative (14 items) and qualitative (10 items) research designs. Regarding the scoring system, each item was rated as Yes (2 points), Partial (1 point), or No (0 points), with N/A applied where an item did not pertain to the study design. The total possible scores were 28 for the quantitative studies and 20 for the qualitative studies. A summary score was then calculated as the total obtained score divided by the total possible score, producing a value between 0 and 1. A cut-off score of 0.55 (per Kmet et al.'s guidance) was applied; studies below this threshold were excluded (13).

Step four: Data analysis

The authors (AF & NS) extracted and analyzed 22 articles. Data analysis followed the integrative review approach outlined by Whittemore and Knafl (2005), incorporating systematic processes of data reduction, data display, comparison, and integration. A standardized extraction matrix was used to record key study characteristics (author, year, country, design, sample, quality score, and main findings). Quantitative findings were reduced to effect estimates or summarized according to the direction of association, while qualitative findings were analyzed using an iterative process consistent with the constant comparison method. Each new piece of qualitative evidence was compared with previously coded data to refine categories, identify patterns, and develop sub-themes nested within the Health Promotion Model (HPM) constructs (individual characteristics, cognitive processes, and social

influences). Through this iterative comparison, converging and diverging evidence across studies and designs was identified. Quantitative findings were narratively synthesized, and where meta-analysis was not feasible, vote counting by direction of effect was applied. Finally, evidence from both qualitative and quantitative studies was integrated using a convergent integrated approach, presented in a joint display table (Table 1) and conceptual diagrams (Figure 2), providing a comprehensive synthesis of factors influencing preconception health behaviors among reproductive-age women.

Step five: Data presentation

Data from 22 studies were presented in tables 1, 2, 3 & 4 summarizing study characteristics, quality scores, and synthesized findings were organized thematically according to the Health Promotion Model domains (individual, cognitive, and social factors). A narrative synthesis integrated quantitative and qualitative results, highlighting patterns and relationships among factors influencing preconception health behaviors (Figure 2).

Results

Summary of study characteristics

After the removal of duplicates and based on our inclusion and exclusion criteria in detail, 975 out of 1,490 identified articles were examined, and 114 records were analyzed for eligibility. In conclusion, this review included 22 articles after performing a quality appraisal, as shown in Figure 1. This encompassed 4 qualitative studies and 18 quantitative studies.

Article details

This review was performed on 22 eligible articles published between June 2014 and June 2024, as explained in Tables 1, 2 & 3. The maximum and minimum sample sizes consisted of 39047 (32) and 15 (20) participants, respectively. Moreover, eight studies were conducted in Asia (Pakistan, Iran, Korea, Bangladesh, and India), six studies were conducted in Africa (Ethiopia, Kenya, and South Africa), five studies were conducted in Europe (Portugal, Netherlands, Italy, and the UK), two studies were conducted in the USA, and two studies were conducted in Australia. Furthermore, three out of 22 articles, selected for final analysis, were qualitative descriptive studies (22, 23, 26). It is noteworthy that one article was a phenomenological study (20). Besides, two out of 18 quantitative studies were RCTs (9, 31), while others followed a cohort (29) and a retrospective cross-sectional design (6). The remaining 14 articles were descriptive cross-sectional studies (8, 14, 15, 16, 17, 18, 19, 21, 24, 25, 27, 28, 30, 32).

Findings of this integrative review are liable to address three categories of the health promotion model, namely individual factors, cognitive factors, and social factors. The preconception health behaviors as an outcome are illustrated in Table 4 & Figure 2.

Individual factors

Prior preconception health-related behavior of women of reproductive age

Seeking guidance from healthcare providers before pregnancy, related to the practice of PCHBs, was found to be correlated with the avoidance of unhealthy behaviors. For instance, women with a high body mass index (BMI) received specialized pre-conception and prenatal guidance on body weight, healthy diet, reduced alcohol consumption, and smoking cessation (14). On the contrary, reproductive-age women with normal or low BMI (underweight) received no advice from healthcare professionals. Yet, maintaining a healthy weight is an aspect of maternal health usually neglected by healthcare professionals and researchers (14). Evidence further suggests that women with inadequate stress management before conception are less likely to establish consistent health-promoting behaviors, highlighting the importance of addressing stress management as a determinant of preconception health practices (15).

Education, socio-economic status, and age of reproductive-age women

Women facing financial challenges or possessing a lower level of education were unlikely to change their lifestyle before pregnancy or plan for pregnancy.

It may be beneficial to engage with these reproductive-age women through non-medical channels, such as schools or community organizations (8).

Regarding age, women aged 18-25 years were less aware of the benefit of certain behaviors as compared to older women, and were also less likely to seek information and take folic acid, while they were more likely to smoke three months before conception (6).

Table 1. Summary of Reviewed Studies (N=21)

Sr.no	Author name/ year/ country	Study design	Study objectives	Sample	Data collection method	Main findings	QualSyst score
1	Bye et al., 2016/UK (16)	Cross-sectional study design	To investigate differences in pre-pregnancy and pregnancy healthy lifestyle advice routinely offered by relevant healthcare professionals to women across three different BMI categories, namely underweight, normal, and overweight or obese.	n=1173 pregnant women at any gestation of pregnancy (sample size was determined based on secondary data from three hospitals in London).	A questionnaire was used to complete the survey	Chi-square and t-test were used for analysis. Providing standard lifestyle advice to low/normal BMI women, with high BMI women more likely to receive targeted guidance on BMI and diet.)	20/22 (0.90%)
2	Nascimento et al., 2019/ Portugual (08)	Cross-sectional study design	To identify determinants of preconception preparation among women with planned pregnancies	n=264 women (18-49 years) (sample was obtained from two health centers)	Sampling women planning or undergoing pregnancies at two São Paulo health centers and collecting social, demographic, reproductive, and health data via brief face-to-face interviews.	Chi-square, univariate, and multiple logistic regression were used for analysis. Preconception training was more common among educated, higher-income, and older infertile women, reflecting strong social determinants.	20/22 (0.90%)
3	Shaahmadi et al., 2019/Iran (15)	Cross-sectional study design	To investigate and identify effective factors on PCHBs based on the Pender model	n=240 women (15-49 years), (sample was determined by considering the 95% CI, the power of 80%, and a 10% attrition rate)	The questionnaire was administered for data collection	HPLP-II scores (mean 106.6) linked to prior health behavior; nutrition highest, physical activity lowest; stress management associated with beliefs, prior behavior, situational influences, and action commitment.	19/22 (0.87%)

Sr.no	Author name/ year/ country	Study design	Study objectives	Sample	Data collection method	Main findings	QualSyst score
4	Lang et al., 2023/Australia (06)	Retrospective cross-sectional study design	To explore (1) preconception information or advice accessed on recommended preconception health topics and (2) preferred sources of preconception information amongst pregnant women receiving care through Australian public and private maternity settings.	n=289 women 18 years old	Recruiting women via a public maternity hospital, a private health insurer, and collecting data through an online questionnaire.	Observing that 78% of women accessed preconception health information on weight, diet, and supplements, primarily from health professionals (74%) and the internet (66%), with variable engagement.	18/22 (0.82%)
5	Daly et al., 2022/UK (16)	Cross-sectional survey design	Investigated knowledge and attitudes of women regarding preconception health, and the acceptability of potential intervention methods.	n=4330 women aged 18-48 years.	Seven primary care centers in the West of England posted questionnaires and requested female patients to fill them.	Using univariable and multivariable multilevel regression to show that younger (18–24) and nulligravid women were less aware of folic acid benefits but more interested in preconception health, highlighting the need for targeted awareness and interventions via healthcare professionals, schools, family, and digital media.	21/22 (0.95%)
6	Ngesa et al., 2021/Kenya (17)	Cross-sectional survey design	To identify the utilization of available free health care services related to reproductive health in Kenya	n=394 Women (18-49 years)	Mixed method (questionnaire for women and Focus group discussion for key informants)	Analyzing younger and nulligravid women's lower folic acid awareness but higher interest in preconception health, emphasizing targeted interventions via healthcare, schools, family, and digital media.	19/22 (0.87%)
7	Tesema et al. (2021)/ Ethiopia (18)	Community-based cross-sectional study	To assess the knowledge of preconception healthcare and associated factors	n=522 women of childbearing age	A systematic random sampling technique was applied for the selection of women. Data were collected	Assessing preconception healthcare knowledge at 51.1% in Jinka town, with higher knowledge associated with being a housewife, having a college	20/22 (0.90%)

Sr.no	Author name/ year/ country	Study design	Study objectives	Sample	Data collection method	Main findings	QualSyst score
			among mothers in Jinka town, southern Ethiopia.		using a semi-structured and pretested questionnaire.	education, no history of neonatal death, and use of family planning methods.	
8	Yasmin et al., 2022/Pakistan (19)	Cross-sectional survey design	To assess levels of knowledge of neural tube defects and folic acid use among women attending the gynecology department of District Head Quarters Hospital, Faisalabad, Pakistan.	n=355 married reproductive-age women	Recruiting women from hospitals during pregnancy, infertility, and contraception visits, obtaining consent, and collecting data through questionnaires.	Using the chi-square test to show low awareness of NTDs (85.4%) and folic acid use (76.7%), with knowledge significantly associated with sociodemographic factors, pregnancy characteristics, antenatal care sources, vitamin information, and health decision-making.	17/22 (0.77%)
9	Jack et al., 2020/Africa (09)	RCT	To assess the impact of an embodied conversational agent system on preconception risks among African American and Black women.	n=528 women of 18-34 years age,	Providing intervention participants with a 12-month online agent delivering tailored dialogue on 102 preconception risks using behavior change techniques, while controls received a risk letter advising clinician consultation.	Using intention-to-treat analysis to show intervention participants achieved action or maintenance for 50% of risks versus 42.7% in controls (IRR 1.16, 95% CI 1.07–1.26).	28/28 (100%)
10	Khan et al., 2019/Australia (20)	Phenomenological qualitative design	To explore attitudes, behaviors, and information needs of women during the preconception period in relation to preventive strategies	n=15 reproductive-age women (n=7 preconception, n=7 pregnant, and n=1 postpartum)		Identifying through thematic analysis limited awareness of supplementation, safe foods, exercise, and preconception health checks, with preferences for information from the internet or GPs, and emphasis on diet and physical activity, highlighting the need for broader awareness of preconception health.	20/20 (100%)

Sr.no	Author name/ year/ country	Study design	Study objectives	Sample	Data collection method	Main findings	QualSyst score
11	Goshu et al., 2018/Ethiopia (21)	Community-based cross-sectional survey	To assess awareness of women regarding preconception care and its associated factors in Adet, Northwestern Ethiopia.	n=422 reproductive-age women	A pretested structured questionnaire was filled out via face-to-face interview.	Using logistic regression to show only 15.9% had good awareness of folic acid use, with higher awareness among educated women, family planning users, those with chronic conditions, and higher income.	19/22 (0.87%)
12	Ndou et al., 2023/ South Africa (22)	Qualitative exploratory design	To determine the implementation of preconception care recommendations at health facilities in the selected districts of Limpopo Province and the associated factors	n=29 Professional nurses, and 6 women of childbearing age,	In-depth interviews with the professional nurses and focus group discussions with the WCBA.	Identifying knowledge gaps on PCC among nurses and low awareness among women of childbearing age, emphasizing focus on the preconception period as critical for pregnancy outcomes.	18/20 (0.90%)
13	Okemo et al., 2021/Kenya (23)	Qualitative approach	To qualitatively assess the determinants of PCC in urban and rural settings in Kenya.	n=21 Pregnant women accepted to participate in in-depth interviews. Aged ≥18 years	In-depth interviews were Conducted	Identifying low PCC awareness and attitudes limiting use, emphasizing education and curriculum integration.	17/20 (0.85%)
14	Roudsari et al., 2016/Iran (24)	Cross-sectional survey design	To investigate the patterns and determinants of preconception health behaviors (PCHBs) in women referred to healthcare centers in Mashhad, Iran.	n=80 Married women who had decided to become pregnant (from five health centers)	A self-structured, valid, and reliable questionnaire was administered	Using chi-square and Kruskal-Wallis tests to show most women had PCC records and advice, but low adherence to PCHB guidelines, with only 6.9% exercising regularly and 39.8% correctly using folic acid.	18/22 (0.82%)
15	Maas et al., 2021/Netherlands (25)	Cross-sectional study design	To explore the associations between preconceptional lifestyle behaviors, health beliefs, and pregnancy planning among Dutch pregnant women.	n=1,077 Low-risk pregnant women	Self-administered questionnaire	Using Mann–Whitney U test to show that overweight and obese women had higher odds of adverse pregnancy outcomes, non-use of folic acid increased risk, prenatal use did not, and most women failed to adhere to preconception health behaviors despite planning pregnancy.	22/22 (100%)

Sr.no	Author name/ year/ country	Study design	Study objectives	Sample	Data collection method	Main findings	QualSyst score
16	Shahabuddin et al., 2017/Bangladesh (26)	Prospective qualitative study design	The objective of this study was to explore the healthcare-seeking behavior of women and their experiences related to pregnancy and delivery in Bangladesh.	n=30 Married women	Collecting data from married adolescent women in two phases using in-depth interviews, key informant interviews, and focus groups with family, community, and health stakeholders to triangulate and validate findings.	Analyzing maternal healthcare-seeking behavior of adolescent women using the Social-Ecological Model, showing individual, interpersonal/family, community, and health system factors influenced behaviors, with limited autonomy making family and interpersonal factors particularly important.	19/20 (0.95%)
17	Bahabadi et al. (2020)/Iran (27) .	Descriptive study design	To determine the predictors of health-promoting lifestyles in pregnant women based on Pender's health promotion model constructs	n=300 childbearing age women in their second and third trimesters.	Collecting data using a demographic questionnaire, the HPLP-II, and a questionnaire based on Pender's model constructs.	Showing that a health-promoting lifestyle in pregnant women positively correlates with social support and perceived benefits, negatively with perceived barriers, with regression analysis indicating all three significantly explain lifestyle variance (P<0.05).	21/22 (0.95%)
18	Kim et al., 2022/Korea (28)	Cross-sectional survey design	This study aimed to explore intentions of preventive depression management for a healthy pregnancy among unmarried college students, as well as factors influencing those intentions, by applying the TPB model	n=828 Unmarried college students aged 18-25 were recruited from a National University in Korea from July to September 2019.	Collecting data from July to September 2019 via 15–20-minute online questionnaires emailed to college students, with participants receiving a $3 gift as compensation.	Using chi-square and t-test to show TPB components influenced intention for preventive depression management in men and women, with self-efficacy having the strongest effect and current depression level significant for women only.	22/22 (100%)
19	Din et al., 2022/ USA (29)	Prospective cohort study design	To assess the effect of pregnancy intention on physical activity and smoking behaviors of female adolescent and young	n= 1049 Women aged 18-39years who had completed primary cancer treatment.	Recruiting participants via California and Texas cancer registries, social media, and physician referrals,	Survivors with increased intention measured by 'trying' were associated with increased physical activity over time (adjusted B [95% CI]: 0.3 [0.01, 0.5]), compared to survivors with no	22/22 (100%)

Sr.no	Author name/ year/ country	Study design	Study objectives	Sample	Data collection method	Main findings	QualSyst score
			adult survivors		measuring pregnancy intention through scores capturing wanting/planning and trying dimensions, and assessing changes over time.	changes or decreased 'trying' intention.	
20	Zace et al., 2022/Italy (30)	Cross-sectional study design	To explore the knowledge and attitudes of young women regarding preconception health.	n=377 Women aged 18-25 years	Creating a questionnaire from a systematic review and distributing it via social media and schools/universities to collect data on physical, reproductive, mental health, vaccination, and lifestyle factors.	Using t-test and ANOVA to show 47.5% of participants were unaware of preconception health, 84% had never asked a clinician, 15.9% took folic acid, with knowledge higher among Italians, employed women, and those informed by healthcare professionals, and associated with mental health visits but not GP or gynecologist visits.	19/22 (0.87%)
21	Rimal et al., 2021/India (31)	Randomized controlled trial	To assess whether improvements in social norms related to iron and folic acid consumption are associated with increased iron and folic acid consumption among reproductive-age women	Control (n=2,048) and intervention (n=2,060) arms at baseline and follow-up (n=1966 and n=1987, respectively).	Using a random number generator, authors randomly assigned clusters to either the intervention (50 clusters with 130 villages) or the control (39 clusters with 109 villages) arm. These groups comprised the two arms for intervention delivery.	Using multilinear regression to evaluate a 6-month intervention (Sept 2019–Feb 2020) on descriptive, injunctive, and collective norms and self-reported iron/folic acid intake, collecting baseline and follow-up data from control (n≈2048) and intervention (n≈2060) arms.	28/28 (100%)
22	Madison et al., 2023/US (32)	Cross-sectional study	To assess the impact of rurality and regional residence on preconception health status	n=39047 women (30% women were in the age range of 18-25 years)	Using data from the 2019 Behavioral Risk Factor Surveillance System (BRFSS).	Using univariate and multivariate regression methods, the average preconception health risk index score among participants was 3.5, with higher average scores in rural areas than in urban areas.	19/22 (0.87%)

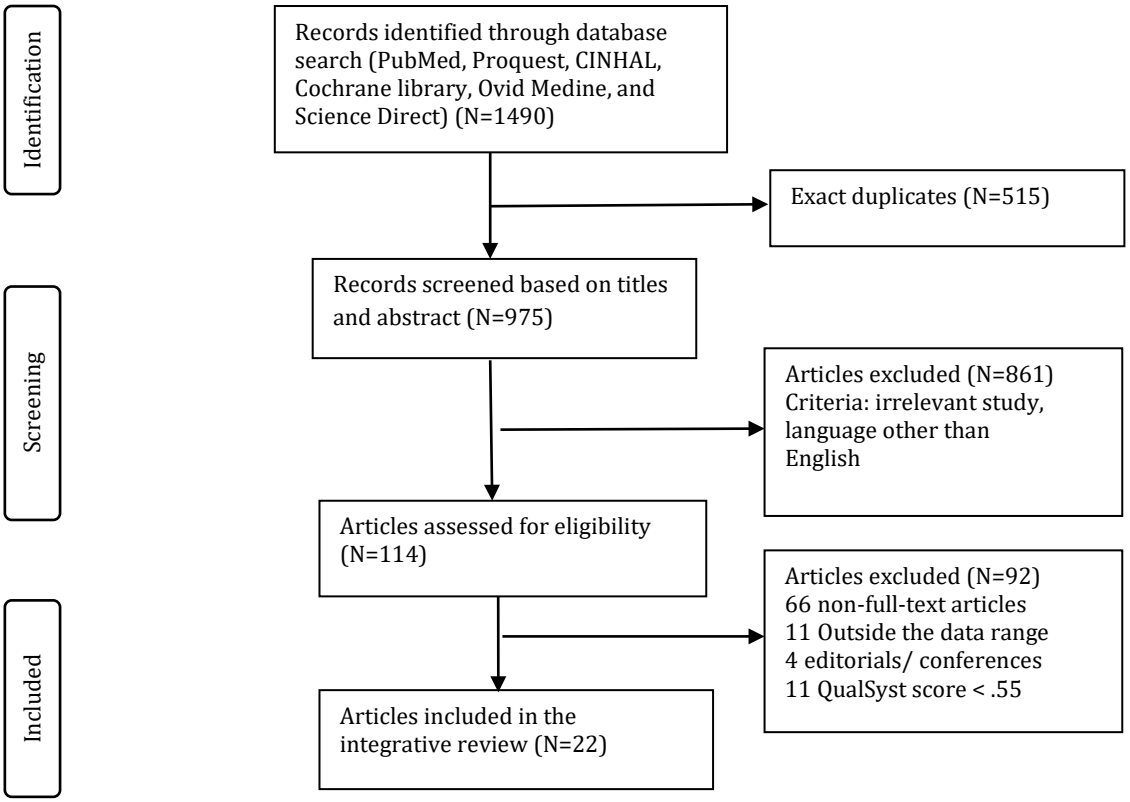

Figure 1. PRISMA 2020 flow diagram of the systematic search strategy

Conversely, young women expressed a keen interest in gaining more knowledge about preconception health, which emphasizes the necessity for greater awareness of overall preconception health and well-being (16).

Cognitive factors

Knowledge, attitude, and awareness related to preconception health behaviors

Tesema et al. (2021) highlighted that the level of knowledge of reproductive-age women regarding PCHBs was the threshold level and contributed to the adoption of unhealthy behaviors before pregnancy, such as a lack of folic acid use (18). Similarly, another study revealed that 85.4% of married women were unaware of neural tube defects, and 76.7% reported that they had no information about folic acid use before pregnancy (19). Also, reproductive-age women were found to have limited awareness regarding preconception folic acid supplementation (21).

Nevertheless, women of reproductive age who adopted healthy behaviors before pregnancy, like folic acid use, a healthy diet, and physical activity, showed positive attitudes towards preconception health (20).

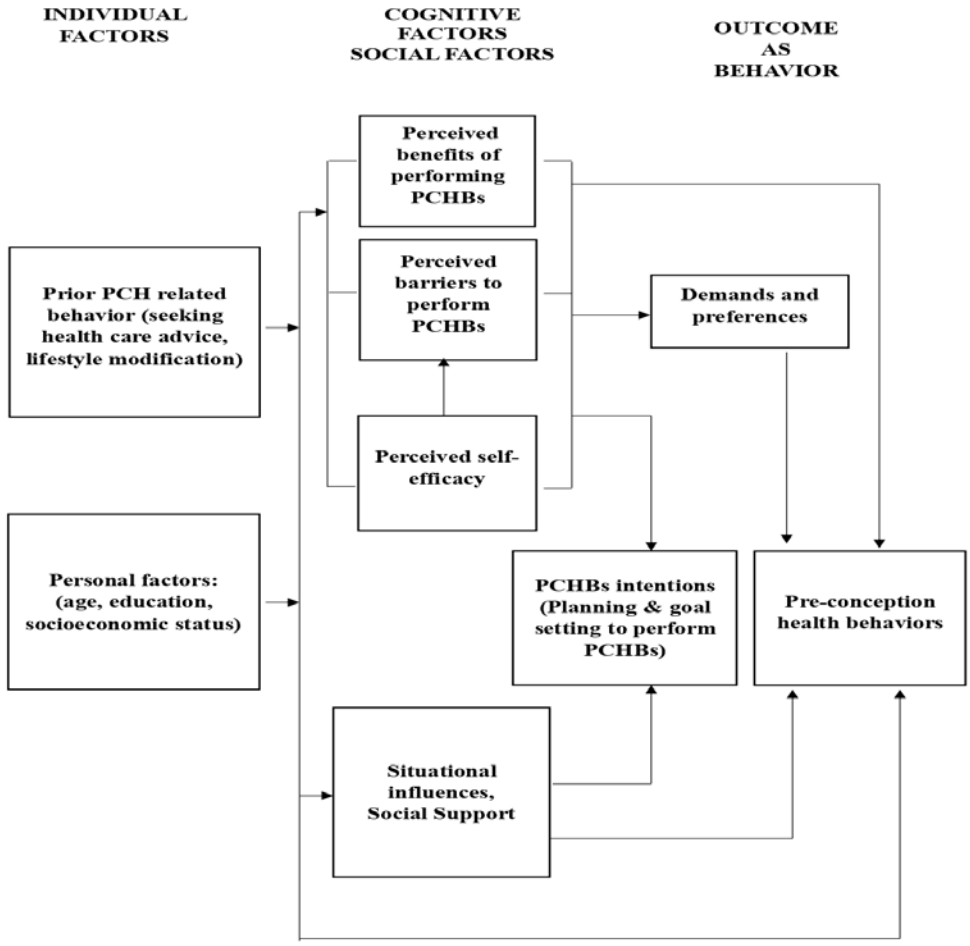

Figure 2: HPM and factors influencing PCHBs among reproductive-age women, figure based upon synthesis of findings from the integrative review, guided by the Health Promotion Model (Pender NJ. *Health Promotion in Nursing Practice*. 3rd ed. Stamford (CT): Appleton & Lange; 1996).

Most importantly, it was found that professional nurses and midwives have a knowledge gap regarding preconception health and care (22). Furthermore, it has been noted that the limited knowledge of reproductive-age women about preconception health, combined with their behaviors related to preconception care and pregnancy, significantly affects its implementation (23).

Perceived benefits of preconception health behaviors

Women who held positive perceptions about engaging in behaviors such as weight management before conception were more likely to adopt these practices, which translated into measurable health gains. Women who perceived limited benefits of weight management were more likely to remain overweight or obese, thereby facing a greater risk of GDM (24). Similarly, women who recognized the benefits of folic acid supplementation demonstrated higher adherence to its use, leading to improved pregnancy and neonatal outcomes (25). These findings underscore how positive perceptions of preconception health behaviors, as part of perceived benefits in the HPM, strongly influence women's intentions and practices, ultimately shaping maternal and child health outcomes.

Perceived barriers to preconception health behaviors

Among reproductive-age women, lack of information regarding sexual health, reproductive health, religious taboos, and socio-cultural norms and practices were significant barriers to preconception health. In this regard, parents of young reproductive-age women thought that early marriage could prevent their daughters from sexual exploitation. Furthermore,

they also have the misconception that a planned pregnancy through contraception may cause infertility (26). The study conducted by Bahabadi et al. (2020) revealed that a healthy lifestyle before pregnancy among women was statistically significant and associated with the perceived barriers (P<0.05), as demonstrated by the findings of regression analysis (27).

Perceived self-efficacy related to preconception health behaviors

Perceived self-efficacy plays a critical role in shaping preconception health behaviors among reproductive-age women. Studies have demonstrated that higher levels of self-efficacy are positively associated with the adoption of health-promoting behaviors such as folic acid supplementation, healthy dietary practices, and regular physical activity. For instance, research indicates that women with greater confidence in their ability to engage in health-promoting behaviors are more likely to adhere to preconception health guidelines (16). In addition, women with a high degree of perceived self-efficacy were likely to be more involved in initiating, planning, and carrying out self-care activities, attempting new health behaviors, or changing the behaviors to which they are accustomed (27). Strategies for increasing self-efficacy were educational interventions, pre-marital counseling, and pregnancy planning among reproductive-age women (27, 29-30)

Intentions of preconception health behaviors

Intentions to engage in PCHBs, such as physical activity, management of stress and depression, were also closely associated with cognitive factors, such as perceived risks and barriers, and perceived self-efficacy. The primary factor influencing the intention to manage stress and depression was perceived self-efficacy (β = 0.34, P < 0.001). This finding has important implications for preconception health, as women with greater confidence in their ability to manage depressive symptoms are more likely to engage in protective behaviors and seek appropriate care before pregnancy. Enhancing self-efficacy for mental health management during the preconception period may therefore play a pivotal role in promoting maternal psychological well-being and reducing adverse pregnancy and neonatal outcomes Furthermore, reproductive-age women with strong intentions were able to prepare for pregnancy in their current circumstances (28). Likewise, an increased pregnancy intention score was associated with greater physical activity (β=0.08; 95% CI: 0.11-1.04) (29).

Identification of preferences of young women regarding preconception health behaviors

Regarding preconception health needs and preferences of women, it was observed that preconception health behaviors were more prevalent among employed women and those who relied on healthcare professionals for preconception information, compared to those who used social media as their primary source (30).

Social Factors

Social support related to preconception health behaviors

Investigation of social factors highlighted that many women were under the influence of family/peers' support, healthcare providers' influence, and were seeking healthy behaviors before pregnancy (17).

For instance, the factor "assistance from someone, like family support, to make a decision" was found to be linked to the high prevalence of practicing preconception health behaviors (P<0.0001, OR=5.236). Shaahmadi et al. (2019) found that social support accounted for 49.3% of the variance in the behaviors of women. They declared that social support fosters health-promoting behaviors as poor interpersonal relationship leads to limited access to or utilization of healthcare services, poor practices of lifestyle behaviors, and, ultimately, negative consequences in the future (15).

Another study indicated the influence of social norms on intentions regarding iron folic acid (IFA) consumption behaviors among women. The norm-based approach indicated that positive shifts in perceived social norms can have a positive effect on the intention of women to consume IFA. It was found that the adoptionof a norm-based approach with consideration of normative aspects leads to positive shifts in social norms and can be an effective strategy for the promotion of IFA consumption among non-pregnant women, provided that other relevant factors also support the behavior (31).

Table 2. Quality assessment score for quantitative studies using (QualSyst assessment tool) (Kemet, Lee & Cook, 2004) (N=22)

Sr. No	Question no	Bye	Nascimento	Shaahmadi	Lang	Daly	Ngesa	Tesema	Yasmin	Jack	Goshu	Roudsari	Mass	Bahabadi	Kim	Din	Zace	Rimal	Madison
1	Question/objective sufficiently described?	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2
2	Is the study design evident and appropriate?	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Method of subject/comparison group selection or source of information/input variables described and appropriate?	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Subject)and comparison group, if applicable (characteristics sufficiently described?	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
5	If interventional and random allocation were possible, were they described?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A
6	If interventional and blinding of investigators was possible, was it reported?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A
7	If interventional and blinding of subjects was possible, was it reported?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A

8	Were the outcome and)if applicable (exposure measure)s (well-defined and robust to measurement/misclassification bias?	2	2	2	2	2	2	2	21	2	2	2	2	2	2	2	2	2	2
9	Means of assessment reported? Was the sample size appropriate?	2	1	1	1	2	1	2	1	2	1	1	2	1	2	2	1	2	2
10	Analytic methods described/justified and appropriately?	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
11	Was some estimate of variance reported for the main results?	2	2	2	2	2	0	1	0	2	2	0	2	2	2	2	2	2	2
12	Controlled for confounding?	0	1	0	0	2	2	1	1	2	0	1	2	2	2	2	0	2	2
13	Results reported in sufficient detail?	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	Conclusions supported by the results?	2	2	2	2	2	2	2	21	2	2	2	2	2	2	2	2	2	2
Total Score		20/22	20/22	19/22	18/22	21/22	19/22	20/22	17/22	28/28	19/22	18/22	22/22	21/22	22/22	22/22	19/22	28/28	22/22

Table S3. Quality assessment score for quantitative studies based on the (QualSyst assessment tool) (Kemet, Lee & Cook, 2004) (N=6)

Sr. no	Questions	Khan	Ndou	Okemo	Shahabuddin
1	Were the questions/objectives sufficiently described?	2	2	2	2
2	Was the study design evident and appropriate?	2	2	2	2
3	Was the context for the study clear?	2	2	2	2
4	Was there a connection to a theoretical framework/wider body of knowledge?	2	0	1	2
5	Was the sampling strategy described, relevant, and justified?	2	2	2	2
6	Were the data collection methods clearly described and systematic?	2	2	2	2
7	Was the data analysis clearly described and systematic?	2	2	2	2
8	Was the verification procedure(s) used to establish credibility?	2	2	1	1
9	Were the conclusions supported by the results?	2	2	2	2
10	Reflexivity of the results	2	2	1	2
	Total Score	**20/20**	**18/20**	**17/20**	**19/20**

Table 4. Factors Influencing PCHBS among Reproductive-Age Women

Categories of Factors	Sub-factors and authors' information influencing PCHBs
Individual Factors related to PCHBs	Prior PCH-related behaviors (14, 15), Education, socio-economic status, and age (6, 8, 16). Knowledge, attitude, and awareness related to PCHBS (18, 19, 20, 21, 22, 23),
Cognitive Factors related to PCHBs	Perceived benefits of PCHBs (24, 25), Perceived barriers to PCHBs (26, 27), Perceived self-efficacy related to PCHBs (16, 17, 29, 30), Intentions of PCHBs (28, 29), Preferences regarding PCHBs (30)
Social Factors related to PCHBs	Social support (15, 17, 31), Situational Influences (32),

Situational influences

Situational influences have a significant impact on the preconception health behaviors (PCHBs) of reproductive-age women. For instance, geographic location determines place-based factors, such as access to transportation, housing, food, and healthcare, all of which can affect maternal health outcomes. Women living in rural areas had more preconception health risks in comparison to the women living in urban areas (32).

Discussion

Preconception health behaviors generally enhance optimal pregnancy outcomes for both mother and infant. An integrated view of preconception behaviors recognizes factors specific to reproductive-age women that may be modifiable for intervention development. Regarding practices of preconception health behaviors by women, many quantitative and qualitative studies have depicted the complexity of several interrelated factors in the health promotion model, comprising individual, cognitive, and social factors (21, 33, 36, 40-41).

Individual factors presented the importance of prior behaviors performed by reproductive-age women to promote preconception health. A statistically significant correlation was observed between the pre-pregnancy healthy behaviors and individual factors. Consistent with the findings of the present study, poor educational status, poverty, and pregnancy at a young age were associated with poor PCHBs. In another study, approximately two-thirds of the early deaths and one-third of the total disease burden in reproductive-age women were associated with limited or no use of available healthcare services (33). Such limited utilization is strongly influenced by low financial status, poor educational status, and younger age. Women living in poverty may face financial barriers that restrict access to healthcare or essential resources needed to maintain healthy behaviors. Poor educational attainment can limit awareness of available services and reduce understanding of the importance of preconception care (33).

Most factors were explained through the "cognitive category", including insufficient knowledge, poor attitude, and awareness regarding preconception behaviors, perceived self-efficacy, social support, and intentions and preferences related to preconception health behaviors. The findings of the present study were consistent with those of several previous

studies and reviews, which emphasized that possessing sufficient knowledge and a positive attitude towards preconception health is particularly beneficial for the health of women of reproductive age and their future infants (34, 42). However, low education levels, poor financial status, and young age were associated with inadequate knowledge and negative attitudes towards preconception health (27).

Likewise, healthcare providers demonstrated limited knowledge and a lack of implementation of interventions and policies related to preconception health behaviors (5). Empirical findings suggested that healthcare services and healthcare professionals should promote knowledge and understanding to raise awareness of PCHBs among women of childbearing age, their families, and communities. Healthcare teams should also emphasize the benefits of various preconception behaviors to promote maternal and child health (30).

Perceived self-efficacy was found to be a proximal and direct predictor of preconception health-promoting behaviors. In this regard, several studies have recommended educational interventions employing different strategies to enhance the self-efficacy of women regarding preconception health behaviors. Additionally, non-medical channels, such as schools, colleges, and universities, have been suggested as effective platforms for delivering preconception health education (36-37).

Although many reproductive-age women are aware of healthy preconception practices, social norms and cultural constraints often prevent them from translating knowledge into action. In this context, social support from family, community, and healthcare providers plays a crucial role in facilitating engagement in preconception health-promoting behaviors. Addressing these social and cultural factors is essential to reduce pregnancy complications, lower maternal mortality, and ensure women remain healthy before, during, and after pregnancy through effective reproductive health practices (36). This underscores that interventions to improve preconception health must target both individual knowledge and the social environment to achieve meaningful behavioral change. Therefore, it can be said that social support provided by family and community for reproductive-age women can enhance their self-efficacy and intentions to engage in preconception health-promoting behaviors, as supported by studies demonstrating that encouragement, guidance, and reinforcement from significant others increase both confidence and adherence to healthy practices (38). Cognitive factors were directly correlated with intentions to perform healthy behaviors before pregnancy, which ultimately led to preconception health behaviors. Intentions, including planning and goal setting, were strongly associated with perceptions and interpersonal influences, such as social norms and social support (31-32).

The strengths of this review include its comprehensive synthesis of both qualitative and quantitative studies and the use of the Health Promotion Model as a framework to systematically categorize findings. By integrating individual, cognitive, social, and cultural determinants, the review provides a nuanced understanding of factors influencing preconception health behaviors. Furthermore, it identifies actionable strategies for healthcare providers and educational institutions, while also highlighting research gaps to inform future studies. This research also faced several limitations, as its conclusions were based on studies performed in different countries with various social scenarios and health systems. Accordingly, the scope of professional practices for the implementation of preconception health behaviors may have differed among reproductive-age women across these different settings. Another limitation of this review was that some included studies were over 10 years old. Changes in healthcare guidelines, educational approaches, and socio-cultural contexts over time may limit the applicability of these findings to current preconception health practices. Consequently, some recommendations or behavioral patterns reported in older studies may not fully reflect contemporary evidence or interventions.

Results of the present review determined several prominent factors influencing preconception health behaviors among reproductive-age women; however, cognitive and social factors were the major contributing factors towards the practice of healthy or unhealthy behaviors before conception. Implications of these findings suggest that healthcare providers, such as nurses and midwives, should take the main responsibility and provide preconception health education to all women, particularly young reproductive-age women, regardless of their intentions or pregnancy status. Findings pointed out that healthcare providers must educate women regarding their preconception healthcare and provide information on health-promoting behaviors, such as the usage of folic acid before pregnancy.

The present review also highlighted the importance of family and societal involvement in

encouraging women of reproductive age to access and utilize available healthcare services. To improve the reproductive health and future outcomes of their pregnancy, it is imperative to understand the needs of reproductive-age women. Cultural barriers and social constraints can be mitigated through the active participation of family and community, helping women plan their pregnancies and perform healthy behaviors during the preconception period.

Further research is needed to focus on factors relevant to preconception health behaviors and design interventions, such as self-efficacy enhancement programs, to improve the intentions of reproductive-age women to perform healthy behaviors and improve the pregnancy outcomes for both themselves and their infants. To better understand the factors influencing preconception behaviors, experimental studies, particularly mixed-method studies, would be highly beneficial.

Conclusion

This integrative review concluded that women of reproductive age are under the influence of many contributing factors that can affect pregnancy outcomes. In addition, women are not the only ones responsible for the performance of healthy behaviors since the interaction of family, society, and healthcare professionals can affect preconception health. Therefore, the promotion of preconception health behaviors should be implemented on an individual level, combining many other categories simultaneously. Additionally, future research projects should assess multiple-level interventions to promote practices of healthy behaviors, particularly before pregnancy, in this susceptible population.

Declarations

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Conflicts of interest

Authors declared no conflicts of interest.

Ethical considerations

This study received approval from the Research Ethics Committee at the Faculty of Nursing, Chiang Mai University, Thailand (No.069/2024).

Code of Ethics

Not applicable.

Use of Artificial Intelligence (AI)

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Authors' contribution

AF, NS, JD, and NC conceptualized and designed the study. AF/NS carried out the literature search and extracted relevant data from selected studies. Subsequently, the data were cross-verified for accuracy by the second author. The first author (AF) and the second author (NS) performed data analysis and prepared the initial draft of the manuscript, synthesized the findings, and structured the content. Next, the third (JD) and the fourth (NC) authors revised and proofread the manuscript and provided editorial revisions. The second author (NS) supervised the overall review process and guided throughout the stages.

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