Preconception knowledge, beliefs and behaviours among people of reproductive age: a systematic review of qualitative studies.

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PRECONCEPTION KNOWLEDGE, BELIEFS AND BEHAVIOURS AMONG PEOPLE OF REPRODUCTIVE AGE: A SYSTEMATIC REVIEW OF QUALITATIVE STUDIES

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Abstract

Background

The health of parents before pregnancy influences the short- and long-term health of their offspring. This systematic review explored the preconception knowledge, beliefs and behaviours held by women and men of childbearing age.

Methods

Databases were searched from 2009-2022 (MEDLINE, CINAHL Full-text, PsycINFO, EMBASE). Inclusion criteria specified qualitative research par, rs which recruited individuals of reproductive age (16-45 years) without existinr h.·'lnic illnesses. Data were quality assessed and analysed using thematic synthesis.

Results

Twelve papers met inclusion criteria. Six themes wer,; ɪL 'lltified (cultural context, pregnancy planning, knowledge, gender roles and responsi'. i[1]lt) , information seeking, prior health behaviours) which relate to individual, so[r] :..[1·] i,:vchological and cultural factors. Cultural context was related to all other themes. Pl . _-nancy planners had greater motivation to optimise their health whereas those nm -- tively planning were focused more on becoming financially stable. Women and men' J \ n)Wledge of how and why to engage in health protective behaviours was limitf.-, W h n health risks and behaviour change discussed in the context of pregnancy rather e-qn i'reconception. Gender roles influenced individual responsibility for preparatiriti c„ · pregnancy, which in tum influenced information seeking behaviours and enga!:„'111-. .„t 'n health behaviours. Online sources of support and information were seen as desirable, ,r 6ardless of pregnancy planning stage.

Conclusions

Our findings indicate that behaviour change interventions designed to support people to optimise health before conception should address cultural, individual, social and psychological factors to facilitate behaviour change. Development of online resources may help to increase accessibility for people across different cultural contexts and stages of pregnancy planning.

Keywords: Preconception; health behaviours; knowledge; beliefs; systematic review; qualitative; pregnancy planning

Introduction

The preconception period can be defined from a biological, individual and public health perspective (Stephenson et al., 2018). From a biological perspective it is the 14 weeks prior to conception (Hoek, Steegers-Theunissen, Sinclair, & Schoenmakers, 2020). From an individual perspective, it is whenever two individuals with reproductive capacity decide they want to have a baby. From a public health perspective, it is any time, prior to pregnancy, when health behaviours are established (Stephenson et al., 2018). Broadly, a preconception population has three defining attributes; 1) reproductive age, 2) individual with the ability to conceive or contribute to conception, and 3) not currently pregnant (Hill, Hall, Skouteris & Currie, 2020). Health behaviours of this population are important as they impact fertility, pregnancy, and future health outcomes (Stephenson et al., 2018). Pregnancy intention is recognised as a key driver to targeting preconception health behaviours. Barker et al. (2018) identified four preconception action phases, 1) children and adolescents who are forming a goal to become a parent, 2) adults with no immediate intention to become pregnant, 3) adults with intention to become pregnant and 4) adults with intention to become pregnant again. However, regardless of pregnancy intention and despite evidence for the benefits health promoting behaviours, women and men of reproductive age are rarely engaging in adequate health behaviour prior to pregnancy (Crozier et al., 2009). For example, in the UK 3 in 4 pregnant women do not take a folic acid supplement before becoming pregnant (Schoenaker et al., 2023). This low engagement can be attributed to lack of awareness of need to address health behaviours prior to pregnancy (Stephenson et al., 2021).

Systematic review evidence, from 42 quantitative and qualitative studies exploring barriers and enablers to women's preconception health behaviours, found that knowledge of preconception health was both an enabler and a barrier for engagement in health behaviours (Kandel et al., 2021). Specifically, misunderstanding what comprised a healthy diet and financial constraints were barriers to improving eating behaviours, whereas having appropriate knowledge of nutrition was considered an enabler. However, the review only focused on health behaviours of women, and did not explore the wider (biological, psychological and social) influences on preconception knowledge, beliefs and subsequent behaviours (Conner and Norman, 2017).

Thus, the existing literature indicates that many of the preconception population have low engagement in health promoting behaviours, linked to poor knowledge, lack of social support and beliefs about consequences. Research into preconception health and behaviours is in its relative infancy where the focus tends to be on women's behaviour, with less consideration of men's behaviour (Soubry, 2018, Caimcross et al. 2019). Hence, there is a need to comprehensively, collate existing qualitative literature to fully understand the potential individual, social, and psychological factors which influence engagement in health behaviours of women and men before conception. This understanding is essential to future health interventions and services so the preconception population can be supported at the biological, individual and public health level.

This study aims to systematically review existing qualitatir [11] l ature to explore knowledge, beliefs and health behaviours of women and men of chiJ, ,bt-_:-:11g age in relation to promoting health before conception.

Methods

The protocol for this review was registerer ·vi:> PROSPERO (CRD42020176845) and uses publicly available summary data, hence, „ ,s not require ethical committee approval.

Inclusion criteria

Studies were eligible for inclusio- 1 1: they met the following criteria:

- Recruited men and/or ·vo _en ofreproductive age (16-45, National Institute for Health and Care Excellerw". [0] 18) who were not currently pregnant
- Addressed knl, •lk;_:;; and/or beliefs of behaviours which can optimise health before conception
- Focused on knowledge and beliefs about optimising health before conception and specific recommended health behaviours (folic acid supplementation, physical activity, smoking cessation, fruit/vegetable consumption)
- Primary studies only
- Qualitative data collection and analysis only [1]
- Published in English language

[1] Inclusion of only qualitative studies allowed exploration of the context and nuances which influence a person's knowledge and beliefs around preconception.

- Published between 2009-2022[2]

Studies which included healthcare professionals or participants who had pre-existing health conditions such as diabetes or epilepsy were excluded due to routine care often including preconception advice.

Search strategy

The search strategy aimed to locate published studies. An initial limited search of MEDLINE (Ovid) and CINAHL Full-Text (EBSCO) was undertaken to identify search terms and relevant articles on the topic. A librarian (AGo) developed a full search strategy for MEDLINE (Ovid) using text words and index terms gathered from relevant articles. The draft search strategy was then peer reviewed by a second librarian (AW) using the Peer Review of Electronic Search Strategies (PRESS) guidelines (McGowan, Sampson & Lefebvre, 2010). A revised search strategy, including all identified keywords and index terms, was adapted for each of the following databases: MEDLINE (Ovid), CINAHL Full-text (EBSCO), PsycINFO (EBSCO), and EMBASE (Elsevier). Databases were searched from inception to present, with date limits of 2009-2022 and English language limits applied to the results. Searches were initially run by AGo in February 2020 and the search was updated in its entirety on April 2022 using the same method except removing the search from 2020 onwards to ensure the most up-to-date evidence was incorporated into the review prior to publication (see Appendix I for full search strategies and results for each database).

Screening and data extraction

Duplicates were removed and all remaining titles and abstracts were screened independently by two reviewers (HW and SD). Full text screening was carried out independently using systematic review screening software Rayyan (HW and SD). Full text screening had an 86% agreement as two studies out of 12 required discussion before a final decision was made. All disagreements were resolved through discussion between HW and SD and did not require a third arbitrator.

All data extraction was carried out by one reviewer (HW) and checked by a second reviewer (SD).

Quality Appraisal

[2] An initial publishing date for included studies of 2009 was chosen to allow a ten year period of relevant research to be analysed when the systematic review was first registered in 2019.

The Critical Appraisal Skills Programme qualitative checklist (CASP, 2018) was used. Using the 'yes', 'can't tell' and 'no' for appraising each checklist item, a score of one was given to 'yes'. Zero points to 'no' or 'can't tell'. This allowed a maximum score of 10 per study. All studies were appraised by one reviewer (HW) and checked by a second reviewer (SD). Any disagreement between reviewers was resolved through discussion.

Analysis and synthesis

The data were analysed using a thematic synthesis (Thomas & Harden, 2008). This involved three stages; 1) line by line coding of the text; 2) development of descriptive themes; 3) development of analytical themes. Data for analysis included th. "ltudies' full results including participant quotes and author interpretations of ther t. U, 'e reviewer (HW) closely read the included studies and carried out line by line codin . u, der supervision of the research team. Codes and themes were discussed and de, loped with the review team (VS,AGr,SC,SD,HW). Through discussions, themes .'eff refined.

Results

The Preferred Reporting Items for Syster .atI Rt- ,iews and Meta-Analyses (PRISMA) guidance was followed (Page et al., 2021).

Search results and study selection

The initial search identified 198.: recut'ds. After the screening process was complete, nine studies met the inclusion critc. -i.a l<igure 1). An updated search was conducted in February 2022 and three additional \cfu_l_ met inclusion criteria, resulting in 12 studies included in analysis. The table oi ,l,_a,_'<l'",eristics (Table 1) identifies included papers.

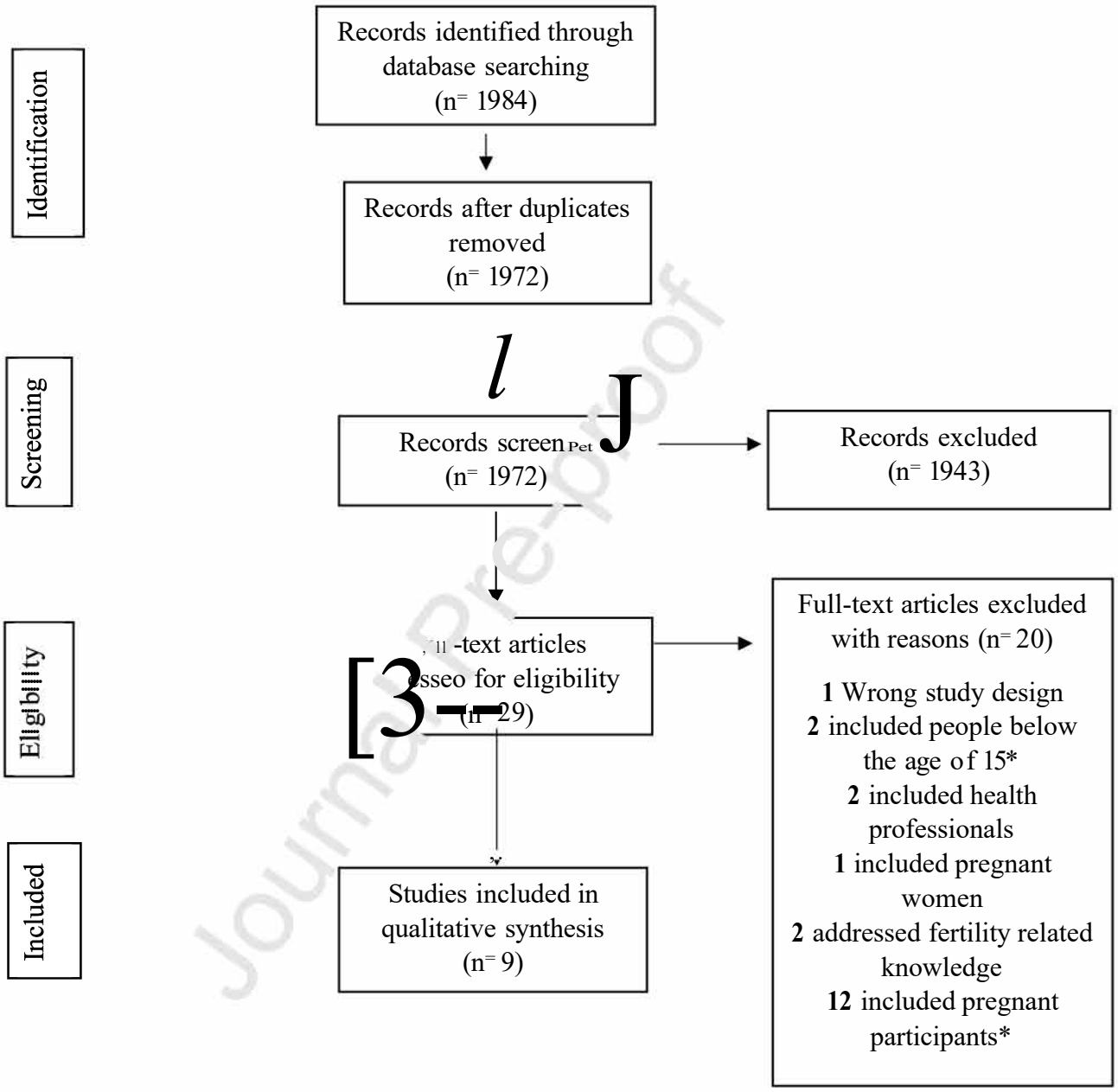

Figure 1. PRISMA flow diagram of initial search, review process and study selection

*sub-group analysis was not possible due to data being combined

Study characteristics and quality appraisal

Included studies were published between 2010 and 2022. Nine studies included women only (1,2,4,5,7,9,10,11,12), and three included women and men (3,6,8). Of the three studies including both sexes, two recruited individuals and one recruited couples (3). Five studies

specified whether participants had children (2,3,6,7,9), four specified that all participants were without children (1,8,10,11) and three did not specify (4,5,12). The pregnancy planning status of participants was specified by one study (3), two studies stated that participants were planning to conceive in the future (7,8) and nine did not specify pregnancy planning status (1,2,4,5,6,9,10,11,12).

A CASP score of 10 was given for three studies, a score of 9 was given for seven studies and a score of 8 was given for two studies (Table 1). Hence studies were of high quality.

Synthesis

Six themes were identified and developed (Table 2). Data from participants are presented in italics in quotation marks. Data from study authors are non-italicised in quotation marks.

Through stages 2 and 3 of the analysis, links between themes were identified. This allowed the six themes to be organised into a guiding framework (Figure 2). The contextual role of culture was overarching and influenced all five other themes. Gender roles and pregnancy planning status influenced information seeking behaviour, which in turn was associated with knowledge. Gender roles, knowledge and pregnancy planning status are all associated with engagement in health promoting behaviour before conception.

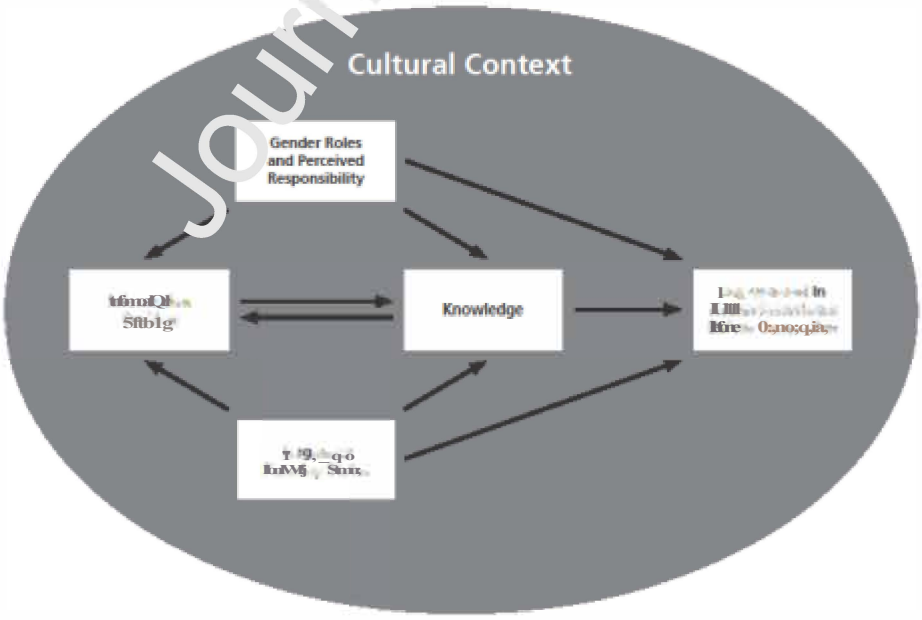

Figure 2. Guiding framework of themes related to knowledge, beliefs and health behaviours of people of reproductive age

Cultural context (2 subthemes)

The theme 'cultural context' incorporates cultural norms and societal norms between countries, religions, and ethnicities. The perceived influence of cultural context was reported in terms of beliefs and preferences towards healthcare and discussed across four studies (2,4,9,11).

Cultural context influenced specific behaviours

Among a sample of native Chinese women, maintaining a her:u1; pl1ysique was viewed as important for both partners (4). Concerns were expressed LO. umg a greater risk of miscarriage if the woman was not physically strong and, for ulen, a strong physique was associated with a healthy infant but also as a factor t" det, rmine the sex of the baby.

In this sample (4), women focused on regulatinr ur ;Jr menstrual cycle and engaging with Chinese medicine approaches. Cultural views ·egalding food were discussed in relation to the belief that cold foods should be avoided ◁ r.eserve fertility and 'tonic foods' such as red dates and donkey-hide gelatin should e consumed alongside dietary supplements to promote health.

Nutrition was also discussed am. ,gst a group of black, South African women who stated that they engaged in particular be ' v: "urs because that was seen as normal among their society and ethnicity (11). The conr,t,/t J f race was discussed regarding physical activity were engaging in health pt\.. ıı ·n::, behaviours such as exercise were viewed as an activity exclusively practised b ', ,hite people (11).

Cultural practices and family structure relate to information seeking

The influence of cultural and societal norms within the context of education was discussed in two studies (2,9) around the availability of sexual and reproductive health information. Among women who received sexual and reproductive health education in Australia, there was discussion about the difficulties they experienced in having subsequent discussions with older family members (2).

Conversations around accessing preconception health information were seen as important and women felt it was essential to engage with this after marriage due to cultural expectations of

pregnancy (9). One woman from an Indian background stated *"because we are thinking about our culture, if you are married then obviously you're going to be having babies."*. Within this study, women from a South Asian background had concerns about stigma associated with infertility in their communities which resulted in a reluctance to discuss pregnancy preparation with friends, family and health professionals (9).

Gender roles and responsibilities (3 subthemes)

Gender roles and responsibilities when preparing for pregnancy were discussed across eight included studies, (1,2,3,4,6,7,8,9) often in terms of partner support and men's involvement in the preconception period.

Men left out of conversations and less likely to talk

In all three papers including men (3,6,8), men discussed preconception and pregnancy as something to be focused on by women and therefore felt less inclined to discuss it. Authors (9) described how women felt that preconception health should "encompass men more directly", this was echoed by a male participant in one study (3) who described a shared approach to pregnancy preparation as being *"more motivating"*.

Women seen as being more knowledgeable with greater responsibility

Men perceived women as being more knowledgeable about health before conception and recognised that women often bear greater responsibility for infant health outcomes. They considered the implications that could arise from pressure being applied to women (1,9).

Despite women being perceived as knowing more and preconception health being viewed as a female dominant area, both women and men expressed a desire for both sexes to be included in discussions about preconception health (1,9). Women expressed a particular discomfort with health messages being aimed at improving health for the purpose of having a baby *"You feel kind of like a baby making machine, if they're like 'you need to do this because it will be good for your pregnancy' and just not highlight other things and be like actually this is really good for your health in the long term"* (1).

Partners behaviours influencing woman's wellbeing

Support from partners was recognised as important for engagement in health behaviours and general mental and emotional well-being across three studies (3,9,2). This was discussed by a woman from an inter-conception (in between pregnancies) couple regarding behaviour

change *"... the support of a spouse can greatly affect the positive behaviors..."* (3). The importance of partner support was echoed around dietary changes.

Partner's behaviours were also recognised as being important regarding the woman's mental and emotional wellbeing. Women stated that some behaviours such as smoking and alcohol use are more relevant to men and due to the importance of women *and* men's behavioural influence, preconception health information should include men (9). Having preconception health messaging being aimed at men was suggested to include encouragement to support and communicate with their partner (2).

Limited knowledge (3 subthemes)

Knowledge of health behaviours and risks was discussed aero." P.ne studies (2,3,4,5,6,7,8,9,12). Behaviours such as alcohol consumrt1 "'Ur 1ld smoking were frequently recognised as being detrimental to health during pregr.-- }, however risks were not always understood relative to preconception health. When in+e •mg to become pregnant, a healthy diet was often acknowledged as being importanl h'ivever depth of knowledge varied. There was a limited understanding across all stw-1:„, . 11;arding the importance of health behaviours before conception with behavioural chan6 , often discussed within the context of pregnancy.

Some awareness of important behavir>•tru

Abstaining from smoking and ale JI,_'1 l,;onsumption were commonly mentioned across included studies by participanL of u fferent age, gender and cultural context (3,4,6).

The concept of maintainiP a i.,.althy physique by adhering to a healthy diet and engaging in physical activity was ""eL'".ied in three studies. One study discussed how participants felt it important to have a *"he[rr]hy lifestyle"* (3). This concept was also mentioned with exercise and diet being mentioned specifically as important behaviours to engage in when intending to become pregnant (4, 6).

Limited understanding of nutrition and supplementation

When discussing folic acid supplementation before conception, there was limited awareness as to why this was important along with confusion regarding dosage and timing of starting supplementation (2,3,5,7). Amongst women with previous pregnancies there was some scepticism regarding the protective health benefits of folic acid supplementation as conception was viewed by some as a natural event which does not require medical

intervention (5). Adequate nutrition was also deemed important however participants' understanding of how to prepare nutritionally was often superficial. Whilst participants felt there was wealth of available information regarding nutrition, this led to a sense of confusion due to variation of advice.

Limited awareness of preconception and health risks

When asked about health prior to conception, risks to health were mentioned in relation to pregnancy specific behaviours (6). A male participant discussed the risks they perceived to be associated with alcohol consumption, *"I've just heard about miscarriages and stuff with drinking alcohol and things like that and smoking causing... I don't know if it's a myth, about it [smoking] stunting growth and that sort of thing. I've heard that before."* (6). The same study reported how smoking cessation was seen as something to be considered after conception. Health risks associated with smoking were also discussed in terms of harm to the smoker, with risks related to passive smoking not mentioned.

The health risks caused by smoking and alcohol consumption and the benefits of behaviours such as folic acid supplementation were also reported as being discussed in the context of pregnancy rather than before conception (2,5,6).

Information seeking (2 subthemes)

Eight studies included discussion about seeking information regarding pregnancy planning and changing health behaviours (2, 3,5,6,7,9,10). Accessing preconception information was deemed desirable by women and men of different preconception action phases (Barker et al, 2018) and cultural context, however there were differences of opinion regarding timing of information being accessed and the delivery of that information.

Preference for online information

Across age and cultural backgrounds there was a preference for using internet sources as a method to find relevant health information (2,6,7,10). Online resources were discussed from two perspectives, that of people planning a pregnancy (adults with intention to become pregnant for first time or again) and that of passive social media users with no immediate plans to conceive (adolescents and adults with no immediate intention to become pregnant). For those with intention to become pregnant again, the internet was seen as a useful tool (2, 10). Among all planners, online resources were used as an initial method of information seeking with health professionals consulted for further guidance Online health information

was also an effective means of reaching those not actively planning a pregnancy. Many studies described the use of social media and influencers for providing information that younger participants could relate to.

Health professionals considered when complications arise

There was a concern expressed by participants across some studies that seeking advice was not the appropriate use of a doctor's appointment (2,7). Consultations with a doctor were considered to discuss any fertility issues or stopping contraceptive use rather than general advice. The concept of having a particular issue or problem to discuss was viewed as a justification for visiting a health professional more so than the L -;ire for general preconception health advice. This perception of the appropria e m of a doctor's appointment led to participants feeling an obligation to seek informatio- inl'ependently before consulting a health professional (2,7).

Pregnancy planning stage (3 subthemes)

Preparation for pregnancy was influenced by r J, - s, Jn people wished to become pregnant, with planners and non-planners having d; .rel :nt priorities. Eight studies included discussion of various aspects of planning (2,3,4,5,6,7,>, 1 0).

Planners more receptive to preconcr pl "ll health information

Women suggested that deliverinc orel,onception health information to people actively planning a pregnancy would -P, 1 ·'1tivating (5,8). However, receptiveness to preconception health information differerl a L · r..ig inter-conception couples depending upon their previous pregnancy experienc1;.,: '1'•,v who had experienced a healthy pregnancy were less likely to view pregnancy preparr t l Jn as important (5). For women who had previous complications, this viewpoint was different. One participant expressed regret about not having planned her pregnancy after experiencing complications (5).

Planners/Non-planners prioritise different ways to prepare for pregnancy

Couples at different stages of pregnancy planning were found to prioritise different behaviours to prepare for pregnancy. For those who were not planning a pregnancy, financial preparation was prioritised more than optimising health (3). These findings were supported in an additional study whereby women who were yet to have children also focused on financial

readiness along with their career and having a good relationship with the partner and family (2).

There was a general confusion among people as to when the most appropriate time is to engage with health advice.

Preconception action phase and degree of planning influence engagement in behaviours

Factors which influenced engagement in health promoting behaviours among those not planning a pregnancy included aesthetic reasons along with mental health and prevention of illness (1,3). Among non-planners (who tended to be younger), the intention to exercise and eat a balanced diet was largely driven by the desire to appear physically attractive. These views are in contrast with those of people who were planning a pregnancy. Among those who had an intention to conceive in the near future, there was greater motivation to seek health information (2, 6).

Behaviour specific barriers and facilitators (3 subthemes)

Behaviour specific barriers and facilitators were addressed by five studies (1,7,8,11,12).

Influence of the family

Family roles were seen to influence participation. Some participant stated her husband was a barrier to improving the family's diet (11). Family influences were observed across cultural backgrounds.

Cost of a healthy diet

The cost of buying healthy food was discussed across studies where some participants felt that price of certain foods was a barrier to healthy eating. When experiencing financial barriers, food choice preferences included low cost, high satiety options which are energy dense. Fresh food was often viewed as unattainable due to financial constraints (12). However, within the same study, some participants identified methods to improve diet quality at a low cost.

Whilst perceived financial barriers influenced food choices, availability of healthy foods was a factor which influenced eating behaviours in deprived communities (11).

Waning motivation

In some cases, motivation to engage in health behaviours diminished over time whilst trying to become pregnant. This was discussed within the context of taking folic acid supplements and eating a healthy diet, with the longer the time taken to achieve pregnancy, and therefore the timeframe leading to conception was unknown, the more likely people found it 'difficult to commit' to behaviour changes. Women described feeling more motivation to make changes to their behaviours once they knew they were pregnant (7).

Discussion

The themes represent key individual, social, cultural and psychological factors which underpin preconception knowledge, beliefs and behaviours.

Cultural factors

There is clear importance of cultural context and how an individual's cultural influences impact preconception knowledge, beliefs and behaviour (Figure 2). Cultural context was predominantly influential upon family and gender preferences for receiving information and how certain health behaviours are engaged in. Research (mainly carried out in majority white/western contexts) has identified higher pregnancy related mortality and morbidity among some ethnic minority groups (Badura, Johnson, Hench, & Reyes, 2008; Homer-Johnson, Akobirshoev, Amutah-Onukagha, Slaughter-Acey, & Mitra, 2021). Hence, the cultural context of health care, information provision and behaviour change should be prioritised in any preconception health research or service. This will enable preconception health information to be culturally sensitive and accessible.

Individual factors

Both women and men's knowledge of the importance of engaging in health promoting behaviours before conception was limited. Behaviours were often discussed within the context of pregnancy. Knowledge of how and when to engage in folic acid supplementation in particular was poor. This is problematic as greater knowledge regarding folic acid is associated with adherence to supplementation (Bayrami, Didarloo, & Asadinejad, 2020; Zadarko-Domaradzka, Kruszynska, & Zadarko, 2021, Kandel et al., 2021). Whilst it has been recognised that knowledge alone is not sufficient for behaviour change, it is seen as the first step to behaviour (Alm-Roijer, Stagmo, Uden, & Erhardt, 2004).

There was a preference across pregnancy planning stage and cultural background for online, preconception health information which could be accessed privately. Online resources can

provide low-cost intervention opportunities to increase awareness of the importance of preconception health for those not actively planning a pregnancy, whilst also providing specific health information for those planning to conceive (Barker et al., 2018). Online preconception resources supporting behaviour change before conception have had promising results (Jack et al., 2020; Gardiner et al., 2013). The current findings could contribute to online interventions to ensure that appropriate information is given to users at the optimal time, whilst addressing knowledge gaps and including a gender neutral, and culturally appropriate approach to ensure that partners can be included.

Social factors

Gender roles related to perceived responsibility of preparatim fm pregnancy. Research has acknowledged that healthcare providers should avoid rein! Jrci ,g gender stereotypes which put undue pressure on women (Mello, Tan, Sanders-Jac.h..."ln, & Bigman, 2019). Despite gender roles influencing perceived responsibility to l>~oa .e for pregnancy, both women and men were receptive to the idea of receiving healtl:. ;11iormation before conception. However, this varied according to pregnancy intention, ncig,~:.g with Barker et al.'s (2018) preconception action phases Formatting .w lch posits that receptiveness to health information is greater after there is in+ention ,> conceive. Whilst planning stage was related to openness to seek and receive infom.Yu 11, .his relationship was complex regarding those who had already experienced pregnanr y. rl_,- findings confirm Hill et al.'s (2019) conclusions that those who intend to become pf' 2ml..t again are less likely to engage in preconception health behaviours compared with +lios intending to become pregnant for the first time. Although our findings caveat that / 110s\ who had previous healthy pregnancies and births were even less likely to seek infom,.'tion, unless they had experienced complications.

Psychological factors

Motivation was implicit in many themes as influencing behaviour. Motivation to engage in healthy behaviours was strongest when pregnancy was planned and in the short term. The fact that motivation to engage in positive health behaviours waned over time is an important finding, confirming earlier work (Barker et al., 2018).

Interventions need to be targeted to pregnancy planning stage and individual motivations, whether that be for a future baby, current health, aesthetics or other motives. Our findings make it clear that behaviour change interventions designed to support people to optimise health before conception should address cultural, individual, social and psychological factors

to facilitate behaviour change. Development of online resources may help to increase accessibility for people across different cultural contexts and stages of pregnancy planning.

Study limitations and strengths

This review systematically summarised the current qualitative evidence describing what people of reproductive age know and believe about preconception health behaviours across different locations, cultural backgrounds and preconception action phases. The inclusion of women and men across studies meant that individual perspectives could be examined along with views regarding partner support before conception.

Although women and men's perspectives are reviewed, only one study included partners which limits any inferences which can be made about dyadic behaviour within couples. Additionally, people with pre-existing conditions were excluded. These individuals are more likely to have dedicated healthcare support and possibly preconception health counselling or support. Although such preconception counselling is variable consistent between condition or healthcare provider, this variation would have influenced results. Additionally, pregnant women were excluded as the review aimed to explore current preconception beliefs, knowledge and behaviours rather than pregnancy accounts. However, the knowledge, beliefs and behaviours of both groups are extremely important and should also be explored.

Conclusions

This review identifies key theories related to peoples knowledge, beliefs and engagement in health behaviours before conception. These themes span individual, psychological, social and cultural factors and should be considered key when addressing behaviour change in the preconception population.

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Author contributions

HW: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Roles/Writing - original draft; Writing - review & editing.SO: Conceptualization; Data curation; Funding acquisition; Methodology; Writing - review & editing. AGr: Conceptualization; Funding acquisition; Methodology; Writing - review &

editing. VS: Conceptualization; Methodology; Writing - review & editing. AGo: Methodology; Writing - review & editing. SC: Conceptualization; Funding acquisition; Methodology; Writing - review & editing.

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Table 1 - Characteristics and quality appraisal of included studies

	Reference; CASP score	Number of participants	Location of study	Participant demographics	Participant ethnicity (N)	Status regarding prev10us pregnancies	Participants planning a pregnancy	Method of data collection
1	Kretowicz et al. (2018) CASP9	20	UK	-Age range 18-49 -All women	White British (20)	All v-Jhout child.. 'n	Not specified	6 focus groups
2	Lang et al. (2020) CASP 10	25	Australia	-Lowest age 18 -All women -Migrant and refugee backgrounds	Afghan (10), Ethiopian (2), 'ndl. n (2), Pakl"i-'l11; \2 1 -,ri Lank .n r :J, Other (7)	3 without children 12 with children	Not specified	2 focus groups with optional interviews if participants preferred
3	Lewis et al. (2013) CASP9	116	USA	-Age range 18-44 **-58** COIIJ,iP J 111.l ht>i1 'OSl Xt..d)	,v'hite (46 women, 42 n,en), African American/Black (8 women, 9 men), Native American (1 man)	13 couples without children 45 couples with children	3 groups of participants: planners, non-planners and recent parents	Couple based structured interviews
4	Liu (2014) CASP8	40	Chh1	-Age range 20-29 -All women	Chinese (40)	Not specified	Not specified	Semi structured interviews
5	Mazza& Chapman (2010) CASP8	17	Australia	-Age range 18-45 -All women	All native to Australia (17)	Not specified	Not specified	3 focus groups
6	McGowan et al. (2020)	21	UK	-Age range 18-45	All native to Northern Ireland (21)	13 without children	Not specified	5 focus groups

	CASP9			-13 women, 8 men		8 with children		
7	M'hamdi et al. (2018) CASP9	28	Netherlands	-Age range 18-41 -All women	Dutch (24) Other unspecified (4)	22 without children 6with children	All planning to conceive in the future	Semi structured interviews
8	Quayyum& Dombrowski (2021) CASP9	19	Canada	-Age range 19-23 -14 women, 5 men	Not specified	All without child.. n	All planning to conceive in the future	Semi structured interviews
9	Tuomainen et al. (2013) CASP 10	41	UK	-Age range 18-45 -All women	South Asian (14) African-Carril !an (11), WJ„te (1 1), M•11;' ' ,L	, without children 23 with children	Not specified	9 focus groups, 19 follow up interviews
10	Walker, Drakeley & Boyle (2021) CASP9	31	Australia	-Age range 18-45 -All womP11.	, Ur :p, d h e d	All without children	Not specified	7 focus groups
11	Ware et al. (2019) CASP 10	29	South Africa	-P. <; •ra. '" 18- I 2-	South African (29)	All without children	Not specified	4 focus groups
12	Yiga et al. (2021) CASP9	41	UganL 1	-Age range 18-45 -All women	Ugandan (41)	Not specified	Not specified	12 focus groups

Table 2. Themes, subthemes, descriptions and example supporting data

Themes	Subthemes	Description of theme	Supporting data
Cultural context	Cultural beliefs influence specific	Culture influences prioritisation of specific behaviours along with avoidance of behaviours	*"If a man maintains good physical strength before conception, it's likely for a couple to*

	behaviours	which do not align with women's cultural norms.	*have a baby boy*. "(4). "*.. As a black kid, I was raised to eat like pap, meat, and sweets"(*11) *"I leave the house early in the morning at 5 r'ld tell myself, you know what? I'm going to .'oc· today. I'm going to start this diet thing. "he minute you walk out, there are people that literally laugh at you. She is acting like a white person, she is running, she is jogging, what is she doing?* "(11)
	Cultural practices and family structure relate to information seeking	Conversations rentre ·.-lound acculturation and the contrastir.6 ',e:;efs about preconception health .' .e L c .• en family members and western P-du ·a,'on.	*"... Here [in Australia] we learn about period, whatever... how to use condoms... stuff like that. But there [in Thailand, where I lived} no, you just learn math, English... They don't have... proper health [education]. .. "* (2). *"I've been raised [in Australia}. .. so I've been taught all of these things in high school... At first I remember her [my mother} being a bit not willing to talk. .. about it; but I've seen over the years that she's more open to it...* "(2).

Gender roles and responsibilities	Men left out of conversations and less likely to talk	Men perceive preconception to be focused on women and felt uncomfortable discussing it with peers.	*"I can imagine there would be a bit of a stigma around [discussing] pregnancy in general [with males] because it's just perceived as a female-led operation"* (6)
	Women seen as more knowledgeable with greater responsibility	Women are perceived as knowing more about pregnancy preparation and men acknowledge that greater responsibility for a baby's health is placed on the mother	*"They [people] would probably have blamed the woman if there were any problems [with a baby]"* (6). *"You feel kind of like a baby making machine, if they're like 'you need to do this because it will be good for your pregnancy' and just not highlight other things and be like actually this is really good for your health in the long term"* (1).
	Partners behaviour, influencing woman's wellbeing	Partners are of great importance when supporting women with engaging in specific health behaviours	*"... we'd be a team and I'd get jealous if I saw him eating a hamburger all the time and I was stuck to salads and fish"* (8). *"A man's temper will affect a woman's emotions, and it will have an impact on the future baby"* (4).
Limited	Some awareness of	Health behaviours such as smoking cessation,	*"The only precautions beforehand are quit*

knowledge	important behaviours	avoiding alcohol along with improving ones fitness and nutrition are frequently recognised as being important.	*smoking, drink less, get into some sort of a healthy routine, make sure that your body is in good shape. But that's a very general kind of precaution. It's not even a precaution. It's what everyone should do anyway"* (2). *'d weight, fitness and nutrition are really 'te main things [for PCCJ, and stay away from bad habits.* " (6)
	Limited understanding of nutrition and supplementation	Limited understandiri a healthy diet entails, along with a k of knowledge regarding fol:., c.i supplementation and its benefitc	*"I've always bought them [folate supplements] and had them ready to go but never really knew why."* (3) *"Because you think you know it. I don't have a child with spina bifida, so why should I take the folate? And I don't need to go the doctor because I've done it all before.* " (3). *"Nutrition [is important for preconception health] probably with the lifestyle choices that you make too, but I don't really know [what else], probably more nutrition I would say"* (6)

			"There are so many different things out there, so many different diets that's a benefit and there's another bit of research that goes against it, and for everything they say is good, there is something else saying it's bad, so I don't really tend to pay too much attention" (1).
	Limited awareness of preconception and health risks	Health risks often conceptualised within the context of pregnancy and there is limited awareness of the benefits of changing in health promoting behaviours before conception.	*"But I did stop drinking alcohol. Regarding smoking, yes I'll consider that when I really am pregnant... I have started to smoke a bit less."* (6). *"I've heard of iron... thing that you just said [folic-acid] ... But I didn't know that you have to take before you get pregnant..."* (2).
Information seeking	Preference for online information	Seeking health information online preferred by people across ages and cultures rather than speaking to a health professional initially.	*"I would seek information beforehand.. My first source would be the internet. If I find.. conflicting messages then I would go to a doctor and.. asking around who I know has been pregnant..."* (2). *'So, if it's on Facebook, if there's like an article or something that seems of*

			interest.. .[you 're] going to look[at it]' (6).
	Health professionals considered when complications arise	Consultations with health professionals are considered in the instance of a problem arising. This could be after finding conflicting information online, or when a couple had fertility concerns.	*"We already had a desire to have childfor some time but still had not succeeded. Therefore, we wanted an appointment with t]:e GP...* " (7) *"l.. ·ttfor preconception care it's an :.ppointment to go and talk, it's not actually a procedure".* (7)
Pregnancy planning stage	Planners more receptive to preconception health information	People who are planning a pre ar „y -, interested in receivinc:; :.. a-' \h.. ,fr .mation. Receptiveness h hea.·:1 information among inter-concep+:u,' c '"uples planning a pregnancy is infll1„ lc+ ₁ J previous pregnancy and birth P,Xp 'fL'UCes.	"lf*you were actively trying I thinkyou would be more inclined to make the effort [to be healthy], but I think that at the minute it's not in my radar"* (6). *"For my unexpected baby, I didn't have idea I had.fibroid.. I should have done more check-ups beforefallingpregnant... I should have prepared". (2)*
	Planners/Non-planners prioritise different ways to prepare for pregnancy	Planners are more receptive to health information, unlike non-planners who prioritise financial stability and building a healthy relationship with their partner. There is uncertainty as to the appropriate time to engage	"...*It's more to do with practicalities rather than to do with health...* ". (2) *"It's kind of hard to say, like, 'When do I sign upfor these things?".* (2)

		with health information.	
	Preconception action phaseand degree of planning influence engagement in behaviours	Motivation to engage in health promoting behaviours differs according to preconception action phase and stage of planning. Whilst those not planning a pregnancy are less receptive to health specific information in relation to conception, younger people not currently planning pregnancy are motivated to [illegible] behaviours such as healthy eating for different reasons such as aesthetics.	*"I think more aboutfitness and what I am going to look like in a bikini"* (1). *"If they're planning on having a child in the next couple of years, there'd definitely be some motivation to try and make sure that you had a healthy baby and stayed healthy yourself"* (3).
Behaviour specific barriers and facilitators	Influence of the family	Family dynamics are particularly important regarding behaviours such as eating healthily. Families can be a source of motivation or a barrier to changing behaviour.	*"I would love to cook with them [lentils and pulses] actually, I really would, but I would need to work on my other half, because he thinks a meal without meat is not a meal"(1).* *"...my mother. I draw inspiration from her. I want to live a healthier lifestyle because I saw what happened to her when she was leading a healthy life..."* (11).
	Cost of a healthy diet	The perception of the cost of particular foods could be either a facilitator or a barrier to	*"Fruits and veg and quality meat is actually really quite expensive"* (1)

		engagement in a healthy diet. Fresh foods are seen as too expensive to be practical for some.	*"I don't think it has to be expensive, eating healthy, as people think, because frozen vegetables have just as much nutritional value as fresh I think, and things like lentils and beans and pulses are very cheap* **".** (1) *"There is no accessibility of healthy food; the only things you get is chips, bunny chow. It's the only things we can afford"* (11).
	Waning motivation	Motivation to engage in health promoting behaviours reduces the level of effort it takes to achieve pregnancy.	*"Yeah I tried quitting smoking but it took so long, so .. yeah... Well my mother also smoked during her pregnancy and here I am, so yeah...* **"** *(7).*

Declaration of interests

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

☐The authors declare the following financial interests/personal relationships which may be considerec' a s 1L ntial competing interests:

Highlights

- Themes span individual, psychological, social and cultural factors
- Life stage and past pregnancy influenced receptivity to preconception information
- Online preconception health information was preferred by women and men
- Preconception health was perceived as the responsibility of women more than men
- Understanding and importance of preconception health was lacking among individuals