
Article:
Fang, W., Reddy, O.S. orcid.org/0000-0002-5825-9547 and Lai, W.-F. orcid.org/0000-0003-0585-6396 (2023) Nutritional awareness of pregnant women and the underlying influencing factors. Nutrition Reviews. nuad074. ISSN 0029-6643

https://doi.org/10.1093/nutrit/nuad074

Nutritional awareness of pregnant women and the underlying influencing factors

Weijie Fang, Obireddy Sreekanth Reddy, Wing-Fu Lai

Abstract

Nutritional awareness is described as having knowledge or understanding of nutrition. It is often related to the ability of an individual to make an accurate estimate of their food intake, which involves comparing their actual nutritional behavior with the recommended food consumption. Nutritional awareness of women during the various phases of pregnancy may vary significantly across countries due to cultural and lifestyle differences. There has been extensive research on nutritional awareness of pregnant women in selected countries or regions; however, relatively few studies have explored it during different stages of pregnancy. To fill this gap, this article reviews the existing literature and draws together insights into the following areas: changes in nutritional awareness during various phases of pregnancy, nutritional awareness of pregnant women and its underlying factors in various nations, and the research methods used to study nutritional awareness of pregnant women.

INTRODUCTION

Nutritional awareness refers to having knowledge or understanding of nutrition.1–4 The existing literature indicates that having nutritional awareness, which includes preoccupation with nutritional information and deliberate control of behaviors that are not in line with nutritional concepts, is important for developing nutritionally healthy behaviors.5 The degree to which a woman can make sense of nutrition-related information in a timely way often determines her nutritional behaviors before and after giving birth.6 The patterns of beliefs about prenatal food and nutrition are highly complicated. Changes in nutritional awareness are associated with good eating habits, physiological changes that occur during pregnancy,7 and food restriction.8 Furthermore, dietary perceptions and practices during pregnancy are frequently influenced by traditional beliefs that have been passed down from generation to generation.9–12 In addition, there are clear guidelines and recommendations on the appropriate amount of food to consume, preferred types of healthy food, and the types of food to avoid during pregnancy.12 For instance, pregnant women are often advised to avoid milk and cowpea seeds in Nigeria due to the traditional belief that they make the fetus overly large and complicate the delivery.10 Traditional cultures and regional practices, and the stage of pregnancy, may affect nutritional awareness of pregnant women.

The nutritional status of a pregnant woman and the health of her unborn infant are closely related. Under- or over-nutrition during pregnancy, and/or consumption of unsuitable foods, will be detrimental to both the mother and unborn child. Poor fetal growth can increase the risks of the baby becoming large and having low birth weight, affect the physical and mental development of the baby after birth, and increase the incidence of chronic diseases in adulthood. By increasing nutritional awareness, we can prevent the effects of negative nutritional habits on the fetus and mother, prevent the effects of poor diet on fetal growth and maternal metabolism, provide a healthy intrauterine environment for the fetus, and prevent the onset of several chronic diseases in adulthood.

Over the years, a number of studies on the nutritional awareness of women have been published in the literature.5,13–18 However, only a few have systematically compared the nutritional awareness of pregnant women in various countries or regions, and even fewer have compared the nutritional awareness of women in different stages of pregnancy. In addition, compared with studies on

developed countries, fewer studies on nutritional awareness have been conducted on developing and underdeveloped ones. More studies have been conducted to identify association of nutritional awareness with other related factors (eg, the impact of the society and the media)19–22 or to investigate specific nutritional behaviors and awareness.20,23,24 To fill this gap, this article retrieved relevant literature on the nutritional awareness of pregnant women in recent years from Web of Science, Scopus, and Google Scholar by using the following keywords linked by the Boolean operators "AND" and "OR": "nutrition*," "adequacy*," "pregnan*," "lifestyle*," "dietary*," and "food intake*." Our objective was to review the existing literature to provide foundational insights for future comparative studies: changes in nutritional awareness during various stages of pregnancy, nutritional awareness of pregnant women and its underlying factors in various nations, and the research methods used to study nutritional awareness of pregnant women.

CHANGES IN NUTRITIONAL AWARENESS DURING DIFFERENT STAGES OF PREGNANCY

Previous studies have indicated that a large number of people can determine whether or not certain nutritional behaviors are healthy even though such knowledge may not necessarily be put into practice.5 For pregnant women, there is some evidence that the nutritional habits of women do not change significantly before or after pregnancy,25 but there is strong evidence that the eating habits of women change during pregnancy, including an increase in the consumption of fruits, vegetables, and dairy products, among other changes.26 This suggests that pregnancy provides a chance to adopt healthy nutritional habits that can continue throughout life.27 It is also well recognized that changes in eating behaviors during the first pregnancy of a woman may affect family members, some of whom may modify their own eating behaviors, even if these changes in eating behaviors do not persist after the woman has given birth. It has been suggested that if women have only been exposed to public health information on nutrition before becoming pregnant, this knowledge may affect their eating behaviors in only a limited capacity.15 However, passively assimilating relevant information before becoming pregnant would place the women in more favorable health situations. This is because the physical, social, and emotional changes that pregnancy brings can motivate a pregnant woman to improve her health, along with that of her unborn child, and any nutritional knowledge she has can support that.6,13 Pregnant women who could receive and selectively absorb nutritional information related to their needs before pregnancy can more easily apply their knowledge to their eating behaviors during pregnancy than those who have only a fundamental understanding of nutrition before pregnancy.

The limitation of intake of particular foods is one of the factors that underlie the nutritional awareness of women of all ages.8 Pregnant women are required to compromise their eating preferences to provide an optimal environment for the fetus throughout pregnancy.28,29 In the River Gee basin, for various reasons pregnant women frequently refrain from eating certain foods, even when they would normally eat them. For example, they may abstain from eating fish, eggs, meat, and pulses, in the belief that doing this will prevent disabilities, early maturation, poor body image, rashes, eczema, hair loss, and respiratory diseases in their offspring. They may also refrain from eating potatoes and honey out of concern for respiratory and sinus problems and their effects on the speech development of their offspring. They may stop eating oranges because of concern for changes in the color of the skin and eyes of their offspring. They may also think that fruits like pineapples, peaches, and guavas lead to skin breaking, ringworm, blisters, and rashes.30 Some ideas about food restrictions are not accepted universally, and to avoid social exclusion driven by cultural practices or for other

reasons,28,29 the majority of pregnant women consume some forbidden foods in exceptional circumstances and rationalize this as being in their best interest.29,31 External monitoring of physiological changes, including weight changes, is widely accepted by pregnant women as a routine procedure during pregnancy.7,29 However, external monitoring of weight gain still causes anxiety and stress; some women manage their weight gain within healthy limits without experiencing excessive stress, while others exhibit a gradual loss of control of their eating behaviors, occasionally or habitually violating aspects of nutritional advice.

Concerning dietary advice, some foods are believed to be beneficial to health when consumed during pregnancy. Some beliefs have a scientific foundation, but others are less well founded.30 For example, women in Fiji tend to eat more toxic marine species during pregnancy and lactation in the hope of effectively protecting both mother and child from fish poisoning in the later stage of life.30,32 There are also women in Africa who prepare herbal soups to ensure successful pregnancy, promote fetal growth,30,33 and facilitate easier childbirth.30,34

The effects of economic pressure on nutritional behaviors before and after the onset of pregnancy need consideration. The impact of economic factors should not be underestimated: women often change their food choices for economic reasons.30 For example, with insufficient income, women are less likely to increase their spending on healthy foods, nutrients, and supplements, and may consume less food and nutrients than they did before pregnancy because of the need to subsequently pay for child upbringing. Ideally, they will try to strike a balance between future childcare costs, household income, and healthy food consumption. There are no direct studies on this issue and related concerns, so research is needed.

FACTORS AFFECTING THE NUTRITIONAL AWARENESS OF PREGNANT WOMEN IN VARIOUS COUNTRIES

So far the majority of the previous studies on the nutritional awareness of pregnant women have been restricted to 1 or more geographically distant regions, comparative research on the nutritional awareness of pregnant women among different regions has rarely been conducted. As a result, in this section, we can only attempt to describe the nutritional awareness of pregnant women for certain regions. A previous study conducted on the nutritional awareness of Dutch women during various stages of pregnancy has confirmed that pregnant women are more aware of their nutrition than those who are not.5 Qualitative research conducted in Sweden on women who are pregnant for the first time has indicated that those women are aware that certain foods have harmful effects on the fetus, even if they did not know the specific foods they have to avoid eating.29 The findings of a quantitative study conducted on pregnant women in France, which have supported a similar view, have demonstrated an increase in the consumption of fruits and vegetables and a decrease in the consumption of sugar during pregnancy.35 According to a previous study, women in Australia have shown interest in accessing information about healthy eating, weight management, vegetarian diets, breastfeeding, morning sickness, and heartburn during pregnancy, among other topics.36 There is insufficient evidence to assess whether women in different countries have similar or different food preferences and orientations to nutrition-related information during pregnancy; however, the available evidence suggests that nutritional awareness does change through the various stages of pregnancy in at least some countries.

Sources of nutritional information

Healthcare professionals, the social environment, and the media are the primary sources of information for pregnant women, but credible pregnancy-focused nutrition-related information from all 3 is regarded as deficient.15 Due to a lack of time, resources, and professional training, healthcare practitioners have insufficient access to nutrition-related information; therefore, the nutritional advice they can offer to pregnant women is, likewise, insufficient.37 While the internet, as the primary source of nutrition-related information in the media, has the advantages of being easily accessible, consistently available, and on-demand,13,29 it is frequently unreliable due to the complex range of information sources.38,39 As a result, the nutrition-related information that pregnant women can seek and receive is mostly limited, and can be contradictory and confusing, making it difficult for them to apply to their dietary plans.15 In addition, some sources of nutrition-related information have more impact than others on nutritional awareness during pregnancy.

Of the many sources of nutrition-related information, the influence of midwives or healthcare providers on the nutritional awareness of pregnant women has received attention. The positive effect of nutrition education during pregnancy by healthcare providers, mainly midwives,40 is well documented in studies from the United Kingdom,41 New Zealand,42 and Australia,43 which means that nutrition advice from healthcare providers, including midwives, is one of the factors influencing the nutritional awareness of pregnant women. For example, in the United Kingdom, recommendations requiring healthcare workers to provide nutritional support and advice to women during pregnancy have been issued through the National Institute for Health and Clinical Excellence.44 On the other hand, in Australia, the Department of Health and the Ageing Healthy Eating Guidelines for Pregnant Women have not provided sufficient guidelines for healthcare workers, who are not trained in nutrition, to offer nutritional advice to pregnant women.40 There is ample reliable evidence that the information provided by midwives on nutrition during pregnancy varies from country to country. For example, in the United Kingdom, some midwives feel there is a lack of information on folic acid requirements to help pregnant women to prevent the recurrence of neural tube defects (NTDs).40,45 In New Zealand, midwives have reported that they are less adept at advising women who are vegetarian or have conditions, such as gestational diabetes, than they are at answering other nutritional questions during pregnancy.29 Midwives in both Australia and the United Kingdom have been found to ignore the presence of excessive obesity or digestive problems in women during pregnancy.46,47 However, no clear evidence has been found to suggest that differences in nutritional awareness among pregnant women in different countries are due to differences in the level of nutritional education provided by midwives or other healthcare workers in those countries, or differences in the attitudes of national agencies towards midwives providing nutritional education guidelines to pregnant women.

Factors of economic level differences

There is a high association among malnutrition in women, their education level, and their household wealth index, according to research that compared the nutritional health of women in various areas of Bangladesh.48 This indicates that the economic power of a woman's family affects her nutritional awareness and, therefore, her nutritional status. On the other hand, a family's financial conditions may be associated with its level of access to transport, healthcare services, food, and employment

opportunities; in addition, the geographical location of the household may affect the nutritional knowledge and status of women.48–50 There is abundant evidence of pro-rich disparities in prenatal healthcare and delivery care services, which tend to emerge in locations with high industrial density.48,51 In a study conducted in Pakistan among people of non-European cultural backgrounds and specific faiths, economic factors have been found to have the most debilitating effects on dietary habits.12 Among people who have a lower socioeconomic status, those who have sufficient knowledge of dietary health and pregnancy care still fail to afford to buy enough food to meet caloric intake requirements during pregnancy, let alone to purchase specific foods to meet special dietary requirements.12 This also suggests that economic circumstances may directly impact the health behaviors of pregnant women, which is likely to result in a shift in beliefs about prenatal diet and nutrition. It may be inferred that a higher proportion of pregnant women in developing countries, which generally have a higher proportion of low-income people than developed countries, may have to change their dietary behaviors (and even their beliefs about healthy nutrition) in response to their economic circumstances, but there is no conclusive evidence for this.people

A lack of healthy foods (such as fruits, vegetables, legumes, and whole grains)30,52 is one of the main causes of stunting in children and of anemia in adult women in South Africa. Approximately 56% of the population of South Africa lives in poverty, with nearly 28% living in extreme poverty.53 Women, as a vulnerable group, are subject to more pressure from poverty, as is the case for the majority of women in the Carter River Valley.30 In a study of the cultural beliefs on food choices and dietary preferences of pregnant women in the Eastern Cape of South Africa, 21% of the women in the Kat River Valley has been found not to have any sources of cash income, and 58% requires support from child support grants, so, for all these women, a daily intake of sufficient quantities and quality of food is unrealistic.30 Additionally, for those pregnant women who have an even greater need for a wide variety of nutrients, they may only be able to afford a diet that falls short of their dietary requirements: their circumstances force them to place a premium on cost rather than nutrition, despite the benefits to themselves and their unborn children. There are notable differences in the resources available to expectant mothers due to economic disparities between developed and developing nations. Some developed nations, however, do not appear to have a distinct advantage over developing nations regarding matters like knowledge of particular nutrient requirements during pregnancy. Studies have shown that knowledge of the importance of folic acid among women of childbearing age is not as high in some developed countries as that of women in some developing countries. One study of women in the United States and Canada has discovered that their knowledge about folic acid is only at the “awareness” stage, and that their understanding of the specific role of folic acid in preventing birth defects is low. Such a situation is even worse than that in Nigeria,54,55 Egypt,54,56 China,54,57 and some other emerging nations, as well as in other industrialized nations like South Korea.58 In the United States and Canada, national health awareness programs and folic acid–related education campaigns introduced in the mid-1990s have substantially improved knowledge of folic acid among women of childbearing age in those countries.54 This is considered evidence that there is a need to emphasize the significance of healthcare personnel in providing health information to pregnant women and to women of reproductive age during health checks, as well as a need for public health education for women of childbearing age.54 It also shows that in areas where nutritional conditions and health care resources are relatively inadequate, it is possible to provide women with the necessary nutritional knowledge through targeted nutritional health education, although it may not be possible to mobilize human and financial resources for large-scale nutrition awareness campaigns.

Access to nutrition education

Access to nutrition education has been recognized as one of the factors that determine the levels of nutritional awareness of pregnant women in various nations. The level of awareness of nutrition among pregnant women in Iran has significantly increased from 3% before to 31% after nutrition education interventions.59 This finding indicates that nutrition education can enhance nutritional awareness of pregnant women by improving their nutritional knowledge. However, the literacy level of the pregnant women affects the efficiency.59 Recently, another study of maternal awareness and knowledge about antenatal care in southwestern Cameroon has found that low levels of maternal education are possible risk factors for NTDs experienced by the newborn.54 Low awareness of the importance of folic acid among pregnant women having low levels of education is part of the reason.54 On the other hand, women with higher levels of education were more likely to have prior access to health information and facilities, in addition to having some knowledge about NTD prevention and folic acid administration during pregnancy.54 This is attributed to the fact that women with higher levels of education are more acquainted with specific methods for gaining access to relevant information and services and are more sensitive to nutritional needs.

The educational level has been shown to be a common predictor of the nutritional knowledge, attitudes, and practices of women in an earlier study, which has examined the nutritional awareness of pregnant and lactating women living with human immunodeficiency virus (HIV) in Swaziland.12 The study has found that education, regardless of whether it is formal or informal, may influence the nutritional knowledge, attitudes, and practices of pregnant and lactating women.12 This reveals that inclusive nutritional education programs across formal educational institutions, communities, and primary healthcare systems should include pregnant and breastfeeding women who are living with HIV.12 Nevertheless, the effect of education on the attitudes of women toward nutritional awareness has yet to be fully corroborated and will continue to be a question for future research and reflection.

Cultural backgrounds and religious beliefs

According to the Food–Health conceptual framework of the United Nations Children's Fund (UNICEF), cultural norms, taboos, and beliefs are listed among the essential contextual factors for malnutrition.60,61 In addition to poverty, the prenatal management of mothers and the birth of their newborns are subject to cultural beliefs. For this, food taboos are important causes of maternal malnutrition during pregnancy62–64 and NTDs in newborns in sub-Saharan Africa.54 A study of cultural beliefs related to food choices and dietary preferences of pregnant women in the Eastern Cape Province of South Africa has revealed that foods [such as meat products, pulses, eggs, cloves, and fruits with an orange tinge (including peaches, pineapples, and guavas)] considered taboos for women during pregnancy tend to belong to the most important food groups that are rich in essential micronutrients, proteins, and carbohydrates.30 Food taboos stemming from religious beliefs and cultural norms can limit the dietary diversity of pregnant women, making nutrient deficiencies more common, as observed in Africa62–64 and Asia.65–67 As an example, the Fulla women in the Gambia, under the influence of religious beliefs and other forces, are prohibited from consuming several foods (such as catfish, pepper, breads, eggs, and bananas) rich in carbohydrates, animal proteins, and micronutrients. This increases their risks of severe undernutrition and protein-calorie malnutrition during pregnancy. In fact, nutritional awareness of pregnant women are influenced by multiple factors. A summary of major factors are shown in Figure 1.30,63

Figure 1

Factors influencing nutritional awareness of pregnant women in various countries.

Open in new tabDownload slide

Factors influencing nutritional awareness of pregnant women in various countries.

RESEARCH METHODS ON NUTRITIONAL AWARENESS BEFORE AND AFTER THE ONSET OF PREGNANCY

Qualitative, quantitative, and mixed approaches have been used in research on nutritional awareness of pregnant women. An interpretive-sequential-research mixed-methods study design has been used to investigate women's knowledge and experiences of nutrition during pregnancy in Australia. The study began with a questionnaire to assess pregnant women's knowledge of nutrition and sources of nutritional information. This was followed by semistructured interviews using focus groups to collect information on motivation to change dietary behaviors during pregnancy, among other topics.68 Here it is worth noting that due to the small sample size as well as the single route of subject recruitment, it is highly likely that the findings are not generalizable and representative.68 The need to extract as much information as possible from respondents in a short amount of time may lead to recall bias as well.

A mixed qualitative–quantitative research design approach has also been adopted to study nutritional awareness of pregnant women in hospitals in Karachi, Pakistan. The study refined the interview questions and obtained additional information through an initial key informant interview, combined with a literature search, to establish an ethnographic field guide and a pre-experiment on the ethnographic guide before collecting interview data.12 Ethnography requires direct long-term immersion in the culture of respondents, which then allows systematic observations and descriptions of the respondents' lifestyles and experience.69 The use of this approach in nutritional awareness studies can help researchers gain a deeper and more comprehensive understanding and knowledge of the living environment, cultural background, economic status, eating behaviors, and perceptions of nutritional health behaviors of women. It also facilitates the exploration of the relationships between these factors and the eating behaviors of pregnant women in subsequent studies.

A study exploring the attitudes of pregnant women toward nutrition-related issues in France has investigated the eating behaviors of pregnant women through a holistic dietary assessment, rather than through the assessment of weight change as what having been done in many previous qualitative studies.15,70–72 French women of childbearing age who had normal weight before pregnancy were chosen for assessment of their lifestyle, dietary composition, and habits during pregnancy. The study was confined to France. For this, the conclusions drawn may not be generalizable. It has, however, provided insights for subsequent studies on nutritional awareness of pregnant women in different countries. For example, the study has stated that attribution theory is useful in understanding the perceptions of pregnant women about nutrition-related problems.15,73 Attribution theory is the study of perceived causality, where people explain behavior in terms of its causes.74 Subsequent research could make use of attribution theory to explore the nutritional awareness of women at various stages of pregnancy in various countries, and to infer the reasons behind their nutritional

behaviors. In addition, the study has asserted that pregnant women could regain control of their nutritional behaviors by adopting strategies to achieve a healthier diet.15 These nutritional behavioral changes include increased consumption of fruits and vegetables, greater adherence to dietary guidelines, reduced consumption of unhealthy foods,15,28,75 and proper meal planning.75 Nutritional awareness of pregnant women can be measured by assessing nutritional behaviors and personal involvement in improving nutrition.76,77 However, when comparing nutritional awareness before and after the onset of pregnancy, the consumption of fruits and vegetables, and use of meal planning, among other behaviors, can be adopted as measures.

Use of a cross-sectional survey design in a study of Dutch women's nutritional knowledge during pregnancy is an typical example of quantitative research conducted in the field.5 Cross-sectional studies are conducted at a single point in time, or over a brief period, and can be used to assess attitudes of patients and health personnel.78 The Dutch study gathered and evaluated information on women's nutritional habits and dietary behaviors throughout pregnancy using a cross-sectional survey.5 It has contributed to the justification of nutritional interventions aimed at women of reproductive age. However, in that study, the target group was not sampled to the highest standard of guaranteed randomness, even though the researchers corrected and matched the sample population for age and education. The sample was, therefore, inevitably skewed toward women with higher education and toward women who were slightly older and intended to become pregnant. All these limit the generalizability of results to the entire population of women.5 To allow the generalization of the findings to a larger population, sampling should be randomized to the greatest extent in future studies. This could be achieved by increasing the sample size. Matching and correcting for confounding factors (such as age and education) are also essential. In addition, this study provides a direction for a future longitudinal study of pregnant women from preconception through pregnancy to the postpartum period to track the processes and factors that may influence nutritional awareness during these transitions.5 Apart from studying nutritional awareness of pregnant women in developed countries, the cross-sectional survey design can be applied to study the situation in developing countries. This is exemplified by a study of pregnant women in western Kenya, in which the researchers have used a cross-sectional survey in addition to a questionnaire to establish a nutritional knowledge score to assess nutritional awareness of pregnant women.79 A summary of major approaches to study nutritional awareness of women before and after the onset of pregnancy, along with the strengths and limitations of each of these approaches, is shown in Table 1.79–81

CONCLUDING REMARKS

Changes in nutritional awareness in different stages of pregnancy provide insights into development of strategies to enhance the nutritional health of pregnant women. This article reviews the information available about the variables affecting nutritional knowledge among pregnant women in various countries. Future research in this field may continue to rely on techniques from the research procedures previously used to compare women's nutritional awareness before and after the onset of pregnancy. The most glaring research gap is the absence of data from comparative studies. Over the years, the majority of prior work has focused on research conducted in a single country. Relatively few studies have evaluated the nutritional knowledge of pregnant women in multiple nations. In addition, the majority of the literature on changes in nutritional awareness and behaviors during pregnancy has considered the pregnancy period as a whole. Studies which segment the pregnancy period (eg, into the first, second, and third trimesters) are scant. Knowledge of differences in nutritional awareness

between women in different stages of pregnancy is, therefore, extremely limited at this moment. There are also limitations in the existing literature in terms of the variety of the population studied. This is because some specific groups, such as pregnant lesbians, have not received much attention. Most reported studies have focused on pregnant heterosexuals, and have failed to consider the impact of the gender of the partner on a pregnant woman's nutritional perceptions. In addition, since the turn of the last century, comparative design has been increasingly recognized as a methodology that has the potential to handle the trend of globalization. Comparative analysis involves comparing structures, routines and cultures. It can be applied to a range of macro-level units, such as countries, subnational regions, social environments and linguistic domains.82 It can also be applied to a range of micro-level units, which has the benefit of expanding the knowledge of researchers about other systems, cultures, and patterns of thinking.82 Furthermore, comparative analysis can be used to test hypotheses in various settings and evaluate the breadth and depth of specific occurrences, thereby contributing to the creation of theories that can be used in diverse settings.82 This implies that, in future research, researchers can analyze narratives and phenomena that contribute to changes in nutritional awareness through cultural, political, religious, educational, and social contexts, among others. This will allow them to draw general conclusions in a dialectical manner and make recommendations to relevant governmental bodies on nutritional intervention strategies that are inclusive of women of various ethnic, religious, and cultural backgrounds.

Acknowledgments

The authors thank Josephine Leung and Yau-Foon Tsui for helpful discussions during the preparation of this manuscript.

Author contributions. W.J.F. contributed to the conception of the work and drafted the manuscript. All authors contributed to data collection, revision of the manuscript and approval of the final version.

Funding. There was no external funding to support this work.

Declarations of interest. The authors have no relevant interests to declare.

REFERENCES

1 Bullen C. Taking public health to the streets: the 1998 Auckland Meningococcal Disease Awareness Program. Health Educ Behav. 2000;27:363–370. DOI: 10.1177/109019810002700310

Google ScholarCrossrefPubMedWorldCat

2 Cashel KM, Crawford D, Deakin V, et al. Is the link between nutrients and foods understood? The case of fibre and folate. Public Health Nutr. 2001;4:913–918. DOI: 10.1079/PHN2001128

Google ScholarCrossrefPubMedWorldCat

3 Bogers RP, Brug J, van Assema P, et al. Explaining fruit and vegetable consumption: the theory of planned behaviour and misconception of personal intake levels. Appetite. 2004;42:157–166. DOI: 10.1016/j.appet.2003.08.015

Google ScholarCrossrefPubMedWorldCat

4 Oenema A, Brug J. Exploring the occurrence and nature of comparison of one's own perceived dietary fat intake to that of self-selected others. Appetite. 2003;41:259–264. DOI: 10.1016/S0195-6663(03)00103-X

Google ScholarCrossrefPubMedWorldCat

5 Szwajcer E, Hiddink GJ, Maas L, et al. Nutrition awareness before and throughout different trimesters in pregnancy: a quantitative study among Dutch women. Fam Pract. 2012;29:i82–i88. DOI: 10.1093/fampra/cmr107

Google ScholarCrossrefPubMedWorldCat

6 Szwajcer EM, Hiddink GJ, Koelen MA, et al. Nutrition awareness and pregnancy: implications for the life course perspective. Eur J Obstet Gynecol Reprod Biol. 2007;135:58–64. DOI: 10.1016/j.ejogrb.2006.11.012

Google ScholarCrossrefPubMedWorldCat

7 Quinla JD, Hill DA. Nausea and vomiting of pregnancy. Am Fam Physician. 2003;68:121–128. DOI: 10.5688/aj670266

Google ScholarCrossrefPubMedWorldCat

8 Ferrari RM, Siega-Riz AM, Evenson KR, et al. A qualitative study of women's perceptions of provider advice about diet and physical activity during pregnancy. Patient Educ Couns. 2013;91:372–377. DOI: 10.1016/j.pec.2013.01.011

Google ScholarCrossrefPubMedWorldCat

9 El Shalazi H. Nutritional Taboos and Traditional Practices in Pregnancy and Lactation Including Breastfeeding. Geneva: WHO/EMRO Technical Publication; 1979.

Google ScholarGoogle PreviewWorldCatCOPAC

10 Ojofeitimi EO, Elegbe I, Babafemi J. Diet restriction by pregnant women in Nigeria. Int J Gynaecol Obstet. 1982;20:99–103. DOI: 10.1016/0020-7292(82)90019-4

Google ScholarCrossrefPubMedWorldCat

11 Gittelsohn J. Listening to Women Talk about Their Health: Issues and Evidence from India. New Delhi: Har-Anand Publications; 1994.

Google ScholarGoogle PreviewWorldCatCOPAC

12 Zobairi SE, Freitas ML, Wasti SA. Diet and nutrition: a knowledge, attitude and practice study of pregnant women in Karachi. Aust N Z J Obstet Gynaecol. 1998;38:188–193. DOI: 10.1111/j.1479-828x.1998.tb02999.x

Google ScholarCrossrefPubMedWorldCat

13 Szwajcer EM, Hiddink GJ, Koelen MA, et al. Nutrition-related information-seeking behaviours before and throughout the course of pregnancy: consequences for nutrition communication. Eur J Clin Nutr. 2005;59(suppl 1):S57–65. DOI: 10.1038/sj.ejcn.1602175

Google ScholarCrossrefPubMedWorldCat

14 Hossain MF, Khalil MI. A study on nutritional status of pregnant woman in south-west region of Bangladesh. Int Res J Pharm Appl Sci. 2013;3:54–58.

Google ScholarWorldCat

15 Bianchi CM, Huneau JF, Le Goff G, et al. Concerns, attitudes, beliefs and information seeking practices with respect to nutrition-related issues: a qualitative study in French pregnant women. BMC Pregnancy Childbirth. 2016;16:306. DOI: 10.1186/s12884-016-1078-6

Google ScholarCrossrefPubMedWorldCat

16 Tuccilli C, Baldini E, Truppa E, et al. Iodine deficiency in pregnancy: still a health issue for the women of Cassino city, Italy. Nutrition. 2018;50:60–65. DOI: 10.1016/j.nut.2017.11.007

Google ScholarCrossrefPubMedWorldCat

17 Jugha VT, Anchang-Kimbi JK, Anchang JA, et al. Dietary diversity and its contribution in the etiology of maternal anemia in conflict hit Mount Cameroon area: a cross-sectional study. Front Nutr. 2020;7:625178. DOI: 10.3389/fnut.2020.625178

Google ScholarCrossrefPubMedWorldCat

18 Combet E, Bouga M, Pan B, et al. Iodine and pregnancy – a UK cross-sectional survey of dietary intake, knowledge and awareness. Br J Nutr. 2015;114:108–117. DOI: 10.1017/S0007114515001464

Google ScholarCrossrefPubMedWorldCat

19 Mohammed SH, Taye H, Larijani B, et al. Food taboo among pregnant Ethiopian women: magnitude, drivers, and association with anemia. Nutr J. 2019;18:19. DOI: 10.1186/s12937-019-0444-4

Google ScholarCrossrefPubMedWorldCat

20 Gebremichael TG, Welesamuel TG. Adherence to iron–folic acid supplement and associated factors among antenatal care attending pregnant mothers in governmental health institutions of Adwa town, Tigray, Ethiopia: cross-sectional study. PLoS One. 2020;15:E0227090. DOI: 10.1371/journal.pone.0227090

Google ScholarCrossrefPubMedWorldCat

21 Katenga-Kaunda LZ, Iversen PO, Kamudoni PR, et al. Food-based nutrition counselling and education intervention for improved diets of pregnant women in rural Malawi: a qualitative study of factors influencing dietary behaviour change. Public Health Nutr. 2022;25:2436–2447. DOI: 10.1017/S1368980022000593

Google ScholarCrossrefPubMedWorldCat

22 Adjei-Banuah NY, Aduah VA, Ziblim SD, et al. Nutrition knowledge is associated with the consumption of iron rich foods: a survey among pregnant women from a rural district in northern Ghana. Nutr Metab Insights. 2021;14:11786388211039427. DOI: 10.1177/11786388211039427

Google ScholarCrossrefPubMedWorldCat

23 Kraemer K, Beesabathuni K, Askari S, et al. Knowledge, attitudes and practices of pregnant women and healthcare providers in Bangladesh regarding multivitamin supplements during pregnancy. Healthcare. 2023;11:713. DOI: 10.3390/healthcare11050713

Google ScholarCrossrefPubMedWorldCat

24 AlDuraibi S, Al-Mutawa J. Knowledge and awareness of folic acid usage in Saudi pregnant women in Riyadh city from 2019–2020. J Family Med Prim Care. 2020;9:5158–5164. DOI: 10.4103/jfmpc.jfmpc_638_20

Google ScholarCrossrefPubMedWorldCat

25 Reroń A, Zareba-Szczudlik J, Was K, et al. Nutrition habits in pregnant women. Przegl Lek. 2003;60:8–11.

Google ScholarPubMedWorldCat

26 Verbeke W, De Bourdeaudhuij I. Dietary behaviour of pregnant versus non-pregnant women. Appetite. 2007;48:78–86. DOI: 10.1016/j.appet.2006.07.078

Google ScholarCrossrefPubMedWorldCat

27 Herman DR, Taylor Baer M, Adams E, et al. Life course perspective: evidence for the role of nutrition. Matern Child Health J. 2014;18:450–461. DOI: 10.1007/s10995-013-1280-3

Google ScholarCrossrefPubMedWorldCat

28 Copelton DA. “You are what you eat”: nutritional norms, maternal deviance, and neutralization of women’s prenatal diets. Deviant Behav. 2007;28:467–494. DOI: 10.1080/01639620701252571

Google ScholarCrossrefWorldCat

29 Wennberg AL, Lundqvist A, Högberg U, et al. Women’s experiences of dietary advice and dietary changes during pregnancy. Midwifery. 2013;29:1027–1034. DOI: 10.1016/j.midw.2012.09.005

Google ScholarCrossrefPubMedWorldCat

30 Chakona G, Shackleton C. Food taboos and cultural beliefs influence food choice and dietary preferences among pregnant women in the Eastern Cape, South Africa. Nutrients. 2019;11:2668. DOI: 10.3390/nu11112668

Google ScholarCrossrefPubMedWorldCat

31 Padmanabhan U, Summerbell CD, Heslehurst N. A qualitative study exploring pregnant women’s weight-related attitudes and beliefs in UK: the BLOOM study. BMC Pregnancy Childbirth. 2015;15:99. DOI: 10.1186/s12884-015-0522-3

Google ScholarCrossrefPubMedWorldCat

32 Henrich J, Henrich N. The evolution of cultural adaptations: Fijian food taboos protect against dangerous marine toxins. Proc Biol Sci. 2010;277:3715–3724. DOI: 10.1098/rspb.2010.1191

Google ScholarCrossrefPubMedWorldCat

33 Malan DF, Neuba DF. Traditional practices and medicinal plants use during pregnancy by Anyi-Ndenye women (Eastern Côte d'Ivoire). Afr J Reprod Health. 2011;15:85–93. DOI: 10.2307/41329779

Google ScholarPubMedWorldCat

34 Towns AM, van Andel T. Wild plants, pregnancy, and the food–medicine continuum in the southern regions of Ghana and Benin. J Ethnopharmacol. 2016;179:375–382. DOI: 10.1016/j.jep.2016.01.005

Google ScholarCrossrefPubMedWorldCat

35 Potier de Courcy G, Deheeger M, Chaveroux F, et al. L'alimentation de femmes enceintes parisiennes et lilloises. Cah Nutr Diét. 1998;33:29–40.

Google ScholarWorldCat

36 Wilkinson SA, Tolcher D. Nutrition and maternal health: what women want and can we provide it? Nutr Diet. 2010;67:18–25. DOI: 10.1111/j.1747-0080.2010.01404.x

Google ScholarCrossrefWorldCat

37 Lucas C, Charlton KE, Yeatman H. Nutrition advice during pregnancy: do women receive it and can health professionals provide it? Matern Child Health J. 2014;18:2465–2478. DOI: 10.1007/s10995-014-1485-0

Google ScholarCrossrefPubMedWorldCat

38 Johnson M, Campbell F, Messina J, et al. Weight management during pregnancy: a systematic review of qualitative evidence. Midwifery. 2013;29:1287–1296. DOI: 10.1016/j.midw.2012.11.016

Google ScholarCrossrefPubMedWorldCat

39 Weir Z, Bush J, Robson SC, et al. Physical activity in pregnancy: a qualitative study of the beliefs of overweight and obese pregnant women. BMC Pregnancy Childbirth. 2010;10:18. DOI: 10.1186/1471-2393-10-18

Google ScholarCrossrefPubMedWorldCat

40 Arrish J, Yeatman H, Williamson M. Midwives and nutrition education during pregnancy: a literature review. Women Birth. 2014;27:2–8. DOI: 10.1016/j.wombi.2013.02.003

Google ScholarCrossrefPubMedWorldCat

41 Mulliner CM, Spiby H, Fraser RB. A study exploring midwives' education in, knowledge of and attitudes to nutrition in pregnancy. Midwifery. 1995;11:37–41. DOI: 10.1016/0266-6138(95)90055-1

Google ScholarCrossrefPubMedWorldCat

42 Elias S, Green T. Nutrition knowledge and attitudes of New Zealand registered midwives. Nutr Diet. 2007;64:290–294. DOI: 10.1111/j.1747-0080.2007.00177.x

Google ScholarCrossrefWorldCat

43 Australian Nursing and Midwifery Council. National Competency Standards for the Enrolled Nurse. Canberra: Australian Nursing and Midwifery Council; 2002.

44 NICE Public Health Guidance. Improving the Nutrition of Pregnant and Breastfeeding Mothers and Children in Low-Income Households. London: National Institute for Health Clinical Excellence; 2008.

Google ScholarGoogle PreviewWorldCatCOPAC

45 Barrowclough D, Ford F. A nutrition open – learning pack for practising midwives. Nutr Food Sci. 2001;31:6–12. DOI: 10.1108/00346650110361185

Google ScholarCrossrefWorldCat

46 Bondarianzadeh D, Yeatman H, Condon-Paoloni D. A qualitative study of the Australian midwives' approaches to Listeria education as a food-related risk during pregnancy. Midwifery. 2011;27:221–228. DOI: 10.1016/j.midw.2009.06.002

Google ScholarCrossrefPubMedWorldCat

47 Schmied VA, Duff M, Dahlen HG, et al. 'Not waving but drowning': a study of the experiences and concerns of midwives and other health professionals caring for obese childbearing women. Midwifery. 2011;27:424–430. DOI: 10.1016/j.midw.2010.02.010

Google ScholarCrossrefPubMedWorldCat

48 Hossain S, Khudri MM, Banik R. Regional education and wealth-related inequalities in malnutrition among women in Bangladesh. Public Health Nutr. 2022;25:1639–1657. DOI: 10.1017/S1368980021003840

Google ScholarCrossrefPubMedWorldCat

49 Khonje MG, Ricker-Gilbert J, Muyanga M, et al. Farm-level production diversity and child and adolescent nutrition in rural sub-Saharan Africa: a multicountry, longitudinal study. Lancet Planet Health. 2022;6:e391–e399. DOI: 10.1016/S2542-5196(22)00071-7

Google ScholarCrossrefPubMedWorldCat

50 Ahmed T, Mahfuz M, Ireen S, et al. Nutrition of children and women in Bangladesh: trends and directions for the future. J Health Popul Nutr. 2012;30:1–11. DOI: 10.3329/jhpn.v30i1.11268

Google ScholarCrossrefPubMedWorldCat

51 Pulok MH, Uddin J, Enemark U, et al. Socioeconomic inequality in maternal healthcare: an analysis of regional variation in Bangladesh. Health Place. 2018;52:205–214. DOI: 10.1016/j.healthplace.2018.06.004

Google ScholarCrossrefPubMedWorldCat

52 Chakona G, Shackleton CM. Household food insecurity along an agro–ecological gradient influences children's nutritional status in South Africa. Front Nutr. 2017;4:72. DOI: 10.3389/fnut.2017.00072

Google ScholarCrossrefPubMedWorldCat

53 Statistics South Africa. Poverty trends in South Africa: an examination of absolute poverty between 2006 & 2015. Pretoria: Statistics South Africa; Pretoria: Government Printers; 2017.

54 Alemajo CA, Halle-Ekane GE, Nkengasong EA, et al. Peri-conceptional folic acid supplementation: a cross-sectional study to assess the awareness, knowledge, use and associated factors among pregnant women attending antenatal care in two secondary health care facilities, southwest region, Cameroon. Obstet Gynecol Res. 2022;5:244–253. DOI: 10.26502/ogr098

Google ScholarCrossrefWorldCat

55 Anzaku AS. Assessing folic acid awareness and its usage for the prevention of neural tube defects among pregnant women in Jos, Nigeria. J Basic Clin Reprod Sci. 2013;2:13–17. DOI: 10.4103/2278-960X.112574

Google ScholarCrossrefWorldCat

56 Al-Darzi W, Al-Mudares F, Farah A, et al. Knowledge of periconceptional folic acid use among pregnant women at Ain Shams University Hospital, Cairo, Egypt. East Mediterr Health J. 2014;20:561–568.

Google ScholarCrossrefPubMedWorldCat

57 Ren A, Zhang L, Li Z, et al. Awareness and use of folic acid, and blood folate concentrations among pregnant women in northern China—an area with a high prevalence of neural tube defects. Reprod Toxicol. 2006;22:431–436. DOI: 10.1016/j.reprotox.2006.02.003

Google ScholarCrossrefPubMedWorldCat

58 Kim MJ, Kim J, Hwang EJ, et al. Awareness, knowledge, and use of folic acid among non-pregnant Korean women of childbearing age. Nutr Res Pract. 2018;12:78–84. DOI: 10.4162/nrp.2018.12.1.78

Google ScholarCrossrefPubMedWorldCat

59 Fallah F, Pourabbas A, Delpisheh A, et al. Effects of nutrition education on levels of nutritional awareness of pregnant women in Western Iran. Int J Endocrinol Metab. 2013;11:175–178. DOI: 10.5812/ijem.9122

Google ScholarCrossrefPubMedWorldCat

60 Ekwochi U, Osuorah CD, Ndu IK, et al. Food taboos and myths in South Eastern Nigeria: the belief and practice of mothers in the region. J Ethnobiol Ethnomed. 2016;12:7. DOI: 10.1186/s13002-016-0079-x

Google ScholarCrossrefPubMedWorldCat

61 United Nations Children's Fund. Strategy for Improved Nutrition of Children and Women in Developing Countries. New York: United Nations Children's Fund; 1990.

Google ScholarGoogle PreviewWorldCatCOPAC

62 Kariuki LW, Lambert C, Purwestri RC, et al. Role of food taboos in energy, macro and micronutrient intake of pregnant women in western Kenya. Nutr. Food. Sci. 2017;47:795–807. DOI: 10.1108/NFS-09-2016-0146

Google ScholarCrossrefWorldCat

63 Martínez Pérez G, Pascual García A. Nutritional taboos among the Fullas in Upper River region, the Gambia. J Anthropol. 2013;2013:1–9. DOI: 10.1155/2013/873612

Google ScholarCrossrefWorldCat

64 Oni OA, Tukur J. Identifying pregnant women who would adhere to food taboos in a rural community: a community-based study. Afr J Reprod Health. 2012;16:68–76.

Google ScholarPubMedWorldCat

65 BBC. The myths about food and pregnancy. Available at: https://www.bbc.com/news/magazine-32033409. Accessed May 19, 2023.

66 Hartini TN, Padmawati RS, Lindholm L, et al. The importance of eating rice: changing food habits among pregnant Indonesian women during the economic crisis. Soc Sci Med. 2005;61:199–210. doi:10.1016/j.socscimed.2004.11.043.

Google ScholarCrossrefPubMedWorldCat

67 Sharifah Zahhura SA, Nilan P, Germov J. Food restrictions during pregnancy among Indigenous Temiar women in peninsular Malaysia. Malays J Nutr. 2012;18:243–253. DOI: 10.1002/mrc.3836

Google ScholarCrossrefPubMedWorldCat

68 Lee A, Newton M, Radcliffe J, et al. Pregnancy nutrition knowledge and experiences of pregnant women and antenatal care clinicians: a mixed methods approach. Women Birth. 2018;31:269–277. DOI: 10.1016/j.wombi.2017.10.010

Google ScholarCrossrefPubMedWorldCat

69 Smith BM, Sparkes AC. Routledge Handbook of Qualitative Research in Sport and Exercise. London: Routledge; 2016.

Google ScholarCrossrefGoogle PreviewWorldCatCOPAC

70 Kominiarek MA, Gay F, Peacock N. Obesity in pregnancy: a qualitative approach to inform an intervention for patients and providers. Matern Child Health J. 2015;19:1698–1712. DOI: 10.1007/s10995-015-1684-3

Google ScholarCrossrefPubMedWorldCat

71 Reyes NR, Klotz AA, Herring SJ. A qualitative study of motivators and barriers to healthy eating in pregnancy for low-income, overweight, African–American mothers. J Acad Nutr Diet. 2013;113:1175–1181. DOI: 10.1016/j.jand.2013.05.014

Google ScholarCrossrefPubMedWorldCat

72 Sui Z, Turnbull DA, Dodd JM. Overweight and obese women's perceptions about making healthy change during pregnancy: a mixed method study. Matern Child Health J. 2013;17:1879–1887. DOI: 10.1007/s10995-012-1211-8

Google ScholarCrossrefPubMedWorldCat

73 Heider F. The Psychology of Interpersonal Relations Hillsdale. New Jersey: Lea; 1958.

Google ScholarCrossrefGoogle PreviewWorldCatCOPAC

74 Kelley HH, Michela JL. Attribution theory and research. Annu Rev Psychol. 1980;31:457–501. DOI: 10.1146/annurev.ps.31.020180.002325

Google ScholarCrossrefPubMedWorldCat

75 Whitaker KM, Wilcox S, Liu J, et al. African American and white women's perceptions of weight gain, physical activity, and nutrition during pregnancy. Midwifery. 2016;34:211–220. DOI: 10.1016/j.midw.2015.11.005

Google ScholarCrossrefPubMedWorldCat

76 Glanz K, Brug J, van Assema P. Are awareness of dietary fat intake and actual fat consumption associated?—a Dutch–American comparison. Eur J Clin Nutr. 1997;51:542–547. DOI: 10.1038/sj.ejcn.1600442

Google ScholarCrossrefPubMedWorldCat

77 Stables GJ, Subar AF, Patterson BH, et al. Changes in vegetable and fruit consumption and awareness among US adults: results of the 1991 and 1997 5 A Day for Better Health Program surveys. J Am Diet Assoc. 2002;102:809–817. DOI: 10.1016/S0002-8223(02)90181-1

Google ScholarCrossrefPubMedWorldCat

78 Kesmodel US. Cross-sectional studies – what are they good for? Acta Obstet Gynecol Scand. 2018;97:388–393. DOI: 10.1111/aogs.13331

Google ScholarCrossrefPubMedWorldCat

79 Perumal N, Cole DC, Ouédraogo HZ, et al. Health and nutrition knowledge, attitudes and practices of pregnant women attending and not-attending ANC clinics in Western Kenya: a cross-sectional analysis. BMC Pregnancy Childbirth. 2013;13:146. DOI: 10.1186/1471-2393-13-146

Google ScholarCrossrefPubMedWorldCat

80 Goodson L, Vassar M. An overview of ethnography in healthcare and medical education research. J Educ Eval Health Prof. 2011;8:4. DOI: 10.3352/jeehp.2011.8.4

Google ScholarCrossrefPubMedWorldCat

81 Caruana EJ, Roman M, Hernández-Sánchez J, et al. Longitudinal studies. J Thorac Dis. 2015;7:E537–E540. DOI: 10.3978/j.issn.2072-1439.2015.10.63

Google ScholarPubMedWorldCat

82 Esser F, Vliegenthart R. Comparative research methods. In: Matthes J, Davis CS, Potter RF, eds. The International Encyclopedia of Communication Research Methods. London: Sage; 2017:1–22.

Google ScholarGoogle PreviewWorldCatCOPAC