

Original Research

Knowledge and Awareness of Vitamin D Among Pregnant or Lactating Iraqi Refugee Women: A Call for Different Approaches in Health Education and Outreach

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Abstract

Vitamin D deficiency during pregnancy and lactation has negative impacts on maternal, fetal, and infant health. Low health literacy and other social determinants of health may increase the risk of deficiency among refugee women. This qualitative study used a survey and in-depth individual interviews to examine knowledge of vitamin D among ten pregnant or breastfeeding Iraqi refugee women in the United States, and sought participants' recommendations on culture-centered and participatory health promotion strategies. All participants reported having insufficient information and understanding of vitamin D, its health benefits, and the risks of deficiency. The

four primary themes that emerged from the interviews were the quality of available vitamin D information, barriers to seeking such information, intersectionality of health and environment, and power differentials and the control of the health agenda. Participants' recommendations included bridging the language barrier and training health care providers to deliver the information needed to raise awareness. The findings of this study provide an opportunity for public health systems to design culture-centered health education and promotion strategies to ensure vitamin D adequacy among this vulnerable population.

Background

The world is facing a refugee crisis; not since World War II has there been such mass movement of people fleeing conflict, war, and persecution (United Nations High Commissioner for Refugees, 2017). The United States (U.S.) admits approximately 70,000 refugees annually, depending on the administration. Refugees face a variety of acute and chronic diseases resulting from the generally poor conditions—including malnutrition and inadequate medical care—in resettlement camps and other settings commonly experienced during displacement and migration. High rates of tuberculosis, malaria, hepatitis, intestinal parasites, and nutritional deficiencies have been documented in resettled refugee adults and children (Ackerman, 1997; Avery, 2001; Chaves et al., 2009; Penrose, Hunter Adams, Nguyen, Cochran, & Geltman, 2012; Sanati Pour, Kumble, Hanieh, & Biggs, 2014; Thacher et al., 2016).

English language proficiency plays an important role in resettled refugees' access to health services and overall health literacy in Anglophone countries (Fein-

berg, O'Connor, Owen-Smith, Ogrodnick, & Rothenberg, 2020; Higginbottom & Safipour, 2015; Kim & Keefe, 2010; Mirza et al., 2014; Morris, Popper, Rodwell, Brodine, & Brouwer, 2009; Pandey et al., 2021; Rootman & Gordon-El-Bihbety, 2008). However, only one-third of refugees admitted to the U.S. in 2008–2013 spoke some English, and 7% had good command of the English language (Capps et al., 2015). Without the ability to speak and read English well, refugees are at a great disadvantage in accessing health information, making medical appointments, communicating with health care providers, complying with medication directions, understanding medication side effects, engaging in preventive care, and advocating for themselves. Low English language proficiency is significantly related to self-reported poor health among women and refugees, resulting in fewer positive health outcomes and less frequent health care service use (Berkman et al., 2011; Pottie, Ng, Spitzer, Mohammed, & Glazier, 2008).

One of the larger groups of recent refugees in the U.S. comprises people from Iraq. Since 2003, war and con-

flict have caused the displacement of more than 4.5 million Iraqis (United Nations High Commissioner for Refugees, 2017), more than 170,000 of whom were admitted to the U.S. from 2006 to 2021 (Refugee Processing Center of the U.S. Department of State Bureau of Population Refugees and Migration, 2022; Refugee Processing Center of the U.S. Department of State Bureau of Population Refugees and Migration, 2017). Iraqi refugee women in the United States report generally poor physical and mental health, as well as unexpected challenges related to language barriers and navigating the U.S. health care system (Salman & Resick, 2015).

Poor health literacy among refugee women can have intergenerational effects. For example, maternal vitamin D deficiency during pregnancy and lactation is linked to adverse effects during pregnancy and in infants. Vitamin D is involved in calcium absorption and in the formation and maintenance of bones, teeth, the immune system, and other bodily functions (Bellamy, Casas, Hingorani, & Williams, 2007; Bischoff-Ferrari, Giovannucci, Willett, Dietrich, & Dawson-Hughes, 2006; Holick, 2013; Lauretani, Maggio, Ruggiero, Ceda, & Ferrucci, 2013; Maladkar, Sankar, & Kamat, 2015; Prietl, Treiber, Pieber, & Amrein, 2013; Wagner & Hollis, 2018, 2020). It is found naturally in a limited number of foods and can also be obtained through sun exposure and from dietary supplements. Dietary factors, higher latitude, limited sun exposure, darker skin pigmentation, pollution, obesity, and other factors are correlated with lower vitamin D levels (Martin, Gowda, & Renzaho, 2016). Awareness of vitamin D can mitigate and prevent negative health effects (Alemu & Varnam, 2012).

Recent studies suggest an association between low maternal vitamin D status and adverse pregnancy outcomes such as pre-eclampsia and cesarean delivery (Hollis, Johnson, Hulsey, Ebeling, & Wagner, 2011; Lo, Wu, Li, & Ding, 2019; Ni et al., 2021). There is also evidence that, without supplementation, breast milk does not provide an adequate level of vitamin D to ensure adequate absorption by infants (Hollis et al., 2011; Liang, Chantry, Styne, & Stephensen, 2010). With respect to pediatric impacts, the causal relationship between vitamin D deficiency and neonatal hypocalcemia and rickets is well established (Kovacs, 2008). In a 2003 study, Turkish researchers also found a correlation between vitamin D deficiency and hypocalcemic convulsions in infants (Pehlivan, Hatun, Aydogan, Babaoglu, & Gokalp, 2003). Low vitamin D in infants has also been linked to the development of Type 1 diabetes (Schwalfenberg, 2012), respiratory infections including pneumonia (Manaseki-Holland et al., 2010; Muhe, Lulseged, Mason, & Simoes, 1997), and asthma (Bener, Ehlayel, Tulic, & Hamid, 2012; Urashima et al., 2010).

Women with limited sun exposure due to wearing a hijab or other Muslim head covering, and/or other mod-

est clothing such as long sleeves and long trousers or dresses, may be at particularly high risk of vitamin D deficiency. A 2021 meta-analysis of 65 primary studies found evidence for higher rates of vitamin D deficiency in Pakistan and Bangladesh than in neighboring countries that are not majority Muslim, and also for higher rates of deficiency in female than in male residents of the region (Siddiquee, Bhattacharjee, Siddiqi, & MeshbahurRahman, 2021). Individual studies have reported a high prevalence of vitamin D deficiency among pregnant and lactating women and their infants in Pakistan (Atiq, Suria, Nizami, & Ahmed, 1998; Hossain et al., 2011; Nausheen et al., 2021); women in Saudi Arabia (AlFaris et al., 2019); and women in Iraq (Al-Hilali, 2016; Issa & Ibraheem, 2006; Skheel, 2013). Muslim dressing customs have been suggested to contribute to the higher rates of vitamin D deficiency observed in Middle Eastern compared to European countries (Lips et al., 2019). A study conducted in Jordan found that women who wore dress styles that covered the entire body, or the entire body plus the face and hands, had higher rates of vitamin D deficiency than men, while women who dressed in Western-type styles did not (Mishal, 2001); a similar study of women in Turkey reported a correlation between more conservative dressing styles and higher rates of vitamin D deficiency (Alagol et al., 2000).

In view of the high rates of vitamin D deficiency observed in Iraqi women and their infants, and the generally poor health of resettled refugees, it is vital that the Iraqi refugee population in the U.S. receive adequate education about the benefits of vitamin D, and that appropriately targeted public health measures are implemented. However, very little is known about refugee Iraqi women who are pregnant or lactating and who are at high risk of vitamin D deficiency due to language barriers, socioeconomic status, and/or limited sun exposure due to Muslim head covering and/or dressing customs. Studies that include the voices of pregnant or breastfeeding Iraqi women regarding vitamin D and effective health promotion strategies are also lacking. The current study addresses this gap in the literature by exploring the knowledge and awareness of vitamin D deficiency and its health effects among ten pregnant or lactating Iraqi refugee women who reside in King County, WA. Furthermore, the study examined individual and structural barriers to the acquisition of vitamin D-related information and sought participants' recommendations on culture-centered and participatory vitamin D health promotion strategies.

This qualitative study used a descriptive case study design to explore the following research questions: (1) How do Iraqi refugee women describe their health during pregnancy, and the health of their baby?; (2) What are the perceptions and awareness of vitamin D and its impacts on maternal, infant, and children's health among pregnant or lactating Iraqi refugee women; (3)

What barriers do the participants experience to accessing information about vitamin D in maternal, infant, and children's health, and what is their attitude to self-efficacy?; (4) What are the participants' recommendations for health care providers, public health systems, and policymakers regarding the identified barriers to health information, and what are their suggestions regarding culture-centered health education related to vitamin D?

Methods

Study design

This qualitative study was conducted using an action research method with a non-experimental design. Qualitative research was deemed appropriate because knowledge, attitude, and practice surveys used in quantitative studies fail to explore culture-specific knowledge or other socio-cultural factors (Launiala, 2009). In addition, in the absence of any survey instruments validated for Iraqi refugee women regarding knowledge, attitudes, and practices related to vitamin D, in-depth interviews were a more appropriate way to answer the questions that framed this study.

The Health Belief Model (HBM) and Critical Social Theory (CST) provided the theoretical frameworks for this study. The HBM has been used since the 1950s to better understand preventive health behaviors (Clark & Janevic, 2013; Skinner, Tiro, & Champion, 2015). Drawing from cognitive theories, the HBM asserts that individuals make decisions about healthy behaviors based on their beliefs, as well as their awareness and information about a particular health issue. Therefore, it is less likely that people will make health-promoting decisions when they are unaware of the problem (Burns, 1992). The HBM provides an appropriate framework for assessing participants' beliefs about susceptibility, severity, benefits, barriers, action, and self-efficacy related to vitamin D deficiency. In addition, since empowerment is key in community health promotion approaches with marginalized people (Ford & Yep, 2003), CST guided the study's examination of social structures that may hinder community voices and empowerment in addressing effective health promotion strategies relevant to vitamin D deficiency. Critical Social Theory focuses on the issues of politics, power, and justice and the ways that society, education, religion, gender, race, sexuality, social discourse, organizations, and cultural situations interact to create a social system. It aims not only to study and understand but also to critique and change society, raising consciousness and affecting the balance of power in favor of those currently less powerful or oppressed (Bennett, Bergin, & Wells, 2016). Furthermore, the juxtaposition of the HBM (an individual model of health behavior) and the CST (a structural model) allows for a deeper examination of the relation-

ship between participants' knowledge of vitamin D deficiency and social/systemic structures responsible for health promotion and health equity.

Participants

The sample consisted of ten Iraqi refugee women residing in King County, WA who were pregnant or breastfeeding. Purposive sampling was used to recruit study participants; this approach is commonly used to select participants based on the richness of information they can provide (Gray, 2014; Patton, 2015). The inclusion criteria were Iraqi refugee women who had arrived in the U.S. during the past ten years and were at least three months pregnant, or breastfeeding. English proficiency was not required; all ten women could read, speak, and understand Arabic.

Recruitment activities were facilitated by the executive director of a community partner serving Iraqi refugees, who granted approval to conduct the interviews at their agency. The English versions of the demographic questionnaire and qualitative interview questions were reviewed by the partner agency. The Arabic translation of the detailed 'Participant's Information Sheet' was posted throughout the agency, and announcements about the study were made during the Center's activities/programs; interested clients were directed to the 'Participants' Information Sheet' for further information about the study. The information sheet contained a brief introduction to the researcher, the purpose of the study, the benefits and risks of participation, information about confidentiality and the right to withdraw, an invitation to participate, and the researcher's contact information. Respondents were contacted and interviews were scheduled on three separate dates.

Ethics

Prior to participant selection, approval was granted from the Institutional Review Board. Before beginning the questionnaire and in-depth interviews, participants filled out the approved written informed consent form, which was provided in English. The content of the consent form was also verbally explained to participants in Arabic, and interpreters (students in the Seattle University Doctorate in Educational Leadership program) were available to assist with the verbal translation of the informed consent documents and process. Confidentiality issues were clarified and discussed prior to each interview, and the option to withdraw from the study at any point was also explained.

Survey design

The written survey included demographic questions about age, number of pregnancies and children, due dates, highest level of education, date of arrival in the United States and in Washington State, frequency

Table 1. Standardized interview questions and optional probes to solicit additional information.

Q	Text	Optional probes
1	Where do you get your information about how to stay healthy during pregnancy, and about vitamin D?	<p>What kind of information was provided?</p> <p>Was the information useful?</p> <p>Was the information in Arabic?</p> <p>If not, who translated for you and how was that accomplished?</p> <p>Did you look for additional information because of knowing about vitamin D deficiency?</p>
2	Did the information help you learn about the importance of vitamin D for your health and your baby's health?	What kind of information would have helped you?
3	How does your doctor communicate with you about your or your baby's health?	To what extent (and how) does your doctor ensure that you understand what you need to know about vitamin D to have a healthy pregnancy and a healthy baby?
4	Tell me about your health care experiences during your pregnancy in the United States.	What barriers do you face? What do you think you can personally do to remove these barriers?
5	What is your assessment of your health during your pregnancy and after pregnancy?	Is their health different or the same as women who were born in the U.S.?
	How healthy do you think other pregnant or breastfeeding Iraqi women are?	Why do you think that?
6	What suggestions and advice do you have for health care providers, policymakers and community-based organizations in regards to vitamin D deficiency health outreach and education?	Not applicable

of doctor visits, English proficiency, and the language used by participants' health care provider(s). The vitamin D-specific questions were modified versions of those used in previous studies (Kavitha, Anjalakshi, Venkataraman, Rukmani, & Murali, 2015; Kung & Lee, 2006; Moffat et al., 2015; Pirrone, Capetola, Riggs, & Renzaho, 2013; Vu, van der Pols, Whiteman, Kimlin, & Neale, 2010; Zhao, Ford, Tsai, Li, & Croft, 2012) and concerned participants' knowledge of vitamin D and its sources. According to the HBM, knowledge of the seriousness of contracting a disease or medical condition and the ensuing negative health consequences can be a strategy in encouraging health-promoting behavior; participants were therefore asked about their knowledge of the impacts of vitamin D deficiency. The HBM also asserts that individuals make decisions about healthy behaviors based on their beliefs, as well as their awareness of a particular health issue. Since sun exposure is an efficient way of obtaining vitamin D, questions were also included to learn about participants' sun exposure habits and their beliefs about its potential risks and benefits. Awareness of public health campaigns can mitigate and prevent negative health effects (Alemu & Varnam, 2012; Martin et al., 2016); questions were therefore also included to assess how participants had learned about vitamin D.

Before the main study began, the translated survey questionnaire was piloted by three Iraqi women with similar characteristics to the target sample. Pilot participants were asked to provide input on the clarity of survey instructions and questions, which was used to revise the sequence of questions and ensure accurate translation from English to Arabic. Specifically, two words, 'latitude' and 'hair growth', were changed in the Arabic version of the survey.

The standardized qualitative interview questions and protocol were designed specifically for the current study based on published guidelines (Jacob & Furgerson, 2012; Patton, 2015). The six qualitative questions (listed in **Table 1**) were designed to develop a more in-depth understanding of HBM constructs as well as structural strengths and impediments that may have affected participants' access to vitamin D-related health promotion and health education. Finally, participants were invited to offer suggestions to health care providers, policymakers, and public health systems concerning culturally-centered health promotions and educational strategies grounded in their own experiences and realities.

Survey implementation

Prior to the in-depth interviews, participants completed the translated demographic information form and translated survey questionnaire. Each woman was then interviewed separately. The interviews lasted approximately 1 hour and were conducted in participants' residences or at the community partner agency. Participants were informed that they could take breaks if they chose to do so. Interviews were recorded with an audio recording device and detailed notes were taken to describe the observed environment, to aid in developing a holistic interpretation of the problem and to allow time to reflect upon ideas and nuances of the study that were not collected directly from the interview questions (Cresswell, 2009; Merriam & Tisdell, 2015). Additionally, field notes served as indicators of the progress of the study and allowed for adjustments based on an inductive analysis of the data (Merriam & Tisdell, 2015). For example, investigator field notes indicated that 8/10 women were frustrated and overwhelmed by the fact that they did not know much about vitamin D deficiency and its impact on their health and that of their children. This knowledge resulted in additional probes for participants' recommendations for policymakers and health care providers during subsequent interviews.

Analysis

An inductive process was employed to capture, analyze, and code the content of each interview. All interviews and field notes were transcribed. Audio-tapes were listened to twice, and the translated transcripts were read three times. Interviews and field notes were analyzed for each participant and manually coded for meaning sentence by sentence. The analysis also included identification of themes by comparing interview transcripts and finding recurring narratives and patterns across interviews; common themes were noted, as well as any outliers. In addition, a deductive process was implemented by re-evaluating data from the themes to determine the omission of any important information. To ensure rigor and credibility, interviews and field notes were cross-referenced (Cresswell & Miller, 2010). Credibility was also achieved by member checking, i.e., sharing the transcripts and findings with participants to ensure their accuracy (Cresswell, 2009). Confirmability was gained by the researcher acknowledging attitudes and biases that may have been present during the study (Thomas & Magilvy, 2011).

Results

Questionnaire results

All ten participants completed the written survey. Participant demographics are summarized in Table 2.

Table 2. Participant demographics.

Characteristic	n (%)
Total	10
Age (years)	
26–29	5 (50)
30–39	4 (40)
40–45	1 (10)
Married	10 (100)
Residency in Washington State (years)	
1–2	3 (30)
3–4	0 (0)
5–6	3 (30)
7–8	2 (20)
9–10	2 (20)
Highest education level completed	
Elementary school	0 (0)
Middle school	4 (40)
High school	2 (20)
Certificate / diploma	2 (20)
Bachelor's degree	2 (20)
Graduate degree	0 (0)
English language proficiency (speak/read)	
None	2 (20)
Beginner level	3 (30)
Intermediate level	3 (30)
Advanced level	2 (20)
Occupation	
Professional	1 (10)
Housewife	7 (70)
Student	2 (20)

General health: The majority of participants (80%) reported having experienced one or more of the following symptoms: chronic fatigue, muscle aches, depression, gestational diabetes, colitis. Seven (70%) women indicated that their health was not good during pregnancy, and two participants (20%) reported not being in good health after pregnancy.

Sun exposure behavior: All participants reported liking being in the sun, and eight women (80%) knew about the benefits of sun exposure. However, half the participants reported avoiding sun exposure despite knowing its benefits. Reasons varied from fear of heat stroke, sweating, and not wanting the sun to tan or darken their skin. All participants stated that they did not think they had enough sun exposure. Two women (20%) used sunscreen occasionally.

Knowledge about vitamin D: When asked about factors that decrease vitamin D absorption, three (30%) reported they did not know, while four of the other seven participants identified at least one correct factor from a list provided. Cloud and shade were identified by three women (30%); two participants (20%) mentioned skin pigmentation, sunscreen use, and time of day; one (10%) identified vegetarian diet; and one (10%) reported pregnancy and lactation as factors impacting vitamin D absorption. Most participants (60%)

reported that they did not know the amount of sun exposure needed to get enough vitamin D. Three participants (30%) indicated that it takes fewer than 15 minutes of daily sun exposure to get an adequate amount of vitamin D, two (20%) said fewer than 10 minutes per week, one (10%) said 1–6 hours per week (which is the correct answer for people who have dark skin and/or wear head coverings), and one (10%) stated 10–60 minutes per week.

Seven participants (70%) said they were aware of the impacts of vitamin D deficiency in pregnant women, while three (30%) said they were unaware. When asked to identify impacts from a list provided, six women (60%) correctly identified bone health as being affected by vitamin D deficiency during pregnancy and one participant (10%) selected infectious disease. None of the participants selected preeclampsia, gestational diabetes, or obstructed labor.

Health information Sources: Most participants (90%) had heard about vitamin D from multiple sources, with common sources including family members, doctors, the internet, school, and magazines. Five women (50%) had heard about vitamin D from their doctor.

Interview results

Four themes emerged, all of which were most relevant to research questions 2 and 3: (1) quality of vitamin D information and information sources, (2) barriers to seeking information, (3) intersectionality of health and environment, and (4) power differential and the control of the health agenda. Participant quotes are *italicized*.

Quality of vitamin D information and information source: The results of both the survey and the individual interviews revealed that nine participants (90%) had heard about vitamin D; five women (50%) identified their doctor as a primary source of information. This awareness was limited to general statements about vitamin D being good and helping with bone health. The benefits of vitamin D had been explained to three women (30%) as decreasing nausea during pregnancy and improving skin health. Only three women (30%) reported being tested for vitamin D deficiency, and those who were tested had informed their doctor of muscle aches, back pain, and chronic fatigue. None of the women reported knowledge of vitamin guidelines for babies. Participants did not report asking or searching for information related to vitamin D. During the interview, one participant suggested that she would have been more inclined to take vitamin D if she had *'awareness classes about where to find vitamin D and learn about its benefits.'* Therefore, awareness of vitamin D was not aligned with knowledge of its health effects and did not result in further information-seeking behavior. This lack of alignment is consistent with the HBM frame-

work (Skinner et al., 2015), which posits that people are more likely to engage in a health behavior if, in addition to awareness, they perceive that: (1) they are susceptible to developing a condition, (2) there are potential serious health effects or other consequences associated with the condition, and (3) a change in behavior could benefit them by decreasing their susceptibility to or the seriousness of the condition.

Barriers to seeking information: Qualitative data revealed language as the primary barrier in participants' communication with their doctors, both about their own health and that of their infants. Seven participants (70%) mentioned language as a barrier to knowing about and taking vitamin D, and identified learning English as an action they could take to improve their knowledge of vitamin D and directly communicate with their providers. All participants relied on the information provided by their health care providers and, based on that information, did not perceive themselves as being at risk and/or did not know enough about vitamin D to ask further questions or research the topic. Seven women (70%) used interpreters during their visits with health care providers. All of them spoke about the challenges of using interpreters, including the occasional use of male interpreters by their providers. Other concerns included interpreters leaving before the visit was over, failing to interpret verbatim, and leaving out important content: *'Some interpreters are in a rush and sometimes in the middle of the interview they leave.'*

Several participants shared their perception that their health care provider did not take their health concerns seriously. The providers seemed to rush through the visits, misdiagnosed problems, or offered solutions irrelevant to the concerns discussed (e.g., drinking water). One participant talked about her doctor suggesting counseling because of her depression, and how she subsequently pretended to be happy due to the fear her children might be taken away.

Intersectionality of health and environment: In each of the participants' narratives, the interplay of daily life challenges such as maintaining emotional health, accessing health care, providing self-care, managing nutrition, and staying healthy was evident. Most participants reported poor health during and after pregnancy, and all participants believed Iraqi-born women were less healthy than their American-born counterparts. The women attributed their poor health to a host of issues including not actively seeking preventive care, difficulty making medical appointments, remaining unfamiliar with the U.S. health system, lacking a support system, worrying about relatives left behind in Iraq, and not knowing how to stay healthy during and after pregnancy. Many of the women had large families and felt overwhelmed by the responsibilities of caring for themselves, their children, and other family

members during their pregnancy. One mother summed it up by saying, *'it gets worse after giving birth because everyone needs me and I don't have the time to accommodate everyone's needs.'*

Power differentials and the control of the health agenda: Participants spoke of the power differential between them and their health care providers and their lack of control of the agenda during their visits with their doctors. They recounted discussions of their health, information shared about vitamin D deficiency, and their perception of their concerns not being addressed properly or adequately.

Throughout the interviews, a common theme among all participants, even those who spoke English well, was their astonishment at not knowing enough about vitamin D and the consequences of its deficiency on their health. A representative statement was as follows: *'Every doctor should not wait for the patient to ask. Doctors should share important information with patients. A person who asks questions knows about it, so when someone doesn't know about vitamin D, how would they ask questions about vitamin D?'*

The recommendations and other responses provided by the participants captured their struggles with navigating a complex health system. Speaking with providers through an interpreter created another hierarchy of power, since participants had to rely on another person to give voice to their health concerns. Although two participants were grateful for having an interpreter present, most discussed the challenges of having a third person present when sensitive and important information was being shared with their provider.

Participant recommendations: Strategies recommended by participants focused on education, bridging the language barrier, and training health care providers to deliver the information needed to raise awareness. Specifically, participants believed that implementing policies that would result in nutritional classes being taught to pregnant women in Arabic, as well as pamphlets and additional health information being provided in Arabic, would empower the community. They also recommended outreach conducted through community centers in Arabic, possibly through the internet or phone, to help the population feel more connected and better informed.

Discussion

This was a pioneer study aimed at assessing the knowledge and awareness of vitamin D among pregnant and lactating refugee Iraqi women residing in King County, WA, USA. The study explored individual and structural barriers to the acquisition of vitamin D information. In addition, participants' recommendations were

sought on culture-centered and participatory vitamin D health promotion strategies.

Our findings are in line with previous work that suggests there is inadequate awareness of vitamin D deficiency among refugee populations. Various social determinants of refugee health also affect health literacy and access to vitamin D-related knowledge. On the individual level, the participants' narratives illustrated that without clear and sufficient information and understanding of vitamin D, its health benefits, and the risks of deficiency, their knowledge about vitamin D was insufficient to promote life-long behaviors that would ensure vitamin D adequacy in the future. At the macro level, there is a two-fold failure of the health system to address health inequities and disparities among this population, particularly in relation to knowledge about the health benefits of vitamin D for mothers, fetuses, and infants: (1) the lack of targeted health education for Iraqi women who are pregnant or breastfeeding, and (2) the inability of health care providers to understand participants' health history and concerns, and their own unfamiliarity with the social determinants of refugee health.

Our findings on the intersectionality of health and environment are supported by a study conducted to identify descriptions of health among Iraqi women refugees, their health status, and health experiences once resettled in the US (Salman & Resick, 2015). The authors reported that issues such as safety and security, loss and grieving, and differences in language and health care system structure are important components of health among this population. Similarly, the health conditions of the participants in the current study must be viewed in the context of their daily lives, both pre- and post- resettlement. In this context, power becomes a relevant concept at both micro and macro levels because it shifts the emphasis from personal responsibility and self-efficacy in achieving health to the role of systems and policies that promote health inequities and disparities. Participants' comparisons of their own health to that of populations who they perceive as having better access to health care, leisure time, and support systems, or as one participant put it, *'an easier life,'* points to the macro structures that create, maintain, and perpetuate health disparities. Recognizing the power differentials present at all levels moves providers closer to creating health strategies that balance this disequilibrium.

Health literacy is strongly correlated with health disparities among people with limited English proficiency, low income, and/or minority status. There is evidence that high-quality interpretation can improve communication between physicians and patients with limited English proficiency and encourage positive health outcomes (Flores, 2005; Karliner, Jacobs, Chen, & Mutha, 2007). Culture-centered health promotion and educa-

tion also play critical roles in ensuring that vulnerable individuals feel in control of their lives and their health (Dutta-Bergman, 2005; Dutta, 2007). However, the notion of empowerment poses an interesting dilemma in the fields of health care, health education, and health promotion (Lupton, 1994). There is already a power imbalance between health care providers and the individuals who seek their care. In most societies, health care providers are the holders of knowledge, and much trust is placed in them because of their knowledge and expertise. Within hierarchical provider–patient relationships, individuals with language barriers and low health literacy and are already disadvantaged by their lack of protective factors among the social determinants of health. These deficiencies often result in individuals giving up their personal power in deciding their own health agenda.

Participants' recommendations to improve knowledge of vitamin D among Iraqi refugee women focused primarily on providing additional education in the appropriate language. It is important to read these recommendations in the context of the overall refugee experience. This perspective places health and access to health education on a continuum of daily struggles, with constant reminders of power differentials within broader society. The recommendations also bring to the surface the failure of refugee policies to ensure health literacy, by neglecting English language learning and/or promotion of health strategies that result in a sense of mastery over one's own health. Community leaders and health care providers should take into account the recommendations provided by participants to ensure health equity for Iraqi refugee women.

The present study has several limitations. First, because of the small sample size, the results cannot be applied to all Iraqi refugee women who are pregnant or breastfeeding. Replication of this study with larger groups of Iraqi women will be important in confirming our findings. Second, the findings are not generalizable to refugee groups from outside Iraq. Follow-up studies will be needed to identify similarities and differences in knowledge and needs between different refugee groups. Third, the scope of this study was limited to Iraqi refugee women who are pregnant or lactating; men, children, older adults, and women who did not meet the inclusion criteria were not part of the study. A broader participant pool might have provided additional insight into Iraqi refugees' knowledge and awareness of vitamin D deficiency, and their barriers to accessing health information. Fourth, the research questions focused primarily on how participants access information about vitamin D, and the barriers that limit their access. Broader questions regarding knowledge of micronutrients may provide a better understanding of participants' nutritional knowledge, attitudes, and practices that affect maternal and infant health. Finally, participants' responses may have been

influenced by the researcher's presence resulting in favorable responses. This study also used interpreters during the qualitative interviews and survey questionnaire. It should be noted that in qualitative studies where the researcher is an instrument in data collection, the use of interpreters poses an obstacle to connecting with participant narratives (Edwards, 1998; Murray & Wynne, 2001).

Recommendations: practice

Inequities in health remain prevalent for the most vulnerable members of society, particularly individuals who belong to racial/ethnic minority groups with limited English proficiency, and with lower educational attainment and limited literacy skills. Forced migration further increases susceptibility to poor health, as well as health inequity. Health education plays a vital role in addressing the social determinants of health, and health equity advocates have long pointed out that health literacy is an important mechanism for ensuring that individuals have sufficient knowledge to take charge of their own health, addressing health disparities. The primary responsibility for the dissemination of health-related information to the public falls on health care providers and systems. The researcher therefore recommends that health care providers and policymakers follow participants' own recommendations and move toward a more culture-centered health education, with promotion strategies that give primacy to those most impacted (Dutta, 2007). A final policy recommendation, not proposed by participants, is that policies must include ethnic-specific trainings for health care providers, as well as education on the refugee experience and social determinants of health.

Recommendations: research

This study also suggests several future research directions. Since health literacy is necessary for the acquisition and use of health-related information, one focus should be on the relationships between vitamin D awareness, health literacy, and social determinants of health.

In many cultures, doctors are perceived as the holders of knowledge, and asking questions may not be deemed appropriate. Studies comparing the interactions of Iraqi- and American-born women during prenatal and other medical visits may identify cultural nuances that add to doctor–patient power differentials, resulting in fewer questions, less assertive patients, and less effective self-advocacy. Since health care providers can provide education to promote vitamin D intake, future research can also examine the role of physicians and other health care providers and the quality of the doctor–patient relationship in preventing vitamin D deficiency.

This study did not examine health care provider perceptions regarding knowledge of vitamin D among Iraqi women who are pregnant or lactating. Future studies should evaluate health care providers' knowledge of the importance of vitamin D, and the communication strategies they use with Iraqi women. Exploring the impact of interpreters on the health of refugee women and on differential health outcomes for refugee women would also be beneficial. Finally, research using CST would be beneficial in further identifying structural barriers and policies that prevent robust culture-centered vitamin D health education and health promotion campaigns.

Conclusion

This study adds to the body of research about the knowledge and awareness of vitamin D in Iraqi refugee women and confirms previous findings that vulnerable refugee populations face language and other barriers to accessing information on vitamin D, with potentially intergenerational negative health impacts. Although drawn from a limited number of participants, the findings of the study offer recommendations for future research, as well as policy and practice. The primary actionable recommendation at this time is that health care providers should move toward more culture-centered health education policies using strategies that give primacy to those most impacted.

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