Research Brief

Impact of Community-Based Nutrition Education on Geophagic Behavior and Dietary Knowledge and Practices among Rural Women in Nakuru Town, Kenya: A Pilot Study

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ABSTRACT

Objective: Geophagia, the deliberate consumption of rocks, soil, or clay, is prevalent in developing countries, particularly sub-Saharan Africa. Health risks associated with this behavior include parasitosis, heavy metal poisoning, nutrient deficiencies, and poor birth outcomes. This pilot study was designed to reduce geophagic practices and improve nutrition among rural Kenyan women.

Methods: The researchers used snowball sampling to recruit participants (n = 135; aged 15–49 years) from low socioeconomic areas who consumed geophagic materials. Interviews were carried out before and after a nutrition intervention implemented by trained community health volunteers.

Results: Nutrition education focusing on geophagia significantly ($P < .001$) decreased the practice in 77% of participants. Postintervention interviews also demonstrated substantial improvement in understanding the concept of making half the plate vegetables using the healthy plate model.

Conclusions and Implications: Nutrition education can be useful for reducing geophagia (a largely ignored, unsafe dietary behavior) and enhancing nutritional knowledge in African women.

Key Words: geophagia, nutrition education, women of reproductive age, women's dietary diversity score (*J Nutr Educ Behav*. 2017;■■:■■–■■.)

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INTRODUCTION

Geophagia, the deliberate ingestion of rocks and soil materials, is highly prevalent in sub-Saharan Africa and is commonly practiced in pregnant or breastfeeding women.[1-4] In Nairobi, Kenya, rates of this form of pica reach 67% in antenatal women,[5] which demonstrates the magnitude of the problem. Indulgence in this behavior can trigger micronutrient deficiencies (eg, iron and zinc), gastrointestinal upset, increased exposure to geohelminths, heavy metal poisoning, soil-borne parasitic infection, dental injury, and achlorhydria.[2-4,6-8] These adverse effects can increase maternal and child morbidity as well as poor pregnancy and birth outcomes.[2,3] In a recent study, Odongo et al[4] (2016) measured lead exposure from geophagic materials in pregnant women from Nakuru Municipality, Kenya. Laboratory analyses of rocks indicated that lead was present in concentrations of 5.00 ± .50 µg/g. Study participants reported consumption of approximately 20 g/d of geophagic material, resulting in approximately 100 µg daily lead exposure. Currently, the US Food and Drug Administration has zero tolerance for lead in food.[9]

In many Kenyan communities, geophagia is a widely accepted behavior that is passed from mother to daughter. It is thought to have health benefits such as boosting fertility, ensuring beautiful offspring, reducing stress, and preventing morning sickness, nausea, and vomiting in pregnancy.[2,3,7,8] Common reasons reported for indulging in this behavior include cravings and appetite suppression.[10,11] In some cases, women practicing geophagia believe that it is a healthy choice for providing essential micronutrients during pregnancy.[8]

Despite the high prevalence of geophagia in some areas in Kenya, prenatal care and national guidelines focus on micronutrient supplementation and deworming, with little or no mention of geophagic behavior.[2] In addition, there are only 1,290 nutritionists nationwide, which translates to 1 nutritionist for every 31,000

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people.[12] This percentage of nutritionists per capita is significantly lower than levels found in developed countries.[13] To overcome the shortage of trained professionals, community health volunteers are often enlisted to augment health promotion project staff. These volunteers are community members with little or no secondary or tertiary education, who are supported by the health system but are not necessarily part of its organization.[14]

Inadequate nutritional knowledge and poor diet diversity, combined with misconceptions and harmful dietary traditions such as geophagia, are potentially dangerous to women and offspring[15] and contribute to poor nutritional status.[16] Effective nutrition education with culturally appropriate dissemination can have a vital role in creating awareness about geophagia and reducing the practice. It can also support behavior change and modify food choices to improve health and well-being. Tools such as the healthy plate model[17] provide an easily understood visual representation of current nutritional guidelines to promote good health.

The objectives of this study were twofold: to pilot-test a short community-based nutrition education program aimed at reducing geophagic practices and to improve diet diversity with the aid of the healthy plate model.[17]

METHODS

Setting and Participants

This pilot study was conducted in the low socioeconomic areas of Nakuru town from December, 2014 to March, 2015. Nakuru town is the headquarters of Nakuru County, which lies within the Great Rift Valley of Kenya. It is an agricultural town characterized by volcanic and sedimentary accumulations in the soil that include clay, gypsum, and diatomite.

Women of reproductive age (aged 15–49 years) who practiced geophagia participated in this study. The researchers excluded those who had stopped consuming geophagic material before the study. With the aid of community health volunteers, snowball sampling was used to recruit women who consumed geophagic materials. Volunteers were enlisted from a previous project in the community that had just ended. Participant recruitment continued until a sample size of 135 was attained. Appropriate sample size was determined by *a priori* power analysis (version 3.1.9.2, G*Power, University of Düsseldorf, Germany).

Educational Materials, Intervention, and Evaluation

Study staff developed culturally appropriate nutrition education materials for this project with the aid of 3 nutritionists from Njoro Health Center, Nakuru Provincial General Hospital, and Bungoma County. Because a significant portion of participants had limited literacy, colorful counseling cards were used, which visually presented key messages about the causes of geophagia, adverse effects of the behavior, and appropriate ways to overcome the practice. For example, the card promoting behavior change included alternative foods to consume, such as crunchy nuts, which provide a similar mouth-feel to the crunchy chewing of rocks. Additional cards demonstrating the healthy plate model[17] illustrated how dietary recommendations could be met using locally available foods. The counseling cards were pretested on 10 local women for face validity, and necessary adjustments (ie, replacement of specific pictures) were made to improve clarity. The Health Belief Model[18] was the basis for the intervention and the counseling cards had graphic depictions of the health dangers of geophagic practices. In addition, social cognitive theory[19] emphasizing self-efficacy was implemented regarding messages concerning the healthy plate model[17] and how to apply these recommendations in daily food preparation.

Community health volunteers participated in an intense half-day training session that provided in-depth explanations of the dangers of geophagic materials and strategies to help individuals decrease consumption. The healthy plate model[17] was also presented, including suggestions regarding how to modify meals using a greater variety of foods with appropriate serving sizes. The last portion of the training involved instruction on how to use the newly developed educational materials, which included counseling cards that specifically addressed geophagia. At a later date, volunteers were responsible for leading half-day interactive nutritional education programs with study participants, which focused on prevention of geophagia and how to plan balanced meals. The intervention involved limited lecture-style instruction with emphasis on group discussion, as well as hands-on activities such as building healthy plate models.[17] The counseling cards provided visual reinforcement of the intervention's messages.

All meetings were held in small groups and were available at no cost. The groups gathered at different neighborhood locations (garage, church, mosque, and homes). Three or 4 weeks after completion of the nutrition education session, 106 participants were located and postquestionnaires were administered in their homes and workplaces. The decrease in the number of participants from 135 at baseline to 106 at follow-up was attributed to several reasons: sickness (4), work (14), relocation or travel (7), and 1 death.

Data Collection Tools

A registered dietitian carried out semistructured interviews at baseline and upon completion of the nutrition education program in a pretest-posttest design.

Data were collected on dietary practices, geophagia, and sociodemographic information (age, highest level of education, employment status, and reproductive status at the time of the study). The respondents were asked to recall the amounts of geophagic materials they consumed in a day. The quantities of geophagic materials were estimated using models of weighed samples of 10, 50, and 100 g of commonly consumed soft rock. The amount consumed was defined as low (≤49 g) medium (50–99 g), or high (≥100 g). Frequency of consumption (once or more than once per day, once or more than once per week, and once a month) and amounts of the material consumed were recorded. Validity of questionnaires, which included 24-hour dietary recall, was determined