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Barriers to uptake of treatment for geophagic women of reproductive age in Tshwane District, Gauteng Province: A qualitative study using the Health Belief Model



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ABSTRACT

Geophagy among women of reproductive age is a major public health concern linked to perinatal and postpartum mortality and morbidity, requiring urgent intervention. Despite available treatments such as oral iron, folic acid supplementation, and intravenous iron therapy, adherence remains low. Geophagy is widespread globally across all socio-economic, ethnic, and social groups. This study used an exploratory qualitative approach, guided by the Health Belief Model, to explore the barriers to treatment uptake among women of reproductive age in Tshwane District, Gauteng Province. Data were collected in antenatal care and family planning units of public healthcare facilities. The findings revealed key barriers, including lack of geophagy health education and iron-deficiency screening in antenatal care, addiction and dependency syndrome, peer influence, fear of judgment, shame in disclosing geophagic practises, and limited awareness of treatment benefits. It is concluded that iron and folic acid supplementation or intravenous therapy alone are insufficient without integrating geophagy focused education into antenatal care to improve adherence and outcomes.

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Introduction

Geophagy is an intentional ingestion of earthy materials such as chalk, soil, rocks, and clay (Orisakwe et al., 2020). Geophagic practise is mostly common and prevalent amongst women of reproductive age worldwide irrespective of their socio-economic status, ethnicity, age, and social status (Konlan et al., 2020; Madziva et al., 2024; Norman et al., 2023; Onyenweaku, 2023). This practise is known as cultural practise that is embedded in indigenous knowledge that is passed from one generation to the next (Kortei et al., 2020; Madziva & Chinouya, 2020; Mashao et al., 2021). Geophagic practise is perceived to offer spiritual, nutritional, mental, physiological and psychological benefits (Asim et al., 2022; Francis et al., 2022; Norman et al., 2023; Schnitzler, 2022; Singh et al., 2020). Geophagic practise is deemed to a socially acceptable practise, that is also prevalent amongst children, men, and elderly people (Madziva & Chinouya, 2020; Malepe, 2022; Mashao et al., 2021).

Factors contributing to the cravings of geophagic materials such as clay soil, which leads to the engagement in the geophagic practise are often not understood (Islam & De, 2022; Jackson et al., 2020; Simmat-Durand & Toutain, 2022). Although women of reproductive age are reported to be the highest consumers of clay soil, it is not clear which one occurs first between geophagic practise and iron deficiency anaemia (Hasan et al., 2022; Jackson et al., 2020; Onyenweaku, 2023). The causal relationship between geophagic practise and various health effects are often not clearly proven since this is dependent on the bioavailability of clay soil, dose, frequency and duration (Molale & Eze, 2023; Ramachandran, 2021).

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The World Health Organization (WHO) has identified and listed geophagy as a medical condition (Organization, 2024). Therefore, the practise of geophagy requires treatment to curb the practise and eliminate the possible health outcomes associated with this practise. Women of reproductive age highlighted various challenges and barriers towards attaining the available treatment for geophagy from public healthcare citing shame or fear to disclose to healthcare providers and the perceived health effects of folic acid and iron supplements (Asim et al., 2022; Biswas et al., 2024; Huda et al.; Njiru et al., 2022; Sanghvi et al., 2023). A gap has been identified that most women of reproductive age who indulge in the geophagic practise lack proper understanding of their nutritional and physiological needs, followed by poor knowledge on the potential health risks linked with the toxic elements found in clay soil (Bonglaisin et al., 2022; Decaudin et al., 2020; Molale & Eze, 2023; Njiru et al., 2022; Yamashita et al., 2021). Iron and folic acid supplements and intravenous iron therapy are presently used to prevent and control the practise of geophagy amongst women of reproductive age which is triggered by iron deficiency anaemia (Huda et al.; Kuche et al., 2024; Njiru et al., 2022; Singh et al., 2020). This study explored the perceived barriers to accessing treatment for geophagy among women of reproductive age in Tshwane District, Gauteng Province, using the Health Belief Model as a theoretical framework.

Literature Review

Geophagy commonly practised for its perceived health and nutritional benefits, especially during pregnancy, poses serious health risks (Mafe et al., 2025). It often contains harmful substances such as heavy metals, toxins, pathogens, and pesticide residues, which can cause toxicity, hinder nutrient absorption, and harm both maternal and foetal health (Mafe et al., 2025). Pregnant women are particularly vulnerable, underscoring the need for greater awareness and informed choices regarding its consumption (Mafe et al., 2025). Iron supplementation in pregnancy is vital for preventing anemia and related complications such as miscarriage, haemorrhage, preterm birth, and low birth weight; however, this intervention alone cannot resolve the problem of geophagy amongst women of childbearing age (Shahzad et al., 2025). Studies have recommended the implementation of educational programs, empowerment of women, and distribution of nutritional supplements during pregnancy to lessen the practise of geophagy amongst women of reproductive age (Gupta, 2019, Kortei et al., 2020, Macheke et al., 2016, Malepe et al., 2023, Mashao et al., 2021). It is beneficial to educate women of reproductive age in their early stages of pregnancy about the dangers of soil consumption and cautioning them about the toxic elements contained in soils as part of the antenatal care classes to avoid potentially harmful health effects associated with the practise of geophagy (Macheke et al., 2016). The high prevalence of anaemic pregnant women due to the practise of geophagy and lack of knowledge on the toxic health effects linked with the practise of geophagy makes it necessary for more research to be conducted (Francis et al., 2022, Macheke et al., 2016, Mireku et al., 2018, Mogongoa, 2020, Young et al., 2019). The purpose of this study was to explore the perceived barriers to accessing treatment for geophagy among women of reproductive age in Tshwane District, Gauteng Province, using the Health Belief Model as a theoretical framework, which assisted in informing the development of health education and promotion intervention program aimed at mitigating geophagy amongst women of reproductive age in Tshwane District, Gauteng Province, as a public health plan to prevent and control the possible health risks associated with the practise of geophagy amongst women of reproductive age.

Theoretical and conceptual background

The health belief model deals with perceptions, behaviours, and attitudes of individuals towards particular illnesses and diseases and uptake of health services and interventions. The Health Belief Model (HBM) is theoretical framework that consist of concepts such as Perceived susceptibility, Perceived Severity, Health Motivation, Perceived Benefits and Perceived Barriers (Green et al., 2020). The model suggests that demographic variables and psychological characteristics such as class, gender, age, and peer group pressure respectively; could influence one's perception about health issues (Green et al., 2020). This model can be used to apply, guide, and develop health promotion programs (Green et al., 2020). Health belief model is relevant to this study and can be applied successfully to execute the study since geophagy is believed to be a cultural and traditional belief embedded in indigenous knowledge. Studies have emphasized that women turn to practise geophagy because they believe it offers them different benefits. This model focuses on individuals' belief which influences their health behaviours, their perceived threat to a disease, perceived belief of consequences, potential positive benefits of action, barriers, and confidence in ability to succeed. Application of this theoretical framework in this study was utilised to explore the barriers to accessing treatment for geophagy among women of reproductive age in Tshwane District, Gauteng Province.

Empirical review and hypothesis development

Women of reproductive age indulge in the practise of geophagy as a cultural norm that is socially acceptable. The practise of geophagy is passed from one generation to the next that is perceived to be offers benefits such as supplementation of iron, nausea and morning sickness management during gestation, as well as feeding cravings of earthy materials that are caused by pica. Nurses hold perceptions that women of reproductive age practise geophagy mostly when pregnant due to iron deficiency anaemia. Iron deficiency anaemia triggers the desire or cravings of ingesting earthy materials such as soil leading to the practise of geophagy. Furthermore, it was discovered that women of reproductive age practise geophagy out of ignorance and lack of proper knowledge and understanding of the toxic elements and potential health risks associated with ingesting earthy materials such as soil. Women of reproductive age perceived folic acid and iron supplements as some of the intervention methods that have shortcomings.

Research and Methodology

Study area

This study was conducted in Tshwane District located in Gauteng Province, South Africa. Tshwane is one of the capital cities of South Africa, that is densely populated by many citizens across different provinces and countries with an estimation of 3.4 million excluding undocumented immigrants. Gauteng Province where Tshwane District is located, it is known to be the economic hub of South Africa. Various healthcare facilities located in Tshwane District, in areas such as Mamelodi, Ga-Rankuwa, Phelandaba, Mabopane, Soshanguve, Pretoria CBD, and Hammanskraal were targeted for inclusion in the study, because street vendors selling clay soil are usually spotted in these locations rather than in suburban areas. The population of women of reproductive age was well represented since the academic hospitals and regional hospitals in Tshwane District also service women from areas that are not mentioned above, through the referral systems from local clinics that is utilised by public healthcare facilities. Tshwane District is dominated by Africans and few minorities of whites and coloureds. The languages most frequently spoken in Tshwane District are Setswana, Sepedi, Xitsonga, Sotho, Isizulu, and Venda. The population of Tshwane consists of men, women, youth, children, and elderly people from different cultures and traditions. There is also a large population of women of reproductive age who are reluctant to accessing treatment for geophagy.

Study design, population, and sample selection

An exploratory qualitative research design approach was followed to conduct this study guided by Health Belief Model. The study has explored the perceived barriers to accessing treatment for geophagy among women of reproductive age in Tshwane District, Gauteng Province applying the health belief model. Purposive sampling techniques was used to select nurses and women of reproductive age as the study participants. Women of reproductive age who were accessing reproductive healthcare services in the antenatal care and family planning units of Tshwane District, who were above 18 years old, willing to participate and sign informed consent form were included in the study as participants. Nurses allocated in the antenatal care and family planning units who were willing to participate and give consent, were also included as participants in the study.

Data collection

Data collection commenced after obtaining ethics approval from Sefako Makgatho Health Sciences University Research Ethics Committee, approval to conduct the study had been received from Gauteng Province: Tshwane Research Committee. Permission to conduct in the healthcare facilities was sought from facilities managers and unit managers in the antenatal care and family planning units. Participants who were willing to form part of the study, were requested to sign informed consent forms post recruitment. The researcher conducted the interviews using an interview guide that consisted of open-ended questions, and an audio recording device for both women of reproductive age and nurses in Tshwane District, Gauteng Province. In-depth interviews and focus group discussions were conducted with women of reproductive age who were accessing reproductive healthcare services in the antenatal care and family planning units in Tshwane District as the study participants, to explore their perceptions towards the practise of geophagy following the health belief model. Nurses were also interviewed using both in-depth interview and focus group discussions to explore their perceptions towards the practise of geophagy. Private rooms to conduct the in-depth interviews and focus group discussions were requested from the managers in the public healthcare facilities. An interview guide adapted from Geramian *et al.* (Geramian et al., 2014) was used during the in-depth interviews and focus group discussions. The guide was written in English and other native languages spoken by the participants, such as Setswana, Sepedi, isiZulu, Venda, and Xitsonga, and questions were asked in English and translated where necessary during the interviews. Participants were also allowed to answer questions in their language of choice, and the answers were translated back to English. Data collection for the entire study took 3 months between September and December 2023.

Sample size and sampling technique

A purposive sampling method was used to sample women of reproductive age who were consulting in the antenatal care and family planning units in Tshwane District, Gauteng Province who were above 18 years of age, willing to participate in the study and sign informed consent. Purposive sampling technique was also used to sample nurses allocated in the antenatal care and family planning units for inclusion in the study who were willing to participate and give consent. The sample sizes were determined by data saturation, which is the stage when the participants are no longer giving new information. The sample size for women of reproductive age who participated in the study was 99 followed by 20 for nurses. The researcher conducted 20 in-depth interviews and 9 focus group discussions and reached a sample size of $n=119$ for all participants. The rationale for conducting both focus group discussions and in-depth interviews was to accommodate all potential participants taking into considering that antenatal care and family planning units are mostly packed and busy for both patients and nurses coupled with long queues.

Data analysis

A computer device was used to record and store data. Qualitative data in the audio recording device was transferred to the computer device to generate transcripts. Qualitative data collected during the in-depth interviews and focus group discussions were processed and analysed using NVivo software 14. The transcripts were edited, cleaned, and imported to NVivo software 14 to identify and

arrange codes. Thematic analysis steps were followed to analyse qualitative data to produce a codebook (Nowell et al., 2017). The researcher familiarized herself with the data by repeatedly reading the transcripts to identify patterns and concepts. Initial codes were generated, followed by a review to ensure themes accurately reflected the data. Themes were further refined by examining the entire dataset, sub-categories, and broader categories, with necessary revisions and merging. Finally, the refined themes were defined and organized into constructs of the Health Belief Model. The newly generated themes following Health Belief Model were then used to present the narrative and describe the study findings. Descriptives statistics were used to describe the socio-demographics data of women of reproductive age and nurses in Tshwane District, Gauteng Province.

Trustworthiness

As this was a qualitative study, it was necessary to ensure the dependability, transferability, conformability and credibility of the research findings (Cope, 2014). The researcher kept field notes for all phases of the study, to ensure dependability. Credibility was ensured through recording and transcribing verbatim when conducting both the in-depth interviews and the focus group discussions. This ensured the accuracy of the data collected from all the participants. A thick description of the methodology and procedures was employed in this study, to allow the application of the same methodology in different settings and with different populations to ensure transferability. Conformability was achieved through auditing to ensure the coherence of the themes, so that the results would truly reflect the ideas of the participants.

Ethical considerations

Clearance and approval were obtained from the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC/H/290/2023: PG) and Gauteng Province: Tshwane Research Committee (NHRD REFERENCE NUMBER: GP_202309_014). Permission to conduct the study in public healthcare facilities was sought from the Gauteng Health Tshwane Research Committee, senior managers of the healthcare facilities, and unit managers in the antenatal care and family planning units in Tshwane District, Gauteng Province.

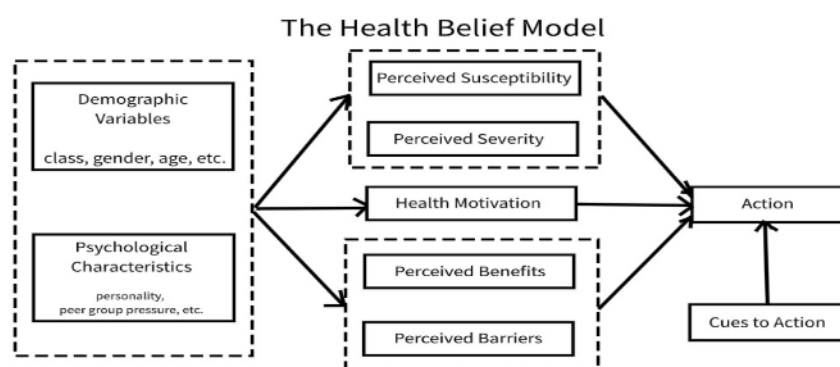


Figure 1: Health Belief Model.

Findings and Discussions

Findings

The findings were reported from both women of reproductive age and nurses in Tshwane District, Gauteng Province. This study has applied the health belief model to explore the perceived barriers to accessing treatment for geophagy among women of reproductive age in Tshwane District, Gauteng Province, using the Health Belief Model.

Demographics characteristics

Women of reproductive age and nurses indicated that age makes people to be susceptible to practise geophagy. It was further revealed that women of reproductive age are most likely to develop cravings of geophagic materials particularly when pregnant due to the increased level of nutrients and minerals that are required in this stage. Women of reproductive age often consume earthly materials such as clay soil as physiological response to their minerals and nutrients deficiencies which manifest in a form of cravings as many in this age group lack awareness when it comes the potential health risks associated with the practise of geophagy. Most geophagic women of reproductive age reported that they started engaging in the practise of geophagy during their gestation period. It was further reported that the practise of geophagy is mostly common amongst women of different cultures, beliefs, ethnicities, classes, and socio-economic statuses. The views of the participants are expressed below:

"I think for some is the hormones that makes women of reproductive age to crave for soil, more especially when a person starts being pregnant. Pregnancy makes people to start craving for strange food and things that are awkward as compared to when one is not pregnant". A 56 years old, Professional Nurse, PPT 19.

"The imbalanced hormones pregnancy makes women of reproductive age to start craving for soil, they end up being addicted and over-powered by the uncontrollable cravings. Many people eat soil because they lack proper minerals and nutrients in their bodies". A 26 years old, pregnant woman, ANC, PPT 18.

"I personally eat clay soil myself; I started some years ago; I was still young. I just started craving soil because of rain smell...I then ate mud soil that generated by rain...then I started buying clay soil when I experienced that craving. The rain smell triggered everything, then I became addicted. I really enjoy clay soil...the taste cannot be compared to anything". A 25 years old, Pregnant woman, ANC, PPT 54.

Perceived susceptibility

Women of reproductive age and nurses hold different views pertaining to access to treatment for the practise of geophagy among women of reproductive age in Tshwane District, Gauteng Province. Some participants revealed that the practise of geophagy makes consumers to be susceptible to the development of various health conditions, signs, and symptoms such as fatigue, iron deficiency anaemia, constipation, shortness of breath, and exposure to harmful biological agents and toxic chemical substances. On contrary, other participants perceived the practise of geophagy not to be harmful, citing many years of practising geophagy without experiencing any health-related challenges, as a result this served as a barrier for participants to seek medical care or any treatment for geophagy. The views and opinions are expressed below:

"I have been eating clay soil for over ten years, however, I have never been admitted to hospital or taken any form of medication for soil addiction. I just drink more water to avoid constipation, that is it". A 26 years old, pregnant woman, ANC, PPT 18.

"When you eat clay soil, you develop iron deficiency. Lack of knowledge on how to deal with pregnancy cravings hinders people from getting treatment. Sometimes it is an issue of these patients taking the pills provided to them during the consultation and putting them at home without drinking them. Then when the experience inadequate supply of iron in their bodies, then they start with soil eating". A 55 years old, Professional nurse, ANC, PPT 4.

"Eating clay soil causes women to lose appetite for eating healthy meals, some they start developing iron deficiency symptoms...the person would become pale especially when you check their hands and nails... and they will constantly complain about fatigue hence they need treatment to correct the deficiency". A 50 years old, nurse, ANC, PPT 10.

"Pregnant women who practise geophagy usually present with symptoms such as low Hb, pale skin and hands and sometimes dry mouth/ lips. Their pregnancy is different from someone who does not practise geophagy. The foetus will be small, mainly because clay soil supresses hunger...the appetite to eat healthy and nutritious food is not there, once you eat clay soil...it feels your stomach and you will lack the desire to eat healthy food...then that will affect the growth of the unborn baby resulting into giving birth to low birth weights". A 55 years old, Hast Counsellor, Nurse, ANC, PP2.

Perceived severity

Some of the participants indicated they may be aware of the health risks associated with the practise of geophagy, but they hardly consider the practise itself as a medical condition that requires treatment. These findings here are attributed to lack of proper knowledge and understanding of the dangers associated with geophagic practise to be a serious barrier towards accessing treatment for geophagy among women of reproductive age in Tshwane District, Gauteng Province. Other participants indicated that sometimes the practise of geophagy is found to be more pleasing as compared to continuously adhering to the folic acid and iron supplements administered in the healthcare facilities, citing bad taste and other side effects as some of the main barriers to accessing treatment for geophagy. Such views are expressed below:

"They are high risk patients who need support and care to prevent pregnancy complications particularly child and maternal mortalities and morbidities". A 39 years old, enrolled nurse, ANC, PPT 8.

There is a risk of developing appendicitis because of soil eating...geophagy is a dangerous practise that many people are not aware of that requires attention at an early stage". A 49 years old, Professional Nurse ANC, PPT 6.

"I experienced complications during my pregnancy due to soil addiction leading to development of piles, worms, and severe constipation". A 34 years old, pregnant women, ANC, PPT 8.

"I cannot stand the taste and smell of the pills they are offering in the hospitals for soil addiction. It is difficult to constantly take medication on a daily basis, it is tiring. I rather continue to eat my clay soil which assists with satisfaction and fulfillment." A 26 years old, pregnant women, ANC, PPT 10.

Health motivation

Nurses indicated that the practise of geophagy is motivated by nutrients, mineral and vitamin deficiencies that occur during pregnancy particularly iron deficiency anemia, resulting from impaired iron absorption. However, nothing motivates most women of reproductive age to seek treatment for geophagy as it is deemed to be culturally, traditionally, spiritually, and socially acceptable practise by many people. Although some may often get motivation to seek treatment for geophagy, they are often hindered by fear

of judgment or ill-treatment from healthcare providers serving as a serious barrier to accessing treatment for many geophagic women of reproductive age. Some participants indicated that they sought medical assistance for them to cease the practise of geophagy motivated by the desire to prevent complications during pregnancy and childbirth, and fear of the long-term health consequences associated with the practise of geophagy such as inability to conceive in future. Meanwhile, others were motivated to obtain treatment for geophagy because of the experience of geophagy-related illnesses, and some were persuaded to get treatment by their fellow peers, family, and neighbour and role models who managed to cease the practise of geophagy. Other participants indicated that it is difficult to request treatment for geophagy from healthcare facilities, since consuming clay soil easily assists them to instantly stop vomiting, morning sickness, fatigue, and spitting during pregnancy as compared to the folic acids and iron supplements that are usually administered in the antenatal care units. Such participants responses are shared below:

“Some women of reproductive age are aware that soil addiction is dangerous to their overall health hence they seek medical care to avoid future complications like not being able to conceive a baby”. A 34 years old, Women of reproductive age, family planning, PPT 4.

“People eat soil because of peer pressure from the company of people they live with. It could be friends, family, and relatives around them who practise soil eating and therefore influence them to want to try the clay soil out. It is also difficult to look for help when you are also surrounded by friends who also eat soil”. A 32 years old women, family planning, PPT 5.

“The moment you mention you eat clay soil, the nurse starts shouting at you, talking to you anyhow, in front of people causing a scene. Sometimes they go to the extent of skipping you on the queue and assist people who came after you simply because you mentioned that you addicted to soil especially when you are pregnant, I normally crave soil when I am pregnant”. A 27 years old, Pregnant women, ANC, PPT 15.

Perceived benefits

Women of reproductive age and nurses perceived that accessing treatment for geophagy will assist consumers to start having adequate energy and strength, improve their iron absorption levels leading to less risk of developing iron deficiency anaemia. Nurses revealed that they continue to encourage women of reproductive age to adhere to folic acid and iron supplements as part of the treatment for geophagy particularly when pregnant to prevent and control iron deficiency. Women of reproductive age indicated they may benefit from taking folic acid and iron supplements to manage and control geophagy, however, the adherence part remains an elusive task to execute. The nutrition status is bound to improve if clay soil consumers start taking treatment for geophagy minimizing the risk of developing malnutrition and severe constipation. It was also stressed by nurses that if women of reproductive age who practise geophagy can be able to obtain treatment and adhere to the prescribed medication, they will be able to cease the practise of geophagy which will result in the improvement of their overall health and well-being of women of reproductive age reducing possibility and risks of developing uterus cancer, cervical cancer, appendicitis, iron deficiency anaemia, fertility problems, pre-contamination of the foetus, and low birth weight babies. Some of the benefits of taking treatment of geophagy as highlighted by nurses and women of reproductive age include safe maternal, positive pregnancy outcomes, reduced stigma and judgement from healthcare providers, prevention of worm infestations, enhanced knowledge and empowerment and ability to make informed decisions, reduced addictions and dependency syndrome, improved mental health status and saving of finances that were used to purchase the clay soil. Such views are expressed below:

“Quitting geophagy and getting treatment will be helpful especially to promote the wellness and wellbeing of the unborn child and the mother”. A 55 years old, Hast Counsellor, Nurse, ANC, PP2.

“Quitting geophagy and taking iron supplements will assist in saving a lot of lives and prevent child and maternal mortalities and morbidities”. A 58 years old, Nurse (admin), ANC, PPT 1

Perceived barriers

Lack of geophagy health education provided in the antenatal care where most women of reproductive age seeking medical care particularly pregnant women was considered to be a serious barrier towards uptake of treatment. Geophagic women of reproductive age stressed that the readily available and low economic costs of geophagic materials such as clay soil in the street markets also served as barriers for consumers to quit the practise of geophagy and seek medical care. Folic acid and iron supplements are more costly, as compared to clay soil which offers satisfaction and contentment after consumption. Addiction, dependency syndrome, and influence of peers-group pressure were reported as the major barriers towards acquiring treatment for geophagy amongst women of reproductive age who participated. It was further emphasised that fear of disclosing to the healthcare workers particularly nurses in the antenatal care units, about their geophagic practise status served as one of the barriers to accessing treatment for this practise. Others indicated they often go to the hospitals to seek medical attention regarding their cravings for clay soil, however, due to the long queues in the public healthcare facilities, they end up going home before consultation. The participants' views are shared below:

Eating soil is so addictive, the cravings are so intense and severe, beyond one's control. People find it difficult to quit this practise and as a result, they struggle to wait in the long queues in the hospitals to get medications for soil addiction. A 26 years old, pregnant woman, ANC, PPT3.

"The moment you mention you eat clay soil, the nurse starts shouting at you, talking to you anyhow, in-front of people causing a scene. Sometimes they go to the extent of skipping you on the queue and assist people who came after you simply because you mentioned that you addicted to soil especially when you are pregnant, I normally crave soil when I am pregnant". A 27 years old, Pregnant women, ANC, PPT 15 as noted earlier.

"I cannot stand the taste and smell of the pills they are offering in the hospitals for soil addiction. It is difficult to constantly take medication on a daily basis, it is tiring. I rather continue to eat my clay soil which assist with satisfaction and fulfillment." A 26 years old, pregnant women, ANC, PPT 10 as noted earlier.

They need help urgently, because it is not normal to want to eat something that nearly killed you again. I think these people must be assisted with something that will make them to quit even before things get out of hand. I feel pity for people who eat soil, I know they are addicted like someone who takes drugs". A 25 years old, pregnant woman, ANC, PPT 23.

Cues for action

Both women of reproductive age and the nurses indicated the need for screening and testing for iron deficiency anaemia and geophagic practise amongst women of reproductive age for detection of those who may require treatment at early stage. Pregnant women must be prioritised for screening when they come for consultations in the antenatal care units as the major consumers of clay soil. Geophagy health education awareness campaigns at community, school, and hospital settings were reported as some of the urgent actions that need to be prioritised by the authorities and government to enhance access to treatment for geophagy amongst women of reproductive age. Other suggestions made by women of reproductive age included soil addition as part of school's curriculum, publishing posters about the practise of geophagy on social media platforms, creation of support and rehabilitation programs for women of reproductive age struggling with clay soil addiction. Nurses emphasized that geophagy health education must be added as part of the antenatal care maternity package to enhance treatment for geophagy amongst women of reproductive age. The views are expressed below:

"We need to start emphasising the dangers of pica amongst patients who attend ANC. It is one of the major public health problems we do not take inconsideration, yet our patients are the biggest targets because of pregnancy hormones, the cravings affect them mostly more than any other group". A 56 years old, Professional Nurse, ANC, PPT 12.

"We must start surveillance in the ANC to check women who are addicted soil and detect them as early as possible". A 50 year old, nurse, ANC, PPT 10.

"We need to teach people more about soil addiction especially here at ANC because most pregnant women develop pica somewhere in their pregnancy period". A 49 years old, Nursing Assistant, ANC, PPT 6.

Action

Establishment of support groups and geophagy health education awareness campaigns for women of reproductive age who are addicted to clay soil, would assist in enhancing and encouraging access to treatment for geophagy amongst women of reproductive age. Implementation of community-based rehabilitation programs targeting geophagy came highly recommended by nurses and women of reproductive age, to reduce the barriers influencing uptake of treatment for geophagic women of reproductive age. In preparation to cease the practise of geophagy, consumers should start treatment of iron and folic acid supplements, or request for blood transfusion therapy as an intervention method to correct the deficiency of iron, since it is reported to be the primary contributing factor towards the practise of geophagy said nurses. Additionally, consumers should go for consultation to seek medical care soon as they start experiencing the cravings for earthy materials said both nurses and women of reproductive age. The views are shared below:

"We need to increase provision of iron supplements and encourage women to take them when pregnant to prevent complications relating to blood disorders that may occur due to consumption of clay soil. A 49 years old, Enrolled Nurse, ANC, PPT 5.

"We need to work together here at ANC with the dieticians to encourage patients who are addicted to eat iron food diet especially those who are addicted, we need to conduct more awareness campaigns even at community level. A 55 years old, Hast Counsellor, Nurse, ANC, PP2.

"We need to incorporate soil addiction/ pica as part of the health talks that we give to pregnant women when they for ANC. A 58 years old, Nurse (admin), ANC, PPT 1.

"Health education about the dangers of eating soil, so that women can know that just because they are pregnant does not mean they should start eating soil. So that when they start craving for clay soil, they will know that they alert the sister/ nurse that they need assistance with cravings. That way they will be able to assess iron supplements fast and correct/resolve the iron deficiency. We need outreaches, open days at healthcare facilities to show case such information and we should list soil addiction as part of the maternity case dangers." A 32 years old, registered nurse, family planning, PPT 13.

Discussion

The practise of geophagy amongst women of reproductive age remains a serious public health concern globally linked with low uptake of treatment such as folic acid and iron supplements that requires urgent attention and prioritization. This study has explored the perceived barriers to uptake of treatment for geophagic women of reproductive age utilising the health belief model. The Health Belief Model constructs consisting of the perceived benefits, motivations, severity, susceptibility, barriers, demographics characteristics and cues for actions pertaining to the barriers influencing access to treatment for geophagy amongst women of reproductive age in Tshwane District, Gauteng Province were explored intensively.

The absence of geophagy health education as part of the antenatal care was emphasized immensely by women of reproductive age as a key barrier towards enhancing treatment uptake amongst women of reproductive age for geophagy. Similar studies confirmed that educating women of reproductive age about nutrition, anaemia risks, chemical and biological composition of clay soil, and uptake of iron and folic acid supplementation could assist in reducing the barriers associated with the practise of geophagy amongst women of reproductive age (Biswas et al., 2024; Gebremichael & Welesamuel, 2020; Gosdin et al., 2021; Huda et al.; Kamau et al., 2020; Njiru et al., 2022; Singh et al., 2020). Women of reproductive age who possess high level of knowledge and understanding of the dynamics pertaining to the practise of geophagy are most likely to seek treatment when they start experiencing cravings of earthy materials such as clay soil that is often triggered by nutrients, vitamins, minerals deficiencies such as iron deficiency, as compared to women who possess low level of knowledge and understanding of the geophagic practise who indulge in the practise without seeking any form of medical care or treatment. Therefore, it is imperative to integrate geophagy-focused health education into antenatal care and to provide healthcare providers with training that equips them to support women of reproductive age with tailored strategies to address the practise of geophagy.

Barriers influencing uptake of oral and intravenous iron therapies that are administered by healthcare facilities included the practise of geophagy itself not regarded as a medical condition that requires treatment by some women of reproductive age who took part in this study, other women of reproductive age lacked awareness when it comes to the benefits of taking oral and intravenous iron therapy, highlighting that oral iron supplements do not have the ability to resolve vomiting, morning sicknesses and nausea during pregnancy. Other women of reproductive age who took part in this study indicated that they fail to adhere to iron supplements provided at the healthcare facilities, alluding to poor taste and other side effects such as weight gain, as the main barriers influencing uptake of treatment for geophagy amongst women of reproductive age who practise geophagy. Studies revealed that despite the effective administration of folic acid and iron supplements from the healthcare facilities, some women of reproductive age still fail to adhere to treatment regardless of collection (Biswas et al., 2024; Gebremichael & Welesamuel, 2020; Lavanya et al., 2020; Njiru et al., 2022). Other participants emphasised that fear of judgement and shame to disclose to the healthcare providers about their geophagic status served as a serious barrier towards accessing treatment for geophagy. Evidence from a similar study indicates that pregnant women are seldom asked by healthcare providers if they eat clay soil during antenatal care visits (Huebl et al., 2016).

Addiction, dependency syndrome, and influence of peers' social groups were reported as some of the barriers towards accessing treatment for geophagy amongst women of reproductive age who participated. Therefore, establishment of support groups and geophagy health education awareness campaigns for women of reproductive age who are addicted to clay soil to enhance and encourage access to treatment for geophagy amongst women of reproductive age, would assist in mitigating the barriers linked with the uptake of treatment for geophagy. Support structures from their fellow consumers could assist with adherence to prescribed medication after accessing treatment for geophagy. Screening for iron deficiency and enquiring whether women of reproductive age partake in the practise of geophagy from pregnant women accessing health in the antenatal care units came strongly recommended as strategy to promote detection of women of reproductive age who may require treatment for geophagy to enhance uptake. It was further reported by literature that if pregnant women were examined for iron deficiency anaemia and possible use of clay soil in the early stages of pregnancies, severe cases of the geophagic practise would be minimised (Huda et al.; Kuche et al., 2024).

Conclusion

The study concludes that the absence of geophagy-focused health education in antenatal care, alongside factors such as addiction, dependency syndrome, peer influence, and fear of stigma, serve as major barriers to treatment uptake among women of reproductive age. Limited awareness of the benefits of oral and intravenous iron therapies further hinders adherence. Thus, iron and folic acid supplementation or intravenous iron therapy alone are insufficient without the integration of geophagy health education into antenatal care to enhance treatment acceptance and adherence.

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References

- Asim, M., Ahmed, Z. H., Nichols, A. R., Rickman, R., Neiterman, E., Mahmood, A., & Widen, E. M. (2022). What stops us from eating: A qualitative investigation of dietary barriers during pregnancy in Punjab, Pakistan. *Public Health Nutrition*, 25(3), 760–769. <https://doi.org/10.1017/S1368980021001737>
- Babah, O. A., Akinajo, O. R., Beňová, L., Hanson, C., Abioye, A. I., Adaramoye, V. O., Adeyemo, T. A., Balogun, M. R., Banke-Thomas, A., & Galadanci, H. S. (2024). Prevalence of and risk factors for iron deficiency among pregnant women with moderate or severe anaemia in Nigeria: A cross-sectional study. *BMC Pregnancy and Childbirth*, 24(1), 39. <https://doi.org/10.1186/s12884-023-06169-1>
- Biswas, B., Gautam, A., Jahnavi, G., Gupta, P., & Varshney, S. (2024). Barriers, facilitators of iron and folic acid supplementation, and deworming program among school-going adolescents of Deoghar, Jharkhand, India: A mixed-methods study. *Journal of the Korean Academy of Family Medicine*. <https://doi.org/10.4082/kjfm.23.0100>
- Bonglaisin, J. N., Kunsoan, N. B., Bonny, P., Matchawe, C., Tata, B. N., Nkeunen, G., & Mbofung, C. M. (2022). Geophagia: Benefits and potential toxicity to human—A review. *Frontiers in Public Health*, 10. <https://doi.org/10.3389/fpubh.2022.893831>
- Cope, D. G. (2014). Methods and meanings: Credibility and trustworthiness of qualitative research. *Oncology Nursing Forum*. <https://doi.org/10.1188/14.ONF.89-91>
- Decaudin, P., Kanagaratnam, L., Kmiec, I., Nguyen, Y., Migault, C., Lebrun, D., Hentzien, M., Bertin, E., Drame, M., & Bani-Sadr, F. (2020). Prevalence of geophagy and knowledge about its health effects among native Sub-Saharan Africa, Caribbean and South America healthy adults living in France. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, 25, 465–469. <https://doi.org/10.1007/s40519-018-0624-9>
- Francis, S., Jagadeesh, N. S., Singaravelu, R., & Subramaniam, A. (2022). The influence of pica practice on nutritional status, stress and anxiety of pregnant women. *Clinical Epidemiology and Global Health*, 17, 101133. <https://doi.org/10.1016/j.cegh.2022.101133>
- Ganesan, P. R., & Vasauskas, A. A. (2023). The association between pica and iron-deficiency anemia: A scoping review. *Cureus*, 15(4). <https://doi.org/10.7759/cureus.37904>
- Gebremichael, T. G., & Welesamuel, T. G. (2020). 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*, 15(1), e0227090. <https://doi.org/10.1371/journal.pone.0227090>
- Geramian, N., Gharaat, L., Taheri, S. A., Mohebpour, F., Nahvizadeh, M., Farajzadegan, Z., & Heidari, K. (2014). Development of a questionnaire to assess drug abuse among high school students of Isfahan province, Iran: An action research. *International Journal of Preventive Medicine*, 5(Suppl 2), S146. <https://doi.org/10.4103/2008-7802.157678>
- Gosdin, L., Sharma, A. J., Tripp, K., Amoafu, E. F., Mahama, A. B., Selenje, L., Jefferds, M. E., Martorell, R., Ramakrishnan, U., & Addo, O. Y. (2021). A school-based weekly iron and folic acid supplementation program effectively reduces anemia in a prospective cohort of Ghanaian adolescent girls. *The Journal of Nutrition*, 151(6), 1646–1655. <https://doi.org/10.1093/jn/nxab024>
- Hasan, M. M., Magalhaes, R. J. S., Garnett, S. P., Fatima, Y., Tariqujjaman, M., Pervin, S., Ahmed, S., & Mamun, A. A. (2022). Anaemia in women of reproductive age in low-and middle-income countries: Progress towards the 2025 global nutrition target. *Bulletin of the World Health Organization*, 100(3), 196. <https://doi.org/10.2471/BLT.20.280180>
- Huda, T. M., Dibley, M., Tahsina, T., Rahman, M. M., Raihana, S., Islam, S., Alam, A., Agho, K. E., Kelly, P., & Rasheed, S. (n.d.). *Effect of early use of maternal iron and folic acid supplements on neonatal survival: A community-based cluster randomised controlled trial in rural Bangladesh (Shonjibon Trial)*.
- Huebl, L., Leick, S., Guettl, L., Akello, G., & Kutalek, R. (2016). Geophagy in northern Uganda: Perspectives from consumers and clinicians. *The American Journal of Tropical Medicine and Hygiene*, 95(6), 1440. <https://doi.org/10.4269/ajtmh.15-0579>
- Islam, M. S., & De, A. (2022). Geophagy is a worldwide health hazard for pregnant women: A view. *Research in Cardiovascular Medicine*, 11(2), 57. https://doi.org/10.4103/rcm.rcm_8_22
- Jackson, M. S., Adedoyin, A. C., & Winnick, S. N. (2020). Pica disorder among African American women: A call for action and further research. *Social Work in Public Health*, 35(5), 261–270. <https://doi.org/10.1080/19371918.2020.1791778>
- Kamau, M. W., Kimani, S. T., Mirie, W., & Mugoya, I. K. (2020). Effect of a community-based approach of iron and folic acid supplementation on compliance by pregnant women in Kiambu County, Kenya: A quasi-experimental study. *PLoS One*, 15(1), e0227351. <https://doi.org/10.1371/journal.pone.0227351>
- Kimassoum, D., Ngum, N. L., Bechir, M., Haroun, A., Tidjani, A., & Frazzoli, C. (2023). Geophagy: A survey on the practice of soil consumption in N'Djamena, Chad. *Journal of Global Health Reports*, 7, e2023010. <https://doi.org/10.29392/001c.74955>
- Konlan, K. D., Abdulai, J. A., Konlan, K. D., Amoah, R. M., & Doat, A. R. (2020). Practices of pica among pregnant women in a tertiary healthcare facility in Ghana. *Nursing Open*, 7(3), 783–792. <https://doi.org/10.1002/nop2.451>

- Kortei, N. K., Koryo-Dabrah, A., Akonor, P. T., Manaphraim, N. Y. B., Ayim-Akonor, M., Boadi, N. O., Essuman, E. K., & Tettey, C. (2020). Potential health risk assessment of toxic metals contamination in clay eaten as pica (geophagia) among pregnant women of Ho in the Volta Region of Ghana. *BMC Pregnancy and Childbirth*, 20(1), 1–7. <https://doi.org/10.1186/s12884-020-02857-4>
- Kuche, D., Abebe, Z., Tessema, M., Girma, M., Hussien, A., Baye, K., & Stoecker, B. J. (2024). The effect of UNIMMAP multiple micronutrient supplements versus iron-folic acid and placebo in anemia reduction among women of reproductive age in Kebribeyah Woreda, Somali Regional State, Ethiopia: A study protocol for a community-based individual RCT. *Trials*, 25(1), 170. <https://doi.org/10.1186/s13063-024-08024-w>
- Lavanya, P., Jayalakshmy, R., Rajaa, S., & Mahalakshmy, T. (2020). Adherence to iron and folic acid supplementation among antenatal mothers attending a tertiary care center, Puducherry: A mixed-methods study. *Journal of Family Medicine and Primary Care*, 9(10), 5205–5211. https://doi.org/10.4103/jfmpe.jfmpe_721_20
- Madziva, C., & Chinouya, M. J. (2020). Clay ingestion during pregnancy among Black African Women in a North London Borough: Understanding cultural meanings, integrating indigenous and biomedical knowledge systems. *Frontiers in Sociology*, 5, 20. <https://doi.org/10.3389/fsoc.2020.00020>
- Madziva, C., Chinouya, M. J., & Njoroge, K. (2024). Experiences of geophagy during pregnancy among African migrant women in London: Implications for public health interventions. *SSM-Qualitative Research in Health*, 5, 100431. <https://doi.org/10.1016/j.ssmqr.2024.100431>
- Mafe, A. N., Makinde, O., & Adeleke, R. A. (2025). Geophagia among pregnant women: Evaluating the microbiological and toxicological safety of calabash chalk and its implications on maternal health. *Environmental Geochemistry and Health*, 47(9), 1–27. <https://doi.org/10.1007/s10653-025-02656-w>
- Malepe, R. E. (2022). *Geophagic materials and their potential impacts on human health in South Africa: A case study from Fetakgomo Tubatse Local Municipality (FTLM) area in Limpopo Province* [University of Johannesburg]. <https://hdl.handle.net/10210/502183>
- Mashao, U., Ekosse, G.-I., Odiyo, J., & Bukalo, N. (2021). Geophagic practice in Mashau Village, Limpopo Province, South Africa. *Heliyon*, 7(3), e06497. <https://doi.org/10.1016/j.heliyon.2021.e06497>
- Mireku, M. O., Cot, M., Massougboji, A., & Bodeau-Livinec, F. (2020). Relationship between stunting, wasting, underweight and geophagy and cognitive function of children. *Journal of Tropical Pediatrics*, 66(5), 517–527. <https://doi.org/10.1093/tropej/fmaa009>
- Mogongoa, L. (2020). Efficacy of oral iron therapy in geophagic women with iron deficiency anaemia residing in Botshabelo, South Africa. *The Journal of Medical Laboratory Science and Technology of South Africa*, 2(1), 13–21. <https://doi.org/10.36303/JMLSTSA.2020.2.1.38>
- Molale, T. L., & Eze, P. N. (2023). Human geophagy (soil ingestion): Biochemical functions and potential health implications. In *Health and Medical Geography in Africa: Methods, Applications and Development Linkages* (ss. 367–385). Springer. [https://doi.org/10.1016/s0048-9697\(01\)01102-0](https://doi.org/10.1016/s0048-9697(01)01102-0)
- Njiru, H., Njogu, E., Gitahi, M. W., & Kabiru, E. (2022). Effectiveness of public health education on the uptake of iron and folic acid supplements among pregnant women: A stepped wedge cluster randomised trial. *BMJ Open*, 12(9), e063615. <https://doi.org/10.1136/bmjopen-2022-063615>
- Norman, I. D., Binka, F. N., & Godi, A. H. (2023). Geophagia: A cultural-nutrition health-seeking behaviour with no redeeming psycho-social qualities. *South Eastern European Journal of Public Health*. <https://doi.org/10.12908/SEEJPH2014-38>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1). <https://doi.org/10.1177/1609406917733847>
- Onyenweaku, E. O. (2023). Geophagia in Nigeria: Perceptions and practices of pregnant mothers versus possible health outcomes. *Jurnal Gizi dan Pangan*, 18(3), 187–196. <https://doi.org/10.25182/jgp.2023.18.3.187-196>
- Organization, W. H. (2024). *Clinical descriptions and diagnostic requirements for ICD-11 mental, behavioural and neurodevelopmental disorders*. <https://iris.who.int/bitstream/handle/10665/375767/9789240077263-eng.pdf?sequence=1>
- Orisakwe, O. E., Udowelle, N. A., Azuonwu, O., Nkeiruka, I. Z., Nkereuwem, U. A., & Frazzoli, C. (2020). Cadmium and lead in geophagic clay consumed in Southern Nigeria: Health risk from such traditional nutraceutical. *Environmental Geochemistry and Health*, 42, 3865–3875. <https://doi.org/10.1007/s10653-020-00632-0>
- Poirier, M., Dizier, C., Caillet, P., Pintas, C., Winer, N., & Lefebvre, T. (2022). Kaolin consumption in pregnant women: What impact on the weight of newborns? *The Journal of Maternal-Fetal & Neonatal Medicine*, 35(25), 7812–7818. <https://doi.org/10.1080/14767058.2021.1937980>
- Ramachandran, P. (2021). Prevention & management of anaemia in pregnancy: Multi-pronged integrated interventions may pay rich dividends. *Indian Journal of Medical Research*, 154(1), 12–15. https://doi.org/10.4103/ijmr.IJMR_994_20
- Sanghvi, T. G., Nguyen, P. H., Forissier, T., Ghosh, S., Zafimanjaka, M., Walissa, T., Mahmud, Z., & Kim, S. (2023). Comprehensive approach for improving adherence to prenatal iron and folic acid supplements based on intervention studies in Bangladesh, Burkina Faso, Ethiopia, and India. *Food and Nutrition Bulletin*, 44(3), 183–194. <https://doi.org/10.1177/03795721231179570>
- Schnitzler, E. (2022). The neurology and psychopathology of Pica. *Current Neurology and Neuroscience Reports*, 22(8), 531–536. <https://doi.org/10.1007/s11910-022-01218-2>

- Shahzad, R., Zakar, R., Shahzad, H., Zakar, N. M., Tariq, F., Ahmed, R., & Fischer, F. (2025). Regional variations in the trend of iron supplementation during pregnancy and its multi-level predictors in Pakistan. *Scientific Reports*, 15(1), 28452. <https://doi.org/10.1038/s41598-025-14616-6>
- Simmat-Durand, L., & Toutain, S. (2022). Clay eating in pregnancy in French Guiana: How does one understand the practices and act for prevention? *Addiction and Substance Abuse*, 1(1), 25–32. <https://doi.org/10.46439/addiction.1.006>
- Singh, P. K., Dubey, R., Singh, L., Kumar, C., Rai, R. K., & Singh, S. (2020). Public health interventions to improve maternal nutrition during pregnancy: A nationally representative study of iron and folic acid consumption and food supplements in India. *Public Health Nutrition*, 23(15), 2671–2686. <https://doi.org/10.1017/S1368980020001007>
- Yamashita, T., Roces, R. E. D., Ladines-Llave, C., Reyes Tuliao, M. T., Wanjira Kamau, M., Yamada, C., Tanaka, Y., Shimazawa, K., Iwamoto, S., & Matsuo, H. (2021). Maternal knowledge associated with the prevalence of iron and folic acid supplementation among pregnant women in Muntinlupa, Philippines: A cross-sectional study. *Patient Preference and Adherence*, 15, 501–510. <https://doi.org/10.2147/PPA.S290940>

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