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Review Article

Theoretical Explanations on the Persistence of Ethno-Medical Pregnancy Nutrition Interventions and Recommendations for Possible Biomedical Interventions

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Abstract

Background: Ethno-medical maternal health care practices during pregnancy are extensive among women especially in Low and Middle Income Countries. Little is known as to why there is an extensive use and reliance on ethno-medical malnutrition remedies over biomedical care, and that they can stand the test of time, even though some are detrimental to human health or based on scientifically incorrect notions. **Methods:** From September 2014 through April 2018, a narrative review rather than a systematic review format was conducted in PubMed, Google Scholar, and Web of Science to identify and evaluate all associated literature. This review brings in constructivists' and Dawkin's memetic theory of evolution in understanding the cognitive basis of the different ethno-medical explanatory models of maternal nutrition and health, and consequently adoption of interventions. **Findings:** Ethno-medical pregnancy nutritional interventions are meant to safeguard the mother and foetus. Ethno-medical nutritional beliefs and practices is a way of life filled with symbolic meanings which women in a given social group have learned over many years through various agents of socialization and help women make sense of and cope with pregnancy complications in order to survive and stay healthy. They are enforced using superstitious threats and blind trust that cannot be verified. These practices are varied hence cannot be generalized to people of the same cultural group or in different generations making it difficult to design a unified biomedical intervention strategy. **Conclusion:** Women have cultural beliefs (memes) about maternal health that have been in existence for centuries, which give meaning to adverse pregnancy outcomes and the appropriate remedies to adopt. Biomedical interventions' meme needs to align themselves with ethno-medical memes. Otherwise, competition for survival will arise, their effectiveness can easily be constrained hence having a hard time proving their survival value.

Keywords: Food taboos; Ethnomedical; Nutrition interventions; Dawkin's theory; Memes; Ante-natal care; Maternal health; Maternal nutrition; Cultural perceptions; Beliefs; Pregnancy

Introduction

Maternal nutrition is a key determinant of maternal, newborn, and child health (MNCH) outcomes. Nutrition is more critical during pregnancy because it lays the foundation for a successful outcome of pregnancy, lactation, survival and development of infants and children. Maternal nutritional deficiency prior and during pregnancy makes the placenta fail to develop fully: therefore it cannot optimally nourish the foetus and this has been associated with intrauterine growth retardation (IUGR), still-birth, low birth weight (LBW) and pre-term delivery conditions [1-7]. Babies born underweight, pre-term or with IUGR have increased risk of neo-natal mortality; the rate is estimated to be

2.6 million per year globally [8]. Studies have further established that unbalanced nutrition, including restrictions on or excessive calorie consumption, or a lack of adequate micronutrient intake, can negatively affect reproductive health including complications during pregnancy and delivery and can even cause maternal death [9-11]. Maternal anaemia, for instance, is associated with increased risks of postpartum haemorrhage (PPH) [5], which is the leading cause of maternal mortality worldwide.

Due to multiple long-term, inter-generational effects associated with maternal malnutrition, several interventions have been designed to improve maternal nutrition. These interventions are designed to address the immediate (inadequate dietary intake as well as disease) and underlying (household food security, maternal and child care, health services and the environment) causes of malnutrition in women. The major focus of maternal nutritional interventions globally recommended by WHO [11] is to promote a healthy diet by increasing the diversity and amount of foods consumed; promote adequate weight gain through sufficient and balanced protein and energy intake; and promote consistent and continued use of micronutrient supplements, food supplements or fortified foods [11]. The immediate (inadequate dietary intake as well as disease) and underlying (household food security, maternal and child care, health services and the environment) causes of malnutrition. *Nutrition education and counselling* is the most widely used strategy, approved by the WHO, to improve the nutritional status of women during pregnancy [11]. The strategy focuses primarily on: promoting a healthy diet by increasing the diversity and amount of foods consumed; promoting adequate weight gain through sufficient and balanced protein and energy intake; and promoting the consistent and continued use of micronutrient supplements, food supplements or fortified foods. Hence, counselling on healthy eating and keeping physically active during pregnancy is recommended for women, to stay healthy and to prevent excessive weight gain. In undernourished populations, nutrition education on increasing daily energy and protein intake is recommended for pregnant women to reduce the risk of low birth weight.

Studies have confirmed that with the effective implementation of and compliance with these interventions, maternal nutrition is improved. Available evidence suggests that nutrition education and counselling may support optimal gestational weight gain (i.e. neither insufficient nor excessive), reduce the risk of anaemia in late pregnancy, increase birth weight, and lower the risk of pre-term delivery [12]. This will consequently reduce infant and child mortality, improve physical and mental growth and development, and improve maternal health and pregnancy outcomes [3,13-17].

However, despite the proven efficacy of the WHO-recommended interventions, the intended outcomes and associated health indicators have been less successful than hoped in most LMICs. Even though a number of personal, environmental and programmatic factors have been established to cripple effectiveness of WHO-recommended interventions [18-23] studies from developing countries have established coverage and adherence as one of major challenges to the effectiveness [19,21,24,25]. Frequency of access to care and gestational age at booking the first ANC appointment have also been established as an impediment to the implementation of nutrition interventions in some regions [18,20]. In places where there was high adherence to WHO-recommended interventions, most women were initiated these interventions after 12 and 16 weeks of gestation, respectively, well after the recommended time period affecting the efficacy of interventions [18].

In contrast to the limited reach to biomedical maternal care for nutrition interventions, Ethnomedical maternal health care remedies and practices during pregnancy are extensive among African women as in many other LMICs. Studies for instance established that women of childbearing age position themselves towards pluralistic nutritional knowledge which dominate their practices, rather than just towards medical nutrition logic [26]. It is also highly unlikely that these traditional maternal beliefs and practices will fade away any time soon. Even after migration to urban areas and other countries, studies have shown that immigrants maintain their cultural beliefs and practices during pregnancy and childbirth, even if they are based on scientifically incorrect premises and may to some extent be detrimental to their health [27-30]. For the interventions to effectively address maternal malnutrition, programme designers and implementers need to not only understand ethno-medical beliefs and practices, but also why these are highly valued, and can stand the test of time even if they are based on scientifically incorrect assumptions and in some cases may be detrimental to the health of pregnant women. This could be a good entry point in bringing change to intervention design hence need for this review.

Methods

This review was conducted to provide an overview of the key literature in this area and was guided by Dawkin's theory of cultural evolution [31] to understand why there is an extensive use and reliance on ethno-medical maternal nutrition remedies, which persist for generations, even though some are detrimental to human health or based on scientifically incorrect notions. From September 2014 through April 2018, the author conducted a review and synthesis of the peer-reviewed and grey literature based on experts' knowledge of the literature and a search of scholarly databases. To capture the multidisciplinary swath of research on the subject, the investigator used PubMed, Google Scholar, and Web of Science. Given the broad scope of this field, the decision was taken to perform a narrative review rather than employing a systematic review format to identify and evaluate

all associated literature. Only articles published in English were considered for this review. While not systematic, this review was intended to provide an overview of the literature as well as practical and theoretical linkages between maternal beliefs and how the appropriate remedies adopted promote persistence of these practices.

Literature Findings on Ethno-Medical Perspectives of Maternal Malnutrition-Related Health Outcomes and Health Interventions

Pregnancy is a life stage associated with several cultural beliefs related to appropriate behavior and nutrition to achieve a positive outcome. For instance, in most societies the mother's eating habits are believed to impact the health and wellbeing of both the mother and the developing foetus. Some foods are believed to have a positive impact, while others may have a negative impact. As a result, many cultures observe nutritional do's and don'ts during pregnancy as a precaution to safeguard the health and wellbeing of the foetus and the pregnant woman for various reasons:

To facilitate easy birth

Some food is believed to make delivery easier, and women are encouraged to eat plenty of it. A study by Liamputton [32] established that pregnant women in Northern Thailand are advised to eat pak plang, a vine-like green vegetable. This vegetable is slippery in texture, hence symbolically believed to make the baby slip out easily and fast during birth. In Kenya and Ghana, pregnant women are also encouraged to consume green leafy vegetables because they are believed to "add blood" that is associated with an easy birth [26,33], whereas, in other communities women are recommended to eat red soil (pica) because it is believed to have iron [33]. In contrast, in Zambia M'soka [34] established that pregnant women were discouraged from consuming okra (a slimy vegetable when cooked) because it is associated with excessive salivation of the child.

Some foods are discouraged during pregnancy because they are believed to cause abstracted or prolonged labour or post-partum complications. In Northern Thailand, for instance, pregnant women are told to consume only half a banana, as eating a whole banana may result in a birth obstruction [32], a similar reason that was established in Kenya for discouraging eggs during pregnancy [33]. Thai women are also discouraged from eating shellfish which is believed to prevent the perineum from drying up properly after birth and to avoid eggplants because they are believed to cause anal pain after birth. In Zambia, M'soka [34] established that it is believed that women who drink alcohol during pregnancy deliver large babies and experience prolonged labour. In The Gambia, eating bread, as well as banana, millet, or groundnut, is believed to potentially lead to problems in labour, and thus their consumption was discouraged [35]. In other communities, rigorous activities such as lifting heavy objects or doing farm work during pregnancy are seen as harmful as this may lead to miscarriage or stillbirth [32,36].

Safeguard the foetus from malformation

Some food precautions are believed to safeguard the foetus from malformations. In Northern Thailand, pregnant women are warned against the consumption of spicy hot food as the baby may be born hairless, and are also warned against drinking coffee and tea because they are believed to make the child unintelligent [30]. Similarly, in Zambia, eating eggs during pregnancy is believed to make babies bald and that consuming salt will make the baby's skin rough, hence salt is discouraged [34]. Eating fish during pregnancy was also believed to cause infant abnormalities, such as a large anterior fontanelle [37]. Similarly, among the Fullas in the upper region of The Gambia, it is believed that if catfish are eaten during pregnancy, the mother would give birth to a flaccid, sloppy, dribbling child, eating eggs may result in a mute, dumb or stuttering child, while eating pepper or bitter tomato may give the new-born baby an irritable skin rash [35].

Gendered food taboos

Other food taboos are based on gender. Some animal organs are reserved for men and must not be consumed by women, whether pregnant or not. Among the Luhya, a community in Kenya, the consumption of eggs is restricted in order to spare chickens, because chicken meat is a delicacy reserved for men and guests [29]. Similarly, among the Kalenjin of Kenya, animal tongue and heart are preserved for men [33].

Misfortune food

Pregnant women are also considered vulnerable to external attacks that can emanate from humans, nature or supernatural powers, and hence they must be protected from harm by observing certain taboos, rituals, and behaviour. Among the Kalenjin people of Kenya, for instance, Riang'a et al. established that a pregnant woman is not supposed to eat meat of an animal carcass [33,36]. Such meat was believed to possess evil spirits that are transferable when eaten. The meat commonly reported to be avoided is an animal that was slaughtered because it suffered and died from pregnancy-related complications, such as placental retention, haemorrhage, an abortion or stillbirth. If eaten, it is believed that the "bad blood" that caused such complications is transferred, causing very similar complications to a pregnant woman who consumed it.

Food to counter evil spirits and supernatural powers

Certain persons in society are believed to have the power, called the "evil eye", foetal malformation or intrauterine diseases which cause abortions. Therefore, pregnant women are protected by taking medicinal herbs or wearing special ornaments to guard

them from miscarriage [36,38-40]. Among the Nandi people of Kenya, for instance Hollis [41] established that during pregnancy, Nandi pregnant women underwent a purification ceremony, after which they are assured of a safe and easy birth. If a misfortune occurs after the ritual, the spirits of departed ancestors and adult relatives are appealed to with offerings of animal blood, milk, beer and food to spare the woman.

Use of medicinal herbs and traditional healers

Studies have shown that many pregnant women seek maternal care and interventions from traditional birth attendants (TBAs) in LMICs. A study by Maimbolwa et al. (2003) in Zambia established that TBAs advised women on the use of traditional medicine, to widen the birth canal and precipitate labour [34,37]. Consumption of traditional herbal medicine during pregnancy in some cultures is encouraged to make the mother and baby strong, as a way of preparing for an easy birth [32,33,36]. Other cultures consume herbs during birth to widen the birth canal and precipitate delivery [34,37]. Consumption of herbal medicine during pregnancy is also used against evil spirits and witchcraft that might cause abortion [38,42], for the treatment of pregnancy-related ailments, discomforts and complications including threatened abortion and postpartum haemorrhage [38,42,43].

Critical Discussion: Understanding the Persistence of Ethno-Medical Maternal Care Practices: Dawkin's Memetic Theory

Dawkin's theory of cultural evolution [31] is used in this review to understand why there is an extensive use and reliance on ethno-medical remedies, which persist for generations, even though some are detrimental to human health or based on scientifically incorrect notions. Understanding this persistence and mode of transmitting these beliefs is important in creating an entry point for an integrative intervention of the two systems of maternal nutrition (ethno-medical and biomedical).

Memetic theory is a new face of the Darwinian theory of evolution which presents themes of recent evolutionary thought and offers a new world view. Evolutionary biologist Richard Dawkins [44] launched the concept 'meme' in his book *The Selfish Gene* where he relates "memes" to "genes"; he floats the term "meme" (short for Greek word "mimeme") for the cultural equivalent of "gene". Dawkins (2008:192) defines a meme as "A unit of cultural transmission or a unit *of imitation*."

A meme is an idea or an entity that is capable of being transmitted from one brain to another. In other words, a meme is an element of culture that may be considered to be passed on by non-genetic means. It can be equated for instance to cultural expressions such as tunes, ideas, catch-phrases, diet, clothes, fashions, hit songs, and ways of making pots or of building arches. In his memetic theory, Dawkins relates cultural evolution directly to genetic evolution processes, and he came up with various principles to explain the evolution and transmission of memes which has been adopted in this review to understand as to why ethno-medical care practices, dominate people's attention and to find out why it has a great psychological appeal' (the survival value) over biomedical interventions as presented in Figure 1.

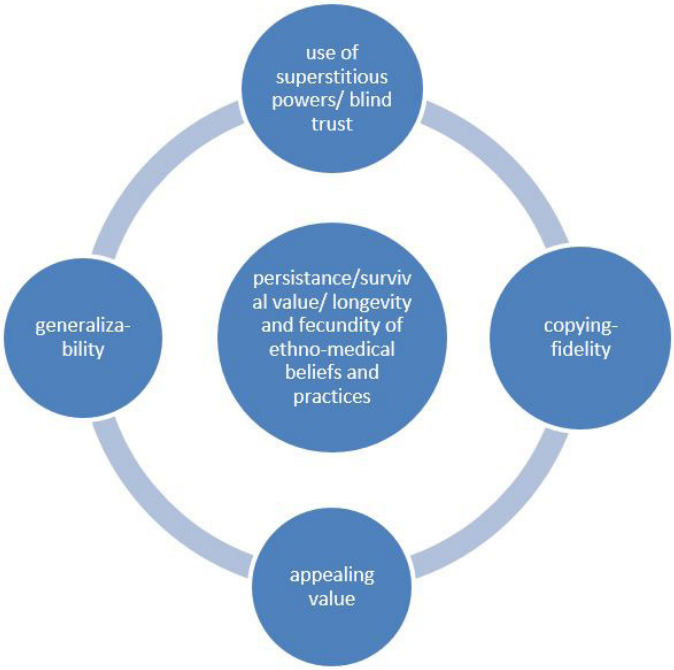

Figure 1: Framework of persistence of Ethno-medical maternal care interventions (own figure based on Dawkin's concepts).

It is argued that ethno-medical beliefs can be considered 'memes', and just like genes they replicate themselves over time. They are replicators in the sense they have a system of inheritance. Knowledge of these systems is passed on from generation to generation through several media of socialization such as parents, relatives, peers and local leaders among others. When the new generations grow up, they tend to imitate what they learned from these media. Different factors contribute to their survival value as presented in Figure 1 and briefly discussed below.

Evolution and Transmission of Ethno-Medical Interventions (Copying Fidelity)

Ethno-medical beliefs and practices are a way of life a lifestyle with shared rules and rituals full of symbolic meaning for a social group. It is a group's way of making sense of the events in their life and appropriate copying mechanisms to adopt in order to survive, stay healthy and well. These ethno-medical customs are very diverse and they include many ideas and beliefs about food to be eaten or avoided, medicinal herbs to use, meanings of some

signs and symptoms of pregnancy, recommended and restricted activities, how to relate to evil/witch people in the society, ancestors and supernatural forces. These and many more human behaviours and products of behaviour form a complex informal system of adoption [44-46].

These ethno-medical customs thus comprise a complex pool of ideas, techniques, strategies and rules developed over many generations and are transmitted from one generation to another (cultural transmission). Each generation has to learn the basic survival techniques of pregnancy from the previous generation through the process of cultural transmission. Therefore, many of the strategies used by the women in these studies to cope with pregnancy complications are based on the knowledge and skills that they have learned over many years since they were children when they were growing up. For this reason, if a woman is abandoned by the group or leaves her group and joins another one, she would find it almost impossible to unlearn all these beliefs or learn new knowledge through trial-and-error learning within a short timeframe and apply it in her life – which explains why immigrants tend to carry and keep their cultural identities to new countries [27-30]. This also explains why these ethno-medical systems have survived over many generations and periods of time.

Appealing value of ethno-medical interventions

Some customs have direct intended benefit to the women which is scientifically verifiable, for example consumption of green leafy vegetables to increase blood volume (iron), eating starchy food to increase energy or avoiding bending for long hours to prevent lower abdominal pain.

Other ethno-medical interventions, though based on "irrational" scientifically unverifiable theories, also have unconscious or unintended, adaptive significance that is very attractive to the people in the society. For instance, the true significance of the taboo of not eating dead meat is to prevent contamination, especially if the animal died out of a dangerous contagious disease rather than the purported reason of "you will die like that animal" [36] that can lead to nutrient losses and in turn, cause reduced dietary intake. In another instance, relating miscarriage and other pregnancy complications to "evil eye" or "witchcraft" is a way of controlling the geographical mobility of a pregnant woman that might expose her to contracting communicable diseases [36]. A taboo against consuming excess salt because it will make the child's skin crack is a way of restricting excessive salt intake, which could help in reducing the risk of hypertension and water retention in pregnant women and thus in reducing the complications of pregnancy and childbirth [32]. However, these women do not justify these practices in medical terms. When a belief works as a metaphor for social problems, this positive biological feedback may have contributed towards the selective retention of these practices over a long period of time.

Ethno-medical customs do not always promote human well-being. Women do not inevitably make maximally adaptive responses or wise healthy choices. Some cultural interventions tend to have maladaptive effects, which are detrimental to women's health. In this review for instance, pregnant women were recommended to eat red soil (*pica*) because it is believed to have iron [36]. Similarly, women are discouraged from consuming food that has high nutritional value and readily available at affordable cost such as eggs [29,33,34] okra [34], bread, tomatoes, banana, millet, or groundnut [35] among others because they are associated with culturally perceived negative effects to pregnancy.

Variability/Complexity, Generalizability and Change in Ethno-Medical Customs (Copying Fidelity)

Just like genes, ethno-medical customs evolve, that is, they undergo directed adaptive changes in response to environmental pressures and challenges through varied mechanisms. This means that what was applicable in the past might not be exactly the same as it is today. Furthermore, just as the genetic pool of populations contains varied genotypes, some which may prove over time to be more adaptive than others to the environmental changes, so the informal pool of ethno-medical customs contains considerable variations. One reason for variation is that each person learns and replicates what he or she is taught in imperfect ways. Especially young people reinterpret rules they have learned from their elders in terms of their own experiences and problems. This is made possible through the "human capacity for culture and learning". For instance, in this review, it was established that among the Kalenjin Community of Kenya, it is believed that the effect of eggs is more severe at certain stages of pregnancy although the stages reported differed, varying from before 6-7 months to 6 months onwards [33].

Changes occur also through selective retention of new ideas and techniques that promote the effectiveness of the group or of the individual in dealing with problems, including the situation that threaten the intergeneration of the group and the self. These new ideas and techniques may be innovated within the group's ecological systems. For example, some respondents reported that if it is essential that a woman eats eggs (e.g due to hospital recommendations or pregnancy "urges") she should mix them with other food such as chapati (flat round shallow fried substance made from wheat flour, salt, sugar and oil) or vegetables, for this is believed to neutralize the effect associated with eggs [33].

However, frequent adaptation extends beyond ecological systems of the group. In many cases they are borrowed from neighbouring groups, travellers, or biomedical intervention strategies. It usually involves adjustments and changes that tend to increase the group's security, maintain the community's physical and emotional health, and protect the individual and defend the ego.

Generalizability

People have at their disposal diverse sets of knowledge, skills and ideas of interpreting and adopting to the learned ethno-medical customs. Thus, some behavioural adaptations to ethno-medical customs are specific to the individual, regardless of cultural background, leading to a cultural complex pool of ideas, techniques, strategies and rules that keep on changing over generations, hence cannot be generalized to people of the same cultural group or in different generations. For instance, it is noted that in Thailand, women are encouraged to consume vegetables that are slippery in texture to facilitate easy birth whereas in Zambia [34] pregnant women were discouraged from consuming slimy vegetables for its negative outcome to the child. Similarly, eating eggs during pregnancy is discouraged for varied reasons across cultures: Among the Fullas in the upper region of The Gambia, eating eggs during pregnancy is believed to result in a mute, dumb or stuttering child [35], in Zambia eating eggs during pregnancy is believed to make babies bald [34] where as in Kenya among the Kalenjin Community eggs make foetus grow big leading to abstracted labour [33] and among the Luhyas of Kenya eggs are restricted in order to spare chickens for men and guests [29].

This makes it even more complex because biomedical interventions cannot design a unified intervention strategy to address different individuals in one community and in different generations.

Use of superstitious powers/ blind trust

Another factor that has been very effective in enforcing ethno-medical practices is the threat of using superstitious powers that cannot be measured or evaluated. This is an idea that enhances greater psychological indoctrination in people's minds. Some beliefs such as that stillbirth is believed to be caused by ancestral spirits or spirits of a dead animal [36], eating eggs will cause obstructed labour [33] or evil eyes and witchcraft [36,38-40] can cause neonatal death, have a deep psychological impact such that no one would wish to face the consequences. These superstitious beliefs have been reinforced by another complex meme called ***faith***. Expectant women blindly trust these taboos even in the presence of scientific evidence presented by nutritional education programmes. The blind faith secures its own perpetuation by the simple unconscious expedient of discouraging rational enquiry of these superstitions.

On the other hand, ethno-medical interventions are reinforced by different *agents and mechanisms* such enforcing fear, or being punished by elders and midwives during birth or losing a marriage for being childless through still birth. In other words, it is a practice into which a woman enters involuntarily and constrains her agency.

However, when environmental change or alteration occurs, for example through an intervention, we expect humans to respond rapidly and flexibly by changing their behaviour. Many change processes, however, tend to have long timeframes, often spanning one generation or more.

Limitations and Strengths of the Study

The author used a traditional, as opposed to systematic, review process in order to research and write this manuscript. As such, the theoretical and practice cases presented in the text should be considered illustrative examples rather than a comprehensive review of the theory and practice related to nutritional believes and practices during pregnancy.

Conclusion

From the above, it can be concluded that people are not a "tabula rasa". They have cultural beliefs and values about pregnancy, health and food, which give meaning to adverse pregnancy outcomes. These meanings direct women to the appropriate remedies and behaviours to adopt in order to safeguard their pregnancy and ensure a healthy outcome. Biomedical interventions also have built in "memes". The newly introduced (biomedical) intervention embodies memes that may agree or conflict with incumbent memes that have been in existence for centuries hence competition for survival arises. New memes may have a hard time proving their survival value. When interventions include limited and generalized nutritional strategies without taking into account the dominant memes, their effectiveness can easily be constrained or reduced. Therefore, it is crucial that local beliefs, norms and practices in relation to pregnancy, health and nutrition are understood and inform intervention design and implementation together with other relevant factors in the context of application.

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