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ASSESSMENT OF KNOWLEDGE, AND PRACTICES OF URBAN WOMEN TOWARDS FOLIC ACID FORTIFIED MAIZE MEAL IN ZIMBABWE

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ABSTRACT

Neural tube defects (NTDs) are the second most common birth defects in humans and are associated with high rates of neonatal mortality, morbidity, disability, psychological and economic costs. Roughly 200,000 neonates are born with NTDs in low- and middle-income countries. To reduce the risks associated with NTDs, pregnant women are recommended to supplement their diets with folate tablets or to consume foods fortified with folic acid. Despite the introduction of a mandatory fortification program of maize meal with folic acid, in Zimbabwe, there is a paucity of literature about the perceptions of individuals towards fortified foods, as well as the storage and processing practices of fortified maize meal. This study aimed to assess the knowledge, as well as, storage and processing practices of folic acid-fortified maize meal in urban poor women. Data on knowledge and practices on fortified maize was gathered using a structured questionnaire from 630 women of childbearing age from low-income suburbs in Kwekwe town, Zimbabwe. The results showed that a paltry 26.3% of the respondents knew about folic acid, 22.5% knew about the effects of folic acid deficiency, 13.8% knew foodstuffs containing folic acid, 4% knew about food fortification and 35.6% had bought and used folic acid fortified maize meal before. Availability and accessibility were the main drivers to purchasing fortified maize meal (90%). There was no significant relationship ($p < 0.05$) between age and folic acid knowledge as well as between level of education and folic acid knowledge. Furthermore, the result indicates that the households were engaged in poor storage practices of the folic acid fortified maize meal. There was a significant relationship between the level of education and knowledge about food fortification. In conclusion, urban women's knowledge regarding folic acid and fortified maize meal is very low in Zimbabwe and households also store the folic acid fortified maize meal under conditions that speed deterioration of the folic acid. Folic acid awareness campaigns are recommended for people to benefit from the government of Zimbabwe's fortification programme.

Key words: Neural tube defects, maize, folate, deficiency, fortification, women

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INTRODUCTION

Micronutrient deficiency, also known as hidden hunger, is one of the global "triple burden" of malnutrition, particularly in developing countries [1]. Globally, over 2 billion people suffer from hidden hunger because of their inability to meet the amounts of essential vitamins and minerals required by their bodies per day [2]. Micronutrient deficiency has severe social productivity implications. Specifically, based on the 1990 social productivity, cumulative hidden hunger can account for a loss of 46 million years globally [3]. However, the encouraging news is that hidden hunger is easily avoidable and rectified through proper dietary regimes, food fortification and supplementation. Indeed, globally, several fortification initiatives for foods such as cooking oil, sugar and maize meal are underway to mitigate the pervasiveness of diseases caused by vitamin and mineral deficiencies [4]. Fortification of foods significantly reduced the prevalence of diseases such as rickets, goitre, and pellagra, over the years from the 20th century [2]. Fortification programs implemented population-wide were connected to a 34% reduction in anaemia from developed iron stores. Greater benefits were realized by those at risk of deficiency, and reduction in the odds of goitre was 74% and 41% for Neural Tube Defects [5].

Folic acid is among the essential nutrients that play a key role in cell division, synthesis of red blood cells, DNA repair and tissue growth [6, 7]. In women of the reproductive age, inadequate folate status results in megaloblastic anaemia, an increased risk of Neural Tube Defects (NTDs) during pregnancy [8, 9]. Spina bifida (improper development of the backbone and spinal cord) and anencephaly (incomplete development or absence of the brain) are neural tube birth defects that occur in the first four weeks of pregnancy due to folic acid deficiency [10]. This means that neural tube defects occur before a woman knows that she is pregnant hence it is difficult to know when to supplement with tablets if their dietary folate is inadequate. Maternal folic acid deficiency also results in early pregnancy loss as well as low birth weight [11, 12]. It is, therefore, important that women of the childbearing age take food fortified with folic acid every day to add to the naturally occurring folate to curb folic acid deficiency.

Public health researchers estimated that 27% of women of childbearing age were anaemic in Zimbabwe [13]. Among children whose birth weight was known, the same survey reported 10% low birth weight. In Zimbabwe, it is estimated that per 1000 of neural tube affected pregnancies, 34% result in live births, 24% result in stillbirths, 27% result in neonatal deaths and 15% result in infant death [14].

Mandatory fortification gives assurance that the fortified food will certainly remit a continuous and unfaltering source of micronutrients pertinent to public health [2].

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The Zimbabwean government made it obligatory for all companies to fortify maize meal, wheat flour, cooking oil, and sugar with effect from 1 July 2017 through Statutory Instrument 120 of 2016 of the Food Fortification Laws [13]. The statutory instrument makes it mandatory for millers to fortify maize meal with vitamins A, B1, B2, B3, B6, folic acid, B12, and D3 as well as Iron and Zinc.

Maize is a predominant crop and a staple cereal for more than 1.2 billion people in Africa and Latin America [15]. Although maize grain contains B group vitamins, essential minerals, and fibre, it is however a poor source of iron, vitamin B12, and folate whose levels are all below human requirements. On average, 100g of maize contains 30.4µg folate [16]. Recommended dietary allowances for folate are 65µg-150µg for infants from birth to 3 years of which their main meals are made of maize meal in most developing countries [17]. Other common sources of folic acid are; green leafy vegetables, liver, beans and legumes, egg yolk, wheat germ and yeast [10]. Nonetheless, people in the drier parts of Zimbabwe do not have access to fresh vegetables and fruits throughout the year [18]. Children who are 4 – 13 years old should get an average of 200 µg-300 µg dietary folate equivalents while 14-year-old to adults must get 400 µg with exception of pregnant and lactating women (600 µg and 500 µg respectively) [9]. However, in developing countries, the intake is not met because despite having poor sources of folate in their diets, folate is also estimated to be 50% in terms of bioavailability.

To date, there is little information about knowledge, attitudes, and practices regarding folic acid and folic acid fortified maize meal among women of childbearing age in Zimbabwe. Therefore, this study sought to assess the knowledge, attitudes, and practices of these women towards folic acid and folic acid fortified maize meal.

MATERIALS AND METHODS

Survey

This study was conducted using a cross-sectional study design. A standard cluster survey approach based on UNICEF's Multiple Indicator Cluster Surveys [19] was used to assess the current knowledge, attitudes, and practices regarding folic acid-fortified maize meal. Data was collected using Fortification Rapid Assessment Toolkit (FRAT) interview-based questionnaire [20] between 16-23 March 2020. A total of seven enumerators were recruited and trained on how to use the FRAT. These enumerators were responsible for administering a pretested structured questionnaire. The study participants were urban poor women from the three high-density suburbs of Kwekwe namely Mbizo, Amaveni, and Stewart and Lloyds, Zimbabwe. The inclusion criteria for the study were;(i) Zimbabwean nationality (ii) women aged 18-49 years (iii) living in the selected area for a minimum of three

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months. Multi-stage cluster sampling method was used in this study. Purposive sampling was used to select the three suburbs where households with low incomes live. Two hundred and ten households with people falling in the inclusion criteria were then systematically selected for interviews per each suburb. The enumerator would skip three households and interview a person at the fourth household if there was a person who fell in the inclusion criteria. Using a saturation method, a total of 630 participants were interviewed. Saturation describes the stage of data gathering at which no new problems or insights are found and the data start to repeat, making more data collecting unnecessary and indicating that a sufficient sample size has been obtained.

Ethical consideration

The Ethical Review Committee for Human Research at the Midlands State University granted study approval for the research. Permission to carry out household interviews was granted from the Department of Health, Kwekwe City Council. Local leaders were also contacted and consulted prior to conducting the survey in their wards. Finally, verbal consent was granted by the primary respondent before the beginning of the interview.

Data processing and analysis

Post-coding was done for uncoded questions, after which data was entered, cleaned, and analysed using Statistical Package for Social Sciences (SPSS) version 20.0. Classification of the women's knowledge was based on their awareness scores, which they got from knowledge questions: 1= knows and 2= do not know. Descriptive statistics were used to summarise the general characteristics of the respondents. Pearson's Chi-Square Test was used to statistically test for the significant relationship between socio-demographic characteristics and awareness of folic acid and fortified maize meal at 5% significance level.

RESULTS AND DISCUSSION

Demographic data

A total of 630 women of childbearing age participated in the survey and 38%; 30% and 31% of the respondents were aged 25-34, 35-49 and 18-24 years, respectively. The age distribution of the respondents shows that the majority had knowledge about the fortification of food. The respondents were primarily those individuals who deal with the purchase and preparation of food within households. They were expected to be well-appraised about folic acid-fortified maize meal as well as its storage and cooking practices.

Slightly less than 50% of the respondents had attended school up to the secondary level. About 42% of the respondents had tertiary-level education. Only approximately 5% of the respondents had attended school up to primary level,

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while about the same proportion had never attended school. This suggests that the respondents were generally literate. This was important for the study given that there was general understanding of the questions that were posed to the respondents enhancing the validity of the responses that were obtained for the study. Literate people are also expected to be able to read and understand food labels which is important in selecting nutritious foods including fortified foods [21]. Food labelling is an important public health tool allowing consumers to make informed and healthy choices [22].

Knowledge of folic acid, buying, use, and storage of folic acid fortified maize meal

Only 26.3% of the respondents knew about folic acid and only 22.5% knew about the effects of folic acid deficiency on human health. Among the respondents, 13.8% were able to name foodstuffs that contain folic acid, 4% knew about food fortification and only 2.9% had knowledge about the Zimbabwean food fortification logo. These results are closely similar to some previous studies which reported 28% and 29% awareness levels of food fortification [23, 24]. The low levels of knowledge on food fortification indicate that there is limited awareness of the regulatory requirements among consumers in the country. This also suggests that there is a limited or weak public health campaign on nutrition issues including fortification. For people to benefit from the country's fortification programme, the government and NGOs working in the nutrition sector should consider campaign strategies to reach all the people, especially the most marginalized [25]. The manufacturers of fortified food are also not seriously marketing their products, especially issues concerning the benefit of buying and consuming fortified food products. A study in Australia also reported that there was limited understanding of the term fortification among the subjects interviewed and concluded that knowledge of fortified products was mostly related to advertisements by producers [24].

The results established that most respondents do not use folic acid -fortified products in their households. Only 35.6% of the respondents claimed that they had bought and used fortified maize meal before. However, it is surprising how they knew it was a folic acid fortified maize meal since only 2.9% knew the fortification logo. About 63% of the participants said they did not know whether they had bought folic acid-fortified maize meals before. Only 34.8% of the respondents had folic acid -fortified maize meal in their households. The percentage of the respondents who said they had consumed a folic acid -fortified maize meal in the last 7 days was 34.4%. It was observed that, most shops in the local market do not stock and sell folic acid -fortified maize meal which suggests that millers were not complying with government regulation on fortification [13]. There is an urgent need for the

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government to enforce the fortification strategies to be applied as it is supposed to. On the other hand, most resource-poor households do not buy processed maize meal; rather they buy unprocessed grain which they take for milling at local grinding mills which have no fortification facilities. This is despite the requirement by law that all producers of maize meal should fortify their products [13]. The authorities must work with small scale millers and researchers to come up with strategies to fortify maize meal at the household level or at small scale mills. This will ensure that the majority of the population will benefit from the country's food fortification program.

Of the 34.8% respondents who had folic acid fortified maize meal in their households, 2.2% highlighted that the media was the main driver who gave them information to buy the food while 7% were influenced to buy fortified maize meal through diet advice from health care professionals and 90% were driven by the availability or accessibility of the fortified maize meal in local supermarkets. The majority of households who had fortified food in their houses obtained it from the local shops. The households had no option but to purchase whatever was sold in the local shops. This means that the availability of fortified foods among households is coincidental, and not about awareness among consumers. Consumer choice dictated that consumers of mealie meals mostly seek the cheapest commodity on the market rather than look for attributes such as fortification. Diet advice by health workers plays an important part in influencing the consumer's choice of food and can be used as a powerful tool in creating positive attitudes towards fortified maize meals. A national study reported that 56% of the respondents indicated that they made dietary changes for health and nutrition reasons because of advice given by doctors, dentists, and nurses [23]. The low percentage recorded in this survey could be due to poor strengthening of health and nutrition education by the health care system in Zimbabwe.

There was a significant relationship ($p = 0.022$) between the number of people who knew about food fortification and the number of people who had bought and used folic acid-fortified maize meals before (Table 2). About two-fifths of the respondents stored maize meals for one month or less, 35.4% lasted 1-2 months, 11% lasted 2-3 months and 9.8% lasted 3 months or more. There was a highly significant relationship ($p=0.000$) between the duration of 10 kg of maize meal and the number of people consuming foods prepared from maize meal in a household. The number of individuals who consume foods prepared using fortified maize meals ranged from one to sixteen per household with a mean of 5.1.

The study also discovered that consumers store their maize meal differently. About 29% of the respondents stored their maize meal in original sack containers, 47% used various closed plastic containers, 10.6% used porous plastic containers, 8.7% used closed metal containers and 4.3% stored their maize meal in original

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khaki papers (Table 1). Storage material used is mainly influenced by the economic situation and knowledge gap. Some researchers argue that if the income and savings of a consumer is high, then they will purchase more expensive products such as metal storage containers compared to inexpensive plastic containers [26]. However, in Zimbabwe, to the best of our knowledge, there is no literature showing public education on different types of storage materials and their effect on food products. A consumer can only change their perceptions and beliefs about a certain product through personal experiences and knowledge acquired from various sources [27].

The majority of the respondents stored maize meal for a month or less. Other researchers also reported that the monthly per capita consumption of maize meal in Zimbabwe is set at 6 kg [28]. These findings are derived from the fact that low-income individuals consume maize-based meals two to three times a day [8]. Storage time of maize meal in a household depended on the size of the household and the number of meals prepared using maize meal per day. The findings tally with the significant relationship between the duration of 10 kg maize meal and the number of people consuming foods prepared from maize meal in a household.

Knowledge of folic acid deficiency and action taken

Most of the respondents (74.1%) who knew about folic acid deficiencies were doing nothing to address the deficiencies. Only 6.2% of the people who knew about folic acid deficiencies were eating fortified foods including folic acid-fortified maize meal. As a preventive measure against the problem, 9.4% were regularly eating folate-containing foods such as dark green leafy vegetables and 10.3% were using folic acid supplementation pills. Pregnant women were the ones mostly taking the supplements because they receive the tablets from clinics and hospitals when they go for check-ups.

Relationship of age, education, deficiency consequences and knowledge of folic acid

There was no significant relationship ($p > 0.05$) between age and knowledge about folic acid (Table 3). The largest percentage (42.8%) of the respondents who knew about folic acid were aged between 25-34 years. The least percentage (22.9%) of respondents who knew about folic acid were women aged 35-49 years. Those in the age range of 18-24 years showed a folic acid knowledge level of 33.9%. The study found that there was no significant relationship ($p > 0.05$) between age and knowledge about folic acid. This can be attributed to the fact that respondents were falling in the childbearing age where folic acid awareness campaigns are targeted by the health department [29]. These findings corroborate other researchers who reported that maternal age is not associated with folic acid awareness [30]. The majority of the respondents who knew about folic acid were women in the age

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range of 25-34 years. Knowledge of folic acid was greatest among women aged 25-34 years [31]. This can be attributed to the fact that this age group is the peak level of conception hence they could access and were more receptive to information regarding folic acid.

Of the 25% of respondents who knew about food fortification in general, 80% had attended tertiary level of education, 16% had gone up to secondary school and only 4% had gone up to primary school (Table 4). There was a significant relationship ($p < 0.05$) between the level of education and knowledge about food fortification. A possible reason for these findings is that with an increase in education, an individual might pay more attention to current affairs, have an interest in searching for information, and or follow up on statutory laws.

However, there was no significant relationship ($p > 0.05$) between the level of education and knowledge about folic acid (Table 5). Although there was no significant relationship between the level of education and folic acid knowledge, there is a general increase in folic acid knowledge with the increase in education. Of the respondents who knew about folic acid 3.6% had never attended school, 5.4% had gone to school up to the primary level and 45.2% had reached the secondary level of education. Although not necessarily in the majority, a greater percentage (45.8%) of the respondents who knew about folic acid had gone up to the tertiary level of education. Findings from this study showed that there is a general increase in folic acid knowledge with an increase in education. The findings are in harmony with the observations on a similar study in Saudi Arabia which reported that most respondents who were aware of folic acid had university degrees [32]. The higher level of knowledge on folic acid among respondents who had acquired tertiary education can be attributed to the fact that increasing educational level results in improved knowledge and perceptions about health issues.

98.6% of the respondents knew about folic acid deficiency (Table 6). 93.1% of people who knew about folic acid could name foods containing the vitamin (Table 7). There was a significant relationship between folic acid knowledge and knowledge of foods containing folic acid ($p= 0.000$). As opposed to the expected results, there was no significant relationship ($p > 0.05$) between level of education and knowledge about folic acid. A probable reason for this observation can be due to the little to non-involvement of folic acid related topics at schools. One only gets to hear about folic acid during antenatal consultation or to a lesser extent through personal research if they are not in health and health related fields of study.

The findings revealed a significant relationship between knowledge of folic acid and knowledge of folic acid deficiencies. This finding is in good agreement with

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reports made by other researchers who observed that 26.4% of the respondents were aware of folic acid and 90% of them were aware of neural tube defects [33]. This significant relationship can be attributed to the fact that usually during nutrition education, a topic on folic acid entails information about sources and consequences if there is no consumption of adequate amounts during the first 28 days of conception [34]. Once an individual gets to know about folic acid, they are bound to know about its sources and deficiencies. There is a significant relationship between folic acid knowledge and knowledge of foods containing folic acid. Elsewhere, 100% of the respondents who were aware of folic acid had good knowledge about folic acid-rich foods [35]. The reason for this significant relationship is whenever nutrition education is given about folic acid details, its rich sources are given.

CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

The study has shown that childbearing-aged women had little knowledge of folic acid and folic acid fortified maize meal. As a result, consumption of fortified maize meal was low. Although many households said they are driven to buy fortified maize meal by its availability or accessibility in local supermarkets, many local stores were not stocking folic acid fortified maize meal. Households also had no knowledge about the Zimbabwean food fortification logo. This situation led to poor practices such as buying unfortified maize meal. Young educated women had more knowledge of fortified maize meal. There is a significant relationship between folic acid knowledge and knowledge of foods containing folic acid. The authors recommend that health promotion and awareness programmes be implemented on folic acid fortified maize meal knowledge through relevant media. Food fortification should also be included in primary and secondary school curriculum. Furthermore, the government should put up systems to enforce compliance to the food fortification program.

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Disclosure statement

The authors declare no conflict of interest.

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Table 1: Storage containers used to store maize meal by households in Kwekwe

Storage container	Percent
Original sack	29.2
Closed plastic container	47.0
Porous plastic container	10.8
Closed metal container	8.7
Khaki paper	4.3

Table 2: Relationship between food fortification knowledge and fortified maize meal consumption

Respondents who know about food fortification	Respondents who have bought and used fortified maize meal			
	Had bought	Never bought	Does not know	Percent of total
Know	5.4%	16.7%	2.8%	4%
Did not know	94.6%	83.3%	97.2%	96%

p = 0.022

Table 3: Relationship between age and folic acid knowledge

Age of respondent	Percent who know about folic acid		
	Know	Does not know	Percent of total
18-24	34.3%	29.7%	31.0%
25-34	42.8%	37.3%	38.7%
35-49	22.9%	33.0%	30.3%

p = 0.053

Table 4: Relationship between level of education and knowledge of food fortification

Level of education	Percent of respondents with knowledge on food fortification		
	Know	Does not know	Percent of total
Never attended school		5.1%	4.9%
Primary	4.0%	4.8%	4.8%
Secondary	16.0%	49.3%	47.9%
Tertiary	80.0%	40.8%	42.4%

p = 0.001

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Table 5: Percent of respondents with knowledge of folic acid fortification at different level of education

Level of education	Percent of respondents with knowledge
Never attended	3.6%
Primary	5.4%
Secondary	45.2%
Tertiary	45.8%

p = 0.581

Table 6: Relationship between folic acid knowledge and knowledge about folic acid deficiencies

Respondents who know about folic acid	Respondents who know the effect of folic acid deficiency		
	Know	Does not know	Percent of total
Know	98.6%	5.3%	26.3%
Does not know	1.4%	94.7%	73.7%

p = 0.000

Table 7: Relationship between folic acid knowledge and knowledge of the foods containing folic acid

Respondents who know about folic acid	Respondents who know about food containing folic acid		
	Know	Does not know	Percent of total
Know	93.1%	15.7%	26.3%
Does not know	6.9%	84.3%	73.7%

p = 0.000

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