

Level of Knowledge and Utilization of Fortified Maize Flour by Primary Food Shoppers in Mathare, Nairobi County, Kenya

Hussein SAMIRA¹, Eunice NJOGU², Drusilla MAKWORO³

¹First author and corresponding author Nutritionist, German doctors Nairobi, Kenya,

Email: nassirsamh@gmail.com

² Lecturer, PhD. Kenyatta University, Nairobi Kenya, Email: njogu.eunice@ku.ac.ke

³ Lecturer, PhD. Jomo Kenyatta University, Kiambu, Kenya, Email: gekondomoke@gmail.com

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Abstract

Micronutrient malnutrition severely affects development and functioning of the body leading to increased morbidity and mortality. The study adopted a cross-sectional research design; cluster sampling was used to target 318 households. The significance level was $P < 0.05$, the mean age of primary food shoppers was 33 years and the average income was 3,000-5,000 Kenya shillings. Slightly above half, 55% of the primary food shoppers knew about fortification but only 25% understood its meaning. Fortified maize flour was consumed by < 80% of primary food shoppers however utilization frequency was low. In conclusion factors that were significantly associated with utilization of fortified maize flour included; knowledge on fortified maize flour ($p=0.00$), household size ($p=0.005$), preference of fortified maize flour ($p=0.000$) and level of fortification knowledge ($p=0.002$). Availability and price were ranked as the most important factors that influence utilization of fortified maize flour at 58% and 55% contrary nutritional value was ranked least important at 37%. The ministry of health and concerned millers should make more emphasis on creating and sustaining awareness more so a steady supply and affordable prices should be ensured by millers so that more primary food shoppers can be able to utilize the fortified maize flour.

Keywords: Knowledge, utilization, Mathare, fortified, maize flour.

Major classification: Food science, Health science.

1. Introduction

The level of malnutrition globally is of dire concern, with many countries still struggling to achieve the second Sustainable Development Goal. Although malnutrition is mainly characterized by insufficient intake of carbohydrates, fats, and proteins, lack of minerals and vitamins comprising the micronutrients predisposes individuals to “hidden hunger” which is not immediately experienced but resulting into adverse long term effects. It was reported by Meenakshi et al. (2010), Over 2 billion people globally are affected by this form of malnutrition. Micronutrient deficiencies adversely affect health contributing to increased morbidity, misery, and economic loss both in the affected individuals and the country at large.

It often is difficult to meet micronutrient needs in some populations of developing countries through consumption of locally available food; this is because foods are often seasonal. This has led to an increased tendency to seek to resolve micronutrient deficiency problem by promoting supplements and Food fortification (Black et al., 2008). “Food fortification is one of the strategies that have been safely and effectively used to curb vitamin and mineral deficiencies” (WHO, 2014).

Universally, 87 nations have a bill that makes it compulsory to fortify at least one cereal grain that is milled in the industry, eleven of these nations fortify more than 50% of at least one cereal grain that is milled in the industry eight of them fortifying wheat flour while 3 fortify maize flour.

The Ministry of Health (2014), shared a report by Maize Flour Fortification Landscape Kenya stated that 40% of maize flour in Kenya is fortified. So far 37 mills fortify maize flour, 23 large mill certified by KEBS and concentrated in large cities and towns they distribute their flour to retail shops and supermarkets country wide, 12 certified medium mills distribute to schools, hospitals other institution and some to retailers while 2 small mills not certified but are assisted by WFP provide flour for 21 schools in Kakuma refugee camp feeding 73,000 learners.

The Kenya national nutrition action plan 2012 -2017 stated one of the programmatic challenge experienced in food fortification as; health service providers and general population lacking sufficient information on the importance of micronutrients hence a strategic objective was developed to reduce the occurrence of micronutrient malnutrition in the population. Therefore, one of the priority area was to advocate and create awareness on food fortification. Unfortunately, public awareness of fortified maize flour by MOH and millers is still a challenge, creating awareness on the existence and importance of fortified maize flour would help build confidence and preference and increase consumption of the product.

The broad Objective of the study was to explore the level of knowledge and utilization of fortified maize flour among Mathare residents, Nairobi.

2. Methods

The study adopted descriptive cross-sectional design to investigate knowledge and utilization of fortified maize flour by household heads in Mathare. The independent variables were socio-demographic characteristics, knowledge and characteristics of fortified maize flour that affect utilization such as color, taste, smell, price, availability, nutritional value. Whereas the dependent variable was the utilization of fortified foods. This study was carried out in Mathare valley, which is a slum area, found in Ruaraka sub County of Nairobi County. This area was relevant to the study since Mathare is among the largest recognized slums in Nairobi. Based on the stratification using the review of literature on the socio-economic, health and sanitation situation of the slums, the slums were classified as Better-Off Slums (Stratum 1) and Worse-Off slums (Stratum 2), (Samuel Kirichu, 2014). Mathare was classified under (Stratum 2), as it has a high poverty index and increased malnutrition compared to other urban areas in Nairobi.

The study population included all the primary food shoppers in Mathare valley whereas the target population covered all primary food shoppers in the selected households. The inclusion criteria was households with primary food shoppers who gave consent to take part in the study. The exclusion criteria included households with non-consenting primary food shoppers. This study utilized cluster sampling method. The entire population in Mathare was divided into different clusters (villages). Five villages were randomly selected (Mathare 4A, Gitathuru, Kosovo, Mabatini and Mashimoni); the households were selected through systematic random sampling. In each study area, the sample size was determined using the proportional method of sample size distribution. Purposive sampling was done to draw a sample of shopkeepers for face to face interviews.

The study used two sets of instruments, which were a researcher administered questionnaire for the primary food shopper and the shopkeepers. University supervisors assisted to validate the questionnaires along with a pretest, 10% of participants in Mathare 4B which was not selected for research were involved in the pre-test. The reliability of the instruments was established using test re-test method. The data collected was analyzed using SPSS version 25. The proposal was authorized by Kenyatta University graduate school and ethical approval was pursued from Kenyatta University Ethics and Review Committee. Authorization to conduct research was granted by National Commission of Science, Technology and Innovation (NACOSTI).

3. Results

Table 1: Socio-demographic characteristic of primary food shoppers

Variables		Male	Female	Total
Average age (years)		36	32	34
Gender of Participants (%)		25	72	100
Marital Status (%)	Single	17.9	19.6	19.2
	Widowed	1.1	8.8	6.8
	Married	73.7	63.9	66.3
	Separated/Divorced	7.4	7.7	7.6

Education Level (%)	No Education	2.1	4.2	3.7
	Primary Level	21.1	40.4	35.5
	Secondary	67.4	49.1	53.7
	Vocational Training	7.4	5.3	5.8
	University	2.1	0.7	1.1
	College	0	0.4	1.1
Occupation (%)	Self Employed	41.1	45.6	44.5
	Casual	28.4	35.8	33.9
	Student	2.1	0.4	0.8
	Employed	28.4	14	17.6
	Other	0	4.2	3.2
Type of house (%)	Iron Sheet	40	51.2	48.4
	Stone	53.7	41.4	44.5
	Mud	6.3	7.4	7.1
Average household size		5	5	5
Residence	Gitathuru	16.8	8.4	10.5
	Kosovo	27.4	23.2	24.2
	Mathare 4A	35.8	51.6	47.6
	Mabatini	4.2	2.8	3.2
	Mashimoni	15.8	14.0	14.5

Table 2: Fortification knowledge of primary food shoppers

Variable	Male	Female	Total
Heard of fortification (Yes %)	56.8	54.7	55.3
Understand definition of fortification (Yes %)	29.5	24.2	25.5
Heard of fortified maize flour (Yes %)	11.6	11.9	11.8
Know importance of fortification (%)			
Not aware	0	0.4	0.3
Not important	29.5	24.2	25.5
Little important	11.6	11.9	11.8
Moderate important	18.9	16.8	17.4
Important	18.9	21.1	20.5
Very important	21.1	25.6	24.5
Importance of fortification			
Boost immunity	62.1	72.3	69.8
Improve appetite	23.2	21.4	21.8
Improve vision	6.3	4.2	4.7
Increase blood level	2.1	4.9	4.2
Level of knowledge			
No knowledge	23.2	24.6	24.2
Little knowledge	28.4	32.3	31.3
Moderate knowledge	46.3	41.1	42.4
Very knowledgeable	21.1	2.1	2.1
Read nutrition information before purchase (Yes %)	2.9	8.7	11.6
Seen fortification logo (Yes %)	2.4	8.4	10.8
Source of fortification information (%)			
Television	12.6	34.5	47.1

Radio	7.3	27.2	34.5
Packet	4.2	17.4	21.6
Newspaper/poster	7.3	4.9	12.2
Social media	2.4	5.9	8.3
Hospital	0	5.7	5.7
Relatives/neighbors	0.5	3.3	3.8
Known Maize flour Fortificants (%)			
Vitamin A	13.3	58.6	71.9
Vitamin B	7.1	22.5	29.6
Iron	4.6	17.3	21.9
Folic acid	0	3.1	3.1
Zinc	0.5	0.5	1.0

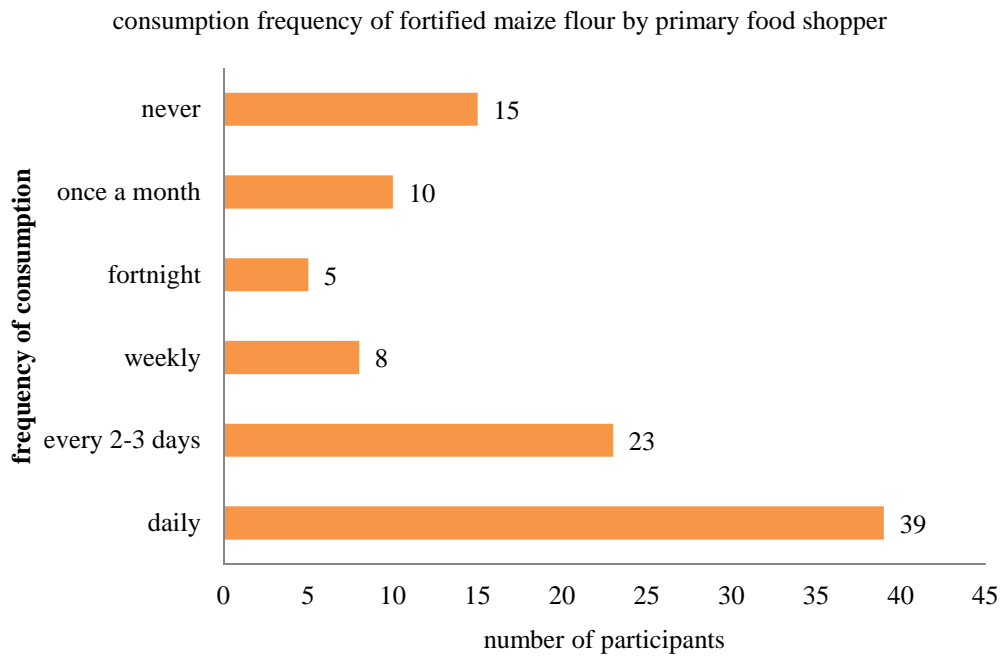


Figure 1: Consumption frequency of fortified maize flour by primary food shopper

Table 3: Factors influencing knowledge of fortified maize flour.

Independent variables	B	S.E.	Wald statistic	P-value	Adjusted odds ratio	Odds ratio 95% C.I.	
						Lower	Upper
Purchase Point	-0.467	0.216	4.687	0.030	0.627	0.411	0.957
Gender	0.141	0.302	0.217	0.641	1.151	0.637	2.081
Age	-0.032	0.015	4.404	0.036	0.968	0.940	0.998
Education level	0.427	0.182	5.504	0.019	1.532	1.073	2.188

Table 4: Influence of knowledge on fortified maize flour on its utilization.

Independent variable	B	S.E.	Wald statistics	P-value	Adjusted odds ratio	Odds ratio 95% C.I.	
						Lower	Upper
Knowledge	1.466	.289	25.646	.000	4.332	2.456	7.640

Table 5: Factors influencing utilization of fortified maize flour

Independent variable	B	S.E.	Wald statistics	P-value	Adjusted odds ratio	Odds ratio 95% C.I.	
						Lower	Upper
Age	-.008	.024	.100	.752	.992	.947	1.040
Gender	-.592	.414	2.044	.153	.553	.246	1.246
Household size	-.250	.090	7.734	.005	.779	.653	.929
Education level	-.313	.258	1.479	.224	.731	.441	1.211
Purchase point	-.338	.303	1.239	.266	.713	.394	1.293
Preference of fortified maize flour	-2.513	.434	33.565	.000	.081	.035	.190
Fortification Knowledge Level	.704	.229	9.471	.002	2.021	1.291	3.165

Table 6: Factors influencing utilization of fortified maize flour

Factor (%)	Does not	Slightly	Influences	Moderately influences	Extremely influences
Price	30	5.5	9.5	9.5	45.5
Taste	29.2	10	17.6	12.4	30.8
Nutritional value	37.6	9.7	16.1	15.3	21.3
Children’s preference	41.6	5.3	11.6	10.3	31.3
Known/trusted brand	39.2	7.9	15.8	9.5	27.6
Availability	32.6	2.4	7.4	5.3	52.4

4. Discussion

A total of 380 primary food shoppers were interviewed. 25% of them were male while 75% were female. This shows the female population plays a major role in the decision to use fortified maize flour hence should be targeted more in creating awareness on the importance of using fortified maize flour so as to help improve the nutritional status of the population.

The Participants’ age ranged from 18 years to 60 years with the average age being 33 years and most common age being 32. More primary food shoppers below the age of 32 years used fortified maize flour compared to primary food shoppers above 32 years this is can be attributed to the fact that younger primary food shoppers have contact with latest technology and affinity to readily adopt it, therefore younger consumers’ may eat more fortified foods,(Nair, 2012). Majority of the primary food shoppers have household income between KSh 3,000 – 5,000. Household size ranged from 1 person to a maximum of 25 per household, most common size being 5 members per household. This low household income and high household size translates to consumption of foods that have low prices as this would be affordable and would ensure at least each household member gets a portion to consume, (Pambo et al, 2013). This explains the results why only 39% of households consume fortified maize flour daily.

Majority of primary food shoppers had heard of fortification at 55.3% however, only 25.5% understood the meaning of fortification. 11.8% of primary food shoppers had heard of fortified maize flour. Low information seeking behavior of primary food shopper was established as very low percentage of primary food shoppers read the nutrition information before purchase at 11.6% in addition only 10.8% had ever seen the fortification logo on the packet of fortified maize flour. More emphasis needs to be made on creating awareness on the meaning and importance of fortified maize flour. Increase in information would lead to increase in utilization. This study corroborates a study by Pambo et al, (2013), where 62.8% of household heads in Nairobi were aware of fortified sugar.

The trust of consumers for the process of fortifying food is vital for them to accept and consume the fortified foods. This includes trusting the safeness of fortified foods; trusting the companies that take part in fortification and delivering of food as well as trusting the inspection of the value and safeness of fortified foods done by respective government departments (Bruno, 2011). The most common reason that was associated with importance of using fortified maize flour was that it boosts immunity, 69.8% of primary food shopper felt that utilization of fortified maize flour helped to stay healthy.

Vitamin A was the Most common fortificant mentioned by 71.9% of primary food shopper, Stevens et al., (2015) stated in Kenya 49% of children had vitamin A deficiency, this led to increased tendency to resolve

micronutrient deficiency problem by promoting supplements and Food fortification making vitamin A a popular micronutrient among the primary food shoppers.

Individuals who search for nutritional information of fortified food prior to purchase, either from relatives, friends or an alternative source, are expected to have higher probability of eating fortified foods. This is because knowledge of fortified foods is likely to increase by inquiring from others, (Pambo et al, 2013). Television was the most used source of fortification information at 47.1% followed closely by radio 34.5% while relatives/neighbors happened to be the least common source of fortification information 3.8%. This communication channels need to be exploited more in order to disseminate fortification information to a large target audience.

The maize flour consumed by primary food shoppers in Mathare is mainly fortified, 83% of primary food shoppers use fortified maize flour 25.2% male while 74.8% female, this statistics corroborates to a nutrition survey by MOH that states 80.9% of maize flour that is consumed from the urban slums of Nairobi is fortified and mainly bought from supermarkets and shops. As such, fortified maize flour is useful in fighting micronutrient malnutrition in the urban slums of Mathare as it is widely consumed. This statistics differs from a study by Fiedler et al., (2013) that reported Consumption sifted maize flour in Kenya was at 33% evidence that a lot of progress has been made in increase of utilization levels of fortified maize flour since 2013.

The frequency of consuming fortified maize flour was low as 39% of primary food shoppers used it daily while 10% used it monthly. These results corroborate the report by KDHS (2014) which revealed 33 per cent of children of the age 6-23 months consumed foods rich in iron the day or night preceding the survey hence corroborating this study. However 15% of primary food shopper reported to never consuming fortified maize flour and attributing this to its high price hence cannot feed their large families, low satiety value and perceived poor nutritional value were the main excuses given. For 49% of the Participants fortified maize flour was the most commonly used maize flour while 46% stated that fortified maize flour was the flour they were currently using.

Knowledge of fortified maize flour determines its utilization, there was significant statistical association in analysis of utilization of fortified maize flour, knowledge of fortified maize flour had a p value = 0.00. When the level of knowledge on fortified maize flour increases by 1 the probability of utilization of fortified maize flour increases by 4.332 times. Individuals who are highly expected to consume fortified foods are the ones with information about the benefits of micronutrients in their meal. This is because micronutrients play a very vital role in improving human health^[7]. More emphasis needs to be made to create awareness on the need and importance of using fortified maize flour so as to fight micronutrient malnutrition using locally available fortified maize flour. Hence the null hypothesis is rejected, as knowledge of fortified maize flour does influence its utilization. Primary food shoppers with knowledge of fortified maize flour are more likely to use fortified maize flour.

Household size is one of the factors that determined utilization of fortified maize flour. This means that analysis of House hold size (P = 0.005) had a significant statistical association to utilization of fortified maize flour. Larger households would need to use a lot of money in order to purchase enough flour to satisfy their high number more so its low satiety value proved uneconomical to households with many members. Thus the null hypothesis is rejected, the larger the household size the less the chances of utilization of fortified maize flour.

Preference of fortified maize flour determined its utilization, with P value = 0.000 preference had a significant statistical association to utilization of fortified maize flour. Hence the null hypothesis is rejected as it is evident that the preference of fortified maize flour indeed does influence utilization. Primary food shoppers who preferred maize flour were 64% utilized it more, most common reason for preference being 'it cooks easily and faster hence consuming less fuel.

The more knowledge a primary food shopper had concerning fortified maize flour the more the chances of its utilization. Analysis of level of food fortification knowledge (P = 0.002) had a significant statistical association to utilization of fortified maize flour. This results lead to rejection of the null hypothesis since the level of food fortification knowledge influenced primary food shoppers to consume it. This results are similar to the results from a study which reported that 'many peoples' decision while choosing food are influenced by their level of knowledge, the more the education; the more knowledgeable they are about nutrition', (Pambo et al., 2013).

To determine the most important factors that influence utilization of fortified maize, primary food shoppers were asked to rate six factors ; price, taste, children's preference, nutritional value, known/trusted brand and availability. The most important factor that influenced utilization of fortified maize flour was its availability. 57.7% of primary food shoppers ranked availability of fortified maize flour as the most important factor that made them utilize it this is because even when there is power blackout/ no electricity they can still get the fortified maize flour unlike those purchasing loose maize flour from posho mill. Point of purchase was mainly the shops at 74% while 7% bought their maize flour from the supermarket; fortified maize flour was readily available in Mathare slum. This result contradicts a study by Lupin and Rodriguez (2012) that states individuals who regularly visit other outlets such as retail stores, shops and open markets are expected to have a lower

consumption of fortified foods.

Food fortification is a convenient and cost-effective approach in improving the nutritional status of the at risk population, mainly infants and women, (Best et al., 2011). Price was ranked the second most important factor influencing utilization of fortified maize flour to 55% of the primary food shoppers. Inflation of the price of fortified maize flour hinders many primary food shoppers from utilizing it.

Its beneficial to Fortify food as it easily reaches a large scope of vulnerable people through available food distribution channels without interfering with their feeding behavior thus making food fortification a useful and practical public health technique, (Best et al., 2011; Serdula, 2010b). Utilization of fortified maize flour by 43.2% of primary food shoppers was influenced by taste, maize flour being a staple food in Kenya is used to fight vitamin A and iron deficiency. Primary food shoppers considered the good taste of fortified maize flour a very important factor that makes them utilize it, fortified maize flour is readily accepted because the Fortificants did not alter its original taste.

Children's preference was a most important factor influencing utilization of fortified maize flour to less than 50 per cent of primary food shoppers. Adult's preference was more influential than the children's preference when it comes to utilization of fortified maize flour, 41.6% of primary food shoppers reported their children's preference of fortified maize flour as the main reason behind its utilization in their households.

Known or trusted brands of fortified maize flour was ranked as the fifth most important factor as it influenced utilization of fortified maize flour as reported by 37.1% of primary food shoppers. Primary food shoppers didn't mind purchasing unpopular brands of fortified maize flour as long as it was available. This result contradicts a study that reports the uptake chances of fortified maize flour are likely to be greater in individuals who trust the food fortification institutions since purchasing decision of the fortified foods is used to show their confidence in it (Pambo et al., 2013).

A barrier to intake of enriched food is still lack of realistic information on consumers' awareness for fortified foods, (Best et al., 2011; Serdula, 2010b). Nutritional value was the least important factor for primary food shoppers as only 36.6% of primary food shoppers reported it as being most important factor that influenced its utilization. Advertisements about fortified maize flour in the media mainly focus on its taste rather than its nutritional value hence leaving many primary food shoppers with little to know about the nutritional value and importance of the fortified maize.

Due to the high number of primary food shoppers who do not understand the meaning and importance of fortification, the Human Nutrition and Dietetics unit in the ministry of health should increase and maintain awareness on fortification.

Majority of primary food shoppers are female yet very few reported the hospital as their source of fortification information, hence Ruaraka sub-county nutrition officer should ensure nutrition education is linked to programs that promote gender such as merry go rounds and also promote consistent nutrition education (that include fortification topic) to be given to mothers during antenatal and post natal visit in the health centers.

Additionally, fortified loose flour should be milled and sold to primary food shoppers, who were more concerned about the low satiety value of sifted flour, those with low household income and large household size as this would enhance more acceptability of fortified maize flour.

5. Conclusion

The study concluded that more than half of primary food shoppers in Mathare are aware of fortified maize and majority of primary food shoppers utilize fortified maize flour as compared to non-fortified maize flour. In addition there was a significant statistical association between knowledge and utilization; this shows that knowledge on fortification increases utilization of fortified maize flour.

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