Original Research Article

Knowledge and Awareness on food fortification among mothers/child caretakers of Kinondoni Municipality, Tanzania

ABSTRACT

Objective: The objective of the study was to evaluate the success of social mobilization and capacity building efforts to educate the mothers/child caretakers and the general public regarding food fortification and the important of consuming fortified food products in Kinondoni municipality.

Methodology: The study involved mothers/child caretakers with children aged 6-59 months who were present during the period of the interview at Sinza hospital (n = 26), Magomeni hospital (n = 39), Manzese dispensary (n = 81) and Tandale health centre (n = 54). The knowledge and awareness information regarding food fortification were collected through face to face interview with the consent of interviewee using structured questionnaires. The data were analysed by using the descriptive statistics.

Results: The study findings showed 64% of the mothers/child caretakers have heard the term micronutrients from various sources and only 7.9 % of mothers/child caretakers were able to define the term micronutrients, as vitamins and minerals. Meanwhile, mothers/child caretakers 29% have heard the term food fortification and 79% don't know types of foods being fortified with micronutrients. The main source of information regarding food fortification mentioned by mothers/child caretakers was health workers (41.7 %) and the most underutilised source of information was posters (0.1%). The study further noted more than 50% of the mothers/child caretakers were not aware of the health benefits of the micronutrients (vitamin A, folic acid, iodine and iron) being added in food. The findings further revealed that knowledge and awareness on food fortification have no influence with income, level of education and age of the mothers/child caretakers.

Conclusion: Generally, the knowledge and awareness regarding food fortification are very low among mothers/child caretakers in Kinondoni municipality prompting a need to conduct intensive social mobilization towards promoting awareness among the mothers/child caretakers as well as the general public to improve child nutrition.

Keywords*: Knowledge, Awareness, food fortification, mothers/child caretakers, vitamins, minerals*

1.0 INTRODUCTION

Micronutrient deficiencies continue to be a problem of considerable magnitude in most of the developing countries including Tanzania [3, 4]. Severe clinical forms due to micronutrient deficiencies include night blindness, cretinism, low birth weight, impaired mental capacity, increased morbidity and mortality associated with certain infections, physical deformity like neural tube defects, cognitive delays, severe anaemia, poor concentration, poor productivity capacity and increased severity of diseases associated with HIV/AIDS due to weakened immune system[5, 7, 11].

In Tanzania, the prevalence of micronutrient deficiencies is quite high, for example according to Tanzania Demographic and Health Survey (TDHS) [1, 2] more than half (58%) of children are anaemic with 35% of children being iron deficient. Also 45% of women of child bearing age are anaemic with 30% being iron deficient. In addition TDHS found that 37% of women aged 15-49 years and 33% of children aged 6 -59 months are vitamin A deficient[1]. Furthermore, an estimated 27,000 infant and 16,000 maternal deaths that occur each year can be attributed to micronutrient deficiencies[14]. In addition to the disease burden, micronutrient deficiencies severely affect economic and human development in Tanzania [8, 14]. For instance, it has been estimated that micronutrient deficiencies (iron, vitamin A and folic acid alone) lead to an annual loss of US$ 518 million each year or about 2.65% of Tanzania's gross domestic product (GDP) [14] and childhood anaemia alone is associated with a 2.5% reduction in adult wages [13].

The strategies to address micronutrient deficiencies in developing countries including Tanzania have included micronutrients supplementation, food and nutritional education, food fortification,

biofortification of staple foods, dietary modification or diversification and reduction of disease burden which exacerbate the micronutrient deficiencies like measles, diarrhea, acute respiratory infections [11, 12]. However, on long term perspective, food fortification intervention seems to be extremely effectively in addressing the problem of micronutrient deficiencies because it is generally recognized as being the most effective, viable, scalable, affordable and sustainable way to eliminate dietary micronutrient deficiencies, especially where multiple micronutrients mixes (e.g. Vitamin A, vitamin B_1, vitamin B_2, vitamin B_6, vitamin B_{12}, niacin, folic acid, iron and zinc) can be used [9]. Many country have been fortifying their staple food like wheat flour, maize flour, sugar, rice, oil and pre-cooked corn flour since late nineties, years later a study showed that there is a decrease in iron deficiency and anaemia by 59% and 47% correspondingly in Venezuela who have been fortifying wheat flour and pre-cooked corn flour [31, 32].

The Government of Tanzania, which has been strongly dedicated to improving nutrition, has introduced the National Multisectoral Nutrition Action Plan (NMNAP) for 2016 to 2021, which states that food fortification is a cost effective approach to reduce prevalence of micronutrient deficiencies [6]. The efforts include promoting food processing enterprises to implement and sustain food fortification activities in line with standards and legislation for the fortification of wheat flour, maize flour and edible oil.

Based on this the National food fortification program was officially launched in Tanzania on May 16th, 2013 by His Excellency Forth President of the United Republic of Tanzania[10]. The program is being overseen by a body known as Tanzania Food Fortification Alliance (TFFA) that was formulated during 2003. The TFFA comprises government Institutions, Academia, Researchers, development partners, NGOs and food processing enterprises. Food fortification standards were gazetted in 2011 and legislation was passed and gazetted in 2011 which requires all food processing enterprises to fortify wheat flour, maize flour with multiple micronutrients (iron, folic acid, vitamin B12 and zinc) and edible oil with vitamin A. Currently there are about 14 large scale food processing enterprises fortifying edible oil with vitamin A and other multiple micronutrients to wheat and maize flour.

Meanwhile a comprehensive social mobilization and behaviour change strategy to ensure that the public is informed about issues of nutritional benefit and other behavioural measures to enhance the impact of the fortified foods was implemented country wide[10]. This study was carried out because there is limited information documented or studies conducted about the knowledge and awareness of mothers/child caretakers regarding food fortification since its commencement in the country five years ago. This study was designed to understand how mothers/child caretakers are aware of food fortification in terms of meaning of micronutrients as used in food fortification program, benefits of consuming fortified foods, types of staple foods fortified with micronutrients, benefits of food fortification and health benefits of important micronutrients used in food fortification program in Tanzania. Results from this study will have impact in planning the most appropriate strategies for conducting social mobilization regarding food fortification intervention in the country. Hence, this study was conducted to assess the levels of knowledge and awareness between November, 2017 to evaluate the success of social mobilization efforts to educate the mothers/child caretakers and general public regarding food fortification in Kinondoni municipality.

2.0 METHODOLOGY

2.1 Study area and population

The survey was conducted, primarily targeting mothers/child caretakers with child/children aged 6 to 59 months attending reproductive and child health clinics in Kinondoni municipality. The survey was conducted at four health facilities of Sinza hospital, Magomeni hospital, Manzese dispensary and Tandale health Centre. A total of 200 mothers/child caretakers were interviewed. The sample size distribution in 4 health facilities was as indicated in table 1.

Table 1: Sample size distribution of mothers/child caretakers in the four health facilities surveyed

Health facility	Sample size (n)	Percent (%)
Sinza Hospital	26	13.0
Magomeni Hospital	39	19.5
Manzese Dispensary	81	40.5
Tandale Health Centre	54	27.0
Total	**200**	**100**

2.2 Data collection and analysis

Team of enumerators who were recruited and oriented was responsible for administering a pre-tested structured questionnaire. Data entry was done in excel spreadsheets and descriptive statistics (percentages) were generated using excel pivot.

3.0 RESULTS AND DISCUSSION

3.1 Socio-economic and demographic characteristics of mothers/child caretakers

The socio economic and demographic characteristics of 200 mothers/child caretakers in the surveyed area are given in table 2. The results showed that, 100% of the mothers/child caretakers were females aged between 18 to 50 years old. About 26% of the mothers/child caretakers were involved in entrepreneurship while 5% of the mothers/child caretakers were employed in a formal sector. The majority (67.5%) of mothers/child caretakers were housewives and the remaining (1.5%) were involved in other activities. On the maximum level of education attained by the mothers/child caretakers, 52% completed primary school, 32% completed secondary school, while 8% completed university/college and 4% never attended school. This study suggests that majority of the mothers/child caretakers attending the reproductive and child health clinics are women aged between 18 to 50 years. This age is within the recommended reproductive age of 15-49 years for women [1, 2, 17, 18]. These findings also resemble other studies in East Africa which reported that women are often seen attending child health clinics compared to men [15, 16]. Other similar studies conducted in

123 Kenya and Myanmar showed that the majority of caretakers were female with age between 18-85
124 years [21] and 15-68 years [21] respectively.

125 **Table 2: The socio economic and demographic characteristics of mothers/child caretakers**

Variable	Frequency(n=200)	Percentage (%)
Age of mother/child care taker		
Between 18 and 50 years	200	100
Gender		
Female	200	100
Male	0	0
Level of education		
University/college	16	8
Secondary school incomplete	9	4.5
Secondary school complete	64	32
Primary school incomplete	3	1.5
Primary school complete	104	52
Adult education	0	0
Never attended school	4	2
Major occupation for income generation		
Agriculture	0	0
Entrepreneurship	52	26
Employed	10	5
House Wife	135	67.5
Other	3	1.5
Number of children		
Total number	200	100
Children(6 to 59 months)	100	50

126

127 **3.2 Mothers/child caretakers awareness on micronutrients**

128 The survey also investigated the mothers/child caretakers if they have heard the term
129 micronutrients. The results of the investigation on the awareness regarding micronutrients are
130 given in Figure 1. When the mothers/child caretakers were asked if they have heard the term
131 micronutrients as used in food fortification program in Tanzania, 64% responded that they have
132 heard the term micronutrients while 36% responded that they have not heard the term
133 micronutrients. The results suggested that most of the mothers/child caretakers had heard the term
134 micronutrients as used in food fortification program in Tanzania which is consistent with study
135 conducted in Northwest of Iran that showed mothers were aware about use of micronutrient [33].

Moreover, the result of the current study shows improvement when compared to the previous survey on consumers aged from 18 to 55 years regarding their knowledge on food fortification and nutrition that found Tanzanian consumers are not fully aware with food fortification aspects [24].

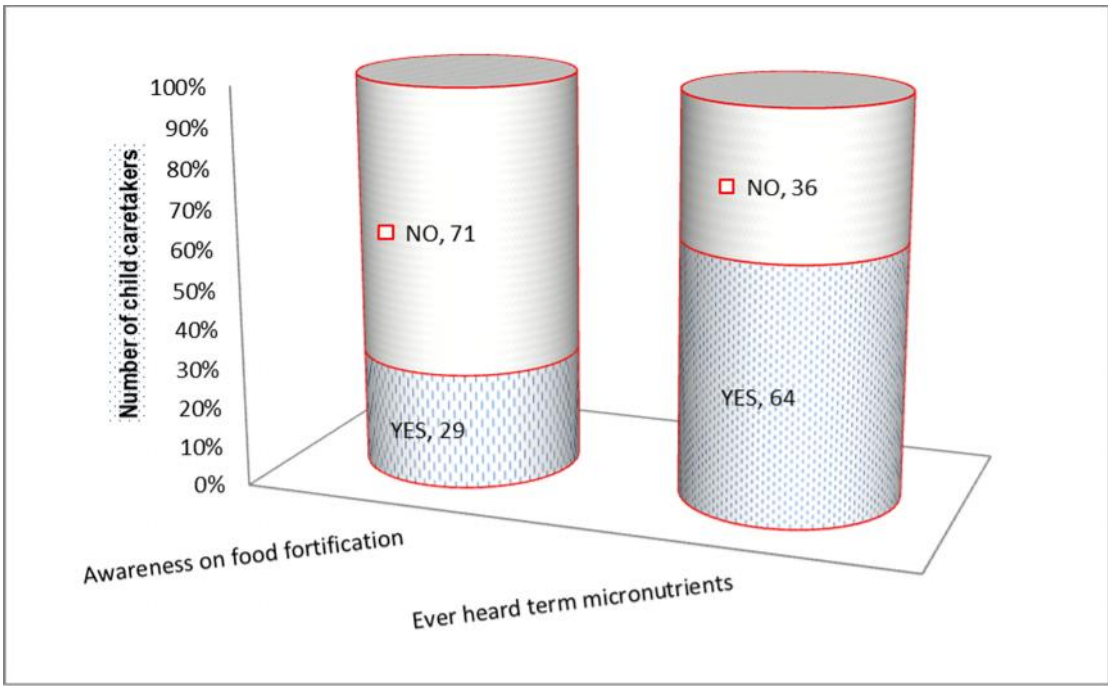


Figure 1: Mothers/child caretakers ever heard term micronutrients and awareness on food fortification

3.3 Awareness on Food fortification

The results of the investigation on the awareness regarding food fortification are given in Figure 1. When the mothers/child caretakers were asked if they have heard the term food fortification, 71% % responded that they have not heard the term food fortification while 29% responded that they have heard the term food fortification. The above results showed that food fortification awareness is very low among mothers/child caretakers in Kinondoni mumicipality. The results of the this study are consistent with the survey on consumers aged from 18 to 55 years about their knowledge of food

fortification and nutrition that found Tanzanian consumers are not fully aware with food fortification [24].

3.4 Knowledge on micronutrients

The mothers/child caretakers, who have heard the term micronutrients, were asked to give the meaning of the term micronutrients. When prompted further, only 7.9% of the mothers/child caretakers were able to define correctly the meaning of micronutrients, which are the vitamins and minerals. The remaining mothers/child caretakers were not able to give any answer or gave incorrect answers about the meaning of micronutrients as used in food fortification program in Tanzania. The result on the knowledge on micronutrients is given in Figure 2. The study revealed that majority of the mothers/child caretakers did not know the definition of the term micronutrients as used in food fortification program. The findings of the this study are consistent with the previous study on Knowledge Attitudes and Practices (KAP) regarding micronutrients in India which revealed that the respondents had poor information on micronutrients [28]. Inability to define term micronutrients may be contributed by ignorance and lack of nutrition education among mothers/child caretakers in the country.

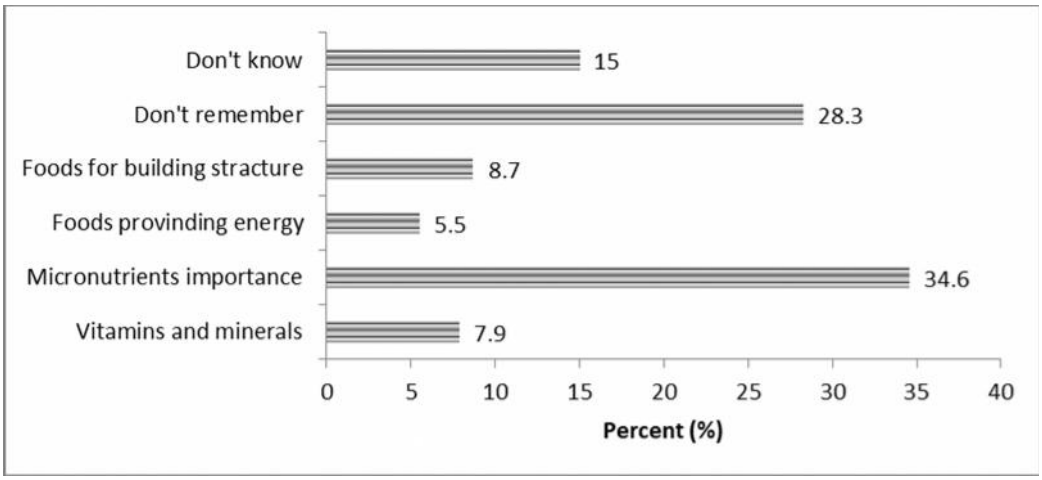


Figure 2: Mothers/child caretakers who are aware of the meaning of term micronutrients

3.5 Types of foods fortified with micronutrients

The mothers/child caretakers were asked about their knowledge regarding the types of food products fortified with micronutrients in Tanzania. The results in Figure 3 indicated that 9% of the mothers/child caretakers mentioned maize flour, 4% mentioned wheat flour. Further analysis revealed that 4% mentioned salt, 2% mentioned edible oil and 2% of the mothers/child caretakers mentioned margarine. On other hand 68% of the mothers/child caretakers responded that they don't know types of foods which are fortified with micronutrients while 11% mentioned other foods. The result of this study also revealed that mothers/child caretakers had poor information on foods which are fortified with micronutrients. The result of this study are consistent with the survey on Tanzanian consumers aged from 18 to 55 years about their knowledge of food fortification and nutrition that found Tanzanian consumers are not fully aware with food fortification [24]. Based on this study, only 29% of the mothers/child caretakers gave the correct types of foods fortified with micronutrients which are edible oil, sembe flour, wheat flour and salt according to Tanzania national food fortification program [24, 25].

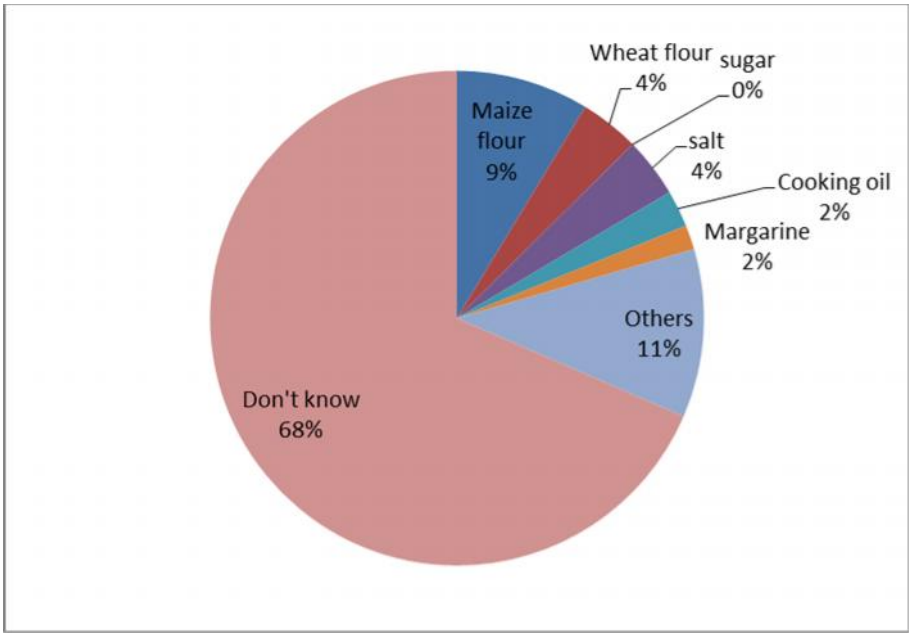


Figure 3: Foods which are fortified with micronutrients

3.6 Main source of information on food fortification

The main sources of information for the mothers/child caretakers who said were aware of food fortification are given in Figure 4. The main source of information was from health workers (41.7%), village leader (21.3%), radio (6.3%), seminar/training (5.5%), Television (5.5%). Other sources of information were school (4.7%), conversation with friends (5.5%) and 9.4% of the mothers/child caretakers received information from other sources. The most under- utilised source of information was posters (0.1%). The current findings are consistent with the previous research reported in Tanzania that the main source of information on health and nutrition related interventions for caregivers (mothers) attending the health facilities were health workers followed by mass media (radio and television) [19, 26]. Other research on the knowledge of food fortification in Philippines reported that health workers were the main source of information for the primary caregivers on knowledge of food fortification [23]. A similar KAP study in Pakistan regarding folic acid showed that health workers are the most effective source of information reported by majority of the respondents [30]. In contrast other finding was reported on the awareness of food fortification in the Philippines that food stores and supermarkets followed by radio were main source of information mentioned by mothers with malnourished children [20]. Other studies on consumer awareness of food fortification in Kenya revealed that the main source of information of food fortification reported by consumers was media [21] and another study in India reported media and read on the products labels [22]. Therefore, dissemination of nutritional information and food fortification awareness through the health workers and community leaders would be more effective in the study area.

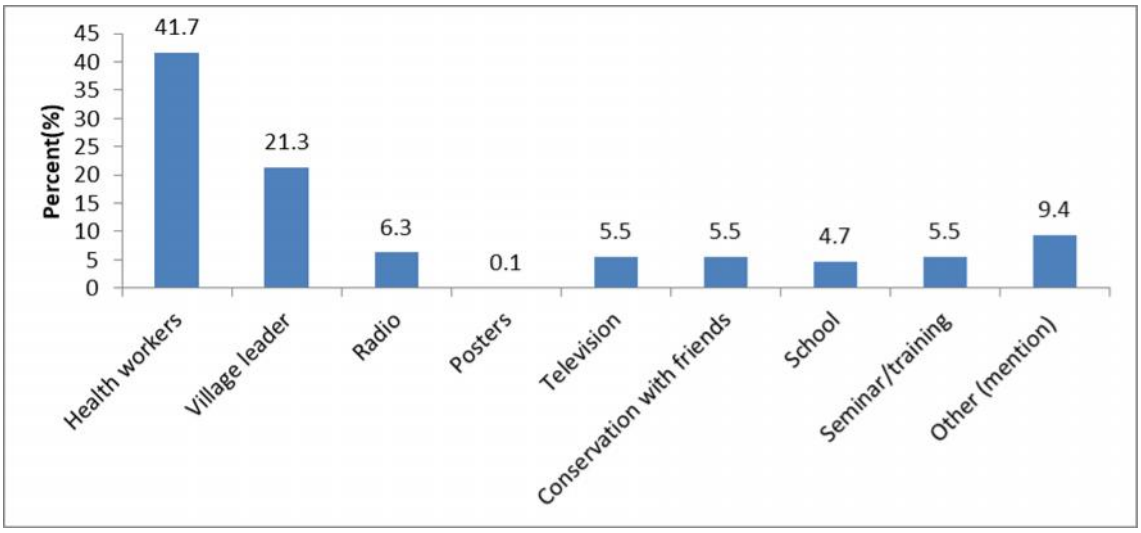


Figure 4: main sources of information

3.7 Benefits of food fortification

The mothers/child caretakers who were aware of food fortification also were asked to mention the benefits of food fortification. The results for the analysis of the benefits of food fortification are indicated in Figure 5. The findings showed that 7.9% of the mothers/child caretakers mentioned improved food quality, 0.8% increased educability in children, 1.6% reduction in maternal mortality, 27.6% reduction in diseases and child mortality and 2.4% increased productivity and national economy. On other hand 53.5% of the mothers/child caretakers don't know the benefits of food fortification while 6.3% mentioned other benefits. Generally, this study suggests that majority of the mothers/child caretakers in Kinondoni Municipality they had low knowledge on the benefits of food fortification. The benefits of food fortification or consumption of fortified staple foods reported in other studies include improve health status of children, prevent micronutrient deficiency and increase appetite [23].

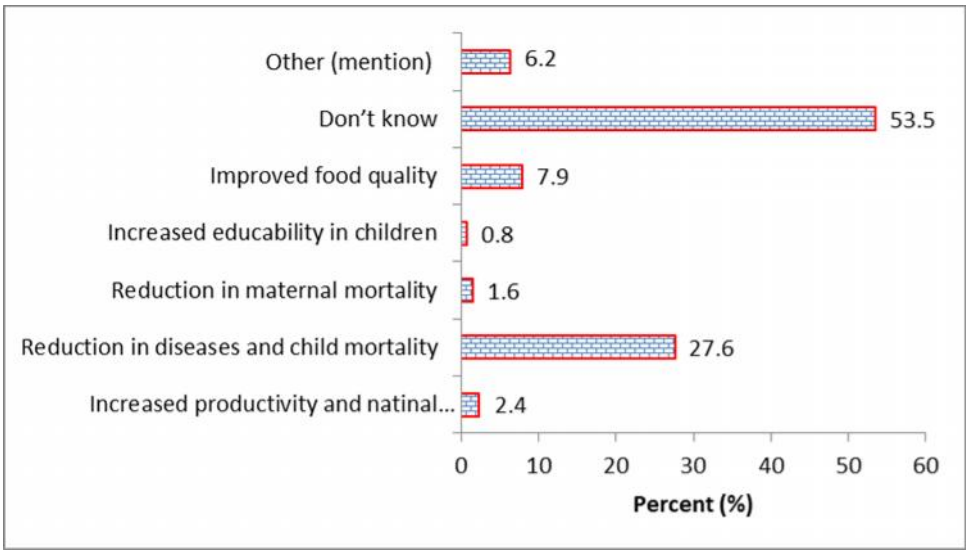
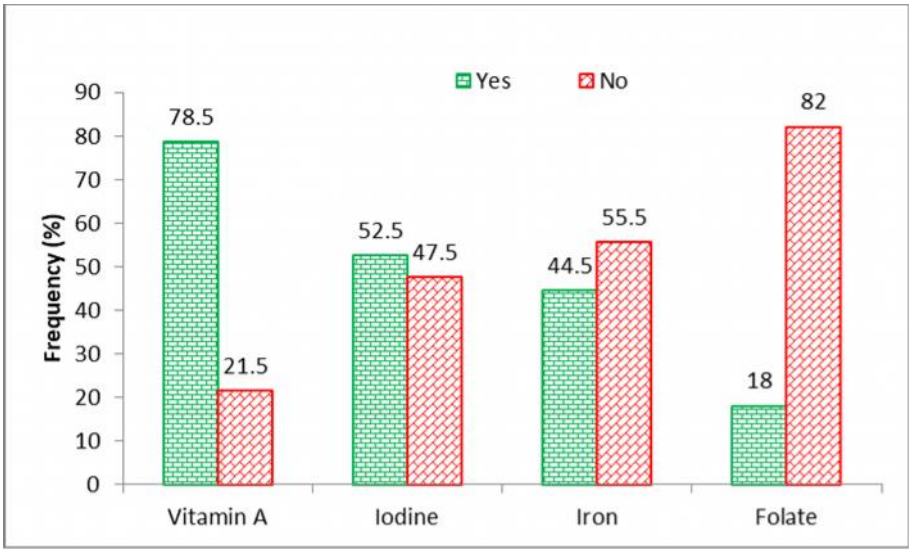


Figure 5: Benefits of food fortification.

3.8 Mothers/child caretakers awareness on individual micronutrients

Mothers/child caretakers were asked on whether they have ever heard of selected micronutrients (vitamin A, Iron, Folic acid and Iodine) that are used in food fortification program in Tanzania. The results on the awareness of individual micronutrients are given in Figure 6. The results showed that 78.5% of the mothers/child caretakers have heard of vitamin A, 52.5% of the mothers/child caretakers have heard of iodine, 44.5% have heard iron and only 18% of the mothers/child caretakers have heard of folic acid. The results showed that 78.5% and 52.5% mothers/child caretakers had adequate knowledge on vitamin A and iodine respectively. The high awareness for vitamin A is mainly due to the twice yearly national campaign on vitamin A supplementation that has been going on for several years in Tanzania. On other hand there is no similar campaign for folic acid, iodine and iron. Another similar findings from the previous study conducted in Chennai India found that 90% of the participants have heard about vitamin A [38]. In contrast to the current study other research conducted in pre and postnatal mothers in Kenya found low awareness on vitamin A [37]. In one study conducted in Norway found that 51.5% and 58.9% of the pregnant women and lactating women respectively reported have heard and knew what iodine is [40]. Previous studies in Australia and South Africa have also found that women and patients respectively have little knowledge about

237 iodine [41, 42].The moderate awareness for iodine may be due to the fact that national fortification
238 of salt with iodine has been going on since 1990 hence the public are somehow aware [25].The low
239 awareness of Iron and Folic acid among the mothers/child caretakers from the current study are
240 consistent with the previous study regarding awareness on micronutrients among Filipino population
241 groups [27]. In other previous study regarding knowledge revealed that 23.9% student had never
242 heard of vitamin A, while 29.6% and 20.7% student had never heard of Iron and Iodine respectively
243 [28].
244



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246 **Figure 6: Mothers/child caretakers awareness on individual micronutrients**

247 **3.9 Foods fortified with micronutrients (vitamin A , iodine, iron and folic acid)**

248

249 **Table 4: Foods fortified with vitamin A , iodine, iron and folic acid**

Foods	**Micronutrient**			
	Vitamin A	Iodine	Iron	Folic acid
	Percent (%)			
Salt	0	38	2	2
Maize flour	0	0	3	17
Wheat flour	1	1	4	0
Margarine	10	0	3	0

Edible oil	3	0	0	0
Don't know	86	61	87	78
Other	0	0	1	3

When enquired about which foods are fortified with vitamin A, iodine, iron and folic acid, 38% of the mothers/child caretakers responded that salt is fortified with iodine, 4% responded that wheat flour is fortified with iron, 17% responded that maize flour is fortified with folic acid, 10% responded that margarine is fortified with vitamin A and 3% responded that edible oil is fortified with vitamin A. The results on the assessment are indicated in table 4. This study suggests that more than 60% of the mothers/child caretakers don't know the types of foods which are fortified with vitamin A, iodine, iron and folic acid. The awareness on fortified food products and the type of micronutrients is very low among the mothers/child caretakers in Kinondoni municipality. These findings concur with the previous study conducted in Tanzania regarding consumer awareness on food fortification [24].

3.10 Mothers/child caretakers knowledge regarding health benefits of vitamin A

The results on health benefits of vitamin A are given in table 5. When the mothers/child caretakers were asked about their knowledge regarding the health benefits of vitamin A, 8.3% of the mothers/child caretakers responded that vitamin A prevents blindness, 22. 3% responded that vitamin A improves immunity against diseases such as diarrhea, 1.3% responded that vitamin A prevents respiratory tract infections and measles, 3.2% responded that vitamin A promotes child growth and development. Additionally, findings revealed that more than 50% of the mothers/child caretakers did not know the health benefits of vitamin A. This study revealed that there was significantly less knowledge regarding the health benefits of vitamin A among the mothers/child caretakers in Kinondoni municipality. The previous study on Knowledge Attitudes and Practices regarding micronutrient in secondary school student revealed that majority of students were aware of at least one function of vitamin A in the body this include important for eye sight, healthy skin, better growth and prevent illness [28]. The findings were similar to a previous study conducted in Chennai India where it was found that only 26% of the respondents knew the functions of vitamin A [38]. Another

study conducted in Kenya regarding knowledge on vitamin A supplementation benefits was generally low among caregivers of children 6-59 months [39].

Table 5: Health benefits of vitamin A

Descriptions	Frequency (n)	Percent (%)
Prevents blindness	13	8.3
Improves immunity against diseases such as diarrhea	35	22.3
Prevents respiratory tract infections and measles	2	1.3
Promotes child growth and development	5	3.2
Helps in fetus growth	0	0.0
Don't know	80	56.0
Other	14	8.9

3.11 Mothers/child caretakers knowledge regarding health benefits of iodine

The study also investigated the knowledge of mothers/child caretakers on health benefits of iodine which is added to salt as recommended by the national food fortification program. The results (table 6) showed that 69% of the mothers/child caretakers don't know the health benefits of iodine, 9% responded that iodine prevents child being borne with physical deformity, 3% responded that iodine prevent goiter and 4% responded that iodine prevents child being borne with impaired mental capability . The current study revealed that there was low level of knowledge regarding the health benefits of iodine among the mothers/child caretakers in Kinondoni municipality. Other research revealed that at least one benefits of iodine was known by 59.2% of students which include prevention of goiter and important for mental development of child [28]. The previous study in Norway revealed that lactating women had more knowledge about the health benefits of iodine than pregnant women; 45.7% correctly mentioned health benefits of iodine as important for normal child growth and development, 17.1% for normal fatal development, and 48.0% for maintaining normal metabolism [40].

293 **Table 6: Health benefits of iodine**

Descriptions	Frequency (n)	Percent (%)
Prevents child being borne with physical deformity	9	9
Prevents goiter	3	3
Prevents child being borne with impaired mental capability	4	4
Don't know	71	69
Other	16	15

294 **3.12 Mothers/child caretakers knowledge on health benefits of iron**

295 Knowledge regarding the health benefits of iron was analyzed to know whether mothers/child
296 caretakers are knowledgeable with the benefits of iron that is added to wheat and maize flour as
297 recommended by national food fortification program. The results (table 5) showed that more than
298 80% of the mothers/child caretakers don't know the health benefits of iron. About ten percent of the
299 mothers/child caretakers responded that iron prevents low hemoglobin, one percent responded that
300 iron improves school performance in children and one percent responded that iron protects fetus
301 during pregnancy. From this study it is clear that majority of the mothers/child caretakers have no
302 idea on the health benefits of iron. In contrast to this study, previous study conducted in China found
303 majority of women of reproductive age (67%) knew various important of iron especially during
304 pregnancy, for wellbeing of mothers and for the growth and development of foetus [33].

305 **Table 7: Health benefits of iron among mathers/child caretakers**

Descriptions	Frequency	Percent (%)
Prevents low hemoglobin	9	10
Improves school performance in children	1	1
Protects fetus during pregnancy	1	1
Don't know	66	82
Other	5	6

306

307 **3.13 Mothers/child caretakers knowledge on health benefits of folic acid**

308 Knowledge on health benefits of folic acid was analyzed to know whether the mothers/child
309 caretakers are knowledgeable with the benefits of folic acid that is added to wheat and maize flour.

The results (table 8) showed that 75% of the mothers/child caretakers responded that they don't know the health benefits of folic acid, 14% responded that folic acid helps in development of red blood cells and 11% responded that folic acid helps in fetus growth. The awareness regarding health benefits of folic acid among the mothers/child caretakers was not satisfactory. Similar study conducted at Turkish hospital reported 48.2% of women of reproductive and pregnant women were aware on importance of folic acid in prevention of congenital anomalies [35]. Also another study conducted in Japan found majority of pregnant women (70·4%) knew about the protective effect of folic acid [36].

Table 8: Health benefits of folic acid

Descriptions	Frequency (n)	Percent (%)
Helps in proper brain growth	0	0
Helps in development of red blood cells	5	14
Helps in fetus growth	4	11
Don't know	27	75
Other	0	0

4.0 CONCLUSION

The knowlege and awareness regarding food fortification survey conducted in four health facilities of Kinondoni municipality found that the level of knowledge on food fortification for mothers/child caretakers is very low, thus it is estimated that 7.9 percent have heard about food fortification. The major source of information on food fortification reported by the child care takers who have heard about food fortification was the health service providers (41.7 percent). Generally, the majority of the mothers/child caretakers are not aware about food fortification and they lack adequate general knowledge on health benefits of selected micronutrients that are used in food fortification program in Tanzania . The findings of this study further revealed that knowledge and awareness on food fortification has no influence with income, level of education and age of the child care takers. The study conclude that there is a need to conduct intensive social mobilization campaign to create awareness among the mothers/child caretakers and the general public on the importance of fortified food and general food fortification program in Tanzania.

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