



Knowledge and Awareness on Food Fortification among Mother/Child Caretakers of Kinondoni Municipality, Tanzania

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Authors' contributions

This work was carried out in collaboration between all authors. Author MLK contributed to concept development, statistical data analysis and manuscript finalization. Author MK contributed to data collection, questionnaire design, managed the literature searches and manuscript preparation and finalization. Author DGM wrote the first draft of the manuscript, data collection and manuscript finalization. Author CMC contributed to data collection, managed the literature searches and manuscript finalization. Author WPM contributed to data collection, questionnaire design and manuscript finalization. Author MCM contributed to data collection, managed the literature and manuscript finalization. Author ET contributed to concept development, manuscript preparation and finalization. All authors read and approved the final manuscript.

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ABSTRACT

Objective: The objective of the study was to evaluate the success of social mobilization and capacity building efforts done to educate the Mother/Child Caretakers and the general public regarding food fortification and the importance of consuming fortified food products in Kinondoni municipality.

Methodology: The study involved Mother/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

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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 Mother/Child Caretakers have heard the term micronutrients from various sources and only 7.9 % of Mother/Child Caretakers were able to define the term micronutrients, such as vitamins and minerals. Meanwhile, 29% Mother/Child Caretakers 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 Mother/Child Caretakers was health workers (41.7 %) and the most underutilized source of information was posters (0.1%). The study further noted more than 50% of the Mother/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 were not influenced with income, level of education and age of the Mother/Child Caretakers.

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

Keywords: Knowledge; awareness; food fortification; Mother/Child Caretakers; vitamins; minerals.

1. INTRODUCTION

Micronutrient deficiencies continue to be a problem of considerable magnitude in most of the developing countries including Tanzania [1, 2]. 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 [3,4,5].

In Tanzania, the prevalence of micronutrient deficiencies is quite high, for example according to Tanzania Demographic and Health Survey (TDHS) [6,7] 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 37% of women aged 15-49 years and 33% of children aged 6 -59 months are vitamin A deficient [6]. Furthermore, an estimated 27,000 infant and 16,000 maternal deaths that occur each year can be attributed to micronutrient deficiencies[8]. In addition to the disease burden, micronutrient deficiencies severely affect economic and human development in Tanzania [8,9]. 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) [8] and childhood anaemia alone is associated with a 2.5% reduction in adult wages [10].

The strategies to address micronutrient deficiencies in developing countries including Tanzania have included micronutrients supplementation, food and nutritional education, food fortification, bio- fortification of staple foods, dietary modification or diversification and reduction of disease burden which exacerbate the micronutrient deficiencies like measles, diarrhoea, acute respiratory infections [5,11]. 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 improve the nutritional intake status of women (15-49 years) and children under five years, especially where multiple micronutrients mixes (e.g. Vitamin A, vitamin B₁, vitamin B₂, vitamin B₆, vitamin B₁₂, niacin, folic acid, iron and zinc) can be used [12]. Many countries have been fortifying their staple food like wheat flour, maize flour, sugar, rice, oil and pre-cooked corn flour since the 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 [13,14].

The Government of Tanzania strongly is dedicated to improve nutrition, introduced the National Multisectoral Nutrition Action Plan (NMNAP) for 2016 to 2021, through which food fortification is identified as a cost-effective approach to reduce the prevalence of micronutrient deficiencies [15]. Achieved by 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 [16]. 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[16]. This study was carried out because there is limited information documented or studies conducted on the knowledge and awareness of mothers/child caretakers regarding food fortification since its commencement in the country five years ago. The study also 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 an impact in planning the most appropriate strategies for conducting social mobilization of

various food fortification interventions in the country. The study was conducted in the month of November 2017 in four health clinics of Kinondoni municipality.

2. METHODOLOGY

2.1 Study Area and Population

The survey was conducted, primarily targeting Mother/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 Mother/Child Caretakers were interviewed. The sample size distribution in 4 health facilities was as indicated in Table 1.

Table 1. Sample size distribution of Mother/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 close-ended questionnaire in the cross-sectional study design. Mother/Child Caretakers who were present at Reproductive and Child Health (RCH) clinics during the interview were briefed on purpose of the study. Data collection was done only to Mother/Child Caretakers with children aged 6-59 months volunteered to participate in the study. Data entry was done in excel spread sheets and descriptive statistics (percentages) were generated using excel pivot.

3. RESULTS AND DISCUSSION

3.1 Socio-economic and Demographic Characteristics of Mother/Child Caretakers

The socio-economic and demographic characteristics of 200 Mother/Child Caretakers in

the surveyed area are given in Table 2. The results showed that, 100% of the Mother/Child Caretakers were females aged between 18 to 50 years old. About 26% of the Mother/Child Caretakers were involved in entrepreneurship while 5% of the Mother/Child Caretakers were employed in a formal sector. The majority (67.5%) of Mother/Child Caretakers was housewives and the remaining (1.5%) were involved in other activities. On the maximum level of education attained by the Mother/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 Mother/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 [6,7,17,18]. These findings also resemble other studies in East Africa which reported that women are often seen attending child health clinics compared to men [19,20]. Other related studies conducted in Kenya and Myanmar showed the majority of caretakers being female with age between 18-85 years [21] and 15-68 years [22] respectively.

3.2 Mother/Child Caretakers Awareness on Micronutrients

The survey also investigated the Mother/Child Caretakers if have heard the term micronutrients and the results are given in Fig. 1. When the Mother/Child Caretakers were asked if have heard the term micronutrients as used in food fortification program in Tanzania, 64% responded that have heard the term micronutrients while 36% responded that have not heard the term micronutrients. The results suggested that most of the Mother/Child Caretakers had heard the term micronutrients as used in food fortification program in Tanzania which is consistent with the study conducted in Northwest of Iran that showed Mothers were aware of the use of micronutrient [23]. 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].

3.3 Awareness on Food fortification

The results of the investigation on the awareness regarding food fortification are given in Fig. 1. When the Mother/Child Caretakers were asked if have heard the term 'food fortification', 71% responded that have not heard the term food fortification while 29% responded that have heard the term food fortification. The above results showed that food fortification awareness is very low among Mother/Child Caretakers in Kinondoni municipality. The result of this study is consistent with the survey on knowledge of food fortification and nutrition that found Tanzanian consumers aged from 18 to 55 years are not fully aware of food fortification [24].

3.4 Knowledge of Micronutrients

The Mother/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 Mother/Child Caretakers were able to define correctly the meaning of micronutrients, which are the vitamins and minerals. The remaining Mother/Child Caretakers were not able to give any answer or gave incorrect answers on the meaning of micronutrients as used in food fortification program in Tanzania. The result of the knowledge on micronutrients is given in Fig. 2. The study also revealed that majority of the Mother/Child Caretakers did not know the definition of the term micronutrients as used in food fortification program. The findings of this study are consistent with the previous study on Knowledge Attitudes and Practices (KAP) regarding micronutrients in India which found that respondents had poor information on micronutrients [25]. Inability to define term micronutrients may be contributed by ignorance and lack of nutrition education among Mother/Child Caretakers in the country.

3.5 Types of Foods Fortified with Micronutrients

The Mother/Child Caretakers were asked about their knowledge regarding the types of food products fortified with micronutrients in Tanzania. The results in Fig. 3 indicated that 9% of the Mother/Child Caretakers mentioned maize flour, 4% mentioned wheat flour. Further analysis revealed that 4% mentioned salt, 2% mentioned edible oil and 2% of the Mother/Child Caretakers

mentioned margarine. On the other hand 68% of the Mother/Child Caretakers responded that don't know types of foods which are fortified with micronutrients while 11% mentioned other foods. The result of this study also revealed that Mother/Child Caretakers had poor information on foods which are fortified with micronutrients. The result of this study is 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 Mother/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 [24,26].

Table 2. The socio economic and demographic characteristics of Mother/Child Caretakers

Variable	Frequency(n=200)	Percentage (%)
Age of Mother/Child Caretakers		
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

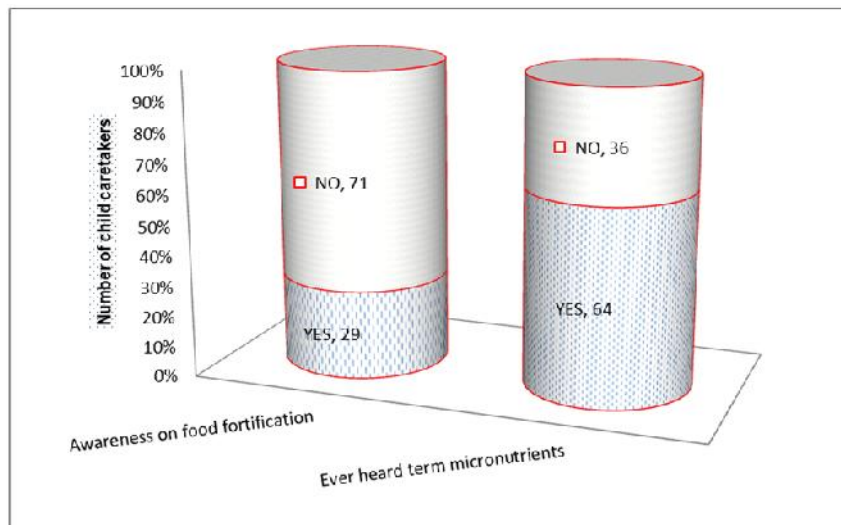


Fig. 1. Mother/Child Caretakers ever heard term micronutrients and awareness on food fortification

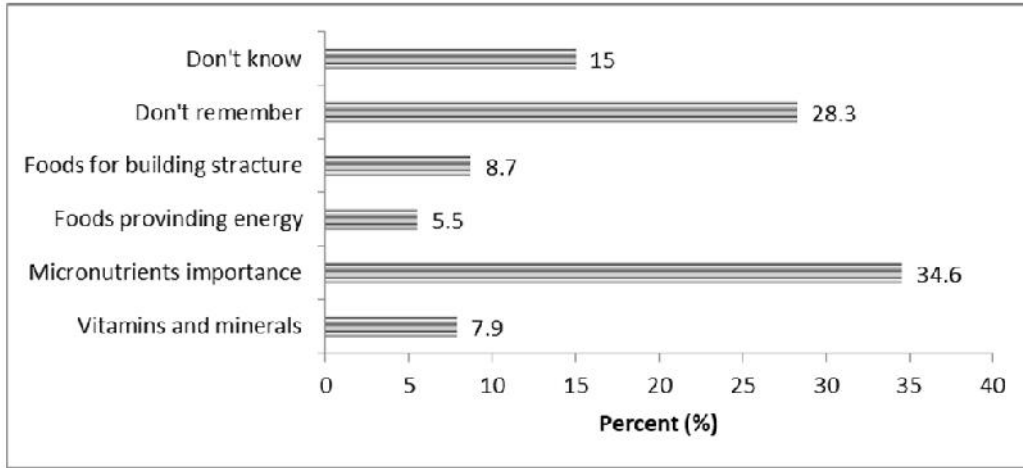


Fig. 2. Mother/Child Caretakers who are aware of the meaning of term micronutrients

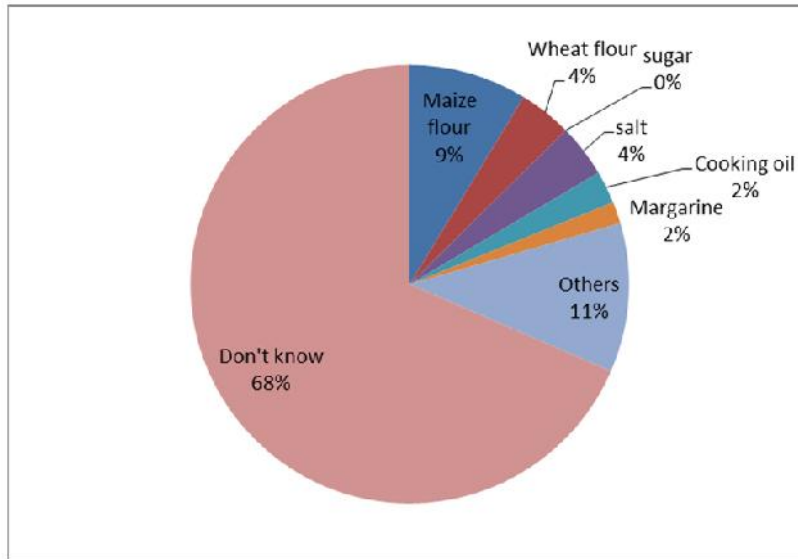


Fig. 3. Foods which are fortified with micronutrients

3.6 Main Sources of Information on Food Fortification

The main sources of information for the Mother/Child Caretakers who said were aware of food fortification are given in Fig. 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 Mother/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) [27,28]. Other research on the knowledge of food fortification in the Philippines reported that health workers were the main source of information for the primary caregivers on knowledge of food fortification [29]. 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 findings were reported on the awareness of food fortification in the Philippines

that food stores and supermarkets followed by radio were the main sources of information mentioned by Mothers with malnourished children [31]. Other studies on consumer awareness of food fortification in Kenya revealed that the main source of information on food fortification reported by consumers was media [21] and another study in India reported media and read on the products labels [32]. Therefore, dissemination of nutritional information and food fortification awareness through the health workers and community leaders would be more effective in the study area.

3.7 Benefits of Food Fortification

The Mother/Child Caretakers who were aware of food fortification also were asked to mention the benefits of food fortification. The results of the analysis of the benefits of food fortification are indicated in Fig. 5. The findings showed that 7.9% of the Mother/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 the other hand, 53.5% of the Mother/Child Caretakers don't know the benefits of food fortification while 6.3% mentioned other benefits. Generally, this study suggests that majority of the Mother/Child Caretakers in Kinondoni municipality 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 it improved health status of children, prevent micronutrient deficiency and increased appetite [29].

3.8 Mother/Child Caretakers Awareness on individual Micronutrients

Mother/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 Fig. 6. The results showed that 78.5% of the Mother/Child Caretakers have heard of vitamin A, 52.5% of the Mother/Child Caretakers have heard of iodine, 44.5% have heard iron and only 18% of the Mother/Child Caretakers have heard of folic acid (folate). The results showed that 78.5% and 52.5% Mother/Child Caretakers had adequate knowledge on vitamin A and iodine respectively.

The high awareness of vitamin A is mainly due to the twice yearly national campaign on vitamin A supplementation for children aged 6-59 months that has been going on for several years in Tanzania. On the other hand, there was no similar campaign for folic acid, iodine and iron. Other similar findings from the previous study conducted in Chennai India found that 90% of the participants have heard about vitamin A [33]. In contrast to the current study, a related research conducted in pre and postnatal Mothers in Kenya found low awareness on vitamin A [34]. Also, a study conducted in Norway found out that 51.5% and 58.9% of the pregnant women and lactating women respectively reported having heard and knew what iodine is [35]. Previous studies in Australia and South Africa reported that women and patients respectively have little knowledge about iodine [36,37]. The moderate awareness for iodine may be due to the fact that national fortification of salt with iodine has been going on since 1990 hence the public are somehow aware [26]. The low awareness of Iron and Folic acid (folate) among the Mother/Child Caretakers from the current study are consistent with the previous study regarding awareness on micronutrients among Filipino population groups [38]. In other previous study regarding knowledge revealed that 23.9% student had never heard of vitamin A, while 29.6% and 20.7% student had never heard of Iron and Iodine respectively [25].

3.9 Foods Fortified with Micronutrients (Vitamin A, Iodine, Iron And Folic Acid)

When enquired about which foods are fortified with vitamin A, iodine, iron and folic acid, 38% of the Mother/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 of the assessment are indicated in Table 4. This study suggests that more than 60% of the Mother/Child Caretakers don't know the types of foods which are fortified with vitamin A, iodine, iron and folic acid (folate). The awareness of fortified food products and the type of micronutrients is very low among the Mother/Child Caretakers in Kinondoni municipality. These findings concur with the previous study conducted in Tanzania regarding consumer awareness on food fortification [24].

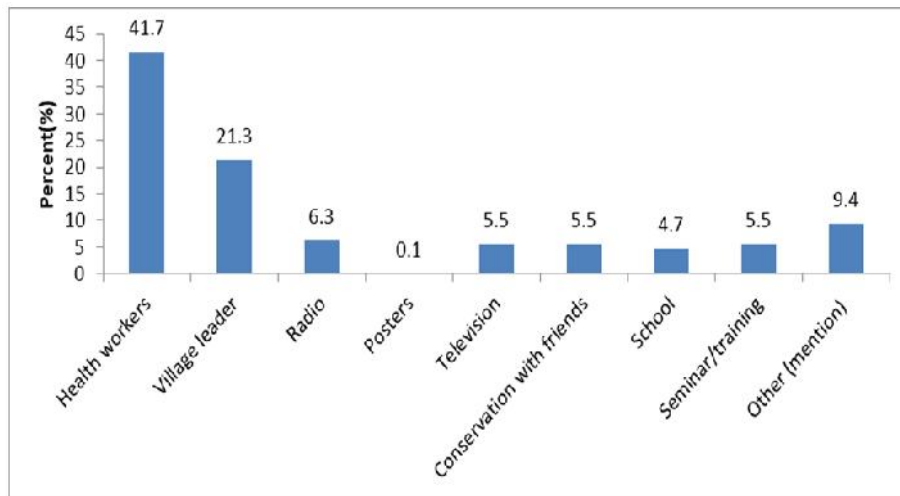


Fig. 4. Main sources of information

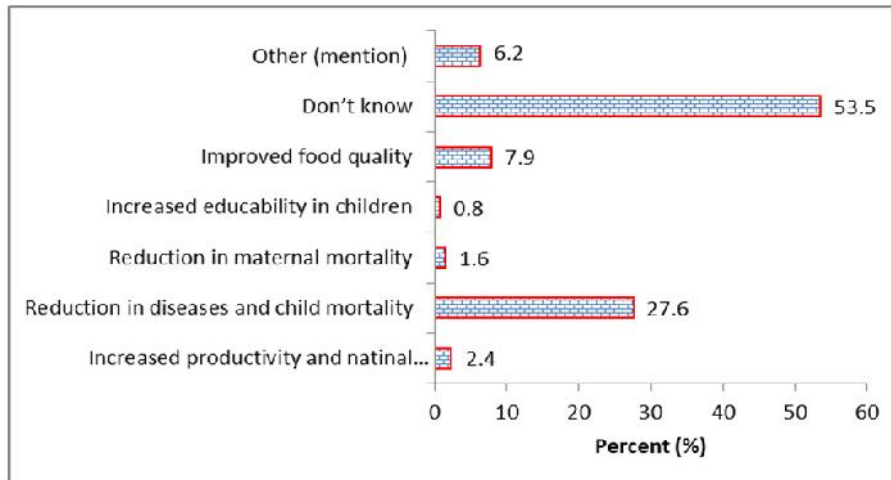


Fig. 5. Benefits of food fortification

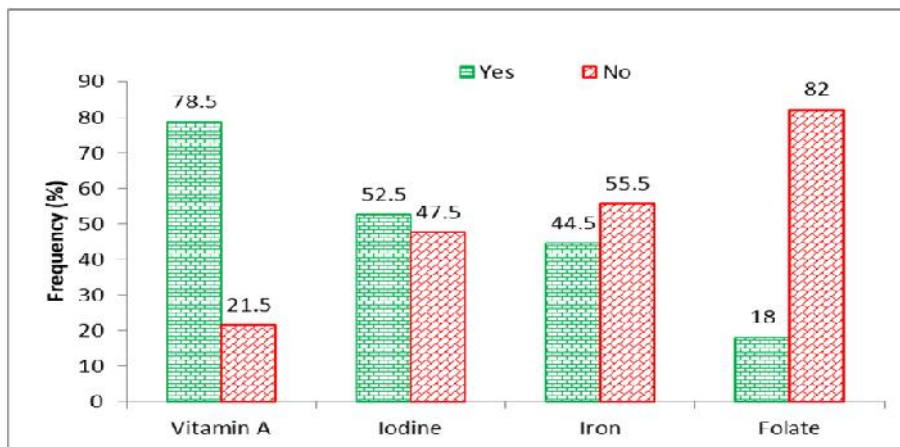


Fig. 6. Mother/Child Caretakers awareness on individual micronutrients

3.10 Mother/Child Caretakers Knowledge Regarding Health Benefits of Vitamin A

The results on health benefits of vitamin A are given in Table 5. When the Mother/Child Caretakers were asked about their knowledge regarding the health benefits of vitamin A, 8.3% of the Mother/Child Caretakers responded that vitamin A prevents blindness, 22.3% responded that vitamin A improves immunity against diseases such as diarrhoea, 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 Mother/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 Mother/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 [25]. 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 [33]. Another study conducted in Kenya regarding knowledge on

vitamin A supplementation benefits was generally low among caregivers of children 6-59 months [39].

3.11 Mother/Child Caretakers Knowledge Regarding Health Benefits of Iodine

The study also investigated the knowledge of Mother/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 Mother/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 goitre 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 Mother/Child Caretakers in Kinondoni municipality. Other research revealed that at least one benefit of iodine was known by 59.2% of students which include prevention of goitre and important for mental development of child [25]. 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 fetal development, and 48.0% for maintaining normal metabolism [35].

Table 4. Foods fortified with vitamin A, iodine, iron and folic acid (folate)

Foods	Micronutrient			
	Vitamin A	Iodine	Iron	Folic acid (folate)
	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

Table 5. Health benefits of vitamin A

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

Table 6. Health benefits of iodine

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

Table 7. Health benefits of iron among mathers/child caretakers

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

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 foetus growth	4	11
Don't know	27	75
Other	0	0

3.12 Mother/Child Caretakers Knowledge on Health Benefits of Iron

Knowledge regarding the health benefits of iron was analysed to know whether Mother/Child Caretakers are knowledgeable about the benefits of iron that is added to wheat and maize flour as recommended by national food fortification program. The results (Table 5) showed that more than 80% of the Mother/Child Caretakers don't know the health benefits of iron. About ten percent of the Mother/Child Caretakers responded that iron prevents low haemoglobin, one percent responded that iron improves school performance in children and one percent responded that iron protects foetus during pregnancy. From this study, it is clear that majority of the Mother/Child Caretakers have no idea of the health benefits of iron. In contrast to this study, the previous study conducted in China found majority of women of reproductive age (67%) knew various important of iron especially during pregnancy, for wellbeing of mothers and (for the growth and development of foetus [40].

3.13 Mother/Child Caretakers Knowledge on Health Benefits of Folic Acid

Knowledge of health benefits of folic acid was analysed to know whether the Mother/Child

Caretakers are knowledgeable about the benefits of folic acid that are added to wheat and maize flour. The results (Table 8) showed that 75% of the Mother/Child Caretakers responded that they don't know the health benefits of folic acid, 14% responded that folic acid helps in the development of red blood cells and 11% responded that folic acid helps in foetus growth. The awareness regarding health benefits of folic acid (folate) 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 [41]. Also another study conducted in Japan found majority of pregnant women (70.4%) knew about the protective effect of folic acid [42].

4. CONCLUSION

The knowledge and awareness regarding food fortification survey conducted in four health facilities of Kinondoni municipality found that the level of knowledge on food fortification for Mother/Child Caretakers is very low, thus it is estimated that 7.9% have heard about food fortification. The major source of information on food fortification reported by the child caretakers who have heard about food fortification was the health service providers (41.7%). Generally, the

majority of the Mother/Child Caretakers were not aware of food fortification and 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 have no influence with income, level of education and age of the child caretakers. The study concludes that there is a need to conduct intensive social mobilization campaign to create awareness among the Mother/Child Caretakers and the general public on the importance of fortified food and general food fortification program in Tanzania.

CONSENT

As per international standard or university standard, written patient's consent has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Olaf M, Michael K. Malnutrition and health in developing countries. *Canadian Medical Association Journal (CMAJ)*. 2005;173(3): 279–286.
2. The United Republic of Tanzania Ministry of Health and Social Welfare. Tanzania National Nutrition Survey; 2014 Final Report.
3. Alison DG, Kerry JS, Christine PS, Keith PW, Parul JC. Micronutrient deficiencies in pregnancy worldwide: Health effects and prevention. *Nature Reviews Endocrinology*. 2016;12(5):274–289.
4. Ramesh V, Suraj C, Mukesh D. Importance of micronutrient supplementation programme in childhood to reduce child mortality: The Haryana experience. *International Journal of Preventive Medicines*. 2016;7:87.
5. The United Republic of Tanzania Ministry of Health and Social Welfare. National Nutrition Strategy July 2011/12 – June 2015/16.
6. Tanzania National Bureau of Statistics and ICF International. 2012. 2010. Tanzania Atlas of Maternal Health, Child Health, and Nutrition. Calverton, Maryland, USA: NBS and ICF International.
7. Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), and ICF. 2016. Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) 2015-16. Dar es Salaam, Tanzania, and Rockville, Maryland, USA: MoHCDGEC, MoH, NBS, OCGS, and ICF.
8. United Republic of Tanzania. National Food Fortification Alliance (NFFA). Action Plan Provision of Vitamins and Minerals to the Tanzanian Population through the Enrichment of Staple Foods: Reviewed and adopted by the High Level Forum called by the Government of Tanzania on 10 September 2009.
9. Alexander JS, Matin Q. The human and economic cost of hidden hunger. *Food and Nutrition Bulletin*. 2007;28:2.
10. Horton S, Ross J. The Economics of Iron Deficiency. *Food Policy*. 2003;28:51-75.
11. Ifeyironwa FS. Micronutrient interventions: Options for Africa. *Food and Nutrition Bulletin*. 2000;21:4.
12. Food Fortification Resource Centre. Large Scale Food Fortification in India: The Journey So Far and Road Ahead. 4th Floor, FDA Bhawan, Kotla Road New Delhi – 110002; 2017. Available:www.fssai.gov.in/dam/jcr:c746d723-ebb1.../Large_scale_Food_Fortification.pdf
13. Eva H, Fanny C. Folic acid fortification of wheat flour: Chile nutrition reviews. 2004; 62:6.
14. Layrisse M, Chaves JF, Mendez C, Bosch V, Tropper E, Bastardo B, González E. Early response to the effect of iron fortification in the Venezuelan population. *American Journal of Clinical Nutrition*. 1996;64:903-7.
15. United Republic of Tanzania. Tanzania National Multisectoral Nutrition Action Plan (NMNAP) for the period July 2016 – June

2021. Strategic Plan: From Evidence to Policy to Action; 2016.
16. Towo E, Mgoba C, Assey V, George K. Food fortification strategy to control micronutrient Deficiencies in Tanzania. *European Journal of Nutrition and Safety*. 2015;5(5):427-428.
 17. Kidayi PL, Msuya S, Todd J, Mtuya, CC, Mtuy T, Mahande MJ. Determinants of modern contraceptive use among Women of reproductive age in Tanzania: Evidence from Tanzania demographic and health survey data. *Advances in Sexual Medicine*. 2015;5:43-52.
 18. WHO. Reproductive health indicators: Guidelines for their generation, interpretation and analysis for global monitoring; 2006.
 19. Issa Y. Daily news. Encouraging men's role in mother, child health program; 2017. Available:<http://dailynews.co.tz/index.php/features/50492-encouraging-men-s-role-in-mother-child-health-program>
 20. Debra SML, Jaya E. The involvement of men in maternal health care: Cross-sectional, pilot case studies from Maligita and Kibibi, Uganda. *Reproductive Health*. 2014;11:68.
 21. Kennedy OP, David JO, Julius JO. Consumer awareness of food fortification in Kenya: The case of vitamin A fortified sugar. Paper prepared for presentation at the International Food and Agribusiness Management Association (IFAMA) 24th annual world symposium to be held in Cape Town, South Africa, 16-17 June, 2014.
 22. Save the Children. Knowledge, Attitudes and Practice (KAP) Survey and Barrier Analysis for Infant and Young Child Feeding Practices. Rakhine State – Republic of the Union of Myanmar, Sittwe and Pauktaw Townships Report_Nutrition_KAP_BA_Rakhine_SCI_Jun2015.pd
 23. Babak A. Maternal knowledge and performance about use of iron and multivitamin supplements in children in Northwest of Iran. *International Journal of Paediatrics*. 2014;2(5):2-2.
 24. Global alliance for improved nutrition (Gain). Increasing quality and awareness of fortified foods in Tanzania; 2016. Available:<https://www.gainhealth.org/knowledge-centre/increasing-quality-awareness-fortified-foods-tanzania/>
 25. Modi B, Patel P, Sutariya S, Dave P. Knowledge attitude and practice regarding micronutrient in secondary school student of tribal area in Gujarat. *National Journal of Community Medicine*. 2010;1:2.
 26. National Bureau of Statistics (NBS). Fortification Assessment Coverage Tool (FACT) Survey in Tanzania; 2015. Available:<http://www.nbs.go.tz/nbstz/index.php/english/statistics-by-subject/health-statistics/fortification-assessment-coverage-tool-fact-survey>
 27. Ngimbudzi EB, Lukumay AM., Muriithi, AW, Dhamani, KA. Petrucka PM. Mothers knowledge, beliefs, and practices on causes and prevention of anaemia in children aged 6-59 months: A case study at Mkuranga District Hospital, Tanzania. *Open Journal of Nursing*. 2016;6:342-352.
 28. Anup N, Asif Y, Shravani G. Perception of rural and urban mothers about consumption of targeted fortified products in Jaipur, Rajasthan - India: A cross-sectional study. *Health Promotion Perspectives*. 2013;3(1):64-72.
 29. Normahitta PG, Maria TMT, Corazon VCB, Maria ATQ. Knowledge and use of complementary food fortification with multiple micronutrient powders in selected communities in the Philippines. *Malaysian Journal of Nutrition*. 2017;23(2):191–198
 30. Aliya H, Mahmood UR, Syed FM. Knowledge, attitude and practice regarding folic acid deficiency; A hidden hunger. *Pakistan Journal of medical science*. 2014; 30(3):583–588.
 31. Cecil TC, Jigzcel DFB. Awareness on Food Fortification among Mothers with malnourished children in selected Barangays at Magpet and Tulunan, Cotabato, Philippines. University of Southern Mindanao Research & Development (USM R&D) ISSN 0302-7937. 2008;16(2):35-44.
 32. Rekha B, Akshata PC. A Study on Awareness and Consumption of Fortified Foods among Male Adults of Mumbai. *International Journal of Advanced Research*. 2017;5(11):403-413
 33. John DA, Brundha MP. Awareness of Vitamin A Deficiency among Middle Aged Men-Research. *Vitamins & Minerals*. 2016;5(2):144. DOI: 10.4172/2376-1318.1000144
 34. Mary AO, David OO, Fredrick KEG. Awareness in the context of prevalence of vitamin A deficiency among households in

- western Kenya using a cross-sectional study. *Journal of Food and Nutrition Sciences*. 2016;4(3):55-64.
35. Lisa GH, Inger A, Anne ML, Anne LB, Sigrun H. Knowledge about Iodine in pregnant and lactating women in the Oslo Area, Norway. *Nutrients*. 2017;9(5):493. DOI:10.3390/nu9050493
36. Karen C, Heather Y, Catherine L, Samantha A, Luke G, Fiona H, Alison G, Gary M. Poor knowledge and practices related to iodine nutrition during pregnancy and lactation in Australian Women: Pre- and Post-Iodine Fortification. *Nutrients*. 2012;4(9):1317–1327.
37. Sebotsa MLD, Dannhauser A, Mollentze WF, Oosthuizen GM, Mahomed FA, Jooste PL. Knowledge, attitudes and practices regarding iodine among patients with hyperthyroidism in the Free State, South Africa. *South African Journal of Clinical Nutrition*. 2009;22(1):18-21.
38. Angeles A, Imelda B, Marlon C, Mario C, Adrienne GM, Glen M. Awareness of micronutrients among selected Filipino population groups: Its implication on program strategies - Micronutrient Forum. 2016. Available:<http://micronutrientforum.org/abstracts/awareness-of-micronutrients-among-selected-filipino-population-groups-its-implication-on-program-strategies/>
39. Murage L, Kung'u J, Kikechi E, Wanyoike C, Wefwafwa T. Micronutrient initiative, nairobi, kenya, ministry of health, Kenya. Knowledge, attitudes and practices (KAP) that contribute to low Vitamin A coverage among caregivers of Children 6-59 months: Results from the KAP Survey done in Kenya; 2015.
40. Tabish H, Li YS. Awareness of Iron Deficiency Anaemia among women of reproductive age in Hubei Province, China. *Asian Journal of Medical Sciences*. 2010; 1:12-13.
41. Güleğül NK, Aysel UD, Onur E, Nimet S, Hülya A, Mehmet K. Awareness and use of folic acid among reproductive age and pregnant women. *Journal of Turkish-German Gynaecological Association*. 2013;14(2):87-91.
42. Yamamoto S, Wada Y. Awareness, use and information sources of folic acid supplementation to prevent neural tube defects in pregnant Japanese women. *Public Health Nutrition*. 2018;21(4):732-739.

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