Food Fortification Knowledge of Healthcare Providers and Barriers to its Consumption among Their Attended Clients: Cross-Sectional Survey from Punjab

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Abstract

Background: Food fortification improves the nutritional value of food products and adds health benefits.
Objective: To assess knowledge of food fortification among health care professionals and barriers to its consumption among their attended Clients of Punjab province.
Methodology: This cross-sectional research design was used to evaluate food fortification knowledge and its related barriers to its consumption amongst healthcare professionals from October 2019 to March 2020. A total of 360 healthcare professionals were selected. Targeted groups include MBBS doctors, nurses, midwives, and lady healthcare workers. A self-administered close-ended questionnaire was formulated. Bar charts were constructed for the source of information regarding food fortification. Chi-Square statistic was used to test the hypothesis. For categorical variables such as knowledge about fortification and barriers to consumption, frequency percentages were calculated.
Results: Overall 121 (33.6 %) healthcare professionals were of the view that food fortification is a type of adulteration, and 214 (59.4%) supported supplements over fortified products. Unaffordability (83%), and change in appearance and taste (84%) were highlighted as top barriers in consumption of fortified foods. Change in color, appearance, or taste of fortified foods 303 (84%) and unaffordability due to high cost 302 (83.8%) were the two most highlighted barriers.
Conclusion: There are major misconceptions about food fortification among healthcare providers and multiple barriers are perceived to be prevalent among patients. Comprehensive efforts are needed to improve knowledge regarding food fortification and its related barriers. The use of educational technology can be beneficial for supporting learning and teaching healthcare professionals and food industrialists regarding food fortification.

Keywords: Food Fortification, Barriers, Micronutrients, Nutrition, Health care Professionals.
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Introduction

Optimal nutrition is essential for attaining and promoting of active and healthy life. The nutritional needs of mothers before and during pregnancy should not be neglected as they play a crucial role in the reduction of risk for many birth defects.[1] Micronutrient deficiency including deficiencies of essential macro or micronutrients is one of the reasons for many health conditions. Globally each year, deficiency of folate in pregnant mothers result in the birth of around 300,000 children with neural tube defect.[2] Similarly, annually due to hypovitaminosis A around 1,000,000 under 5 years of age children lose their life.[3] Zinc insufficiency is related to global 800000 children mortality. During pregnancy iodine paucity leads to a decline in cognitive functioning and hindered physical development and growth of the infant. Maternal and fetal hypothyroidism is one of the examples of this deficiency.[4] Global burden of disease results in a significant number of morbidity, mortality, and disability patterns due to nutritional deficiencies. Micronutrient deficiency is responsible for around 32.0 percent of global disease burden.[5] Consumption of Omega 3, 6, and 9 food sources in all age groups is helpful in the reduction of mortality rates due to sudden cardiac arrest and stroke.[6] Similarly considering only calcium as a major nutrient and its consumption without considering its recommended dose can be detrimental to renal, cardiovascular, brain, and parathyroid function.[7]

A balanced diet consists of food items from each of the five food groups. Inadequate intake of a balanced diet is one of the main reasons for hidden hunger. Similarly hindered absorption due to disease or illness conditions and drug abuse may also be the causative factors.[8] The most advantageous method in terms of both price and long-term positive results is food fortification. According to Codex Alimentarius,

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when a food lacks some essential micro or macro nutrients naturally then adding that particular nutrient is termed as food fortification.[9] In the current era iron, calcium, zinc, and iodine are considered important and are being used as fortificant.[10] Dietary reference intakes are the reference values that assess the nutrient intakes of a healthy population. These reference values are of vital consideration during the fortification process to avoid any toxicity. For example, beta thalassemia hemochromatosis leads to iron overload. Here comes the vital role of dietitians in assessing your food intake and maintaining the correct balance of nutrients in your body. In the light of the foregoing it is also important to consider prevalent nutritional problems and food consumption patterns should be considered before fortifying any product. Similarly, food palatability and the presence of dietary inhibitors with absorbers should not be neglected. Factors that affect the physical and chemical properties of food include heat, humidity, oxygen, light, pH, oxidizing and reducing agents. Fine manufacturing practices and regulations are important factors when initiating a fortification program.[11] While launching any fortified food product in the market and increasing its purchase food packaging and commercials played on any electronic media play a vital role.[12] For the successful implementation of food fortification programs proper program analysis, assessment, and monitoring should be done. In this context, mass media campaigns are considered as one of the best tools for circulating knowledge regarding.[13] Door-to-door health and nutrition education can be done in such areas where there is a lack of digital and social media coverage.[14] The scale of knowledge and information is more widespread among the urban population and major villages on the other hand had a strong proclivity to a particular brand, quality, color, and manufacturing place while purchasing any commodity.[15]

Pakistan a developing country has recently started various voluntary fortification programs but still general public is still not aware of its significant role in nutritional well-being and health. One of the best examples is salt iodization by Nutrition International. Moreover, wheat is being fortified with vitamin B12, B9, zinc, and iron, and vitamin A and D are also being added to cooking oil by the Punjab Food Department.[16,17] In Pakistan there is an increased need to start up mandatory fortification to reduce the burden of disease. The present research shall help to develop strategies and approaches to address hidden nutritional deficiencies, particularly among children within the country. The objective of this study was to measure the level of knowledge of healthcare professionals related to food fortification as they are the main stakeholders in the dissemination of information in the latter implementation stages. Additionally, this research also highlights the barriers to the consumption of fortified products.

Methodology

This cross-sectional study was conducted among health professionals in Punjab. Selected participants were health professionals working as medical doctors, nurses, midwives, and lady health workers in 40 districts of Punjab from October 2019 to March 2020. Nutritionist and dieticians are usually well conversant and aware of food fortification knowledge so this group were excluded from the conducted study, moreover, all those health professionals who disagreed to sign the consent form were also not included in the research. It was reviewed and approved by the departmental ethical board. The sample size calculated by the formula i.e. $N=Z^2P(1-P) \div d^2$ was 360. In the given formula P 0.42 was calculated from one of the studies conducted in Tanzania to find out food fortification knowledge among mothers.18 Convenience sampling was applied to obtain the required data. In-person questionnaires with informed consent forms were filled up by Medical doctors and nurses. As midwives and lady health workers were available in far-flung areas so through while telephonic conversation questionnaire with oral consent was filled out by the aforementioned group. A self-administered questionnaire was drafted to gather the calculated sample. The questionnaire includes characteristics of the targeted population i.e. age, gender, understanding and awareness about food fortification and its products, and barriers to regulation and acceptance of fortified foods among the general population. The value of Cronbach Alpha was 42% and the reliability of the questionnaire was at a satisfactory level. Statistical analysis of the data was done by using SPSS version 24. After the analysis of data, it was displayed through frequency distribution tables and bar charts. Bar charts were

constructed for sources of food fortification information while frequency percentage was calculated for questions relevant to knowledge and barriers in utilization of fortified foods.

Results

Out of a total of 360 healthcare professionals, 121 (33.6%) were of the view that food fortification is a type of adulteration. Only 97 (26.9%) agreed that the above-said procedure is helpful in treating micronutrient deficiencies. Among all healthcare professionals, only 139 (38.6%) supported the consumption of fortified foods along with the intake of a balanced diet.

Supplementation was considered one of the most effective tools to combat vitamin and mineral deficiency by 214 (59.4%) healthcare professionals. Similarly, out of a total of 360 selected healthcare professionals, 197 (54.8%) believed that fortification is for specific age groups.

Change in color, appearance, or taste of fortified foods 303 (84%) and unaffordability due to high cost 302 (83.8%) were the two most highlighted barriers. Similarly, 242 (67.2)% of healthcare professionals were of the view that fortified foods are not safe to use regularly. Only 104 (28.9%) of them believed that nutrient loss occurs as a result of washing fortified foods.

Source of information regarding fortification:

Table-I: Respondents Knowledge Regarding Food Fortification and Fortified Food (N=360)

Knowledge	Doctors 90(%)	Nurses 90(%)	Midwives 90(%)	LHWs 90(%)	Total 360(%)	P value
Fortification is a type of adulteration	40 (11.1)	31 (8.6)	46 (12.8%)	4 (1.1)	121 (34)	0.00
Food Fortification treats Micronutrient deficiency	32 (8.9)	6 (1.7)	37 (10.3)	22 (6.1)	97 (26.9)	0.00
If the patient takes a balanced diet, food fortification is still important	19 (5.3)	35 (9.7)	1(0.3)	84 (23.4)	139 (38.6)	0.00
Supplement is the best method to overcome mineral deficiency for fortification	66 (18.3)	86 (23.8)	49 (13.6)	13 (3.6)	214 (59.4)	0.00
Food fortification is for a specific age group	48 (13.3)	83 (15)	54 (15)	12 (3.4)	197 (54.8)	0.00

Table-II: Respondents Perception Regarding Barriers Regarding Food Fortification and Fortified Food

Barriers for Consumption	Doctors 90(%)	Nurses 90(%)	Midwives 90(%)	LHWs 90(%)	Total 360(%)	P value
Food Fortification changes the appearance, taste, or color of food.	71 (19.7)	88 (24.5)	64 (17.8)	80 (22.2)	303 (84.)	0.00
Nutrient losses take place when fortified food is washed before cooking.	39 (10.8)	11 (3.1)	33 (9.2)	21 (5.9)	104 (28.9)	0.00
Fortified foods are not easily available in markets.	58 (16.1)	60 (16.7)	56 (15.6)	24 (6.7)	198 (51)	0.00
Fortified foods are more expensive than non -fortified foods.	78 (13.6)	88 (24.4)	49 (13.3)	87 (24.2)	302 (83.8)	0.00
Fortified foods are not safe to use on a daily basis.	51 (14.2)	77 (21.4)	33 (9.2)	81 (22.5)	242 (67.2)	0.00

Among doctors, books/magazines (64%) followed by conversation with friends (29%) and social media (26%) as their source of information regarding food fortification (Figure-I). Similarly, a majority of nurses voted for books /magazines (71%) followed by conversations with friends, television, seminars, and newspapers as their source of information (Figure-I). Midwives did not report any proper source. Seminars (30%) followed by workshops, conversations with friends, newspapers, and social media (Figure-III). The majority of lady health workers went with seminars and workshops as their source of information. A small number of workers answered conversations with friends, books/magazines, television, social media, newspaper, and radio as information sources (Figure-IV).

Figure-I: Source of information regarding food fortification of Doctor

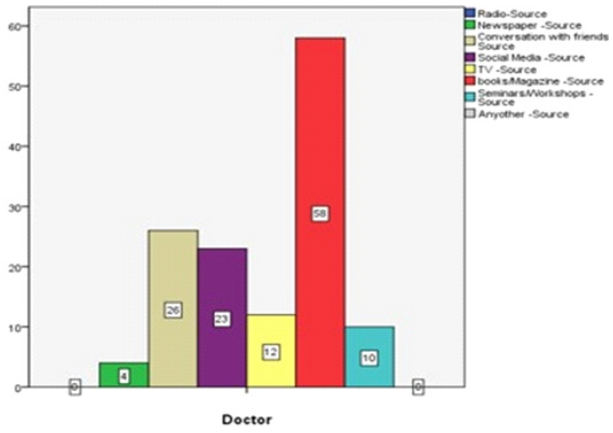
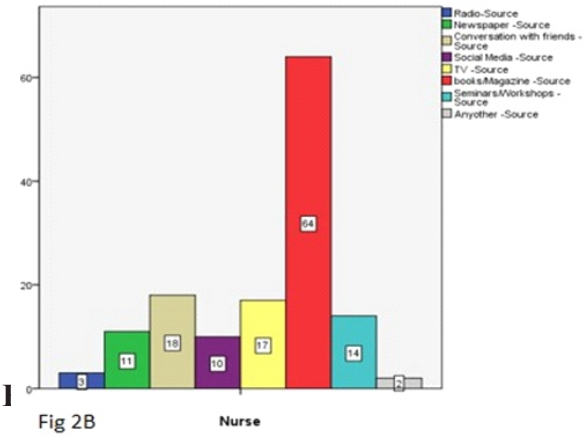


Figure-II: Source of information regarding food fortification of Nurses



food fortification of Mid Wives

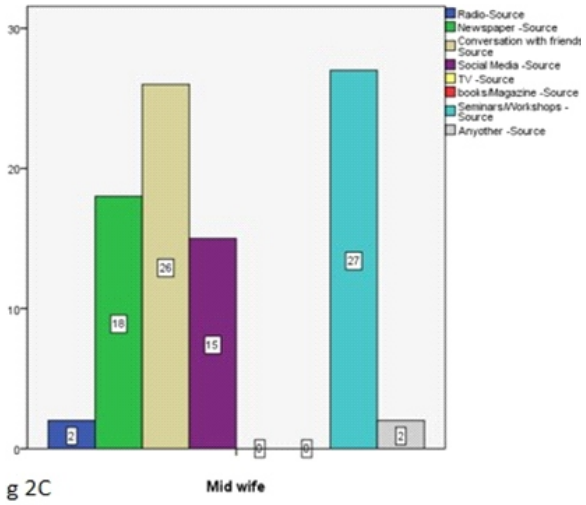
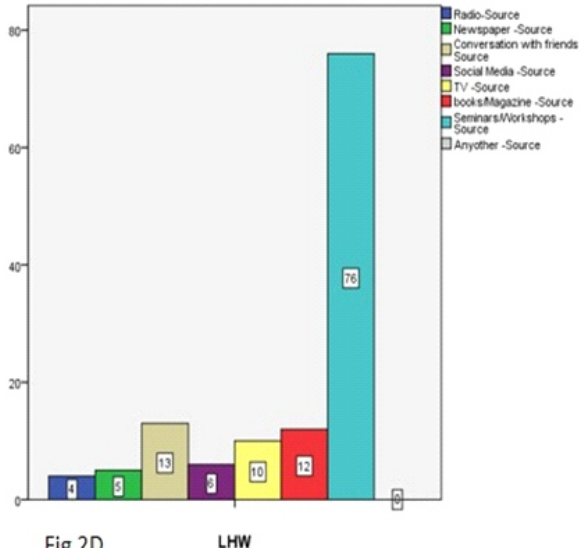


Figure-IV: Source of information regarding food fortification of LHW



Discussion

This descriptive study conducted among healthcare professionals of Punjab revealed that the majority of the health professionals were not aware of the food fortification process and its resulting product. Only of few lady healthcare workers had the basic concept. The increased price of available fortified products, their unsafe consumption, and the difference in appearance, taste, and color of fortified products to normal food products were some pinpointed barriers by healthcare products that may become hurdles in the consumption of fortified products by the general public. This conducted research showed that the

consumption of supplements has been the preferred source to curb micronutrient deficiency. A similar study was organized in India but the targeted audience was women of reproductive age (15 to 59 years old women). The research concluded that 43 % of females had knowledge regarding the process of food fortification. In that study, 76 % of females were consuming fortified foods, and 24 % of females who were hesitant to consumption of fortified products answered unaffordability, unavailability, and lack of health benefits as the hurdles related to the consumption of fortified foods.[9] Similarly, analysis was done among mothers and childcare custodians in East African countries to get to know the level of awareness of fortified foods. Only 29% of the targeted group were aware of fortification and its related products and lady health care workers were the major source of their information.[18]

Bio-fortified products are already available in developed countries and this initiative is contributing towards the reduction in micronutrient deficiencies.[20] Developed countries show different trends in terms of knowledge and level of awareness. According to one of the observational studies held in Europe, one in five consumers supported the consumption of supplements while more than 60 % answered to safe use of fortified products to curb micronutrient deficiency, and 50% of consumers were actually consuming fortified products.[21] In a few of the developed countries targeted human milk fortification was carried out but no dismissive results were seen.[22] As a developing country, voluntary fortification is being implemented in Pakistan but still there is no study being reported previously related to the valuation of knowledge related to food fortification and its products. Based on the previous research conducted and as per the current scenario it is clear that our health system is still facing various challenges with respect to the health care industry. Knowledge upgradation related to preventive measures through basic training of health care professionals can result in better health care outcomes. Similarly, public-private partnerships will help in the provision of human and physical resources in the fortification program development phase.[23] Healthcare practitioners can be used as the most effective tool in behavior change intervention. They have also maximum general public interaction. Health professionals can motivate and uplift the general public about the safety, nutrition, and health benefits of consuming fortified foods[24], and implementation of such programs results in overall benefits to health.[25]

Conclusion

There are major misconceptions about food fortification among healthcare providers and multiple barriers are perceived to be prevalent among the patients and population. This conducted research deduced that, to increase the consumption of fortified foods among the general public we first need to clear the general food fortification concepts of our health care professionals. Keeping market conditions and public needs coordinated activities can lead to an increased demand for fortified products and the implementation of a mandatory fortification program in Pakistan.

Authors Contribution: WN: Conception of work, Acquisition and Analysis of data and Drafting. **RS:** Acquisition and Analysis of data, Interpretation of data and revising. **SN:** Design of work, Acquisition and Analysis of data and revising. **HT:** Interpretation of data and revising. **RZ:** Acquisition and Analysis of data and drafting.

All authors critically revised and approve its final version.

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