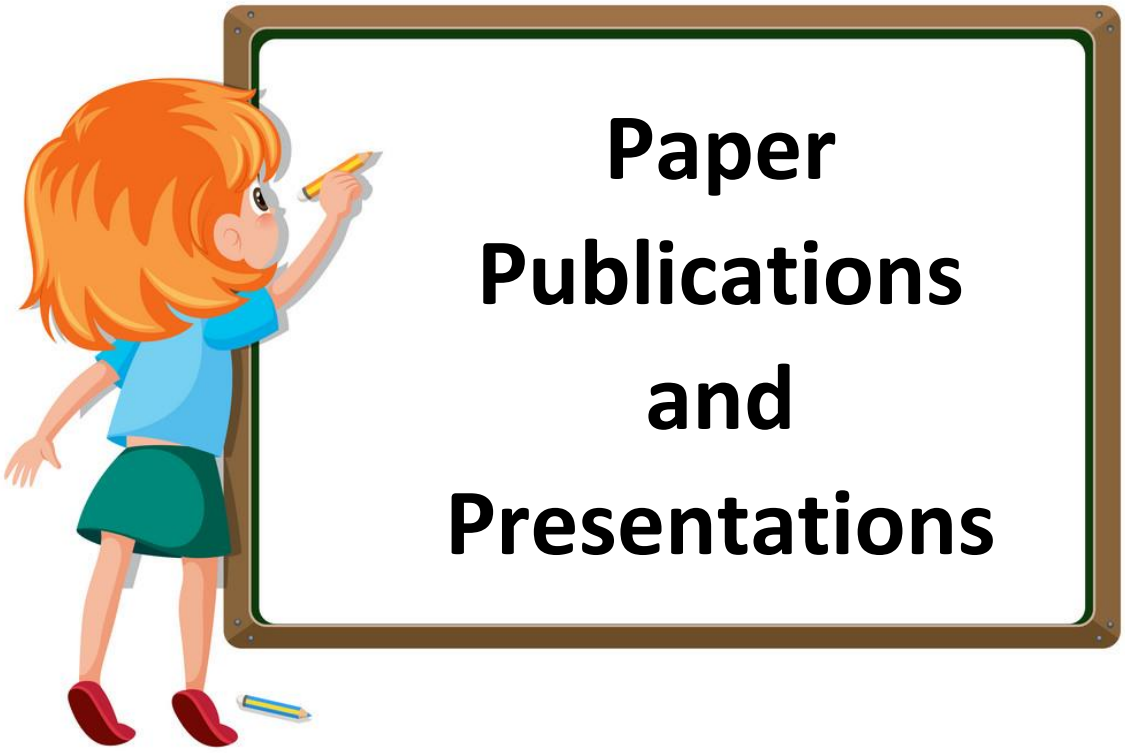

# Paper Publications and Presentations

# CHAPTER 9

# PAPER PUBLICATIONS AND PRESENTATIONS

- **Publications in Peer Review Journals**

1. **Ahuja R and Sheth M (2021)** Action Research on Advocating Use of Fortified Foods in the Free-Living Population of Urban Vadodara using Diffusion of Innovation Model. Asian Pacific Journal of Health Sciences.
2. **Ahuja R and Sheth M (2021)** A Cross Sectional study on Consumer Awareness of Fortified Foods in Vadodara City. Paripex- Indian Journal of Research

- **Presentations in Seminars and Conferences**

1. **Ahuja R and Sheth M (2022) Current** Knowledge of Health Benefits for Various Fortificants amongst the Free Living Population in Vadodara, India: e-Assessment. IAPEN Clinical Nutrition Congress on "Nurture through Nutrition" from I2th -13th February 2021.
2. **Ahuja R and Sheth M (2022)** Implementing e- Intervention for Promoting Fortified Foods amongst the General Population in Vadodara district, Gujarat, India. USFN Conference on Clinical Nutrition and Dietary Lifestyle" during May 20$^{th}$ and 21$^{st}$, 2022 at Bangalore, India.

- **Conferences/Seminars/Webinars attended for Food Fortification**

1. Attended Gujarat Food Fortification Summit – 2019 -12th April, 2019 in Ahmedabad, Gujrat
2. Attended National Food Fortification Webinar organized by 'Symbiosis Institute of Health Science 'and Nutrition society of India- IDA, NETPROFAN Pune Chapter on 18th December 2020
3. Attended India Milk Fortification Summit – Fortifying Milk for Nutrition and Immunity held on 26 November 2020.
4. Attended Global Summit On Food Fortification Quality Digitization On Wednesday 30 JUNE 2021 held on June 30, 2021.
5. Webinar organized by HADSA on Tackling Malnutrition though the Food System- Why Public Private Partnership is Necessary- 24th September 2021
6. Won the first prize in Slogan Competition on Fortification carried out by NETPROFAN and Department of Foods and Nutrition, MSU, sponsored by HEXAGON Nutrition, February 2022

ORIGINAL RESEARCH ARTICLE e-ISSN: 2349-0659 p-ISSN; 2350-0964

# Action Research on Advocating Use of Fortified Foods in the Free-Living Population of Urban Vadodara using Diffusion of Innovation Model

Ria Ahuja[1], Mini Sheth[2]

## Abstract

Worldwide, unaffordable healthy diets, dependability over staple food items, and lack of knowledge have been the major cause of malnutrition. Government programs, promoting dietary diversity and supplementation have not given promising results in improving the micronutrient status of the population. Government of India, along with Food Safety and Standards Authority of India have chosen five vehicles, namely, rice, wheat flour, salt, milk, and oil for the fortification process to combat the micronutrient deficiency. Fewer studies aimed at creating advocacy about fortified foods among the free living population and stake holders. The present study undertook the advocacy for fortified foods amongst the free living population using the Diffusion of Innovation Model (DIM) for the purchase of fortified foods. An E- Intervention using graphics, audios and videos were given to the participants on WhatsApp for 1 month. The results in the study have shown significant difference in the awareness, perception and purchase of fortified foods for all the five staples post intervention, which provides enough evidence that the proposed strategy for creating awareness and promoting purchase of fortified foods amongst the selected participants was highly effective. Use of different E-communication channels can be used by researchers at large for creating the awareness about the safe consumption of fortified foods. Besides this, conducive environment is needed for fortification program to be a success, which will ensure the proper supply and demand to make the food fortification program viable.

**Keywords:** Advocacy, Attitude, Awareness, Food fortification, Micronutrient deficiency, Purchase practice

*Asian Pac. J. Health Sci.,* (2021); DOI: 10.21276/apjhs.2021.8.4.40

## Introduction

More than 3 billion poor people in the world are not availing the minimal healthy diets due to its unaffordability, worsening the nutritional security of the people. Less developed countries rely more on staple foods as they are easily affordable which makes the consumption of vegetables and fruits difficult contributing to micronutrient deficiency. Globally, 144 million children below the age of five, are stunted, 47 million wasted, and 38.3 million are overweight.[1]

Although micronutrients are required in tiny amounts but are an essential part of the diet for the development and growth purposes in the human body.[2] Due to the outbreak of COVID-19, food quality and availability have worsen which makes it challenging for the world to achieve the 2025 targets of Sustainable Development Goals of zero hunger.

Several schemes and programs have been going on in India for many years toward eradicating the micronutrient deficiency and reducing the undernutrition status. These include Integrated Child Development Scheme, Mid-Day Meal (MDM) Programs, Anemia Mukt Bharat (Free India from Iron Deficiency), National Iron plus Initiative, and Vitamin A prophylaxis program. However, the burden of all forms of malnourishment continues to be challenging.[2]

Since the nutritional status of the people is one of the factors in deciding the national productivity, it becomes more important to make contributions in the health systems and policies which can further lift up the nutritional status of every individual in the country.[3]

Supplementation and dietary diversity are two strategies which can help in overcoming the deficiency rates however the approaches are not practical to target masses.

[1]Department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda Vadodara, Gujarat

[2]Department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda Vadodara, Gujarat

**Corresponding Author:** Ria Ahuja, Department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda Vadodara, Gujarat, India. Phone: +91-7490029622. E-mail: Ria.ahuja-fnphd@msubaroda.ac.in

**How to cite this article:** Ahuja R, Sheth M. Action Research on Advocating Use of Fortified Foods in the Free-Living Population of Urban Vadodara using Diffusion of Innovation Model. Asian Pac. J. Health Sci., 2021;8(4):199-204.

**Source of support:** Nil

**Conflict of interest:** None

**Received:** 18/06/21 **Revised:** 29/07/21 **Accepted:** 22/08/21

Poor people often find it difficult to include diverse food groups in their diet; hence, it becomes important to employ sustainable solution that will fulfill the micronutrient needs of the people and will also be affordable.[1]

Food Fortification is a process of adding vitamins and micronutrients to staple food items to tackle the rising micronutrient deficiency rates. It is one of the cost effective and viable approaches as it does not alter the dietary habits of an individual. Government of India, along with Food Safety and Standards Authority of India (FSSAI) have chosen five vehicles, namely, rice, wheat flour, salt, milk, and oil for the fortification process and have given the standards for nutrient incorporation in the gazette, FSSAI, 2017.[4]

Enough evidence is available for supporting the food fortification as a strategy to overcome the micronutrient deficiency rates amongst the people. A study conducted by Das *et al*., 2019, has recorded reduction for various micronutrients and vitamins.

Iron deficiency anemia got reduced by 72%, Vitamin A by 58%, Vitamin B2 by 64%, Vitamin B6 by 91%, and Vitamin B12.[5] Studies have also undertaken clinical trials and have reported similar findings as of other researchers.[5-8] However, few studies aimed at creating advocacy about fortified foods amongst the free living population and stake holders. The present study was, therefore, planned to undertake the advocacy for fortified foods amongst the free living population using the Diffusion of Innovation Method to create social marketing for promoting purchase of fortified foods.

The Diffusion of Innovation theory, by Rogers "*is a theory that seeks to explain how, why, and at what rate new ideas and technology spread.*" In this model, adopters are categorized on the basis of their rate of adoption as innovators, early/late adopters and laggards.[9]

The data presented in this study is the part of the research to fulfill Doctoral research work of the researcher.

## Methods

### Sampling

Using a cross-sectional study design parents of the students ($n$ = 1600) from the Foods and Nutrition department of the Maharaja Sayajirao University of Baroda were screened to elicit the data, of which 349 parents participated until the completion of the study [Figure 1]. Subjects who were responsible for buying groceries for the family, having active internet and WhatsApp connection and can comprehend in Hindi language were included in the study.

### Base Line Data Collection

Pre-tested questionnaires were used to collect the data on socio-demographic information, awareness, perception, and purchase of fortified foods using Google form from September 2020 to March 2021.

### E- Intervention

The details of the E- Intervention on creating awareness, improving perceptions, and purchasing practices of fortified foods. The details of E- intervention are presented in Figure 2.

List of Messages that were shared during the E- Intervention Period

1. What is Fortification
2. Why it is important
3. Current deficiency rates of different vitamin/micronutrients
4. Staples which are being fortified and their fortificants
5. Fortified foods availability
6. Disclaimer on vegetarian sources being used for fortification purposes
7. Identification of logo only on Packed Branded foods and Not on Loose Food Items
8. Message on fortification does not change taste, smell, shelf life of the product and its consumption is safe
9. List of available fortified brands as per the request from subjects [Figure 3].

Post data were collected on the parameters similar to the baseline.

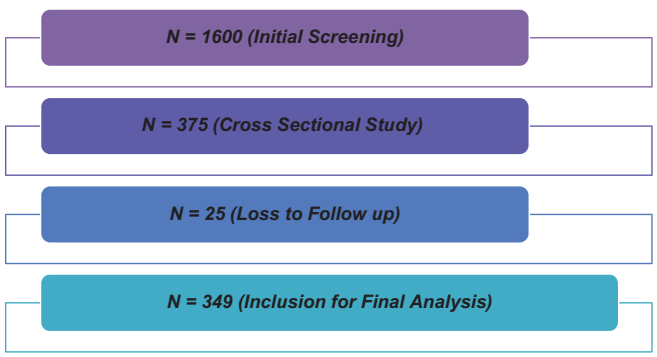


**Figure 1:** Sample Selection for the study

### Statistical Analysis

Categorical variables were presented as proportions while continuous variables were either presented as mean with standard deviation or median with range. Categorical variables were compared by Fisher exact test or Pearson's Chi-square test. The McNemar test was used to determine if there were differences on a dichotomous dependent variable between two related groups.

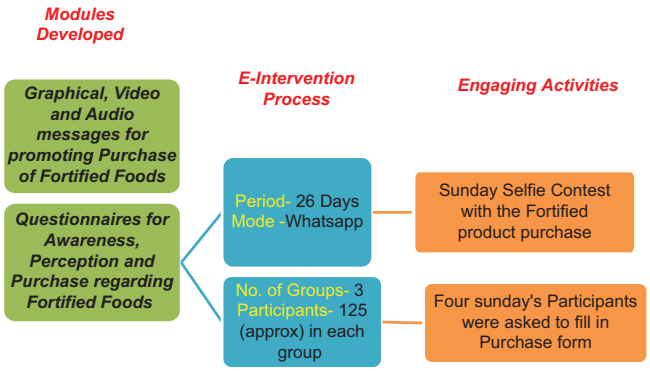


**Figure 2:** The E-intervention methodology


**Figure 3:** Glimpse of the Graphics developed in Hindi for E-Intervention strategy

All tests were two-tailed and $P < 0.05$ was considered as significant. Data were analyzed using SPSS software version 25 (Armonk IBM Corp). The Statistical analysis was outsourced by the professional statistician.

## Ethical Approval and Consent to Participate

The study was approved by the institutional review board of the Department of Foods and Nutrition, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda. The ethical approval number of the study is IECHR/FCS/2020/62. Participants were enrolled on the basis of their consent.

## Results

### Socio-demographic Characteristics of Subjects

The gender profile of the study population revealed that 76% of females and 24% were males. Most of the respondents were in the age group of 41–50 years (47.7%). Most of the respondents had honors degree (57.6%), followed by high School (15.2) and intermediate (11.5). The data on occupation shows that majority of the respondents were either unemployed or belonged to Professional category. Majority of the households belonged to Upper Middle Class (48.3), followed by Lower Middle Class (39.5) [Table 1].

### Effect of the Intervention on Subject's Awareness of Fortified Food before and after the Intervention

The impact of the E-intervention session was studied amongst the 349 subjects for the various awareness parameters, presented graphically in Figure 4.

Figure 4 shows the percent of subjects who gave correct responses at the baseline and post-intervention. There was shift of 62%, 73%, and 88% for subjects who gave correct response for what are fortified foods, identification of correct +F logo and for the participants who agreed fortified foods is essential for everyone respectively. Using McNemar's test, it was determined that the results post-intervention were highly significant for all the awareness parameters with $P < 0.001$.

### Impact of Intervention on Awareness of Fortified Staples Under FSSAI Regulations 2018

Impact of advocacy regarding staples that are being fortified (FSSAI 2018 regulations in India) is presented graphically in Figure 5. It is evident from the figure that post-intervention, there was a drastic improvement in the awareness of fortified staples. One hundred and sixty one, 157,252,183 and 185 subjects marked correct response for rice, wheat flour, and oil, salt, and milk, respectively.

**Table 1:** Socio-demographic characteristics the enrolled subjects

| *Indicators* | *No. of subjects* | *Percent* |
|---|---|---|
| Gender | | |
| Male | 90 | 24 |
| Female | 285 | 76 |
| Age group (in Years) | | |
| 20–30 | -- | -- |
| 31–40 | 103 | 27.5 |
| 41–50 | 179 | 47.7 |
| 51–60 | 93 | 24.8 |
| Education | | |
| Graduate | 37 | 9.9 |
| Honors | 216 | 57.6 |
| Intermediate | 43 | 11.5 |
| High school | 57 | 15.2 |
| Middle school | 16 | 4.3 |
| Primary school | 6 | 1.6 |
| Profession | | |
| Profession | 125 | 33.3 |
| Semi profession | 23 | 6.1 |
| Clerical | 36 | 9.6 |
| Skilled | 34 | 9.1 |
| Unskilled | 24 | 6.4 |
| Unemployed | 133 | 35.5 |
| Monthly income of the family (in Rupees) | | |
| 199,862 | - | - |
| 99,931–199,861 | 32 | 8.5 |
| 74,755–99,930 | 73 | 19.5 |
| 49,962–74,755 | 159 | 42.4 |
| 29,973–49,961 | 111 | 29.6 |
| Type of family | | |
| Nuclear family | 283 | 75.5 |
| Joint family | 92 | 24.5 |
| Socioeconomic group | | |
| Upper | 7 | 1.9 |
| Upper middle | 181 | 48.3 |
| Lower middle | 148 | 39.5 |
| Upper Lower | 39 | 10.4 |

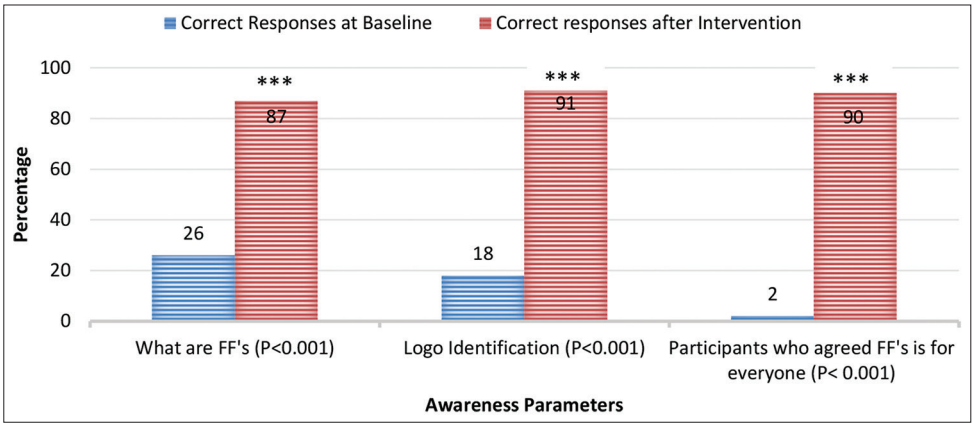


**Figure 4:** Increase in awareness of fortified foods

### Impact of Intervention on Subject's Perception for Fortified Foods

Results on subject's perceptions for preferring fortified foods before and after the intervention are presented graphically in Figure 6. Post-intervention, there was a positive shift in the perception of most of the subjects with regards to safety of fortified foods (40%), their willingness to pay more (26%). Many participants (23%) perceived fortified foods as healthy, 35% accepted that the taste and smell of fortified foods does not get altered. The E- Intervention could persuade 26% of the participants to shift to other brands for choosing fortified staples over the non-fortified staples.

McNemar's test was applied for all the parameters of perception which determined that there was a statistically significant difference post-intervention, $P < 0.001$.

### Impact of Intervention on Subject's Purchase Practices regarding Fortified Foods

Figure 7 shows significant increase in the purchase practices of all the staples post-intervention ($P < 0.001$). The purchase of fortified foods at baseline was unintentional for 60% of the subjects; however, post-intervention it was observed that the purchase of five fortified staples increased intentionally.

Using McNemar's test, it was determined that there was a statistically significant difference in the proportion of purchase practices of fortified rice, wheat flour, salt, milk, and oil, post-intervention, with $P < 0.001$.

### Barriers for Change in Behavior Toward Purchase of Fortified Foods as Reported by the Subjects

Subjects were asked about the reasons that were impeding their purchase of fortified foods. Majority (38%) of subjects reported unavailability of fortified foods in the nearest store, followed by preference toward buying local/unpacked staples such as rice and wheat kernels (34%) [Table 2].

### Association Between Pre and Post Intervention Results for Awareness, Perception, and Practice using Wilcoxon Signed-Ranks Test

Using Wilcoxon signed-ranks, for the three parameters (Awareness, Perception, and Purchase) it can be seen that the positive ranks were more, that is, improvement from pre- to post-intervention data. There was a significant improvement for all the parameters ($P < 0.001$) [Table 3].

### Analysis Based on Diffusion of Innovation Model (DIM) for Purchase Practices

Using DIM, purchasing practices were categorized on the basis of adopters, depending on the rate of adoption which was adopted by the enrolled subjects. The results revealed that 12.4% of the subjects were categorized as innovators, 24.3% as early adopters, 26.2% as early majority, 8.2% as late majority, and 24.7% as laggards. Table 3 clearly describes the week of adoption and the category of the subjects following the DIM [Table 4].

The proposed bell shaped curve by Roger's has not been observed in the study as it varies with the product that is being promoted or diffused amongst the subjects, along with socioeconomic characteristics of the adopters [Figure 8]. Orange line in the graph shows the trend followed by the subjects during the E-intervention study with regard to purchase practices. Degree of adoption was higher in the 1st week as compared to the DIM, however in the 2nd and 3rd weeks of intervention the degree of adopters were more or less similar to DIM. Upto 5th week, post-intervention the adopters in the intervention group reduced to 20% and many subjects (21%) remained in the category of laggards who did not report to purchase FF's during the study period.

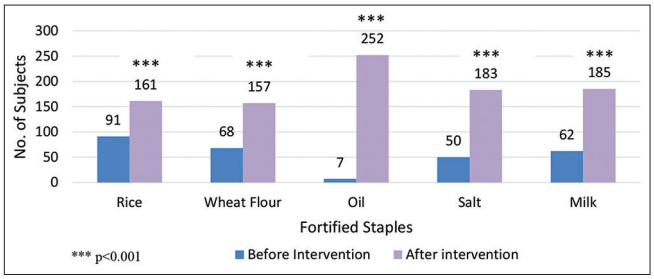


**Figure 5:** Impact of intervention on awareness of fortified staples among the subjects ($n = 349$)

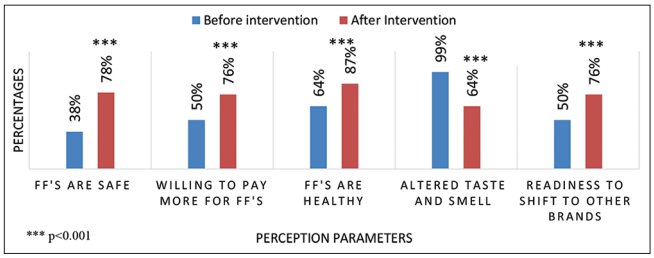


**Figure 6:** Percent increase in the perception of fortified foods post-intervention

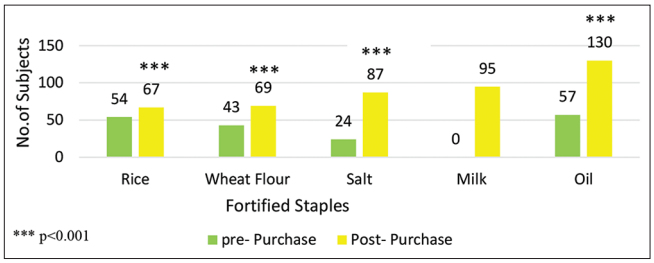


**Figure 7:** Impact of intervention on purchase practices for the five staples

**Table 2:** Barriers for change in behavior towards purchase fortified foods by the subjects

| *Bottlenecks* | *No. of subjects (n=326)* |
|---|---|
| Unavailability in the nearest store | 144 (38.4) |
| It's expensive | 2 (0.5) |
| Prefer buying loose products/Local | 129 (4.4) |
| Preferred brand is not fortified | 51 (13.6) |

## Discussion

The increased micronutrient deficiency has given food fortification a way to combat the situation, as it is one of the cost effective and viable approaches.[10] The advantage of the strategy is to

**Table 3:** Wilcoxon signed-ranks test for awareness, perception and practice pre- and post-intervention

| *Pre –Post intervention parameters* | *n* | *Mean rank* |
|---|---|---|
| Post – pre-awareness | | |
| Negative ranks | 4[a] | 28.00 |
| Positive ranks | 95[b] | 50.93 |
| Ties | 9[c] | |
| Total | 108 | |
| Wilcoxon signed-ranks test | | |
| Z | −8.480[b] | |
| *P*-value | <0.001 | |
| Post – pre-perception | | |
| Negative ranks | 80[a] | 136.30 |
| Positive ranks | 236[b] | 166.03 |
| Ties | 33[c] | |
| Total | 349 | |
| Wilcoxon signed-ranks test | | |
| Z | −8.731[b] | |
| *P*-value | <0.001 | |
| Post - pre purchase | | |
| Negative ranks | 6[a] | 66.25 |
| Positive Ranks | 232[b] | 120.88 |
| Ties | 116[c] | |
| Total | 354 | |
| Wilcoxon signed-ranks test | | |
| Z | −13.203[b] | |
| *P*-value | <0.001 | |

[a]Post < Pre, [b]Post> Pre, [c]post= Pre

**Table 4:** Comparison between the percent adopters in the study and the standard DIM

| *Week of adoption* | *No. of subjects* | *Percent adopters during intervention* | *Percent adopters as per DIM* |
|---|---|---|---|
| 1st week - innovators | 47 | 13 | 2 |
| 2nd week-early adopters | 73 | 20.3 | 14 |
| 3rd–4th week early majority | 87 | 24.2 | 34 |
| 5th week – late majority | 68 | 20 | 34 |
| >5th week -laggards | 74 | 21.2 | 16 |

DIM: Diffusion of innovation model

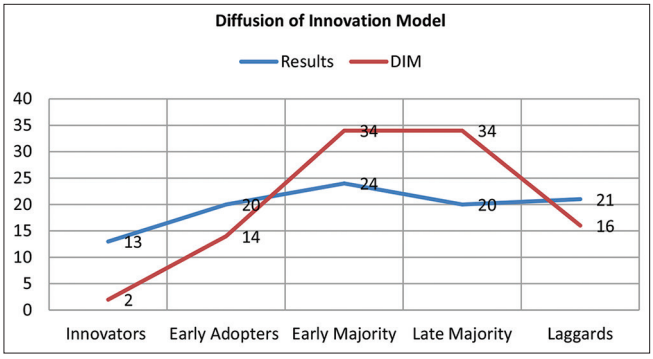


**Figure 8:** Rate of adoption for the purchase of fortified foods during the intervention

provide micronutrients without altering the dietary practices of the population. The vehicles for fortification are chosen on the basis of staple foods that are consumed frequently and in large quantities.[11]

Few researchers have collected the data from the different communities regarding the consumer's knowledge, attitude, and practice for fortified foods which created the need for intervention based studies.

A study conducted among 150 urban women in Delhi, reported good (48%) awareness on fortified foods logo, where 69.8% agreed to consumption of fortified foods as essential.[10] An interventional study conducted by Sirohi[12] among 400 subjects, recorded awareness of fortification as 12% at the baseline which increased to 72% after the intervention. A study conducted in Kenya on 1435 subjects found that only 28% of the respondents had awareness about "fortified foods." Findings of the present study have also recorded knowledge at baseline at 26% which increased to 88% after the E-intervention.[13]

A study conducted in NkowaNkowa Township, Africa, to determine the knowledge of women on fortification reported, majority (57%) of the participants were able to define food fortification correctly, and 72% of the participants were aware about the foods that are being fortified, the staple that is being fortified in South Africa is maize, which was reported by 70% of the participants. The target group for which fortification is essentially being done are the children (<6 years of age) was answered correctly by 72% of the participants. However, in the present study after the intervention, 87% of the subjects gained knowledge on "*What is fortification*" however only 26% could give correct responses at the baseline. Fifty-seven percent of the subjects were able to identify fortification logo correctly, 18% of the participants were able to identify the correct fortification logo at the baseline, and 91% of the participants were able to identify, post intervention.[14] The possible reason for better knowledge amongst the Africans was the mandatory use of fortification logo on breads, flour, and maize, however in India the +F logo for identification of fortified foods was created in 2016 after the development of food fortification resource center.[15]

The subjects in the present study were willing to pay more for fortified foods by 50% at the baseline, which increased to 76% after the E-intervention. The results of Garg and Kumar[10] also observed the similar findings ($P < 0.01$). On questioning about the difficulties for purchase of fortified foods, only 0.5% of the subjects marked price as one of the reason for not buying fortified foods, while unavailability (38%) and preference toward buying unpacked staples (38%) were the other reasons which jeopardized the purchase of fortified staples amongst the participants. A report by Dalberg estimated that 40–60% of the fortified food production in India is not reaching the general population. Thus, it becomes important to create supply and demand for fortified foods simultaneously.[15] An Australian research found that the notion among the participants who were skeptical regarding purchase of brand products was that fortification is being followed only by expensive products. However, in India and as well as other developing countries, staples are being fortified and even sold through the other government channels.[16]

A cross-sectional study conducted in 13 counties among 1435 subjects to collect information on fortification awareness studied the association of knowledge with different socioeconomic characteristics. It was found that awareness was significantly associated with occupation ($P < 0.001$)), education levels ($P < 0.001$), and age ($P < 0.025$) (13); however, no such association was observed in the present study.[13]

The results in the study have shown significant difference in the awareness, perception, and purchase of fortified foods for all the five staples post-intervention, which provides enough evidence that the proposed strategy for creating awareness and promoting purchase of fortified foods among the selected participants was highly effective.

A cross-sectional study conducted among school going kids in Benghazi city, among 200 students, observed significant reduction in the consumption of chocolate ($P < 0.01$), chips ($P < 0.01$), bread and other fast foods, post-nutrition intervention;[17] however, due to pandemic E- education sessions using WhatsApp as the education platform proved to be highly effective in terms of improving the awareness, perception, and purchase practices.

In an educational intervention study, carried out among 400 subjects, the improvement in knowledge for soybean oil increased to 62% from 10%, knowledge about various fortified food products also enhanced to 83% from 40%,[12] There are multiple studies that have undertaken advocacy strategies for improvement in the knowledge, attitude, and practices of the subjects; however, the results of the intervention can vary depending on the outcome variables, characteristics of the subjects and the tool used for advocacy strategies.[18]

Besides, the impact of the intervention, the study has also used Diffusion of Innovation theory to track the adopter's categories. According to Rogers's model, the four components that can persuade the person toward adoption of innovation are relative advantages, compatibility, complexity, and trialability, which were considered while sharing the messages on WhatsApp during intervention. Messages regarding advantages of food fortification, safe use while cooking and consumption, and the availability of fortified foods in the markets for promoting triability were ensured. The DIM model has been applied in agricultural, public health, social marketing, and educational based interventions.[19]

The success of DIM can vary with the type of technology and innovation that is being promoted to the target audience. However, the graph observed in the present study was similar to the bell shaped graph that was proposed by Roger's in his model.

## Conclusion

The study has shown a significant impact of the adopted E-intervention strategy for advocacy of fortified foods using DIM. The adoption of DIM has helped categorize characteristics of the participants enrolled in the study based on their rate of adoption and practicing purchase of fortified foods. Use of different E-communication channels can be used by researchers at large for creating the awareness about the safe consumption of fortified foods.

Besides this, conducive environment is needed for fortification program to be a success, which will ensure the proper supply and demand to make the food fortification program a success.

## Acknowledgments

All the participants that enrolled in the study are acknowledged by the authors.

## References

1. Food and Agriculture Organization. The State of Food Security and Nutrition in the World. Rome, Italy: Food and Agriculture Organization; 2020.
2. Gonmei TG. Micronutrient Status of Indian population. Indian J Med Res 2018;148:511-21.
3. World Health Organization Fact Sheets-Malnutrition. Available from: https://www.who.int/news-room/fact-sheets/detail/malnutrition. [Last accessed on 2021 Mar 13].
4. FSSAI Gazzete Notification; 2018 Available from: https://www.fssai.gov.in/cms/gazettenotificationviewall.php. [Last accessed on 2021 Feb 21].
5. Das JK, Salam RA, Mahmood SB, Moin A, Kumar R, Mukhtar K, *et al*. Food fortification with multiple micronutrients: Impact on health outcomes in general population. Cochrane database Syst Rev 2019;12:CD011400.
6. Hower J, Knoll A, Ritzenthaler KL, Steiner C, Berwind R. Vitamin D fortification of growing up milk prevents decrease of serum 25-hydroxyvitamin D concentrations during winter: A clinical intervention study in Germany. Eur J Pediatr 2013;172:1597-605.
7. Black LJ, Seamans KM, Cashman KD, Kiely M. An updated systematic review and meta-analysis of the efficacy of Vitamin D food fortification. J Nutr 2012;142:1102-8.
8. Oakley GP, Tulchinsky MP. Folic acid and Vitamin B12 fortifi cation of flour: A global basic food security requirement. Public Health Rev 2010;32:284-95.
9. LaMorte WW. Diffusion of Innovation Theory. Massachusetts: Boston University School of Public Health; 2019. Available from: https://www.sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories4.html. [Last accessed on 2021 Apr 14].
10. Premkumar GV. Consumer Knowledge, attitude and practice of using fortified food in India: A study among women in Urban Delhi. Int J Health Sci Res 2020;10:277-82.
11. Das JK, Salam RA, Kumar R, Bhutta ZA. Micronutrient fortification of food and its impact on woman and child health: A systematic review. Syst Rev 2013;2:67.
12. Impact of Educational Intervention Measures on Knowledge Regarding Vitamin A and D Fortified Soyabean Oil Among Inhabitants of Urban Area of a City of Central India. Berlin, Germany: ResearchGate; 2015.
13. Linda AA, Kyallo F, Okoth JK, Kahenya P, Makokha A, Sila D, *et al*. Food fortification: The level of awareness among Kenyan consumers. J Nutr Metab 2020;2020:8486129.
14. Motadi SA, Mbhatsani V, Shilote KO. Food fortification knowledge in women of child-bearing age at Nkowankowa township in Mopani district, Limpopo Province, South Africa. Afr J Prim Health Care Fam Med 2016;8:1-5.
15. Fortifying India: The Impact and Potential of Food Fortification in India-Dalberg; 2020. Available from: https://www.dalberg.com/our-ideas/fortifying-india-challenges-and-opportunities-for-large-scale-food-fortification-in-india. [Last accessed on 2021 Feb 27].
16. Rowland E, Dugbaza J. Consumer awareness, Attitudes and Behaviours to Fortified Foods. New Zealand: Food Standards Australia New Zealand; 2010. Available from: https://www.foodstandards.gov.au/publications/Documents/Fortification%20report%20-%20qualitative.pdf. [Last accessed on 2021 May 02].
17. Sachithananthan V, Buzgeia M, Awad F, Omran R, Faraj A. Impact of nutrition education on the nutritional status. Nutr Food Sci 2012;42:173-80.
18. Contento I, Balch G, Bronner Y, Lytle L, Maloney S, Olson C, *et al*. The effectiveness of nutrition education and implications for nutrition education policy, programs, and research: A review of research. J Nutr Educ Ser 1995;27:284-41.
19. Dearing JW. Applying diffusion of innovation theory to intervention development. Res Soc Work Pract 2009;19:503.

ORIGINAL RESEARCH PAPER

Health Science

KEY WORDS: Food Fortification, Consumer Awareness, Micronutrient Deficiency, Food Fortification logo

# A CROSS SECTIONAL STUDY ON CONSUMER AWARENESS OF FORTIFIED FOODS IN VADODARA CITY

**Ms. Ria Ahuja*** Doctoral Student at the Department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda Vadodara- Gujarat. *Corresponding Author

**Prof. Mini Sheth** Professor at the Department of Foods and Nutrition, The Maharaja Sayajirao University of Baroda Vadodara- Gujarat.

**ABSTRACT**

The growing Micronutrient deficiency rates in India and worldwide have been a cause of concern. Recent National Family Health Survey (NFHS) reports have shown that the micronutrient levels are affecting the overall health of the individuals. The diet that the population is having at large is not serving the daily amounts of micronutrients in the substantial amounts, thus, to address this, Government of India (GOI) and The Food safety and standards Authority of India (FSSAI) have implemented food fortification program in India, focusing on five staples, namely rice, wheat flour, oil, milk and salt. The present study was carried out in the department of foods and nutrition in Vadodara, Gujarat, amongst 375 parents who were responsible for buying groceries for their families. The aim of the study was to assess the knowledge of the population regarding fortified foods using google forms. The study revealed that only 33% of the subjects, knew about the term fortified foods, however on asking about its identification attribute, only 28% were able to give the correct answer. Most of the subject (89) subjects marked correct response for the fortification logo. However, the knowledge regarding the food sources of fortified foods was lacking amongst the study subjects. Efforts should be made to create awareness about the new fortified foods and its benefits at large scales through different media channels.

## INTRODUCTION

India is a home of 138. 85 crores people according to recent UN report. (World meter, UN as on 15th March 2021) Health of the population is important for every country for improving the economic performances and thus the productivity of the nation. Thus, it becomes important for every nation to monitor the health of the individuals and design strategies to overcome every health related issues that the country is facing. (Raghupathi, 2020). One of the major health problem that the world is facing with, is micronutrient deficiency. Everybody knows how important are the various macronutrients for the development and functioning of the body, but equally important are the micronutrients like Vitamin A, Vitamin D, and B12etc. Which are required in tiny amounts. Micronutrient deficiency is a growing global health, adding onto the burden of various health related problems like anaemia, affecting physical and mental development in children, vulnerability of diseases, night blindness etc. It is also defined as 'Hidden Hunger' as the signs of deficiency are not visible. According to World Health Organization (WHO) nearly two billion people worldwide are suffering from micronutrient deficiency (Ritchie and Roser, 2017).

Researchers have revealed that nearly 50-60% of the preschool children and an equal number of women in India are anaemic, (Gonmei and Toteja 2018), 62% of Indian Population have low levels of Vitamin A and 50-94% people in different states of India are suffering from Vitamin D deficiency. (GAIN, India 2018). According to NFHS-4 (2015-2016 data), micronutrient deficiency are prevalent in all the age groups. The recent NFHS-5 data has not shown any significant improvement in the nutritional status of the children. The rates for stunting and wasting has increased or showed no improvement as compared to the NFHS-4.

The Novel Corona virus has also worsen the situation and has impacted the health of the people, efforts should be made to achieve the sustainable development goals (SDG 2) by The United Nations which aims to eliminate hunger and all forms of malnutrition by 2030.

Several programmes and schemes targeting towards iron and Vitamin A deficiency are active in India amongst various age group but the results have not shown any significant Improvement in the overall status which leaves the micronutrient deficiency as one of the grim public health concern for India.

Thus to combat micronutrient deficiency, WHO has recognized fortification as a bridge in filling the micronutrient gaps which is an affordable and viable approach. Food fortification is defined as 'the practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements) in a food, so as to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health' (WHO). To overcome the micronutrient deficiency which remains as an obstacle in the development of nation, Government of India (GOI) and Food safety and standards authority of India ( FSSAI) has initiated food fortification in five staples, namely rice, wheat flour, oil, milk and salt which are commonly used in an Indian diet, however the knowledge of food fortification is necessary for promoting or creating awareness amongst individuals for the benefits of consuming fortified foods and for identifying the fortified food while purchasing for their grocery needs. Therefore, percent study was undertaken to look at the consumers, perception, awareness and purchase practice regarding fortified foods in urban Vadodara, Gujarat, India.

## METHODOLOGY

***Study design, and selection of the Participants:*** Using a cross sectional study design parents of the students (N=1600). From the Foods and Nutrition department of the Maharaja Sayajirao University of Baroda were screened to elicit the data, of which 375 parents consented to participate in the study. Subjects who were responsible for buying groceries for the family, having active internet and WhatsApp connection were included in the study.

***Data Collection:*** The subjects were approached telephonically and were briefed about the study. The study was conducted from September- December 2020. A pre tested Structured questionnaire was administered. Information on sociodemographic characteristics and awareness regarding food fortification was collected using Google forms

**Ethical Approval:** The study was approved by the institutional review board of the Department of Foods and Nutrition, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda. The ethical approval number of the study is **IECHR/FCS/2020/62**

**Statistical Analysis:** The data was analysed using Microsoft

excel for calculation of percentages and the number of subjects in each category.

**RESULTS:**

**1. Sociodemographic Characteristics of subjects:** The gender profile of the study population revealed that 76% of females and 24% were males. Most of the respondents were among the age group of 41-50 years (41.6%). Most of the respondents had honors degree (57.6%) followed by High School (15.2) and Intermediate (11.5).The data on occupation shows that majority of the respondents were either unemployed or belonged to Profession category. Majority of the households belonged to Upper Middle Class (48.3), followed by Lower Middle Class (39.5).

**2. Awareness on Food Fortification:** As seen in Fig.1, subjects who self-reported about the familiarity with the term 'Food Fortification' 33% self-reported that they knew about the term 'Fortified Foods' while majority of the subjects 66.7% didn't hear about fortified foods at all. When subjects were asked about what they knew about fortified foods, from the multiple options provided to them, 28% marked the correct response.

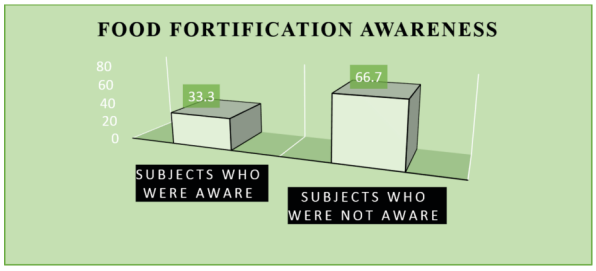


**Fig 1: Percent subjects having awareness about Food Fortification (N=375)**

The results of our study are consistent with the research conducted in Kenya on1435 subjects it was revealed that nearly 28% of the subjects were aware of food fortification, of which female respondents were more likely to be aware of it. (Linda, et al, 2020).Another study conducted in Urban Delhi amongst 150 women, 56% of women were aware about food fortification and 69% also reported its importance in the daily diet (Kumar Garg, 2020).

**Source of Information:** Majority of the subjects (45.2%) reported broadcast media (Television, Radio, etc., Internet) as the major source of information from where they learnt about fortified foods, followed by print media for 38.7% subjects, while a few of them reported internet ( 8.9%) and outdoor media (bill boards, neighbours) by 7.3% of subjects.

**3. Awareness about Fortification Logo:** Respondents were given three image options and were asked to select the correct logo for fortification used in India. 80% of the respondents who reported about being aware of food fortification, marked the correct responses i.e.89 respondents out of 112. A study conducted in Urban Delhi among 150 women, showed that 48% of the respondents were aware about the correct fortification logo available on pre packed foods (Kumar and Garg, 2020)

**4. Knowledge on Foods that are being fortified in India:** It was important for the researcher to know whether the subjects who reported about awareness of fortified foods, also knew about the staples that are getting fortified in India. The subjects were given the option to choose multiple responses. Majority of the subjects were aware about wheat flour fortification (33.2%), and rice fortification (33.3%), followed by milk (25%) and salt (22%), while only 3% (approx.) marked oil as the source. Study conducted in Delhi reported that 40% of the respondents knew about the available fortified foods in Indian market. (Kumar and Garg, 2020) **Fig 2**

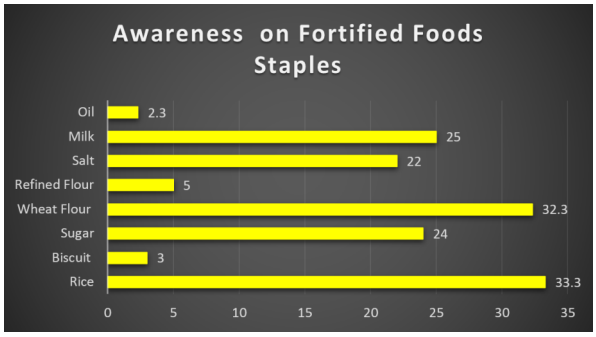


**Fig 2: Percent subjects having awareness on Staples that are being fortified**

**CONCLUSION:** The present study revealed that 33% of the subjects, had awareness about the term fortified foods, however on asking about its attribute, only 28% could recognize the correct answer.The major source of knowledge was broadcast media which is television and radio, (45.2%). Out of 375 subjects, 89 subjects marked correct response for the fortification logo. However, the knowledge regarding the food sources of fortified foods was lacking amongst the study subjects. Thus, Efforts should be taken to create awareness about fortified foods and its identification while practicing its purchase to make the implementation of FSSAI 2018 regulation more effective.

**REFERENCES:**

1. World Meter, UN, Current World Population, Available from https://www.worldometers.info/world-population/ as on March 15 2021
2. Raghupathi, V., and Raghupathi, W. (2020). Healthcare Expenditure and Economic Performance: Insights From the United States Data. *Frontiers in public health*, *8*, 156. https://doi.org/10.3389/fpubh.2020.00156
3. Hannah Ritchie and Max Roser (2017) - "Micronutrient Deficiency". *Published online at OurWorldInData.org.* Retrieved from: 'https://ourworldindata.org/micronutrient-deficiency' [Online Resource]
4. Gonmei Z, Toteja G S. Micronutrient status of Indian population. Indian J Med Res 2018 [cited 2021 Jun 13]; 148:511-21. Available from: https://www.ijmr.org.in/text.asp?2018/148/5/511/249978
5. Global Alliance for Improved Nutrition (GAIN) India, 2018
6. **National family health survey** (**NFHS-4**) 2012–14 [Internet]. Mumbai: International Institute for Population Sciences (IIPS) and Macro International; 2009. Available from: http://www.rchiips.org/**nfhs**/**nfhs4**.shtml [**cited** 2014 December 18].
7. Linda AA, Kyallo F, Okoth JK, Kahenya P, Makokha A, Sila D, Mwai J. Food Fortification:The Level of Awareness among Kenyan Consumers. J NutrMetab. 2020 Apr 7;2020:8486129. doi: 10.1155/2020/8486129. PMID: 32322418; PMCID: PMC7166277.
8. Kumar and Garg, Consumer Knowledge, Attitude and Practice of using Fortified Food in India: A Study among Women in Urban Delhi, International Journal of Health Sciences and Research,2020, July; Volume: 10 | Issue: 7 | Pages: 277-282. Available from: https://www.ijhsr.org/IJHSR_Vol.10_Issue.7_July2020/IJHSR_Abstract.042.html

# Current Knowledge of Health Benefits for Various Fortificants amongst the Free Living Population in Vadodara, India: E-Assessment

Ria Ahuja[1]

Mini Sheth [2]

1PhD Scholar, Dept. of Food and Nutrition,
Faculty of Family and Community Sciences. The Maharaja Sayajirao University of Baroda, Vadodara;
Ria.ahuja-FnPHD@msubaroda.ac.in, *7490029622*
2 Professor, Dept. of Food and Nutrition,
Faculty of Family and Community Sciences. The Maharaja Sayajirao University of Baroda, Vadodara;
*shethmini@gmail.com; +91-9879359229*

**Rationale:** Micronutrients are an important part of the diet and are required in substantial amount for the proper functioning of body. According to various researches and reports it has been seen that the Micronutrient deficiency prevalence is increasing in India because of which it has now became a public health issue. One of the reason for low micronutrient deficiency could be the knowledge of various micronutrients that are now being used as fortificants for overcoming the deficiency rates. **Methods**: A cross-sectional study design has been planned for assessing the current knowledge regarding the health benefits for various micronutrients that are being used as fortificants. The study is planned amongst the parents of the students enrolled in the Faculty of Family and Community Sciences i.e. 1600 students , efforts were made to enrol maximum parents for the study, however minimum sample size that was calculated considering the 20% dropouts came out to be 315 individuals. Subjects were enrolled on call and e-questionnaire using Google form were sent to the individuals. The socioeconomic data was collected using kuppuswamy scoring method. **Results**: The Individuals selected multiple responses for the knowledge on health benefits of Vitamin A, d, B12, Iron and Iodine. 78% of Individuals gave correct responses for Vitamin A health benefits s. 74% of individuals gave correct response for Vitamin D, 37% for Vitamin B12 health benefits, 61% for Iron and 70% for iodine gave correct responses. **Conclusion:** The Knowledge amongst the Individuals regarding the health benefits for various fortificants was highly excellent, however, it is essential to note that there are individuals who had selected ‘don’t know; as their response. Also, knowledge of various sources is also important to make the changes in their dietary habits. The intervention regarding the advocacy can be designed for the overall gain in knowledge for various micronutrients considering their sources.

Organization Logo

Photograph

**Title:** Implementing e- Intervention for Promoting Fortified Foods amongst the General Population in Vadodara district, Gujarat, India

**Name: Ria Ahuja and Prof. Mini Sheth**
**University/Organization: The Maharaja Sayajirao University of Baroda, Gujarat**
**Country: India**

**Abstract:** Worldwide, unaffordable healthy diets, dependability over staple food items, and lack of knowledge have been the major cause of malnutrition. Government programs, promoting dietary diversity and supplementation have not given promising results in improving the micronutrient status of the population. Government of India, along with Food Safety and Standards Authority of India have chosen five vehicles, namely, rice, wheat flour, salt, milk, and oil for the fortification process to combat the micronutrient deficiency. Fewer studies aimed at creating advocacy about fortified foods among the free living population and stake holders. The present study undertook the advocacy for fortified foods amongst the free living population using the Diffusion of Innovation Model (DIM) for the purchase of fortified foods. An e- Intervention using graphics, audios and videos were given to the participants on WhatsApp for one month. Innovative graphics with messages in Hindi language were developed for creating the interest of the participants, and already existing audios and videos developed by FSSAI, or government were used for creating the awareness on fortified foods. The results of the study have shown significant difference in the awareness, perception and purchase practices of fortified foods for all the five staples post intervention, which provides enough evidence that the proposed strategy for creating awareness and promoting purchase of fortified foods amongst the selected participants was highly effective. The research also undertook a survey for different fortified products available in the markets of Vadodara city. The markets were selected purposively from each of the four zones

of Vadodara, since the purchasing preferences are evolving day by day, efforts were made to include traditional ration shops, online retail shops, and hyper markets. The results revealed that there was limited availability of the products, which further creates the need for availing fortified products in the market in order to promote its purchase and achieving the goal of combating with micronutrient deficiency. Different E-communication channels can be used by researchers at large for creating the awareness about the consumption of fortified foods. Besides this, conducive environment is needed for fortification program to be a success, which will ensure the proper supply and demand to make the food fortification program viable.

**Biography:** Miss Ria Ahuja is a Ph.D. Scholar who has completed her B.Sc in Foods and Nutrition from Lady Irwin College, Delhi, and her ,Msc in Public Health and Nutrition from the Maharaja Sayajirao University of Baroda. Currently she is undergoing her doctoral degree program along with it she is working with an NGO namely MAMTA-Health Institute of Mother and Child as a Regional Manager in Mother and Child Health Department