STUDY ON CONSUMPTION PATTERN OF FORTIFIED FOODS AMONG HOUSEHOLDS BELONGING TO DIFFERENT SOCIOECONOMIC STATUS OF MUMBAI CITY

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ABSTRACT

Food fortification addresses the problem of micronutrient deficiencies and offers a public health benefit with no danger to health. It is a scientifically validated, affordable, scalable, and sustainable global intervention. The aim of this study is to assess the baseline consumption of fortified foods of Mumbai-based families from different socioeconomic status. In addition, this study seeks to offer a nutrition education intervention on food fortification and analyze post-intervention changes in consumption pattern of fortified foods among the same families. The total sample size (N) was 90 households, out of which 45 households belong to Upper class and 45 households belong to Upper lower class. The participants completed a self-reported questionnaire containing questions related to staple foods and fortified food consumption, p values of less than 0.05 were considered statistically significant. Both socioeconomic groups' consumption patterns of staple foods were found to be quite similar, while consumption of fortified foods was higher in the upper class than in the upper-lower class. Compared to other staple foods, fortified salt and oil were two major foods that practically all socioeconomic groups adopted. The upper class (93.3%) has higher consumption compared to the upper lower class (60%) for fortified salt and consumption of fortified oil was less in the upper lower class (32.8%) as compared to the upper class (75.6%). In conclusion, the upper class has a higher consumption of fortified food as compared to the upper lower class.

Keyword: - *Fortified food, consumption pattern, Upper class, upper lower class*

1. INTRODUCTION

WHO defines Fortification as the deliberate addition of one or more micronutrients (such as vitamins and minerals) to a portion of food or condiment to enhance the nutritional value of the food supply and benefit the general public with little health risk. Essential vitamins and minerals are added to frequently consumed foods such as maize flour, edible oil, rice, salt, and wheat flour through food fortification. Mandatory mass fortification is especially well suited for foods like cereals, oils, dairy products, beverages, and various condiments like salt, sauces (like soy sauce), and sugar. These foods have some, all, or none of the following traits in common: They are ingested regularly, in sufficient, and comparatively constant amounts by a sizable majority of the population, including (or especially) the population groups most at risk for insufficiency.

A comprehensive nutrition strategy that includes additional nutrition-specific and nutrition-sensitive interventions should consider food fortification as a complementary intervention to preventing and treating vitamin and mineral

deficiencies [1]. Initially restricted to a few specific foods, fortification is now included in a variety of grain products, snack foods, meal replacements, artificial sweeteners, and even bottled water. Intake of multivitamins and mineral supplements and particular nutrient supplements is increasing, in addition to the consumption of fortified foods [2].

1.1 Government bodies that monitor Large Scale Food Fortification

For decades, WHO has been methodically working on food fortification and collaborating with various networks for fortification at the regional, national, and local levels. The basic guidelines for the addition of important nutrients to foods were produced by WHO, the Food and Agriculture Organization of the United Nations, and the Codex Alimentarius Commission to offer guidance, protect health, and promote implementation among Member States [3].

The Fortification Assessment Coverage Toolkit (FACT) was created and made operational by the Global Alliance for Improved Nutrition in 2013 to facilitate coverage evaluations in both population-based (such as LSFF) and targeted (such as baby and young child feeding) fortification initiatives. The toolkit was created to evaluate programme utilization and coverage as well as to speed up the programme feedback loop by pointing up coverage bottlenecks and obstacles that might and ought to be resolved during deployment. Numerous projects that were evaluated have a great potential for impact based on the use of fortifiable vehicles; however, this potential can only be realized with significantly better compliance with fortification [4].

The World Health Organization advises widespread food fortification as a potent, evidence-based, and economically viable strategy to combat vitamin and mineral deficiencies, including, among others, anemia, iron insufficiency, and iodine deficiency illnesses. In all contexts, recommendations include: Rice, wheat flour, corn meal, and maize flour are all fortified with vitamins and minerals through the process of universal salt iodization. Globally, mandatory restrictions are frequently used to compel food manufacturers to fortify their products with micronutrients like iodine, iron, vitamin A, and folic acid. The iodization of salt is the practice that is used the most frequently worldwide [3]. Programs need to use food items that are consumed by the poor and add bioavailable fortificants at sufficient content levels to bridge dietary gaps and minimize micronutrient deficiencies in order to have an impact. This will help identify programme adjustments that are necessary and will strengthen causal inferences about impact [5]. The aim of this study was to assess the consumption pattern of fortified food among different socioeconomic group.

2. METHODOLOGY

The proposed study is a pre-post interventional study. Data was collected by conducting face-to-face interviews through the interview method. The study was conducted for four months amongst households residing in Mumbai City belonging to various socio-economic classes. The overall sample size (n) was 90 households. According to Kuppuswamy's socioeconomic classification of 2021, 45 of the 90 recruited families belonged to the Upper class and 45 to the Upper Lower class. The Participants were recruited through the purposive sampling method. The participants were included based on the inclusion and exclusion criteria. The participants were explained in detail about the purpose of the study by providing a participant information sheet and written informed consent was obtained. After the screening process, the participants were given the participant information sheet, consent letter, and the questionnaire consisting of the case record form and Modified FACT household questionnaire (Fortification assessment coverage toolkit). The data were analyzed by using SPSS (Statistical Package for Social Science) software (Version 21). Descriptive statistical tests and inferential statistical tests like t-test for obtaining the results. p values of less than 0.05 were considered statistically significant.

2.1 Inclusion criteria

Participants were recruited based on the following inclusion criteria:

- Households residing in Mumbai.
- Households belonging to the upper class (I) and upper lower (IV) categories of socio-economic classes are classified according to Kuppuswamy Socioeconomic Class 2021.

2.2 Exclusion criteria

Samples were eliminated based on the following exclusion criteria

- Households residing outside Mumbai City

- Households belonging to the upper middle (II), lower middle (III) and lower class (V) according to Kuppuswamy socioeconomic class 2021

3. RESULT AND DISCUSSION

The study sample consisted of 90 participants involved in household food purchase and preparations, belonging to different socioeconomic status in Mumbai city. They were screened using the Kuppuswamy Scale 2021, which classifies participating households into the necessary socioeconomic category group based on the head of the family's occupation and education as well as the family's total monthly income. The mean age of the study sample was 46 years. The male-to-female ratio in the study was 1:3.5.

3.1 Categorical Classification of households recruited based on socioeconomic status (Based on Kuppuswamy Scores 2021)

The Kuppuswamy Scoring Scale 2021 was used to screen the participants for the family head of household employment. Occupation of the head of the family showed that the majority (34.4%) of the heads of the participant families were legislators and senior officials. Education of the head of the family resulted that the majority (37.8%) of the participant families' heads of households were graduates and Total monthly income of the family (Rs.) showed that The majority (30%) of participants earned more than 123,322 rupees per month. According to the inclusion criteria based on the Kuppuswamy Scores 2021 for this pre-post interventional study, the total study sample (N = 90) was recruited using the purposive sampling method, with an equal number of families (50%) in both socioeconomic groups, namely Upper Class (n = 45) and Upper Lower Class (n = 45).

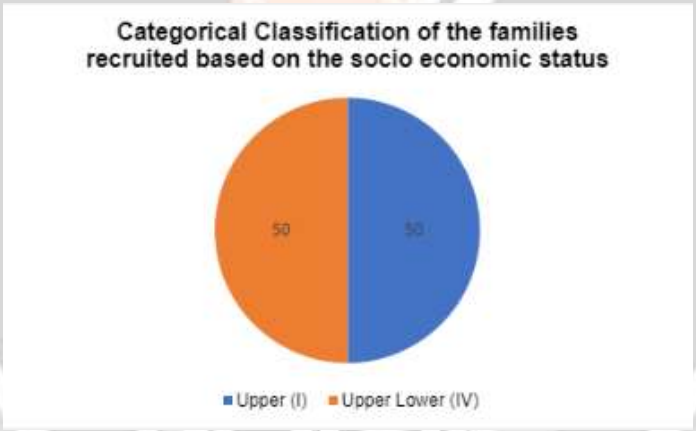

Fig.1: Percentage distribution for categorical classification of the families recruited based on the socio-economic status

The socioeconomic status of the recruited participants was not taken into account in any of the studies [6, 7, 8, 9, 10] reviewed during the literature review for this research study, which is a unique feature of this investigation. Additionally, no research has been done to track the intake of fortified foods for this two-class (higher and lower class) socioeconomic category.

3.2 Pre-post intervention analysis for change in consumption pattern towards fortified foods among households

Fortified coverage surveys were used to measure the consumption of fortified foods among households for staple items such oil, cooking fat, wheat flour, milk, and salt. To assess the trend in buying behavior, the frequency, amount, and source of purchases of staple foods—wheat flour, rice, milk, oil, and salt—were examined. The lack of change in practice behavior in these areas between pre-and post-intervention indicates that these are ingrained behaviors that have developed over time in response to a variety of factors, including income, the size of the family, residence, way of life, etc. and cannot be altered by a minimally intrusive educational intervention. The amount of basic foods bought mostly depends on one's purchasing power, or income and the size of one's household.

3.2.1 Fortification Coverage of Cooking Oil

A.Use of cooking oil

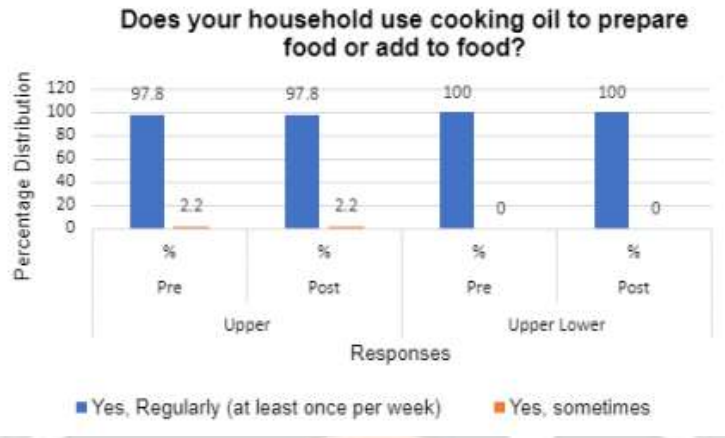

Fig. 2: Percentage distribution of use of cooking oil in households

Every household regularly uses cooking oil. A similar outcome was also seen in the study population. Both the upper class (97.8%) and upper lower class (100%) use cooking oil to prepare or add to food both before and after the intervention. Consequently, it is simple to make alterations or adaptations to fortified oil.

B.Types of cooking oil used amongst household

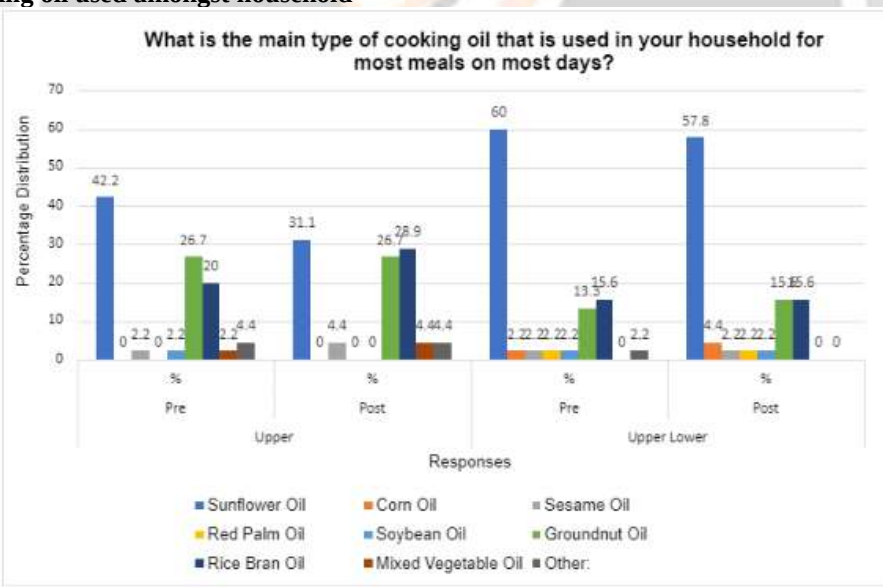

Fig. 3: Percentage distribution for types of cooking oil used in households

In every household, many different types of cooking oil are used. Pre and Post-intervention, the majority of the upper class used the same type of cooking oil. Pre-intervention 42.2% used sunflower oil, 26.7% used groundnut oil and 20% used rice bran oil, while less than 4.5% of other varieties of oil were used in households. Post-intervention 31.1% consumed sunflower oil, 28.9% consumed rice bran oil and 26.7% consumed ground oil while the remaining others were less than 4.5%. Similarly, The upper lower class also utilized similar cooking oils, such as 60% using sunflower oil before intervention and then 57.8% started using sunflower oil post-education, 15.6% consuming rice bran oil both before and after the intervention, and there is an increase in the percentage of consumption from 13.3% to 15.6% for groundnut oil. All of these types of oil are fortified and freely accessible on the market. Both the upper and upper lower classes were educated about brands of fortified oil via brochures and videos.

C. Brands preferred by the study population while the purchase of cooking oil

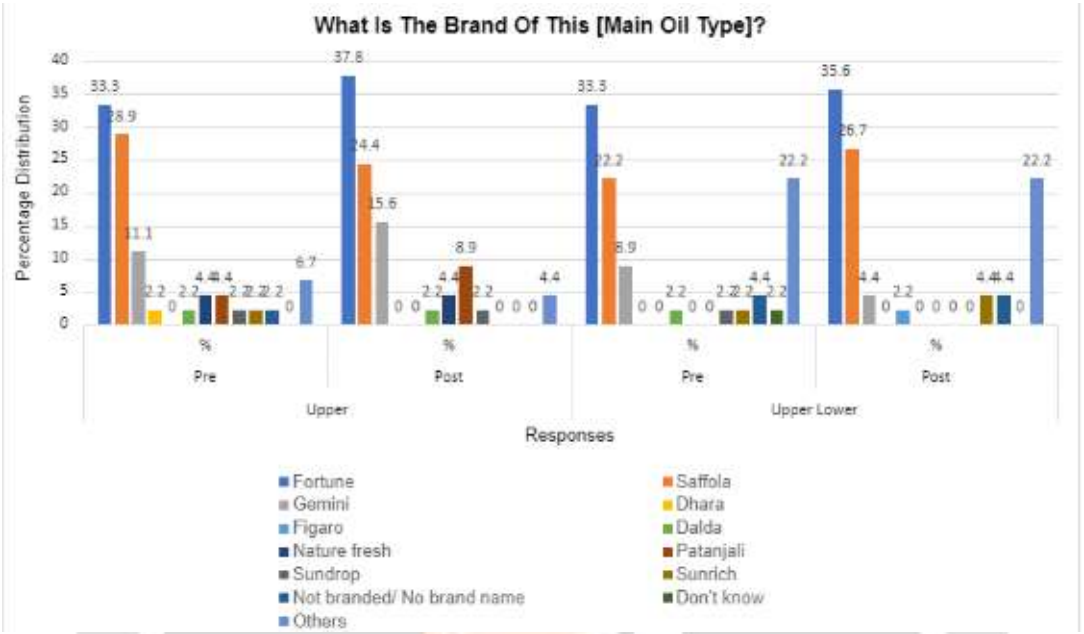

Fig. 4: Percentage distribution for types of brands of cooking oil used in households

Before intervention, it was observed that the majority of the upper class (33.3%) and upper lower class (33.3%) favored the brand Fortune while purchasing oil. Saffola came in second with 28.9% upper class, 22.2% upper lower class, and Gemini in third with 11.1% upper class, 8.9% lower class. Another brand that upper-lower-class people frequently used was Sunday. Brands of oil that have been fortified, like Fortune, rice bran oil, and Gemini, are accessible and popular. Following the education intervention, more people were buying Fortune-enhanced oil. Saffola is used by the upper class 24.4% of the time and the lower class 37.8% of the time, while sunflower oil is used by the upper class 37.8% of the time and Gemini had a decline of up to 4.4% in the upper lower class and a 15.6% increase in the upper class. It can be concluded that neither population experienced a significant change in their consumption of fortified foods ($p>0.05$). It was observed that consumer demand for some brands of fortified oil increased after spreading knowledge among the general public.

D.Cooking Oil consumption: Fortified vs. Non-Fortified via logo

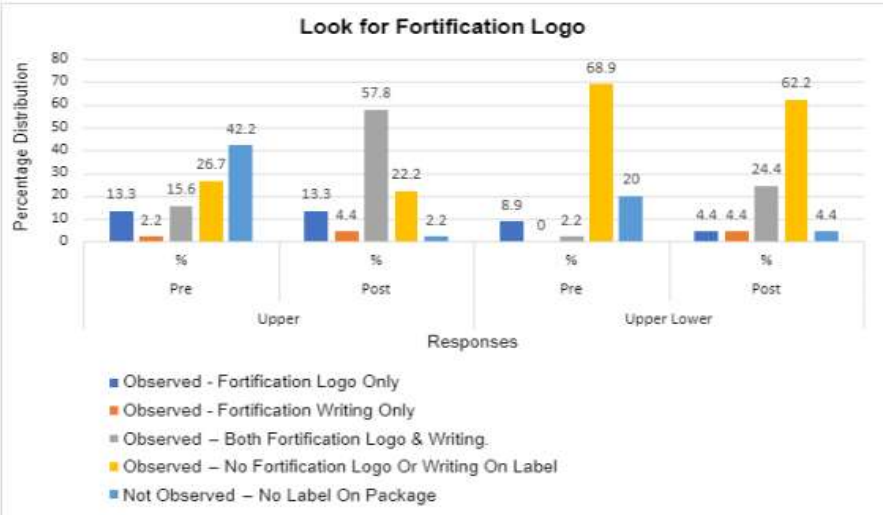

Fig. 5: Percentage distribution of conservation documented for fortification logo for oil

To determine what percentage of the product shares are fortified and whether the education intervention persuaded the participant families to look for the fortification logo on brands of staple foods and its consumption information was gathered from participant families' pre- and post-intervention purchases of various brands of staple foods. It was discovered that, prior to intervention, 42.2% of upper-class families had not observed any label on a package, 26.7% had observed and noticed that no logo was present, only 15.6% had seen it solely both log and writing, and 13.3% had seen a logo only. But after the intervention, an increase in awareness brought about the change, and now upper-class households started observing both writing and logos (57.8%) and started consuming it. In terms of the upper lower class, 68.9% of them were unable to recognise the F+logo on the product, and 20% of them failed to see anything at all while making a purchase. Following the intervention, 24.4% of the upper-lower class has begun to observe and use enriched oil.

Post-nutrition education resources like recipe books gave the study population an idea of how fortified food can be added to daily cooking practices. It also showed a significant (p-value = 0.034) increase in the consumption of fortified oil for the upper class (75.6%) and upper lower (32.8%). Some families didn't buy any brands of enriched oil prior to and after the intervention. These factors can be credited with this.

3.2.2 Fortification Coverage of Wheat Flour

A. Consumption of Wheat Flour

In India, wheat flour is one of the major staple foods. Both upper and upper lower class consumes wheat flour on a regular basis (95.6%) Except for a few who does not consume or consume it sometimes (4.4%)

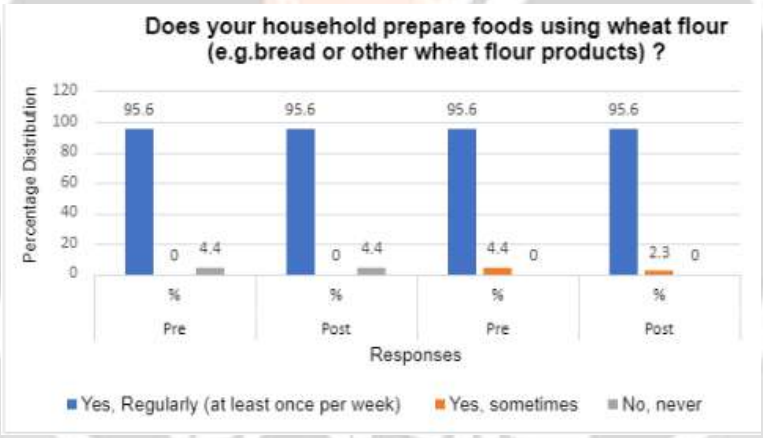

Fig. 6: Percentage distribution of consumption of wheat flour

B. Brands preferred by the study population while purchasing Wheat flour

There was a startling pattern in the brands of wheat flour that were frequently bought. Participants in the interview gave the following reasons: a lack of enriched wheat flour. Chakki atta (20%), Ashirwaad atta (Pre: 24%, Post: 41.4%), and no branded atta (Pre: 28%, Post: 24.15%) were the top three brands that the upper class favored. The majority of upper lower class consumers (Pre: 11.1%, Post: 12.5) bought chakki atta, ashirwaad atta (Pre: 33.3%, Post: 37.5%) No branded atta (Pre: 22.2%, Post: 12.55). In conclusion, it can be claimed that regardless of the participants' socioeconomic class, Chakki atta and Ashirwaad atta were the two most popular brands of wheat flour. The intervention did not influence either socioeconomic class' purchase of fortified wheat flour (p-value>0.05). The purchasing of different brands of wheat flour across socioeconomic classes was observed, however, there was no noticeable difference between pre and post-intervention.

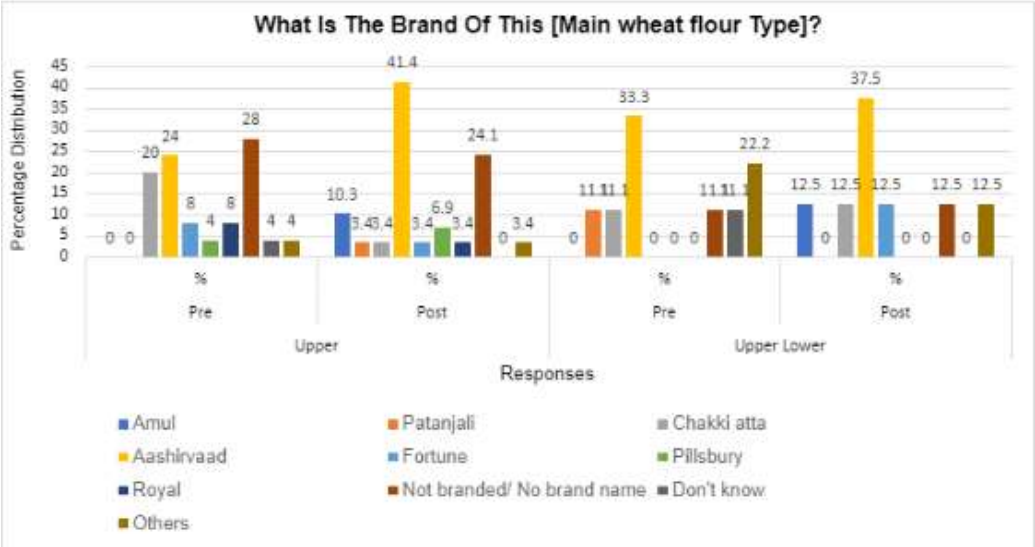

Fig. 7: Percentage distribution of different brand of wheat flour consumed by households

C. Wheat Flour consumption: Fortified vs. Non-Fortified via logo

Information was acquired from participating families' pre- and post-intervention to establish how much of the wheat flour is fortified and whether the education intervention convinced the participant families to check for the fortification logo on brands of staple items. Prior to intervention, it was found that 44% of upper-class families had seen the label on a product, 36% had noticed that there was no logo present, just 12% had noticed both the logo and writing and 8% had noticed the logo alone. But following the intervention, a rise in awareness led to a shift, and upper-class households now began to notice and use both writing and logo (65.5%). In terms of the upper lower class, 44.4% of them had noticed nothing on the label, 22.2% had noticed that the logo was not simple, and just 11.1% had noticed writing and a logo while making a purchase. After the intervention, the upper lower class started to notice that about 50% have looked for the logo and label but didn't see it, while 25% were able to see the login writing and have also bought it.

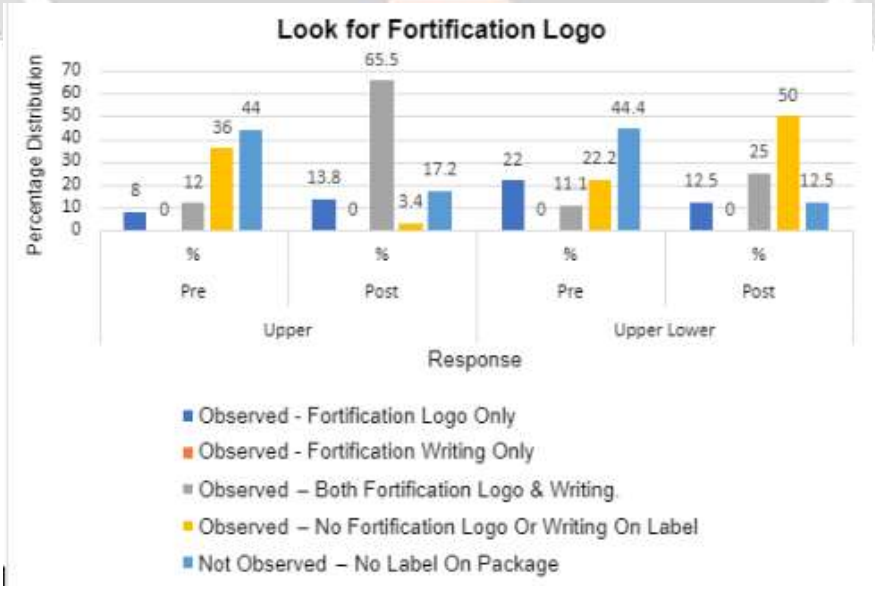

Fig. 8: Percentage distribution of observation documented for fortification logo for wheat flour

3.2.3 Fortification Coverage of Milk

A. Consumption of milk

In India, milk consumption is very high. Both the upper class (previously 93.3%, now 100%) and upper lower class (previously 88.9%, now 91.1%) of the population routinely eat milk

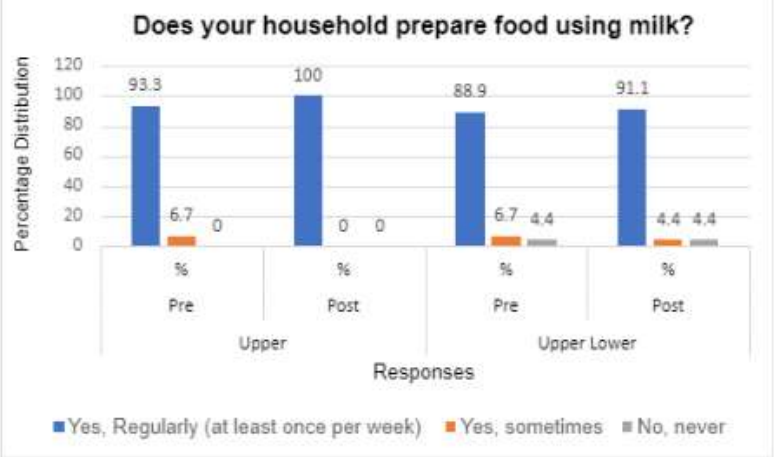

Fig. 9: percentage distribution of consumption of milk

B. Brands preferred by the study population while purchasing of Milk

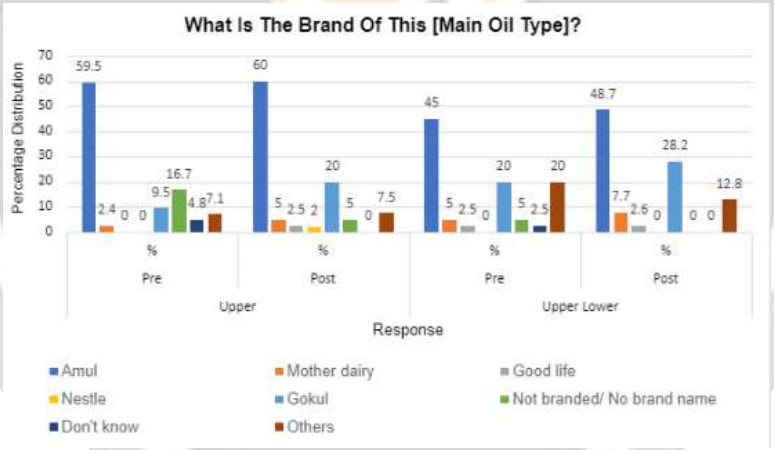

Fig. 10: Percentage distribution of brand types of milk

Amul and Gokul are the two most popular brands of milk. 59.5% of the population were from the upper class before, and 60% were after. and upper lower class takes Amul milk, followed by Gokul from the upper class (Pre: 9.5%, Post: 20%), and upper lower class (Pre: 45%, Post: 48.7%).class (Pre: 20%, Post: 28.2%), and upper-lower class. While some other brands, such as local dairy shops and mother dairy, are also consumed

C. Milk consumption: Fortified vs. Non-Fortified via logo

Prior to intervention, it was noted that, with the exception of two families, neither the upper class nor the upper lower class consumed fortified milk or even noticed the emblem on milk packaging. Following the campaign, there was an increase in upper-class households buying and noticing the logo on fortified milk from 4.8 to 17.5%. Prior to the intervention, 2.5% of the people in the upper-lower class group consumed fortified milk; however, it is only now that 7.5% of them are doing so. Since they couldn't afford it and fortified milk wasn't widely accessible, there was a decrease in the consumption of fortified milk.

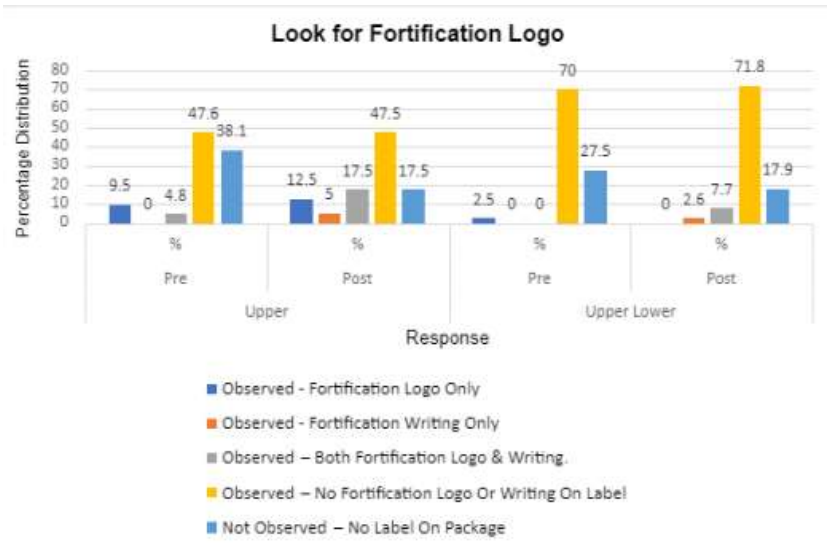

Fig. 11: Percentage distribution of conservation documented for fortification logo for milk

3.2.4 Fortification Coverage of Salt

A. Consumption of Salt

One of the most crucial spices to use when cooking is salt. Every family regularly uses salt. Every household, whether upper class or upper lower class, uses salt every day.

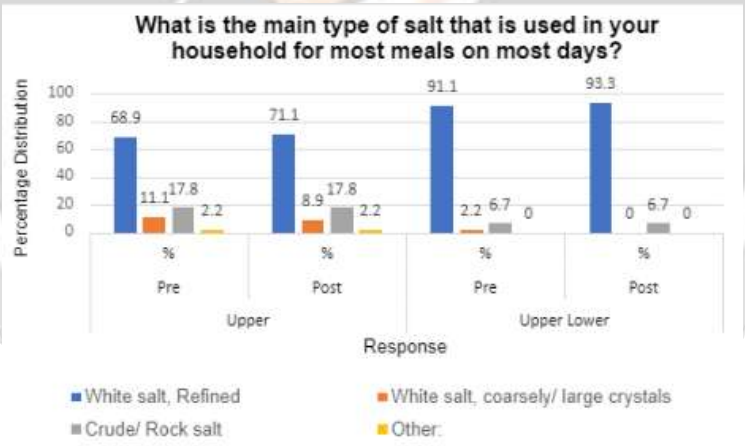

Fig. 12: Percentage distribution of types of salt used across households

There are numerous types of salts available on the market. White salt and pink salt are the two most often used salts. Most of the study's participants—both upper class (pre: 68.9%, post: 71.1%) and upper lower class (pre: 91.1%, post: 93.3%)—consume white refined salt. Crude/rock salt, or upper class (Pre: 17.8%, Post: 17.8%), and upper lower class (Pre: 6.7%, Post: 6.7%), came in second and third, respectively. Interestingly, 2.2% of upper-class households also use reduced sodium salt. Different salt compositions with added nutrients including iron, iodine, and low sodium are available and will benefit consumers. The vast majority of people choose the original packaging from the manufacturer. Households purchasing the original packet will have the chance to correctly read labels and view the fortification logo.

B. Brands preferred by the study population while the purchase of salt

Tata and Pure are the most popular salt brands that are utilized by the entire population in India. Upper class (Pre: 90%, Post: 86.7%) and Upper lower class (Pre: 84.4%, Post: 84.4%), both Consume Tata salt, while consumption of

puro salt was, upper class (pre: 4.4%, post: 4.4%), and upper lower class (pre: 8.9%, post: 4.4%), as the second most popular brands. Some other populace also use brands like Good Life, Ashirvaad, and others.

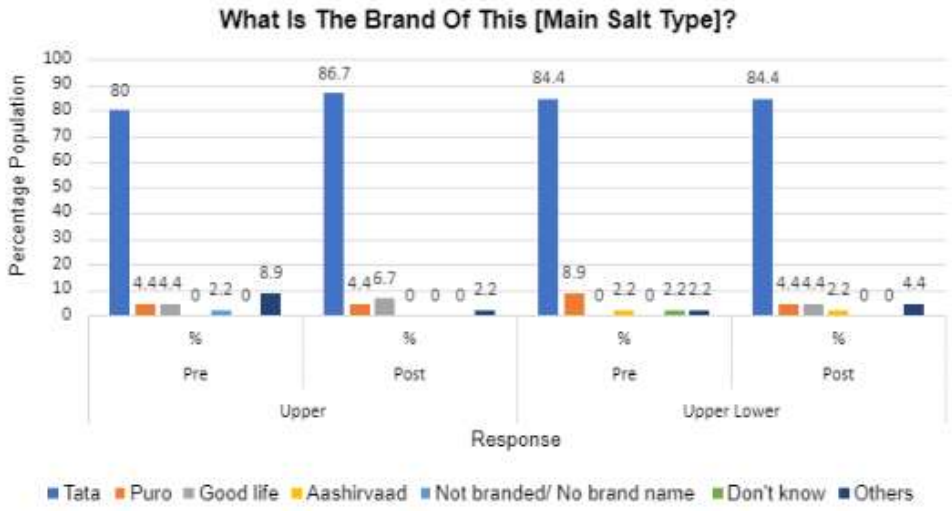

Fig 13: Percentage distribution of brands of salt used across study population

C. Salt consumption: Fortified vs. Non-Fortified via logo

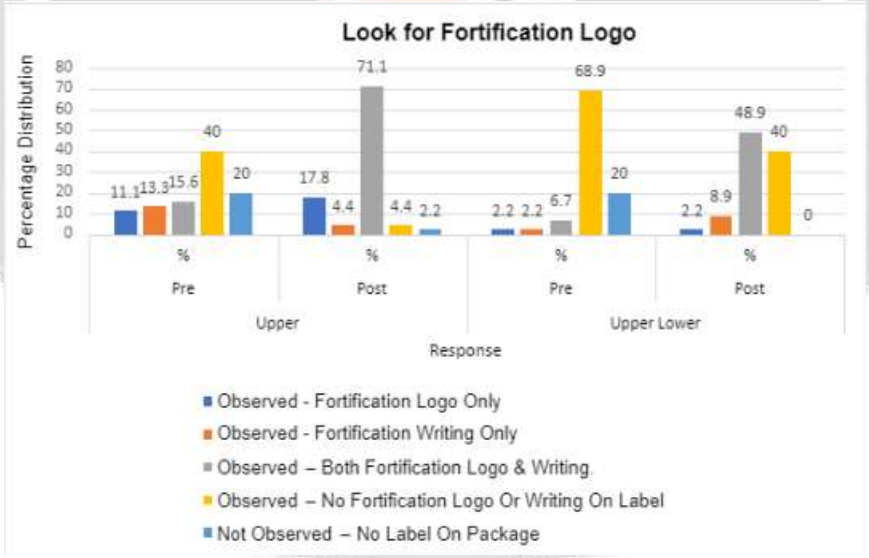

Fig. 14: Percentage distribution of conservation documented for fortification logo for salt

Prior to providing education about fortification through the designed intervention, it was observed that very few participants' households had purchased salt that was not only fortified with iodine but also claimed to be "double fortified with iron & iodine." No matter the socioeconomic status of the families, this pattern was present. From the upper class, 40% of upper-class people consumed fortified salt before the intervention, however only 11.1% of them could recognise the logo, 13.3% could only recognise the writing, and the remaining 15.6% were the only participants who could recognise both the logo and the writing. Out of the remaining 60%, 40% were using regular salt and noticed there was no logo or lettering; 20.5% of them did not read the label or packaging. After the intervention, it was discovered that 17.8% of individuals who were consuming fortified salt had just seen the logo, while 71.1% had noticed both the logo and writing.

However, just 6.7% of the upper middle class had seen logos and written words prior to intervention, whereas 2.2% had only seen logos. The majority of the people (68.9%) had noticed no logo on their salt packets, while 20% had

yet to notice any packaging or labels. Significant changes were seen after the intervention, with 48.9% of the population now consuming reinforced salt and 40% of them did not observe the logo. That means they are not consuming fortified food. In conclusion, it can be seen that after the intervention, upper-class consumers tended to buy fortified staple foods in greater quantities than upper lower-class consumers. The upper and lower classes demonstrated, on average, the smallest shift in their consumption of staple foods towards fortified foods, which may be related to challenges such as a lack of purchasing power, or affordability as well as accessibility and availability issues

4. CONCLUSIONS

Pre and post-intervention analyses in the current study considerably raised the degree of knowledge regarding food fortification among families, regardless of socioeconomic status. A positive shift in the propensity to buy such fortified staple items was observed across the research group across both socioeconomic classes as awareness of food fortification increased. Both socioeconomic groups' consumption patterns of staple foods were found to be quite similar, while consumption of fortified foods was higher in the upper class than in the upper-lower class. Compared to other staple foods, fortified salt and oil were two major foods that practically all socioeconomic groups adopted.

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