The Pharma Innovation Journal 2023; SP-12(9): 662-672

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(9): 662-672

www.thepharmajournal.com
Received: 22-05-2023
Accepted: 26-06-2023

Varshini Shalom S
PG Scholar, Department of Agricultural and Rural Management (CARDS), AC & RI Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Samsai T
Professor, Department of Agricultural and Rural Management (CARDS), AC & RI Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Velavan C
Professor, Department of Agricultural and Rural Management (CARDS), AC & RI Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Prahadeeswaran M
Associate Professor, Department of Agricultural Economics (CARDS), AC & RI Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Raja K
Professor, Department of Seed Science and Technology, AC & RI Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Corresponding Author:
Varshini Shalom S
PG Scholar, Department of Agricultural and Rural Management (CARDS), AC & RI Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

A study on consumer preference towards fortified flour products and constraints encountered in the purchase of fortified flour products in Coimbatore City

Varshini Shalom S, Samsai T, Velavan C, Prahadeeswaran M and Raja K

Abstract
In line of concern towards the health and welfare of the humankind, the issue of malnutrition as to be addressed straightaway. Fortification deployed on the front as solution for Global Hidden hunger. As a step forward fortification of staples is taken as a resort to address malnutrition globally. This study's primary objective was to examine Consumer Preferences towards fortified flour products in proximity of Coimbatore City. Embed with a purpose to explore and analyse the issues hindering consumer preference, this study employed Convenience sampling for pooling the primary data from 150 respondents who have purchased and consumed fortified flour products in the past. Descriptive analysis and Garret ranking were the two statistical techniques used in the analysis. The analysis has revealed the preference of consumers towards the various categories of fortified flour products in existence. The study reflects the impact of inadequate knowledge, product unavailability, and relative high prices to the question of hindering factors in the purchase of Fortified flour product.

Keywords: Fortified flour products, consumer awareness, consumer preference, brand awareness, constraints for the purchase of fortified flour

Introduction

Fortification is the purposeful addition of one or more micronutrients (such as vitamins and minerals) to a food or condiment in order to enhance the nutritional value of the food supply and promote public health. Over 90% of the entire amount of cereal consumed worldwide is made up of wheat, maize, and rice. The addition of micronutrients like iron and folic acid to these basic foods not only improves diet quality but also effectively and affordably reduces malnutrition among a huge portion of the population. Health organizations have mandated wheat and maize fortification in the mills as a result of the low uptake of dietary supplements and other Nutraceuticals owing to lack of understanding and additional expense. The global market for fortified foods is expected to reach USD 127.2 billion in 2021 with a 6.3% CAGR. The fortified flour market alone (Global Market Estimates, 2022) is responsible for 8.5% of the 6.3% CAGR in the overall fortified food industry. Wheat flour, maize flour, rice flour, and more recently millets and multigrains are available on the fortified flour market. As per FFI Annual Report 2022, the 944 Metric tons of Grains available for global consumption, 130 Metric tons is industrially milled & fortified of the 417 M metric tons of wheat flour available for human consumption globally, 107 M metric tons is industrially milled & fortified. Of the 127 M metric tons of maize flour available for human consumption globally, 11 M metric tons is industrially milled & fortified. Of the 401 M metric tons of rice flour available for human consumption globally, 12 M metric tons is industrially milled & fortified. 92 nations throughout the world have laws requiring the fortification of at least one industrially milled cereal grain.

Food fortification is recommended by India's 10th, 11th, and 12th Five Year Plans, the POSHAN Abhiyan (National Nutrition Mission), and the Anaemia-Mukt Bharat Mission as a crucial technique to combat micronutrient deficiency. (2017 TATA TRUSTS Report). In the regions of India where wheat is grown (North, West, and Central India), wheat is consumed as handmade chapattis or rotis (unleavened flat bread), which are produced from whole wheat flour that has been specially milled. The consumption of wheat is anticipated to be 104 MMT in 2022–2023 (Indian Statista, 2022). Therefore, wheat flour is chosen as an appropriate fortification vehicle to raise the general population's nutritional status.

Likewise given that rice is the main food consumed by 65 percent of Indians and reaches the most vulnerable and impoverished sections of society, it may be thought that rice fortification has the best potential to fill the gap in present staple food fortification initiatives. Through the Public Distribution System (PDS) and the efforts of TATA Trusts, fortified wheat flour and rice are being distributed throughout India. Firms like ITC, HUL, Cargill and Patanjali has started fortification of their flagship brands.

The moment has come to go deep under the data, analyze customer preferences, search for constraints that hinder the choice of consumers, and act accordingly. By delving so deeply into the insights of consumer behavior in the food market, opportunities could be evaluated and strategies could be developed to maximize the use of the current customer base and to reach a high-fairing consumer base supported by reliable data and consumer analysis. The research was advanced to explore the specified goals.

Research Objectives

The research objectives of this study are

- To determine the consumer preference towards Fortified Flour Products in Coimbatore City.
- To examine the constraints faced by the consumers for the purchase of fortified flour products.

2. Review of Literature

Ares *et al.* (2008) [2] found that lack of nutritional knowledge limited the acceptance of functional foods and suggested the need to assure that consumers are aware of the health benefits that are expected from functional foods.

Siro *et al.* (2008) [24] reported that Consumer acceptance of the concept of functional foods has been determined by a host of factors such as primary health concerns, consumers' familiarity with the ''functional food'' concepts and with the functional ingredients, the nature of the carrier product, the manner of health effect communication, etc.

Mullie *et al.* (2009) [14] conducted a study on cultural, socioeconomic and nutritional determinants associated with functional food consumption pattern among 5000 military men of Belgium found age, physical activity, level of education, use of vitamin supplements and cultural background are predictors of functional food consumption patterns.

Annunziata and Vecchio (2010) [3] described that consumer acceptance of the idea of functional foods and a deeper knowledge of its causes are crucial success factors for market orientation, development, and effectively negotiating market opportunities.

Pounis *et al.* (2011) [9] reported that Consumer perception on iron fortified foods is associated with nutrition knowledge and highlight the importance of focused nutrition education in consumer informed choices.

Buyuk Kargoz *et al.* (2014) [25] investigated the consumers awareness, acceptance, and attitude towards functional food in turkey and the result of the study indicated that socio demographic characters influenced the consumer awareness. The study also posited that consumer with high level of university education were more likely to consume probiotic and cholesterol lowering products. In organophilic attributes, taste is the most important factor that affected consumer's choice.

Jain *et al.* (2014) [23] has evaluated consumer behaviour and attitudes regarding the consumption of functional food and measured consumer willingness to pay for functional foods containing special health claims. Consuming less fat and eating more vegetables and fruits has increasingly become food habit of the respondents owning to lifestyle changes.

Kasankala *et al.* (2018) [12] described that awareness of food fortification among Mother/Child Caretakers was quite poor and it was estimated that 7.9% had heard about food fortification. The health care providers were the primary source of knowledge about food fortification reported by child caretakers who had heard about it. This study's findings also demonstrated that income, level of education, and age of child caretakers had no effect on knowledge and awareness of food fortification. The study found that there is a need of aggressive social mobilisation effort to raise awareness among Mother/Child Caretakers.

Battalwar and Chavan (2017) [17] described that almost all male participants in Mumbai city had a high level of awareness about fortified food and they learned about it through friends, relatives, internet and media. The fortified foods were consumed in a healthy manner, and this was mostly attributed to their favourable health effects and they conclude that there is a rising tendency towards the consumption of fortified foods in modern society.

Shamal and Mohan (2017) [22] stated that the attitudes of consumers towards fortified foods and beverages were influenced by factors such as age, gender, education, income, and employment. Health consciousness also plays a significant role in shaping people's opinions on these products. Subjective norms, such as the opinions of doctors, nurses, and friends and family, also influence purchase intentions. Additionally, labelling is an essential aspect that impacts consumer buying decisions.

Rekha and Chawan (2017) [17] in their work on awareness and consumption of fortified foods among adult consumers in Mumbai found the attitude of respondents towards consumption of fortified foods was mainly due to health benefits and affordable prices.

Anjuli *et al.* (2018) [1] in their review on food fortification a nutritional management strategy in India concluded that even though trials conducted with fortified foods in India mostly were found having positive results to improve the nutritional status there is sufficient scope and necessity to broaden the trial design including the population of different age groups and socioeconomic status with special emphasis on female of childbearing age and geriatric population.

Darnton-hill and Nalubola (2018) [6] suggested that political support for food fortification campaigning is crucial, as is increasing consumer knowledge of the seriousness and consequences of vitamin deficiencies. Otherwise, the sustainability and role of food fortification as a complementary approach is at risk

Clark *et al.* (2019) [5] reported that 51% of the sample were able to state fortified food products and the attitude towards fortified foods was favourable with 63% of the sample size by responding that the foods need to be fortified and complement existing market offerings.

Wanyama *et al.* (2019) [26] shed light that consumers welcome micronutrient-fortified foods but the willingness to pay is meagre through her study conducted amongst the poor consumers of Africa for purchase, willingness & ability to pay for nutritionally enriched foods.

De Groote *et al* (2018) [7] found that food fortified was preferred over instant, premix and wholegrain pearl millets. Willingness to pay higher for fortified foods were influenced by product information, still keeping the cost effective.

Linda *et al.* (2020) [13] described that the idea of adding vitamins and minerals to food is well-known, only a few consumers are familiar with the term "fortification". When compared to men, women were more likely to be aware of programmes for food fortification and also found that consumer knowledge of food fortification is highly influenced by age, family composition, and occupation level and the results of their study implied that formal education promotes knowledge of nutritional issues.

The study of Premkumar and Garg (2020) [15] indicates low levels of knowledge about micronutrient deficiencies and the availability of fortified staple foods.

Begum and Robuil (2021) [4] found that the overall knowledge level and consumption rate of vitamin A fortified edible oils and rice is poor especially in rural and slum populations in Tangail Sadar Upazila. Lack of knowledge about vitamin A fortified rice and oils accounted solely for poor consumption. Knowledge level about vitamin A fortified edible oils and rice and consumption rate were found statistically significantly (p<0.05) with participant's place of residences, education level and monthly income.

Ahuja and Sheth (2021) [18] described in their study that although 33% of the individuals were aware of the term "fortified foods," only 28% were able to name the right response when asked about it. Broadcast media, which includes radio and television, was the main source of information. Out of 375 participants, 89 marked the fortification logo as the right option. However, more individuals lacked knowledge about the food sources of fortified foods.

Rizwan *et al.* (2021) [20]. In their study revealed consumers' attitudes toward Zn-biofortified wheat and the determining factors for its acceptance and the results regarding sensory perceptions rating distribution illustrate that participants liked Zn-biofortified wheat in the context of appearance and aroma. In contrast, conventional wheat scored more concerning texture and taste. While taste factor found non-significant to Zn-biofortified when they asked for trading with conventional wheat. Moreover, when the participants were asked to trade choices, i.e., conventional to Zn-biofortified wheat, many were ready to get Zn-biofortified wheat. In addition, socioeconomic factors were also found to influence Zn-biofortified wheat acceptance among participants. The findings recommend that Zn-biofortified wheat has a scope of acceptance in Pakistan. Therefore, efforts should educate the people about the significance of this variety, and its availability must be ensured in the market.

Rokeya Begam *et al.* (2021) [4] reported that awareness and consumption of rice and edible oils enriched with vitamin A are lower in rural and slum regions than in urban and semi-urban areas. Effective nutritional education programmes should be implemented to inform people of rural and slum areas about foods fortified with vitamin A. To help people realise the value of consuming rice and edible oils supplemented with vitamin A, several health promotion strategies must be implemented.

Rani and Virginia (2022) [16] reported that study conducted in Mumbai among the sample respondents of 18 to 60 years found that there exists poor awareness and consumption of fortified foods. But the majority of the male respondents in Mumbai city had a high level of awareness about fortified foods. They gained knowledge about fortification through friends, relatives, the internet, and the media. The fortified foods beneficial impacts on health were regarded as the key factor in the fortified foods consumption. Foods that have been fortified were becoming increasingly popular in modern countries.

Sahu *et al.* (2023) [21] found that Staple foods are fortified through existing government nutrition programs or other authoritative bodies with the objective of overcoming endemic nutritional diseases using common food as vehicles, including salt fortification with iodine, Double Fortified Salt (with iodine and iron), milk, and rice fortification (with Vitamin A). This has resulted in the prevention of goitre and Vitamin A deficiencies in India.

3. Research Methodology

The Coimbatore city was purposively selected as the study region for studying the consumer preference of fortified flour products due to its significant population and market size besides the city's record for having the most retail outlets. The existing infrastructure and awareness of fortified flour products in this city made it conductive for gathering feedback and analysing consumer perceptions and so the research study aims to study the consumer preference towards fortified flour products. Further, the sample respondents for this study were selected using convenience sampling method from different regions of Coimbatore city who purchased fortified flour products in supermarkets, hypermarkets, and other retail formats and online platforms. Primary Data was collected from 150 consumers through personal survey. The survey was conducted during the months of July and August 2023. Tools used for data analysis were Percentage analysis for analyzing consumer preference and consumption pattern, and Garret ranking technique to identify the issues that hinder the purchase of fortified flour products.

4. Results and Discussions

(A) Demographic Details

The demographic characters namely gender, age, education, occupation, family type, family size and family income of the sample respondents are listed in Table 1. Therewith, we could infer that the majority of the samples were Male respondents (65.33 percent) followed by Female (34.67 percent). On a scale of age factor, majority of the respondents fall between 51-60 (45.34 percent) followed by 21-30 (23.33 percent), 41-50 (18 percent), 31-40 years (9.33 percent), and 4 percent of the respondents were above 60 years while no respondents were of less 20 years. As in line with the literacy rate of the Coimbatore city, the educational status of the sample respondents divulge that majority of them were Postgraduates (46.67 percent) followed by Undergraduates (44.66 percent), Ph. D (4.67 percent), Higher Secondary Education (4 percent) and none of the respondents were illiterates or with only a primary/secondary education. In terms of Occupation, 30.67 percent of the respondents are in Private sector while 28 percent of the respondents are in Public sector. 25 percent of the sample size were of Business class, 7.33 percent were Homemakers while 5.33 of the respondents are students. Almost 2.67 percent of them are retired and 0.67 percent facing unemployment. Speaking of the marital life of the respondents, 76.67 percent are married while the remaining percent of 23.33 are not married yet. Highlighting the family type, 62 percent of the surveyed population were of nuclear category without elders while 27.33 percent were of nuclear category with elders and a 10.67 percent of the respondents lived jointly. As for the size of the family 49.33 percent were a family of 4 members, 26 percent of category equal to/Less than 3 members and 24.67 percent with a size of Equal to/More than 5 members. In regard to the financial setup of the respondents' monthly income, 61.33 percent of the respondents' earnings were above 1 Lakh per month followed by 14.67 percent earned anywhere between 50,000-75,000, 14 percent had a monthly income of 75,000-1 Lakh while 8 percent fell under the category of 40,000-50,000 income with negligible percent (0.67) having a pay less than 10,000 monthly.

(B) Consumer Awareness

Table 1: Demographic details of sample respondents

S. No.	Characteristics	Category	No of Sample respondents(n=150)	Percentage to Total
1	Gender	Male	98	65.33
		Female	52	34.67
	Total		150	100
2	Age (In years)	Up to 20	0	0
		21-30	35	23.33
		31-40	14	9.33
		41-50	27	18.00
		51-60	68	45.34
		Above 60	6	4.00
	Total		150	100
3	Education	Illiterate	0	0
		Primary Education	0	0
		Secondary Education	0	0
		Higher Secondary Education	6	4
		Undergraduate	67	44.66
		Postgraduate	70	46.67
		Ph.D.	7	4.67
		Others	0	0
	Total		150	100
4	Occupation	Private sector	46	30.67
		Public sector	42	28
		Business	38	25.33
		Student	8	5.33
		Retired	4	2.67
		Homemaker	11	7.33
		Unemployed	1	0.67
	Total		150	100
5	Marital Status	Married	115	76.67
		Unmarried	35	23.33
	Total		150	100
6	Family Type	Nuclear without elders	93	62
		Nuclear with elders	41	27.33
		Joint	16	10.67
	Total		150	100
7	Family Size	Less than/Equal to 3 members	39	26
		4 members	74	49.33
		More than/ Equal to 5 members	37	24.67
	Total		150	100
8	Family Income (per month)	Below 10000	1	0.67
		10001-20000	0	0
		20001-30000	0	0
		30001-40000	2	1.33
		40001-50000	12	8
		50000-75000	22	14.67
		75000-1 Lakh	21	14
		Above 1 Lakh	92	61.33
	Total		150	100

Table 2: Level of awareness about fortified flour products

S. No	Awareness level	No of Sample Respondents (n=150)	Percentage to Total
1	Highly Aware - I am well-informed about fortified flour products, its benefits and actively seek it out when making purchasing decisions	11	7.33
2	Moderately Aware - I have some knowledge about fortified flour products and its advantages, but I may not always prioritize it when buying flour products	72	48
3	Less Aware - I have limited knowledge about fortified flour products and its benefits and it doesn't influence my purchasing decisions	67	44.67
		150	100.00

We could infer from the Table 2, 46.67 percent of the sample respondents were Moderately Aware of Fortified Flour products yet they didn't prioritize its usage over various reasons. Equally 46 percent of the respondents had low level of awareness about Fortified Flour products. Strikingly only 11 percent were highly aware of fortified flour products.

Table 3: Source of Awareness

S. No	Source of Information about Food Outlets	No of Sample respondents (n=175)	Percentage to Total
1	Television – Commercial Advertisements	16	10.67
2	Government campaigns	5	3.33
3	Print Media - Newspapers/Magazine	43	28.67
4	Social Media	12	8
5	Online articles/blogs	12	8
6	Word of Mouth	36	24
7	Sales promotions	2	1.33
8	PDS	1	0.67
9	Health Professionals/Nutritionist	11	7.33
10	Self-exploration	12	8
	Total	150	100

Table 3 enlists the headstream of information promulgation to the consumer population. For almost 28.67 percent of survey population Print media has been the prime source of awareness followed by 24 percent of them were informed about Fortified Flour products through Word of Mouth, 10.67 percent through Commercial Ads on TV, 7.33 percent came to know of the enriched flours through Health Professionals/ Nutritionists. An equal percent of population (8 percent each) had their info portal via Social Media and Online articles/blogs. Another 8 percent of the respondents were of self-exploring when it comes to information seeking. 3.33 percent were introduced to such an existence of fortified foods through Government campaigns and 0.67 percent via PDS. Sales promotions has impacted the level of information upon 1.33 percent of the survey size.

Table 4: Fortified Flour Product awareness amongst the consumers

S. No	Fortified Flour Products available in the Market	No. of Sample Respondents	Percentage to Total (N=150)
1	Fortified Wheat Flour	147	98
2	Fortified Rice Flour	46	30.67
3	Fortified Maize Flour	8	5.33
4	Fortified Multigrain Flour	64	42.67

Upon an equal chance of enquiry to 150 respondents for each of the Fortied flour products individually Table 4. Placards that 98 percent of the respondents were aware of Fortified Wheat Flour while 64 percent of the respondents were aware of Fortified Multigrain Flour. Fortified Rice Flour was familiar to a percent of 30.67 whereas only 5.33 percent of the respondents were aware of the prevalence of Fortified Maize Flour.

Table 5: Consumer' awareness about the nutrients added to Fortified Flour Products

S. No	Nutrients	No. of Sample Respondents	Percentage to Total (N=150)
1	Iron	31	20.67
2	Vitamin B 12	32	21.33
3	Folic Acid	19	12.67
4	All the above	68	45.33
Total		150	100.00

As per the regulations of the FSSAI, staples and flour products are topped up with nutrients by means of Fortificants. As a part of consumer awareness, a check of nutrients presence in the flour as per consumers knowledge was tested to reveal that 68 percent of the respondents were aware of all the stated nutrients in the mixture. 21.33 percent were aware of Vitamin B12 in the mixture, 20.67 of the total percentage could only think of Iron as supplements into the mixture. 12.67 percent knew of the proximity of Folic Acid in the Fortified Flour products.

Table 6: Consumer's checklist for the package labels

S. No	Contents on the Pack	No. of Sample Respondents (out of 150)	Percentage to Total (N=150)
1	Date of Manufacture	39	26
2	Expiry Date	107	71.3
3	Fortification logo	29	10.3
4	Nutritional Content	65	43.3
5	Net weight	81`	54
6	MRP	92	61.3
7	Vegan/Non vegan signs	9	6
8	fssai details	11	7.3
9	Brand – Product name	96	64
10	All the above	42	28

Table 6 is a checker list of the contents that consumer look for while purchasing fortified flour products. Out of 150 respondents, 39 of them do look date of manufacturing, 107 has the habit of checking the Expiry date, 29 do look for Fortification logo, with 65 respondents scanning for Nutritional content, 81 peeks for net weight and 92 for MRP. Vegan/Non vegan signs were checked upon by only 9 respondents while 11 respondents did look for fssai details. 96 of the sample respondents has the habit of checking the Brand – Product name before purchase. While all the above said labels were thoroughly checked upon by only 45 of the respondents.

Table 7: Consumer' awareness of Product Availability in the market

S. No	Fortified Flour Products	Category	No. of Sample Respondents (n=150)	Percentage to Total
1	Fortified Wheat Flour	Available	146	97.33
		Not Available	0	0
		Maybe	4	2.67
	Total		150	100.00
2	Fortified Rice Flour	Available	44	29.33
		Not Available	0	0
		Maybe	106	70.67
	Total		150	100.00
3	Fortified Maize Flour	Available	0	0
		Not Available	45	30
		Maybe	105	70
	Total		150	100.00
4	Fortified Multigrain Flour	Available	72	48
		Not Available	2	1.33
		Maybe	76	50.67
	Total		150	100.00

Categorically, 97.33 percent were aware of the availability of Fortified Wheat Flour on a commercial scale while 2.33 percent had only a guess of its availability and none stated negative. The availability of Fortified Rice flour in the market was assured by 29.33 percent while 70.67 percent supposed its existence in the market. Almost 30 percent of the respondents were sure about the non-availability of Fortified Maize Flour in the Indian market while 70 percent was sceptical of its prevalence. Half the respondents supply reckoned the prevalence of Fortified Multigrain Flour while 48 percent was sure about its market presence with only 1.33 percent claims of its non-availability.

C) Brand Awareness

Table 8: Level of Awareness of Brands in Fortified Flour Products

S. No	Awareness level	No of Sample respondents (N=150)	Percentage to Total
1	Highly Aware - I have thorough knowledge about different brands of the fortified flour products	4	2.67
2	Moderately Aware - I have some knowledge about the brands of fortified flour products	33	22
3	Less Aware - I have limited knowledge about the brands providing fortified flour products	113	75.33
		150	100.00

Table 8 recounts the Brand Awareness and its equation of levels of Fortified Flour products. The Product awareness already in regard, brand awareness is charted to flash the brand awareness is low with 75.33 percent. 22 percent of the respondents have moderate level of awareness when it comes to brands within fortified flour products and only 2.67 percent of them are highly aware of the brands prevalent.

Table 9: Consumer awareness in Brands of Fortified Wheat Flour

S. No	Brands of Fortified Wheat Flour	No of Sample respondents(n=150)	Percentage to Total
1	Aashirvaad (Namma Chakki)	140	93.33
2	Pilsbury	56	37.33
3	Annapurna	62	41.33
4	Patanjali	75	50.00
5	Harmony Gold	31	20.67
6	Vitamin Plus	14	9.33
7	BB Royal	28	18.67
8	Organic Gyaan	15	10
9	Gilco	1	0.67
10	Kumar Brand	0	0.00
11	Brands Not available in the market	0	0.00
12	Not aware of any of the brands	2	1.33

Elaborating the brand awareness of Fortified Wheat flour among the city consumers, Aashirvaad is popular with a score of 93.33 percent of total survey population seconded by Patanjali – 50 percent, Annapurna - 41.33, Pilsbury – 37.33 percent. Brands like Harmony Gold, BB Royal, Orgaic Gyaan, Vitamin Plus was known in and around the market. While Kumar brand was not even known to a smaller extent.

Table 10: Consumer awareness in Brands of Fortified Rice Flour

S. No	Brands of Fortified Rice Flour	No of Sample respondents (N=150)	Percentage to Total
1	Daawat	18	12
2	Asbah	1	0.67
3	Sri Lohita	9	6
4	Brands Not available in the market	9	6
5	Not aware of any of the brands	120	80

A major share of population is not aware of any of the brands concerning fortified rice flour, whereas only 12 percent are familiar with Daawat, 6 percent with Sri Lohita, 6 percent of the population claim none of the above said brands are available in any of the accessible markets.

Table 11: Consumer awareness in Brands of Fortified Maize Flour

S. No	Brands of Fortified Maize Flour	No of Sample respondents (N=150)	Percentage to Total
1	Brands Not available in the market	27	18
2	Not aware of any of the brands	123	82
	Total	150	100.00

82 percent are unaware of any of the brands when it comes to Fortified Maize flour while the remaining 18 percent claim the unavailability of any branded product incase of Fortified Maize flour.

Table 12: Consumer awareness in Brands of Fortified Multigrain Flour

S. No	Brands of Fortified Multigrain Flour	No of Sample respondents(n=150)	Percentage to Total
1	BB Royal	50	33.33
2	Brands Not available in the market	0	0
3	Not aware of any of the brands	100	66.67
	Total	150	100.00

Nearly 66.67 percent are unaware of any brands concerning Fortified Multigrain flour products while the remaining 33.33 percent do know of BB Royal.

D) Brand Preference

Table 13: Consumer Preference of Brands in Fortified Wheat Flour

S. No	Brands of Fortified Wheat Flour	No of Sample respondents(n=150)	Percentage to Total
1	Aashirvaad (Namma Chakki)	94	62.67
2	Pilsbury	10	6.67
3	Annapurna	8	5.33
4	Patanjali	19	12.67
5	Harmony Gold	5	3.33
6	Vitamin Plus	2	1.33
7	BB Royal	3	2
8	Organic Gyaan	7	4.67
9	Gilco	0	0.00
10	Kumar Brand	0	0.00
11	Others	0	0.00
12	Never purchase (I don't prefer)	2	1.33
	Total	150	100.00

Aashirvaad was the most preferred (62.67) brand in case of Fortified Wheat flour while Vitamin Plus was the least preferred by 1.33 percent and with no preferences for either Gilco or Kumar Brand. Likewise no upvotes for brands other than enlisted.

Table 14: Consumer Preference of Brands in Fortified Rice Flour

S. No	Brands of Fortified Rice Flour	No of Sample respondents(n=150)	Percentage to Total
1	Daawat	7	4.67
2	Asbah	1	0.66
3	Sri Lohita	3	2.00
4	Other Brands	0	0.00
5	Brands Not available in the market	7	4.67
6	Never purchase (I don't prefer)	132	88.00
	Total	150	100.00

A major share of population never purchases fortified rice flour, whereas only 4.67 percent are familiar with Daawat, 2 percent with Sri Lohita, 4.67 percent of the population claim none of the above said brands are available in any of the accessible markets.

Table 15: Consumer Preference of Brands in Fortified Maize Flour

S. No	Brands of Fortified Maize Flour	No of Sample respondents(n=150)	Percentage to Total
1	Brands Not available in the market	14	9.33
2	Never purchase (I don't prefer)	136	90.67
	Total	150	100.00

90.67 percent never prefers to purchase Fortified Maize flour while the remaining 9.33 percent claim the unavailability of any branded product in case of Fortified Maize flour.

Table 16: Consumer Preference of Brands in Fortified Multigrain Flour

S. No	Brands of Fortified Multigrain Flour	No of Sample respondents(n=150)	Percentage to Total
1	BB Royal	37	24.67
2	Other Brands	0	0.00
3	Brands Not available in the market	1	0.67
4	Never purchase (I don't prefer)	112	74.66
	Total	150	100.00

24.67 percent of the survey population prefers BB Royal while nearly 74.66 percent never purchases Fortified Multigrain flour products

E) Consumer Preference

Table 17: Decision maker of purchases

S. No	Decision making Personnel	No of Sample respondents(n=150)	Percentage to Total
1	Male Adult	26	17.33
2	Female Adult	96	64.00
3	Children	2	1.34
4	Joint Together	26	17.33
	Total	150	100.00

From Table 17. We could conclude that 64 percent of the decision makers were Female adults when it comes to purchase of Fortified Flour products.

Table 18: Preference of mode of purchase

S. No	Mode of Purchase	No of Sample respondents(n=150)	Percentage to Total
1	Offline Physical store	82	54.66
2	Online Platform	7	4.67
3	Both	61	40.67
	Total	150	100.00

As stated in Table 18. A higher percentage of population (64 percent) preferred to purchase Fortified Flour products in Physical stores while only 4.67 percent preferred the online mode of purchase. Yet 40.67 percent of them preferred both the modes for effectuating the purchase.

Table 19: Physical Retail format of purchase

S. No	Retail formats – Physical store	No of Sample respondents(n=150)	Percentage to Total
1	Supermarkets/Hypermarket	104	69.33
2	Departmental Store	25	16.67
3	Brand outlets	15	10.00
4	Never purchase in store	6	4.00
	Total	150	100.00

Specifically for preference of physical stores, 69 percent of the survey population purchased Fortified Flour products from Supermarkets/Hypermarkets followed by 16.67 percent making purchases at Departmental stores. 10 percent made their purchases at Brand outlets while 4 percent never preferred in-store mode of shopping.

Table 19: Online Retail format for purchase

S. No	Retail formats – Online	No of Sample respondents(n=150)	Percentage to Total
1	Brand website	7	4.67
2	Online Grocers (Amazon, Flipkart, etc.)	57	38.00
3	Store Apps	9	6.00
4	Never purchase online	77	51.33
	Total	150	100.00

Table 19 clarifies the consumers' preference amongst the online platforms for purchasing fortified flour products wherein 51 percent never make online purchases while 38 percent prefer online grocers like Amazon etc.

Table 20: Consumers Opinion

S. No	Parameters	In-Store	Online Shopping	Both	Neither In-store or Online	Total
1	Availability of the desired product/brand	69	57	24	0	150
		46	38	16	0	100.00
2	Variety of Product/Brands	57	70	23	0	150
		38	46.67	15.33	0	100.00
3	Convenience	93	25	32	0	150
		62	16.67	21.33	0	100.00
4	Offers/Discount	70	57	23	0	150
		46.67	38	15.33	0	100.00

Taking consumers opinion into considerations, it is inferred that 46 percent do find fortified flour products available in-store, 38 percent' choice of online while 16 percent confirms the availability of the product on both the platforms. Concerning the prevalence of product/brand varieties in fortified flour products, 46.67 percent chose online mode followed by 38 percent choosing in-store and 15.33 checking both. 62 percent of the sample size felt in-store being convenient to online mode. With tactics of retailers/grocers 46.67 percent of the consumers feel offers/discounts are more in-store.

F) Consumption Pattern

Table 21: Frequency of Purchase

S. No	Frequency of Purchase	Fortified Wheat Flour		Fortified Rice Flour		Fortified Maize Flour		Fortified Multigrain Flour	
1	Weekly once	2	1.33	0	0	0	0	1	0.67
2	Two weeks once	0	0	0	0	0	0	1	0.67
3	Monthly once	102	68	2	1.33	0	0	10	6.67
4	Monthly twice	13	8.67	1	0.67	0	0	1	0.67
5	Whenever needed	11	7.33	4	2.66	0	0	16	10.66
6	Rarely	16	10.67	3	2	0	0	7	4.66
7	Just once	4	2.67	1	0.67	0	0	1	0.67
8	Never purchase	2	1.33	139	92.67	150	100	113	75.33
		150	100.00	150	100.00	150	100.00	150	100.00

Table 21 exhibits the Purchase Frequency of the various fortified flour products. On a maximum scale Fortified Wheat flour was bought monthly once by 68 percent of the respondents. 92.67 percent of them never purchased Fortified Rice Flour and none of them purchased Fortified Maize Flour. 75.33 never purchased Fortified Multigrain flour followed by 10.66 percent making purchases whenever needed.

Table 22: Quantity of Purchase

S. No	Quantity of Purchase	Fortified Wheat Flour		Fortified Rice Flour		Fortified Maize Flour		Fortified Multigrain Flour	
1	1 kg	16	10.67	7	4.66	0	0	22	14.67
2	2 kg	53	35.33	3	2	0	0	14	9.33
3	3 kg	39	26	1	0.67	0	0	1	0.67
4	4 kg	21	14	0	0	0	0	0	0
5	5 kg	16	10.67	0	0	0	0	0	0
6	5 - 10 kg	3	2	0	0	0	0	0	0
7	Never purchase	2	1.33	139	92.67	150	100	113	75.33
		150	100.00	150	100.00	150	100.00	150	100.00

Contemplating the purchase quantity of fortified flour products, Fortified wheat flour' maximum purchase quantity was 2 kg by 35.33 percent respondents. Almost 92.67 percent never purchased Fortified Rice flour. With absolute no purchase of Fortified Maize flour embarking a score of 100 percent. Fortified multigrain flour was never purchased by 75.33 percent while 14.33 percent bought 1 kg.

Table 23: Frequency of Consumption

S. No	Frequency of Consumption	Fortified Wheat Flour		Fortified Rice Flour		Fortified Maize Flour		Fortified Multigrain Flour	
1	Once a day	7	4.66	0	0	0	0	18	12
2	Weekly once	22	14.67	1	0.67	0	0	13	8.66
3	Few times a week	82	54.67	2	1.33	0	0	3	2
4	Monthly once	2	1.33	0	0	0	0	1	0.67
5	Few times a month	25	16.67	7	4.66	0	0	1	0.67
6	Rarely	9	6	1	0.67	0	0	0	0
7	Tried Just once	1	0.67	0	0	0	0	1	0.67
8	Never consume	2	1.33	139	92.67	150	100	113	75.33
		150	100.00	150	100.00	150	100.00	150	100.00

As enlisted in Table 23. Frequency of consumption of various fortified flours, Fortified Wheat flour is consumed few times a week by 54.67 percent. 92.67 percent never intakes Fortified Rice flour and 100 percent never consuming Fortified Maize flour. Fortified Multigrain flour is consumed once a day by 12 percent, weekly once by 8.66 percent while 75.33 percent has never consumed so far.

Table 24: Quantity of Consumption

S. No	Quantity of Consumption	Fortified Wheat Flour		Fortified Rice Flour		Fortified Maize Flour		Fortified Multigrain Flour	
1	½ - 1 kg	19	12.66	6	4	0	0	28	18.67
2	1 – 2 kg	79	52.67	4	2.66	0	0	9	6
3	2 – 4 kg	37	24.67	1	0.67	0	0	0	0
4	4 – 5 kg	10	6.67	0	0	0	0	0	0
5	Above 5 kg	3	2	0	0	0	0	0	0
6	Never consume	2	1.33	139	92.67	150	100	113	75.33
		150	100.00	150	100.00	150	100.00	150	100.00

Table 24 states the Consumption quantity of fortified flour products as surveyed. 52.67 percent consumes 1-2 kg of Fortified Wheat Flour per month, 92.67 percent never consumes Fortified Rice flour, 100 percent having never consumed Fortified Maize flour and 18.27 percent consuming ½ -1 kg Fortified Multigrain flour per month on an average.

G) Constraints faced by consumers in pursuit of shopping for Fortified Flour products

At the question, Rank the constraints/factors that hinder the purchase of fortified flour products?

Statements used for Garett's Ranking technique

- Lack of awareness.
- Unavailability of the product.
- Lack of product variety.
- Limited promotions.
- Relatively priced high.
- Non-visibility of fortification logo.
- Cultural barriers & Traditional practices.
- Dietary restrictions.
- Perception of fortified foods as artificial.
- Non importance of reading the contents.
- Swift of lifestyle towards organic products.

Table 25: Issues that hinder the purchase of Fortified Flour Products

S. No	Constraints	Garett Score	Rank
1	Lack of awareness	70.05	I
2	Unavailability of the product	64.19	II
3	Lack of product variety	59.21	III
4	Limited promotions	58.31	IV
5	Swift of lifestyle towards organic products	56.55	V
6	Relatively priced high	53.13	VI
7	Perception of fortified foods as artificial	51.85	VII
8	Non-visibility of fortification logo	51.15	VIII
9	Non importance of reading the contents	50.07	IX
10	Cultural barriers & Traditional practices	46.54	X
11	Dietary restrictions	36.20	XI

Table 25 highlights the issues faced by consumers in the purchase of fortified flour products. Lack of awareness with a Garett score of 70.05 has been listed as the prime constraint seconded by the Unavailability of the product (64.19) in accessible markets especially the store-bought as fortified flour products are not omnipresent in the retailing formats. The third major constraint being the lack of product variety followed by Limited promotions. Swift of lifestyle towards organic products ranked fifth among the constraints forming a chain link with the perception of fortified foods as artificial in the seventh. The sixth restriction being Relatively High priced in comparison to other variants of flour products within same brands. Non-visibility of fortification logo assumes the eight constraint followed by Non importance of reading the contents ranked ninth. Cultural barriers & Traditional practices and Dietary restrictions forms the least of restricting factors.

Conclusions

This study examined how well the sample respondents from Coimbatore city were aware of and used fortified flour products, namely wheat, maize, and rice flour. Additionally, its acceptance and customer impression. Overall, this study provided a track of consumers in the Coimbatore region's knowledge level, acceptance of, and availability of items made with fortified flour products that might be expanded to other locations. By examining these specifics, a comprehensive picture of customer perception, attitude, and preference for the consumption of items made with fortified flour was evaluated and has put forth an eagle view of Consumer Preference as much as possible. It was observed through the study that the level of awareness is moderate in case of fortified flour products, closely followed by low level of awareness indicating the novelty of the concept especially in flour - staples. Of the aforementioned, 98 percent are aware that fortified wheat flour is available, whereas only a very small number are even aware that fortified rice, maize, and multigrain flour are available. Relatively the awareness level is very poor in case of brand awareness of fortified flour products with Aashirvaad taking the limelight with its brand influence for wheat flour. The analysis for Consumer Preference has put forth that almost 92 percent regularly prefer Fortified Wheat flour whereas Fortified Rice Flour, Fortified Maize Flour and Fortified Multigrain Flour are not at all preferred by almost 92.67 percent, 100 percent and 75.33 percent respectively. Thus, it may be said that there is a strong preference for Fortified Wheat Flour. With Print Media and Word of Mouth being the major channels of information, limited promotion is rendered as a constraint. Lack of Awareness, Unavailability of product and lack of product variety forms the major triad issues that hinder the purchase of fortified flour products. Closely attenuated by Swift of consumer' lifestyle towards organic and perception of fortified flour products as artificial has yet another perspective and skepticality.

References

1. Anjuli Sirohi, Aditya Pundhir, Sampat Ghosh. Food Fortification: A Nutritional Management Strategy in India, Innovare Journal of Food Sci. 2018;6(2):1-8.
2. Ares Gastón, Ana Giménez, Adriana Gámbaro. Understanding consumers' perception of conventional and functional yogurts using word association and hard laddering. Food Quality and Preference. 2008 Oct 7;19:636-643
3. Annunziata, Azzurra, Riccardo Vecchio.. "Italian consumer attitudes toward products for well-being: The functional foods market." International Food and Agribusiness Management Review. 2010;13(1030-2016-82823):1-32.
4. Begum, Rokeya, Islam, Robiul. Vitamin a fortified edible oils and rice: The knowledge level and consumption rate among different place of residences in Tangail District, Bangladesh. Journal of Nutritional Science and Vitaminology. 2021;67:13-20. 10.3177/jnsv.67.13.
5. Clark B, Hill T, Hubbard C. Consumers perception of vitamin D and fortified foods, British Food Journal. 2019;121(9):2205-2218.
6. Darnton-Hill Ian, Ritu Nalubola. Fortification strategies to meet micronutrient needs: Successes and failures. Proceedings of the Nutrition Society. 2018;61(2):231-241.
7. De Groote H, Kariuki SW, Traore D, Taylor JR, Ferruzzi MG, Hamaker BR. Measuring consumers' interest in instant fortified pearl millet products: A field experiment in Touba, Senegal. J Sci. Food Agric. 2018 Apr;98(6):2320-2331. DOI: 10.1002/jsfa.8722. EPUB 2017 Nov 17. PMID: 28990670.
   https://www.futuremarketinsights.com/reports/fortified-food-market
8. George D Pounis, Stella Makri, Lazaros Gougias, Haralambos Makris, Marianna Papakonstantinou Demosthenes B Panagiotakos. Consumer perception and use of iron fortified foods is associated with their knowledge and understanding of nutritional issues. Food Quality and Preference. 2011;22:683-688
9. Goel, Rekha. Consumers Awareness regarding Fortification in Food Processing Industry. International Journal of Innovations in Engineering and Management. 2015;4(2):30-35.
   https://static1.squarespace.com/static/5e1df234eef02705f5446453/t/6479fc300d14487cc6b03587/1685716024333/FFI_AnnualReport_2022.pdf
10. Kasankala ML, M Kitunda, DG Mushumbusi, CM Cyprian, WP Meghji, MC Mgoba, *et al.* Knowledge and awareness on food fortification among mother/child caretakers of Kinondoni Municipality, Tanzania. Asian Food Sci Journal. 2018;2(2):1-13.
11. Linda, Amaya Aura, Florence Kyallo, Judith K Okoth, Peter Kahenya, Anselimo Makokha, *et al.* Food fortification: The level of awareness among Kenyan consumers. Journal of Nutrition and Metabolism; c2020.
12. Mullie P, I Guelinck, P Clarys, E Degrave, M Hulens, G Vansant. Cultural, socioeconomic and nutritional determinants of functional food consumption patterns, European Journal of Clinical Nutrition. 2009;63:1290-1296.
13. Premkumar, Garg, Vandana. Consumer Knowledge, Attitude and Practice of using Fortified Food in India: A Study among Women in Urban Delhi; c2020. p. 277.
14. Rani DA, Paul Virginia, Afreen Sana. Fortified Food Consumption and Awareness in Indian Market. International Journal of Research in Engineering and Science. 2022;10(5):1-3.
15. Rekha Battalwar, Akshata Paresh Chavan. A study on awareness and consumption of fortified foods among male adults of Mumbai. International Journal of Advanced Research. 2017;5(11):403-413.
16. Ria Ahuja, Mini Sheth. A cross sectional study on consumer awareness of fortified foods in Vadodara city. Indian Journal of Research. 2021;10(6):85-86.
17. Ritu G, Ajay Gupta. Fortification of foods with Vitamin D in India: Strategies targeted at children. Journal of the American College of Nutrition. 2015;34(3):263-272.
18. Rizwan M, Zhu Y, Qing P, Zhang D, Ahmed UI, Xu H, *et al.* Factors determining consumer acceptance of biofortified food: Case of zinc-fortified wheat in pakistan's punjab province. Front Nutr. 2021 Jun 9;8:647823. DOI: 10.3389/fnut.2021.647823. PMID: 34179055; PMCID: PMC8220091.
19. Sahu, Poonam Singh, Anamika Singh, Anjali Verma, Dileep. Effect of micronutrient fortified food as an Adjuvant in nutritional deficiencies among young Children: A Review. 2023;13:663-672. 10.1729/Journal.33684.
20. Shamal S, Bijuna C Mohan. Consumer behaviour in fortified food choice decisions in India. Nutrition & Food Science. 2017;47(2):1-16.
21. Shikha Jain, Kirti Sharma, Mansi Khadke. Consumer Behaviour towards Functional Foods in India – A Study of Market Drivers and Challenges. IOSR Journal of Business and Management (IOSR-JBM). E-ISSN: 2278-487X, P-ISSN: 2319-7668. 2014;33-40:12.
22. Siro Istvan, Emese Kapolna, Beáta Kápolna, Andrea Lugasi. Functional food. Product development, marketing and consumer Acceptance-A Review. Appetite. 2008;51(3):456-67.
    https://www.tatatrusts.org/our-work/nutrition/food-fortification
23. Celikoglu M, Bayram M, Sekerci AE, Buyuk SK, Toy E. Comparison of pharyngeal airway volume among different vertical skeletal patterns: A cone-beam computed tomography study. The Angle Orthodontist. 2014 Sep 1;84(5):782-7.
24. Wanyama R, Gödecke T, Qaim M. Food security and dietary quality in African slums. Sustainability. 2019 Oct 28;11(21):5999.