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NEXUS BETWEEN SOCIO-ECONOMIC ATTRIBUTES AND FORTIFIED FOOD: A KAP STUDY IN PUNJAB, PAKISTAN

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ABSTRACT

Pakistan experiences high rates of acute malnutrition, with stunting and underweight children surpassing emergency levels. Additionally, micronutrient deficiencies, including iron, vitamin A, and vitamin D, are prevalent among young women. To tackle malnutrition and nutrient deficiencies, food fortification is seen as a viable and promising approach. Food fortification is considered a cost-effective strategy. Despite its potential and the initiation of different Food Fortification Programs in Pakistan, the awareness and usage of fortified food in Pakistan remain insufficiently explored. Exploration of Knowledge, Attitude and Practices (KAP) towards a particular topic is deemed important for its promotion and acceptance. Therefore, in this study Knowledge, Attitude, and Practices of people toward food fortification at the household level in Punjab, Pakistan is investigated. The study covered four randomly selected districts: Lahore, Faisalabad, Multan, and Sargodha. The sample size consisted of 500 households, and respondents were selected using a multistage sampling technique. From each district, one tehsil, five urban Union Councils (UCs), and 25 females from each selected UC were chosen at random, resulting in 125 females from one district and 500 respondents overall. Data were collected through questionnaires and interviews and then analyzed using the Statistical Package for Social Sciences (SPSS). The level of knowledge of study participants about fortified food was relatively low. However, the attitude towards using fortified food was generally positive about the perceived positive impacts of fortified food on health. Regarding practices, respondents mainly used fortified wheat flour and fortified ghee/oil at the household level. Regression analysis revealed that age, education, family size, and occupation were statistically related ($P<0.05$) to their awareness of fortified food. A statistically significant relationship ($P <0.05$) was also established between the socio-economic attributes of respondents and their Knowledge, Attitude, and Practices towards fortified food, thus the null hypothesis was accepted. Moreover, the skill development initiatives for the women to prepare fortified food at the households level can become a source of guidance and motivation for the aspirants of fortified food use.

INTRODUCTION

According to the National Nutrition Survey conducted by UNICEF in Pakistan in 2018, the prevalence of zinc deficiency was found to be 22.1% in females of childbearing age and 18.6% in children under the age of 5. Communities with low socio-economic status are particularly vulnerable to micronutrient deficiencies due to limited access to a diverse range of foods and food insecurity (Brazier et al., 2020). Research by Lowe et al. (2020) revealed that approximately 30% of women of their reproductive age, residing near brick kilns close to Peshawar, have plasma zinc levels below the recommended threshold of 660 µg/L. Additionally, according to the latest report by the World Food Program in 2023, chronic malnutrition affects 40% of children aged between 6 to 59 months. Pakistan's Human Development Index ranking in 2022 was 161 out of 191 countries, indicating developmental challenges. However, the country is making efforts to combat malnutrition and food insecurity through various developmental initiatives.

It is crucial to adopt effective strategies to eliminate the issue of hidden hunger within the most vulnerable populations (United Nations, 2021). The existing methods to enhance micronutrient consumption encompass supplementation, fortification, biofortification, and diet diversification. While all these techniques have the potential to bring about beneficial health effects, their efficacy is influenced by factors such as the context in which they are implemented, adherence, quality assurance, and the availability of resources (Lowe, 2021).

Pakistan, like many other developing countries, is grappling with the challenge of escalating malnutrition and nutritional deficiencies among its population. Despite having abundant food resources, the nation is facing a malnutrition crisis due to factors such as poverty, lack of education, and inadequate healthcare services (USAID, 2020). A notable issue is the high prevalence of stunted growth in Pakistani children, with inadequate maternal nourishment during pregnancy being a significant contributing factor. This concern affects approximately 10 million children in the country (WFP, 2023). Malnutrition refers to a condition where the body does not receive sufficient nutrients to maintain optimal health, leading to various health problems such as impaired growth, weakened immunity, and, in severe cases, mortality (Saunders and Smith, 2010).

A rapid assessment conducted in 15 flood-affected regions revealed that about 33% of children aged between 6-23 months are experiencing moderate acute malnutrition (MAM), while 14% are affected by severe acute malnutrition (WFP, 2023).Poverty remains a significant factor contributing to malnutrition in Pakistan (Arif et al., 2014). According to a report by the World Bank (2023), approximately 37.2% of Pakistan's population falls below the poverty line. Consequently, impoverished families struggle to afford a balanced diet for their children, leading to malnutrition (Shahid et al., 2022). These children, residing in underprivileged conditions, face additional health risks due to inadequate sanitation and infectious diseases, further exacerbating their nutritional deficiencies (Hansen and Paintsil, 2016).

In addition to poverty, another key factor contributing to malnutrition in Pakistan is a lack of education about proper nutrition. Community awareness regarding the importance of a balanced diet is insufficient, and access to information about proper nutrition is limited (Ali and Rahut, 2019). Furthermore, cultural practices like early marriage contribute to malnutrition among girls, who often become pregnant before their bodies have fully developed (Asim and Nawaz, 2018).

Insufficient health services also play a role in contributing to malnutrition in Pakistan. Many health facilities in the country lack the necessary equipment and resources to identify and treat malnutrition. A study by Habib et al. (2021) reported that due to these challenges in healthcare facilities, many cases of malnutrition and related issues go undiagnosed and untreated. On the other hand, effective health services and regular visits by Lady Health Workers (LHWs) have been shown to reduce malnutrition among children aged five years in Pakistan (Shahid et al., 2022). In another study, Puett et al. (2013) found that LHWs achieved over 90% success in combating malnutrition among people in Pakistan.

The consequences of malnutrition are severe and have long-lasting effects. Children who suffer from malnutrition are more likely to experience impaired cognitive development, reduced school performance, and lower productivity in adulthood. Cognitive processes appear to be influenced by both age and nutritional status. Children affected by malnutrition showed subpar performance on assessments evaluating attention, working memory, learning and memory, and visuospatial ability, except for the test measuring motor speed and coordination (Kar et al., 2008). Malnutrition can also lead to compromised immune systems, making individuals more susceptible to illnesses and infections. Moreover, the economic consequences of malnutrition are substantial, leading to increased healthcare expenses and reduced productivity levels (Ijarotimi, 2013).

To address the issue of malnutrition in Pakistan, several measures must be taken. Government efforts should be directed towards reducing poverty, increasing education about proper nutrition, and providing adequate healthcare services. Implementing programs to increase access to nutrient-rich foods, such as fortifying staple foods with essential vitamins and minerals, could also be beneficial. Additionally, establishing programs focused on providing nutrition education to parents and caregivers could help address the problem.

Fortified Foods' Effect on Health

For several decades, the practice of fortifying foods has had a significant positive impact on the health of individuals and communities worldwide. One of the

most significant benefits of fortified foods is their role in reducing nutritional deficiencies (Olson et al., 2021). For example, in many developing countries, iron deficiency is a widespread issue that can lead to anemia, fatigue, and other health problems. Fortified foods, such as iron-fortified cereals or bread, offer an easy and affordable way for people to obtain the iron they need (Kaur et al., 2022). Similarly, fortifying foods with vitamin A can help prevent vision impairment and other health issues associated with a lack of this vitamin in the diet (Hombali et al., 2019). Furthermore, fortified foods can contribute to the reduction of chronic disease risks. Including folic acid in fortified foods can decrease the likelihood of neural tube defects in newborns and has shown potential in lowering the risk of heart disease and stroke among adults. Wang et al. (2019) conducted a study showing a significant decrease in the risk of stroke in patients who underwent folic acid therapy. Additionally, fortified foods can serve as an important source of vitamin D, which is essential for bone health and has been linked to a lower risk of certain types of cancer. Gupta (2014) emphasized the fortification of staple diets with Vitamin A to combat health issues.

Fortified foods can also play a crucial role in addressing health disparities, especially in communities where access to healthy foods may be limited, particularly for those with tight budgets. While adopting fortified food can sometimes increase expenses (Horton, 2006), it offers an affordable way for people to obtain necessary nutrients regardless of their income level. This is particularly important for low-income families with young children, who may be more vulnerable to nutritional deficiencies. However, it is important to acknowledge that fortified foods should not replace a nutritious and balanced diet entirely. While they provide essential nutrients, they should not be relied upon as the sole source of nutrition. Additionally, some fortified foods may contain high amounts of added sugars or sodium, which can have negative health effects if consumed excessively. Data and Vitolins (2016) pointed out that fortification can lead to nutrient intake surpassing safe limits, indicating both advantages and disadvantages of consuming fortified foods. Therefore, while encouraging the continued use and development of fortified foods, it is essential to consider their role alongside a well-rounded and healthful diet, especially in communities where access to nutritious foods may be limited.

The community's perception of fortified foods

Fortified food refers to food that has been enhanced with additional nutrients to improve its nutritional value. People's attitudes towards the use of fortified food vary from country to country and depend on various factors. In certain regions of Pakistan, chronic poverty, frequent disasters, and unstable political and economic conditions contribute to the prevalence of undernutrition and food insecurity (Zareef et al., 2022; USAID, 2020).

Despite overall improvements in food production, economically disadvantaged and marginalized individuals in Pakistan still struggle to afford a sufficient and nutritious diet (USAID, 2020). Inadequate maternal nutrition during pregnancy is a significant factor contributing to malnutrition and the high prevalence of stunting among children in the country (WFP, 2023). Consequently, utilizing fortified food can be an effective approach to address malnutrition and improve the overall nutritional status of the population. However, the attitude of people towards the use of fortified food in Pakistan remains uncertain. Therefore, it is essential to raise awareness about the benefits of fortified food and educate people about its use to improve their nutritional status.

Need of study

Food fortification emerges as a cost-effective and promising solution to combat micronutrient deficiencies. Various studies have highlighted the benefits and cost-effectiveness of food fortification. Enhancing the nutritional content of food through fortification is a crucial approach for promoting long-term health, offering enhanced nutrition, affordability, environmental sustainability, public health advantages, and receiving endorsement from the World Health Organization (Grasso et al. 2023; Olson et al., 2021; de Lourdes et al., 2012). Various systematic reviews have reported that food fortification improved the socio-economic conditions and reduction of anaemia in the general population (Keats et al., 2019; Best et al., 2011; Eichler et al., 2012; Ramakrishnan et al., 2011; Das et al., 2013). Studies such as Mkambula et al. (2020), Beal et al. (2017), Dary and Mora (2002), and Horton and Ross (2003) have also endorsed the positive impacts of food fortification on the nutritional status

of the people. These studies imply that food fortification is a possible and viable option to meet the nutritional deficiency in people.

Pakistan, being the sixth most populous country in the world is confronted with nutritional issues of the general public. The country's acute malnutrition rate has surpassed the emergency threshold, with 17.7% of the population affected. Additionally, a significant proportion of households lack access to basic services, further exacerbating malnutrition. Among children, there are alarming rates of wasting (17.7%), stunting (40.2%), and underweight cases (28.9%). Micronutrient deficiencies, such as iron, vitamin A, and vitamin D, remain high, affecting women of reproductive age. The prevalence of malnutrition is expected to worsen due to the negative impact of the current situation on the nutrition status of children and women. Pakistan's high burden of malnutrition, coupled with the ongoing COVID-19 outbreak, leaves the country vulnerable to health crises, necessitating urgent action to address nutritional deficiencies. Considering the existing challenges and success stories in the world, food fortification is the most viable option to adopt and promote among people. In Pakistan, the government introduced different programs for food fortification such as the Universal Salt Iodisation Program (USIP), the Global Alliance for Improved Nutrition (GAIN), the Iodine Nutrition Program, Assisted National Wheat Flour Fortification Project (KPK), and World Food Program (WFP) (Rehman et al., 2013). e-Pact (2021) evaluated the food fortification programs in Pakistan and their endline assessment report they highlighted that food fortification is possible in Pakistan, but the programs had limited success for many reasons regarding governmental, legislative, administrative, poor cooperation and socio-economic challenges of the people. Food fortification cannot achieve its objective sunless the people are not aware of and have enough knowledge of its use.

In Pakistan, there is no specific research study available emphasising exploring the sociological aspect of the community to underpin their likely inclination towards food fortification. The only study conducted by Murtaza et al. (2022) found that 53.3% of consumers were known to term food fortification and 67.5% urged the government to declare food fortification mandatory. This research gap elicits the need for studies to highlight the knowledge, attitudes and practices of consumers towards food fortification. Haq et al. (2012), Andrade et al. (2020), Saadatjoo et al. (2021) and Qutob and Awartani (2021) have conducted successful surveys on Knowledge, Attitude and Practice (KAP) of community, and engrossed importance for the policy decisions. According to the Guidelines of World Health Organisations (2008), KAP surveys are true representatives of a specific population to collect data on what is known, believed and done in relation to a particular topic and are also an integral instrument for behavioural research. In line with the Who guidelines, this study was planned to explore people's knowledge, attitudes and practices towards food fortification.

Objectives

To check the awareness level of the respondents regarding fortified food and to examine the practices of respondents regarding the fortified food, to suggest some policy measures

METHODOLOGY

Lawai (2019) defined that social research as a systematic approach to discovering new facts, establishing their sequence and relationships, interpreting them, and identifying the underlying natural laws that govern them. The detailed procedures followed in this study are explained as under. One of the initial stages in research projects involving human participants involves formulating a precise and comprehensive description of the target population. In all research designs that involve human subjects, including experimental, observational, and qualitative studies, it is crucial to define the study population to ascertain the eligibility of individuals for participation in the study (Eldredge et al., 2014). In this study, all the urban households living in study districts such as Multan, Faisalabad, Sargodha and Lahore were considered as the study population, where the sample was drawn from. More specifically, the urban union councils were targeted for the identification of population and determination of sample. The researchers employed a multi-stage sampling technique to select participants from the study areas (Figure 3.6). Multistage sampling is a commonly used approach for household surveys when there is no readily accessible sampling frame or when the population is geographically scattered across a vast area (Chauvet, 2015). In the first stage, a total of four districts (Multan, Sargodha, Faisalabad, and Lahore) were selected through a simple random sampling technique. In the second

stage, from each district one tehsil was selected at random, thereby selecting a total of four tehsils. In the third stage, from each tehsil, a total of five urban union councils (UCs) were chosen using a random sampling technique, thereby making a total of 20 UCs from the four districts. In the fourth stage, from each selected UC total of 25 females were chosen, thereby making 125 females from one district and making a total sample of 500 respondents from the four districts. The research instrument employed in this study was an interview schedule, which was carefully designed to align with the study objectives. In this study, collected data were analyzed using Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

Results and discussion is deemed as most important section of the thesis. In this section, the results of the study are explained interpreted and discussed for appropriate conclusions. Bavdekar (2015) reported that results and discussion is the chapter of thesis which allows the researcher to display results.

Table 1: Relationship of socio-economic attributes of respondents with their knowledge regarding fortified food

	B	S.E.	Wald	df	Sig.	Exp(B)
Age	0.582	0.232	6.313	1	0.012*	0.159
Education	0.214	0.264	0.656	1	0.028*	0.308
Income	-0.288	0.261	1.223	1	0.269	0.749
Family structure	-0.236	0.226	1.088	1	0.297	0.790
Family Size	0.359	0.227	2.489	1	0.115	1.432
Marital status	0.290	0.263	1.211	1	0.271	1.336
Occupation	0.203	0.297	0.469	1	0.493	1.225

Pseudo R^2=0.277

-2 Log likelihood=663.378

The data given in Table 1 refers to the association between the socio-economic attributes and knowledge of the community about the fortified food. The overall model of binary logistics regression was statistically significant, $\chi 2=31.426$, $p < 0.05$. The model explained 27% of the variance in community knowledge about fortified food. Among the independent variables, age and education had statistically significant ($p < 0.05$) relationship with the knowledge regarding fortified food. Whereas, the variables income, family structure, family size, marital status, and occupation were statistically insignificant with the knowledge regarding fortified food.

The statistically significant association (p = 0.012; β=0.159) between the age of respondents and knowledge about fortified food indicates that there was likely 15% increase in knowledge of respondents with the unit increase in their age. This implies that with the increase in age there was likely a more need of the fortified food, thus community tend to gain more knowledge. This is well established by the studies that with the increase in age the health issues normally increase, thus the need of balanced food arises. This assumption is well endorsed by the result of this study that by the increase in age the knowledge was found increasing especially about the fortified food.

As for as education of the respondents was concerned, there was likely a 30% more knowledge of respondents with the unit increase in education (p = 0.028; β=0.308). This implies that educated persons were likely to have more knowledge about the fortified food. Results are endorsed by the findings from Kairiza et al. (2020) as they found that with the increase in education there was a probability of more utilization of the fortified food. This is believed that educated people remain more concerned about their health, therefore they are likely the more adopters of the nutritious food. Findings are supported by the results from Motadi et al. (2016); Premkumar (2020); Linda et al., (2020), as they reported that education had positive and significant association with the knowledge regarding use of fortified food. In a study, Sirohi et al. (2014) confirmed that due to increase in education there was a significant increase in community knowledge regarding use of fortified food.

Other independent variables like income, family structure, family size, marital status and occupation were statistically insignificant relationship with the knowledge (P > 0.05). This was not necessary that

these variables had nothing to do with the knowledge creating among respondents. They could be playing positive or negative impact on the knowledge generation, although in this study significant relation is not explored. For instance, the large family size, low-income status and unemployment might have negative impact on the knowledge of the respondents.

Table 2: Relationship of socio-economic attributes of respondents with their attitude towards fortified food

Socio-economic attributes	B	S.E.	Wald	df	Sig.	Exp(B)
Age	-0.492	0.232	4.514	1	0.562	0.611
Education	0.153	0.263	.337	1	0.034*	0.259
Income	-0.298	0.268	1.237	1	0.266	0.742
Family structure	-0.195	0.231	.711	1	0.399	0.823
Family Size	0.302	0.228	1.754	1	0.185	1.353
Marital status	0.231	0.256	.816	1	0.366	1.260
Occupation	0.612	0.292	4.404	1	0.036*	0.542

Pseudo $R^2 = 0.168$

-2 Log likelihood= 661.888

Table 2 shows the obtained results regarding association between the socio-economic attributes of the respondents and their attitude towards the fortified food. The results of the binary logistics regression analysis indicate that the overall model was statistically significant, $\chi 2=41.342$, $p < 0.05$. The model explained 16% of the variance in attitude of the respondents towards the use of fortified food. Among independent variables, educational level and occupation of the respondents were statistically significant ($P<0.05$) with the attitude and other variables like age, income, family structure, family size and marital status were statistically insignificant ($P>0.05$) with their attitude.

Educational level of respondents indicated 25% variation in the attitude of the community ($p = 0.034$ $\beta = 0.259$). The statistically significant relationship indicates that with the unit increase in education there was likely a 25% increase in the attitude of the community towards fortified food. Educated people remain more concerned with their health, they change their attitude quickly as compared to uneducated people. Findings are endorsed by the results from Premkumar (2020) as he found that education had positive and significant influence on the attitude of the people regarding fortified food. In another study, Linda et al. (2020) demonstrated that education was critical in making community aware about the nutritional food. However, the results are inconsistent with those of Bormag et al. (2019) as they found non-significant association between the education and attitude towards fortified food.

Occupation of the respondents had statistically significant impact on the attitude of the respondents ($p = 0.036$ $\beta = 0.542$). Occupation of the respondents was found contributing 54% in attitude of the respondents towards fortified food. Occupation earn income for the people which can be spend on the fortified food. Similarly, the occupation is also the source of exposure, which may also persuade. However, these results are not supported with the results of Bormage et al. (2019) as they found occupation was statistically non-significant with the awareness and attitude of the people towards industrial food fortification. Another study conducted by Premkumar (2020) conformed non-significant relationship between occupation and attitude of the people regarding attitude towards the use of fortified food.

Table 3: Relationship of socio-economic attributes of respondents with their practices towards fortified food

	B	S.E.	Wald	df	Sig.	Exp(B)
Age	-0.359	0.227	2.497	1	0.014*	0.109
Education	-0.183	0.269	0.463	1	0.046*	0.193
Income	-0.148	0.268	0.305	1	0.001*	0.463
Family structure	-0.226	0.226	1.002	1	0.317	0.798
Family Size	0.358	0.227	2.487	1	0.115	1.430
Marital status	0.228	0.263	0.749	1	0.387	1.256
Occupation	-0.370	0.289	1.634	1	0.201	0.691

Pseudo R^2= 0.207

-2 Log likelihood=665.469[a]

Table 3 indicates the relationship between the socio-economic attributes and the practices of the community regarding sue of fortified food. Binary logistics regression analysis was performed to explore the impact of different socio-economic attributes on the practices of the respondents concerning with fortified food. The overall model of logistics regression was statistically significant, $\chi 2$=39.169, $p < 0.05$. The model explained 20% of the variance in dependent variable.

Among independent variables age, education and income had statistically significant impact on the practices of community towards fortified food (P<0.05) whereas family structure, family size, marital status, and occupation had statistically insignificant association with the practices (P>0.05).

Age of the respondent had statistically significant impact on practices (p = 0.014 β=0.109). This implies that there was a probability of 10% increase in practices regarding use of fortified food. There were number of studies which have associated age of respondents with the practice of using fortified food such as Verbeke (2005), Cirino et al. (2014), Hirvonen et al. (2012), Sicinska et al. 2018 and Temesi et al. (2019). These studies were in agreement that age was the significant predictor of practicing and using different fortified foods. Seniors were like to use functional foods irrespective to the taste of this particular food (Verbeke, 2005).

Education had statistically significant impact on the practices as well (p = 0.046 β=0.193). The results indicate that there was a probability of 19% increase in practices with the unit increase in education. Studies such as Cirino et al. (2014) and Bielemann et al. (2015) had reported that education had significant influence on practices of using fortified food. As for as income of the respondent was concerned, the relation was statistically significant (P = 0.001 β=0.463), implying a 46% probability of increase in practices with the unit increase in the level of income. Results are supported by the findings from Temesi et al. (2019) as they found that income mattered for the people while making decisions and purchasing the fortified food. However, there were number of research studies where no statistically significant relationship was found between the income and use of fortified food (Verbeke, 2005, Hirvonen et al., 2012, Cirino et al., 2014, Bielemann et al., 2015, Sicinska et al., 2018). The results further indicated that family structure, size of family, marital status and occupation were statistically non-significant with the practices regarding use of fortified food.

Conclusion

This study was conducted to explore the knowledge, attitude and practices of women towards fortified food in order to curtail the malnutrition and improve the health. This study concludes that the women in study area had low level of knowledge about fortified foods. This indicates a need for increased awareness and education regarding the benefits and importance of fortified food. In the study area, the information acquisition was found primarily through social media tools and least use was of traditional sources like accessing information from the family friends. Binary logistics regression analysis showed that age, education, family size and occupation had statistically significant relationship with awareness about the fortified food. In context of Knowledge, Attitude and Practices, respondent's age and education were statistically significantly related with knowledge, education and occupation with attitude and age, education and income were statistically significant with practices. The attitude of the respondents was positive towards the use of fortified food however subject to access, availability and affordability of the fortified foods. They expressed

openness and willingness to use fortified food products once they were made aware of their benefits. There is potential for acceptance and adoption of fortified food among this population. The practices related to the consumption of fortified food among women in Punjab were found to be limited. This implies that the use of fortified food products was relatively low, and there was a need for more widespread availability and accessibility of such products in study areas. The respondents believed that fortified food is expensive, thus beyond the affordability of many families. This highlights the importance of improving knowledge dissemination and creating awareness campaigns to enhance the understanding of women regarding fortified food. Efforts should be made to address barriers such as limited availability and accessibility of fortified food products. By promoting positive attitudes and increasing the adoption of fortified food practices, the nutritional status and well-being of women in Punjab can be improved.

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