DECOMPOSITION OF SOCIO-ECONOMIC CHANGE IN MICRONUTRIENTS IN PAKISTAN BETWEEN 2015-16

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Abstract:

This study aimed to examine the relationship between income and nutrient consumption in Pakistan, and its impact on reducing malnutrition. The researchers analyzed data from the nationally representative Household Integrated Economic Survey conducted in 2015-2016. The study focused on changes in nutrient consumption, including total calories, macronutrients, and micronutrients, in response to changes in income. Various parametric regression methods were used to estimate the nutrition-income elasticity ratio for Pakistan. The findings of this study contribute to understanding the importance of income in ensuring adequate nutrition and preventing nutrition-related diseases, particularly in developing countries like Pakistan. The provision of high-quality food is a primary factor in ensuring adequate nourishment and preventing malnourishment-related diseases in Pakistan. This study, therefore, aimed to quantify the impact of income on nutrient consumption in Pakistan, with the hypothesis that income has a primary role in reducing malnourishment in the developing world. To do this, we estimated nutrient–income elasticity defined as the proportion of change in nutrient consumption in response to a change in income for total calories, macronutrients, and micronutrients, using the nationally representative Household Integrated Economic Survey data (2015–2016) for Pakistan. Nutrient–income elasticity values were derived using several parametric regression approaches.

Keywords: *Copula Function; Decomposition; Micronutrient Intakes; Pakistan; Socioeconomic Factors.*

1. INTRODUCTION

Background of the study

Malnutrition is a broad term that encompasses various conditions related to shortages, excesses, or imbalances in a person's energy and nutritional consumption. It can refer to both undernutrition and over nutrition. Undernutrition typically refers to a lack of necessary calories and essential nutrients, resulting in conditions such as stunting (short stature for age), wasting (low weight for height), underweight (low weight for age), and deficiencies in vitamins and minerals. On the other hand, over nutrition includes conditions like obesity, overweight, and diet-related non-infectious diseases such as heart disease, stroke, diabetes, and cancer.

When discussing malnutrition, it is important to consider the two types of nutrients: macronutrients and micronutrients. Macronutrients refer to the major nutrients needed in larger quantities, such as carbohydrates, proteins, and fats. Micronutrients encompass essential vitamins and minerals that are required in smaller quantities but play crucial roles in maintaining human health.

Micronutrient deficiency, also known as "hidden hunger," occurs when the intake of bioavailable micronutrients falls short of the body's requirements. Unlike the visible effects of macronutrient deficiencies, the consequences of micronutrient deficiencies are often not immediately apparent.

However, they can have significant impacts on physical and cognitive development, particularly in young children. Micronutrient deficiencies contribute to high mortality rates, especially among children and women, and can result in negative pregnancy outcomes and reduced productivity in adults. They are also associated with various diseases such as coronary heart disease, diabetes, anemia, stroke, cancer, delayed growth, and low birth weight.

Overcoming micronutrient deficiencies is crucial for proper growth and development. UNICEF has identified commercial, social, and political factors as the underlying causes of malnutrition. To address micronutrient deficiencies, several strategies can be employed, including nutrition education, food fortification, supplementation, international public health initiatives, and other problem management approaches. However, food-based tactics, such as improving overall nutrition and fortifying foods with micronutrients, are considered long-term and sustainable approaches to combatting micronutrient deficiencies.

At the household level, various socioeconomic and demographic factors influence micronutrient consumption through diet. Understanding the impact of these factors can assist developing nations in making more effective policy decisions. Studies have shown that factors such as income, family size, dietary awareness, access to diverse foods, and maternal education play significant roles in determining micronutrient status. For example, low-income communities may face limited access to a variety of nutritious foods, leading to micronutrient deficiencies. Additionally, household wealth and maternal education have been identified as critical factors in improving micronutrient intake. Cultivating nutrient-rich crops and promoting the consumption of fruits and vegetables can also help meet micronutrient requirements at the household level.

In summary, malnutrition encompasses a range of conditions related to inadequate or imbalanced energy and nutritional consumption. Micronutrient deficiencies, often referred to as hidden hunger, have significant impacts on physical and cognitive development, particularly in children. Addressing these deficiencies requires a comprehensive approach that includes education, food fortification, supplementation, and other strategies aimed at improving overall nutrition. Socioeconomic and demographic factors play a crucial role in determining household-level micronutrient consumption, and understanding these factors can guide effective policy decisions in combating malnutrition.

The consumption of micronutrients is crucial for the overall health and well-being of individuals, particularly in developing countries like Pakistan. Micronutrients, such as vitamins and minerals, play a vital role in various physiological functions, including growth, development, and immune system regulation. Inadequate intake of these essential nutrients can lead to various micronutrient deficiencies, which have detrimental effects on human health, especially in vulnerable populations like children and pregnant women.

Pakistan faces significant challenges in addressing the issue of malnutrition, with a high prevalence of micronutrient deficiencies among its population. Factors such as poverty, limited access to diverse and nutritious foods, inadequate healthcare facilities, and lack of awareness about proper nutrition contribute to the persistence of this problem.

Understanding the determinants of household micronutrient consumption is crucial for designing effective interventions and policies to improve nutritional outcomes in Pakistan. This study aims to analyze the various factors that influence households' consumption of micronutrient-rich foods and supplements. By identifying these determinants, policymakers and nutritionists can develop targeted strategies to promote healthy dietary practices and bridge the nutrition gap.

The study will explore a range of factors that potentially affect household micronutrient consumption. These factors may include socio-economic status, education level, household size, access to healthcare services, geographical location, availability and affordability of nutrient-rich foods, cultural beliefs and practices related to food, and knowledge about the importance of micronutrients.

Through a comprehensive analysis of these determinants, the study seeks to provide insights into the underlying causes of low consumption of micronutrients in Pakistani households. The findings will help inform the development of evidence-based interventions, such as nutrition education

programs, agricultural initiatives to improve food diversity and quality, and social safety nets to alleviate poverty and enhance access to nutritious foods.

Ultimately, the goal of this study is to contribute to the broader objective of reducing micronutrient deficiencies and improving the nutritional status of households in Pakistan. By addressing the root causes and understanding the factors influencing household micronutrient consumption, policymakers and stakeholders can work towards sustainable solutions that promote better health outcomes for the population.

Hirani et al., 2012 Pakistan, a developing country in South Asia, faces significant challenges in addressing its high infant and child mortality rates, which are among the highest in the region. Malnutrition is a key underlying factor contributing to these alarming rates. Despite ongoing efforts to combat malnutrition in young Pakistani children, a comprehensive and effective solution to this growing problem has yet to be identified. The determinants of malnutrition in Pakistani children are multifaceted and occur at the individual, family, and community levels. A thorough analysis reveals that biological, maternal, socio-cultural, environmental, and politico-economic factors are interconnected. Therefore, addressing this issue requires integrated interventions targeting malnourished children, their families, and the wider Pakistani community.

Malnutrition is frequently used to refer to undernourishment rather than over nutrition, with undernourishment implying that a person does not always obtain enough calories and vitamins. There are two types of nutrients: macronutrients and micronutrients. Micronutrients cover all of the well-known nutrients as well as important trace minerals. Intake of sufficient micronutrients is critical for human health. Micronutrient deficiency is increasing when bioavailable micronutrient intake falls short of needs. Unlike electricity-protein malnutrition, the fitness effects of micronutrient insufficiency aren't often obvious, which is why it's sometimes referred to as "hidden hunger." In general, micronutrient deficiency has a bigger influence on young people's physical and intellectual development than it does on older people. It contributes to high mortality rates, particularly in children and women, as well as negative pregnancy outcomes and lower adult painting output. Micronutrient deficiencies cause a variety of diseases, including coronary heart disease, diabetes, anemia, stroke, cancer, baby boomer delay, and sometimes low birth weight. Several studies have concluded that adequate micronutrient intake is critical for children's psychomotor coordination, cerebral functioning, and thin fitness. Overcoming deficiency in the micronutrients is a prerequisite for rapid and appropriate development. A paradigm developed with UNICEF identifies commercial, social, and political factors as the fundamental causes of malnutrition. To combat micronutrient deficiencies, four major techniques may be used: nutritional development, food fortification, supplementation, international public health, and other problem management approaches. However, food-primarily based tactics, like as nutritional development and food fortification, are thought to be the most long-term approaches to improving micronutrient reputation in people by way of increasing micronutrient consumption. As a result, the nutritious intake of micronutrients by utilising families is the most important factor in overcoming hidden hunger in developing nations. At the household level, a variety of socioeconomic and demographic factors influence micronutrient consumption depending on meals. Analyzing the impact of those factors can help developing nations make more effective coverage decisions. Numerous studies have been published that show the causes and consequences of micronutrient deficiency. Families' micronutrient reputation is determined on sociodemographic factors and lifestyle. Micronutrient malnutrition in low-income communities is thought to be caused by a lack of access to a variety of foods. Micronutrient insufficiency is frequently caused by low family income, a large circle of relatives, and a lack of dietary attention. Wealth has been identified as a critical factor in Dominican Republic women's consumption of micronutrient-rich foods. In Europe, there is a link between micronutrient consumption and family socio-financial standing. Maternal training at a high level is generally associated with lower expenses of micronutrient deficiencies. The output of nutrient-rich plants and culmination allows for the satisfaction of micronutrient requirements at the household level. A micronutrient-fortified beverage can help terrible residential school students overcome common place illnesses. Age, gender, birth order, religion, ethnicity, academic

and literacy level, working repute, and marital repute are the most important factors impacting under Neath nutrition in growing countries, according to a review of 98 publications. In rural households in three East African nations, namely Rwanda, Uganda, and Tanzania, income, gender of the meal preparer, number one training, and domestic gardens for vegetable and fruit production have all been found to have a significant impact on micronutrient intakes. Herrador et al. examine the distribution of micronutrients and anaemia in Ethiopian schoolchildren depending on socio-demographic characteristics, fitness roles, and dietary habits. Meshram et al. discovered that public fitness issues, parental training stage, HH wealth index, sickness, and insufficient nutritional consumption are all significant factors impacting micronutrient deficiency in Maharashtra State's Pre-School Tribal Children. Parental training, parental employment, own circle of relatives' length, profits, socioeconomic repute, resources, and a few family characteristics are noted as important predictors of malnutrition and micronutrient deficiencies in the family stage, according to a review of well-known studies. Furthermore, knowledge of the underlying mechanisms affecting micronutrient deficiency in a developing country like Pakistan is critical for developing policies and intervention programmes. Pakistan is a rapidly expanding country with a population of 210 million people in which micronutrient malnutrition is a serious health problem due to poverty, a lack of government assistance, and insufficient attention. During the previous few decades, no significant improvements in malnutrition have been observed. In Pakistan, one-third of newborns are born with low birth weight, 42 percent of children are stunted, and 14 percent of children are wasted before the age of five. Pregnant women make up 10% of the population, while preschool-aged children make up 13%. More than four million newborns are suffering from iodine deficit, while 51 percent of preschool-aged children and 39 percent of pregnant women are suffering from anaemia due to iron insufficiency. Diet cereals are referred to as basic staple meals, and they provide 62 percent of Pakistan's total electricity demand. Consumption of fruit, vegetables, seafood, and meat remains low, although milk consumption is more common in Pakistan as compared to other Asian nations. Variation with inside the obtainability of those crucial diets is probably to be one of the elements accountable for micro- nutrient malnutrition problems located in Pakistan Several research concerning evaluation of micro- vitamins in Pakistan are observed, i.e. However, those research include descriptive evaluation of micronutrients in youngsters and ladies with the aid of using protecting best a part of the u . s .. None of the above research makes use of country wide stage families' records to research the elements affecting availability of micronutrients for intake in Pakistan. Soofi et al. consists of cluster evaluation with the aid of using taking a pattern from Sindh province of Pakistan and unearths that the usage of micronutrient powders is supporting to conquer iron-deficiency anemia in younger youngsters. Sharieff et al. evaluates tremendous high-quality effect of micronutrient consumptions on prevalence of diarrhea in younger youngsters of Karachi, Pakistan. Bhutta et al. analyses effect of micronutrient malnutrition on pregnant ladies and their newly born infants in Karachi (Pakistan). Ejaz and Latif evaluates micronutrient deficiency in babies' elderly 6 to 60 months admitted in a tertiary care sanatorium Karachi, Pakistan. Khan et al. conducts an evaluation of micronutrients deficiency in youngsters randomly selected from District Bannu of KPK, Pakistan. Tariq et al. unearths out age of mom on the time of beginning, mom's consumption of iron dietary supplements for the duration of being pregnant, wealth, and awareness because the main elements affecting beneath Neath nutrients in Pakistan. To the pleasant of authors' knowledge, no have a look at has been performed to this point to decide the elements affecting micronutrient malnutrition at family stage in Pakistan. The evaluation may also offer an in depth in- sight to coverage makers for stunting boom in Pakistan. Hence, econometric evaluation approximately the effect of a few crucial socioeconomic and demographic elements on families' micronutrient intake in weight loss plan is about because the primary goal of this have a look at. Moreover, maximum of the econometric research associated with families' dietary safety use binary logistic framework. However, ordered logistic regression framework offers designated evaluation in comparison to binary logistic regression framework. Hence, every other wonderful characteristic of the have a look at as in comparison to the preceding econometric research on nutrients is the software of partial proportional odds version which offers a deep perception to research families'

malnutrition in micronutrients with the aid of using estimating various cumulative estimates at 3 stages of families' micronutrients safety.

Malnutrition in Pakistan is a complex and multi-faceted issue that encompasses a wide range of nutritional problems, including under-nutrition, overweight, obesity, and non-communicable diseases. These problems arise from deficiencies in energy, protein, and micronutrients, as well as poor-quality diets and low physical activity levels. Unfortunately, Pakistan has made limited progress in addressing child malnutrition over the past decade.

The latest National Nutrition Survey (NNS) conducted in 2011 revealed a Global Acute Malnutrition (wasting) rate of 15.1%, higher than the 13% rate reported in the previous NNS conducted in 2001. The disaggregated data showed that wasting rates were 12.6% in urban areas and 16.1% in rural areas. Additionally, over 30% of children in Pakistan are underweight, 44% are stunted, and 49% of women suffer from moderate anemia. Anemia affects over half of children under the age of five, and 39% of children are zinc deficient. The World Health Organization (WHO) Nutrition Programme aims to address all forms of malnutrition by strengthening and evaluating multi-sectoral programs and policies. These initiatives are designed to enhance the diets, nutritional status, and overall health of mothers, infants, and young children during critical stages of their lives. The WHO Nutrition Programme is committed to providing technical support to the federal and provincial governments of Pakistan, as well as the federating areas, on nutrition-specific and nutrition-sensitive issues. Through collaboration and comprehensive approaches, the program aims to tackle malnutrition in Pakistan effectively.

The World Health Organization (WHO) has offered its expertise to support Pakistan in evaluating its Food Safety Legislations. The objective is to pinpoint any deficiencies and shortcomings in the current food laws and regulations. By conducting this review, opportunities can be identified, and areas requiring policy development in the crucial field of food safety can be highlighted. Substantial resources have also been dedicated to training Food Inspectors in the application of "Hazard Analysis of Critical Control Point" principles. Additionally, the WHO has supplied Food Safety Laboratory equipment to facilitate the training of future food inspectors in the testing of potentially harmful food and additives.

Rebecca et al., (2013) The findings revealed that the processed food industry in the Philippines, Indonesia, and Vietnam is not always required to use fortified staples and condiments. However, incorporating fortified ingredients in widely consumed processed foods could significantly contribute to meeting the recommended nutrient intake. In the Philippines, for example, including iodized salt in dried salted fish could provide 64% to 85% of the iodine RNI for women of reproductive age and 107% to 141% of the iodine RNI for children aged 1 to 6 years. In Indonesia, fortifying wheat flour in a 75g pack of instant noodles, a highly consumed product, could supply 45% to 51% of the iron RNI for children aged 4 to 6 years and 10% to 11% of the iron RNI for women of reproductive age. In Vietnam, the increasing popularity of biscuits containing vegetable oil presents an opportunity to fortify them. A 35g biscuit serving with fortified vegetable oil could provide 13% to 18% of the vitamin A RNI for children aged 4 to 6 years and 12% to 17% of the vitamin A RNI for women of reproductive age. The study concludes that requiring the food industry to use fortified staples and condiments in processed foods would ensure that these foods contribute to improving micronutrient intake, particularly as the consumption of these foods is increasing. Policymakers and nutrition program managers are encouraged to consider the potential contributions of fortified staples and condiments in processed foods and to mandate their use in the industry to maximize the impact on population nutrition.

Pakistan has achieved self-sufficiency in several essential agricultural products, demonstrating notable rankings in global production. The country stands at the 8th position in terms of wheat production, the 10th position in rice production, the 5th position in sugarcane production, and the impressive 4th position in milk production. These achievements highlight Pakistan's significant progress in ensuring an adequate supply of staple foods for its population. Despite being self-sufficient in major staples such as wheat, rice, sugarcane, and milk production, only 63.1 percent of households in the country are considered "food secure." This information is based on the Ministry

of Health and UNICEF's National Nutritional Survey from 2018, which incorporates the Food Insecurity Experience Scale developed by the Food and Agriculture Organization (FAO) of the United Nations. The scale categorizes food insecurity into three dimensions: mild, moderate, and severe. Alarmingly, 18.3 percent of the food-insecure households in Pakistan face "severe" food insecurity, experiencing hunger on a chronic basis. It is also noted that the provinces of KP and Gilgit Baltistan are relatively more food secure compared to Sindh and Balochistan (The State of Pakistan's Economy)

Literature review about Work on Micronutrients in Pakistan

According to Brazier et al (2020). It is essential to consume a diverse diet in order to ensure appropriate micronutrient consumption. The purpose of this study was to determine the biological process standing and nutritional variety of females of reproductive age (WRA) living in a rural Pakistani community. The study enlisted 47 WRA (35 to 77 years old) who were not pregnant or wet at the time of enrolment. The research nutritionist performed 24-hour food recall interviews, and the information gathered was used to create a minimal dietary diversity for women score (MDD-W) on five occasions during the particularly during the rainy periods. The state of the biological process was determined using exploitation measurements and organic chemical indicators. Body mass index (BMI) was calculated using height and weight, and the circumference of the mid-upper arm was measured. Inductively coupled mass spectrometry was used to evaluate plasma atomic number 30, iron, and antioxidant concentrations, and iron status was assessed using body fluid protein and blood hemoprotein concentrations. The mean ± (SD) food cluster diversity score was 4±1, with 26 to 41 percent of individuals scoring a 5 on the MDD-W. With a BMI of 27.2 5.5 kg/m2, 28 percent of people were obese, 34 percent overweight, and 6 percent were underweight. The prevalence of zinc insufficiency, as measured by plasma zinc concentration, was 29.8%; 17% of the individuals had low plasma antioxidant levels; 8.5 percent were iron deficient; and 2% had iron deficiency anaemia. The data suggest that the women in this community eat a food with little variety, as well as a diet deficient in nutrients, indicating that deficiency illness is common. To improve micronutrient intake, particularly zinc, in this group, public health initiatives focused at promoting dietary diversity are needed.

According to Wieser et al (2017). Nearly half of Pakistan's children under the age of five are stunted, and one in three is underweight. Substance deficits, a less obvious form of malnutrition, are widespread. They'll result in increased morbidity and mortality, as well as a decline in psychological and physical development. The goal of this study was to calculate the lifetime costs of micronutrient deficits in Pakistani children aged six to fifty-nine months. We usually create a health economic model of the long-term health and financial effects of iodine, iron, vitamin A, and metal deficiency. Medical expenses, production losses in terms of future revenues lost, and disability-adjusted life-years are some of the metrics we use (DALYs). The estimate is based on large population surveys, data from irregular trials on the health implications of drug deficits, and a variety of other sources. Medical expenses of US$46 million, output losses totaling US$3,222 million, and 3.4 million DALYs are included in the total social group charges. The poor psychological feature development induced by iron deficiency anaemia in 6- to 23-month-old children, as well as the death caused by axerophthol deficiency, dominate pricing. In impoverished households, prices are significantly higher. Social group costs amounted to 1.44% of gross domestic product and 4.45% of in 2013, DALYs were recorded in an Asian country. These costs stymie the country's progress. Improved nutrition for 6- to 59-month-old children and public health interventions might remove the problem. Our findings may aid in the development of effective treatments to reduce drug abuse in children and its long-term effects.

According to Javid Hussain et al (2011). This research was conducted to determine the organic process and mineral composition of a variety of vegetables commonly consumed in Pakistan. Abelmoschus esculentus, Solanum melongena, Cucurbita moschata, Allium sativum, gourd vine, and Portulaca oleracea were gathered in Mardan, Pakistan, and nutritional analysis was performed on them. AOAC techniques were used to determine nutrient analysis (total proteins, lipids, carbs, ash, energy worth, and moist contents) of vegetable species. Metal (Ca), metallic element (Mg),

metallic element (K), Na (Na), and phosphorus (P) components were examined using the Atomic Absorption chemical analysis technique, as were tiny parts such as iron (Fe), metallic element (Zn), metal (Mn), copper (Cu), nickel (Ni), and element (Se). Wet (wet and dry basis), ash, lipids, fibres, proteins, energy value (305.9-382.6 Kcal/100g), and carbohydrates of certain vegetable species ranged from 62.9-92.7, 5.4-7.7, 3.1-23.1, 0.3-8.3, 10.2-22.5, 7.7-16.9, and 51.3-80.2 percent, respectively. The micronutrients, as well as Fe, Zn, Mn, and Cu, were found to be in the ranges of 6.2-24.1, 0.2-11.7, 0.6-16.7, and 0.1-70 ppm. The findings of macronutrients with Ca (90-1850 ppm), Mg (94-571 ppm), K (2078-4010 ppm), sodium (2-170 ppm), and P (250-1532 ppm) levels were obtained. Nickel and selenium levels were found to be low in these veggies. The findings show that all of these veggies have the ability to provide critical nutrients to humans. The gourd vine and alliaceous plant were discovered to be a reliable source of proteins, lipids, and carbs, allowing them to provide energy to the customer. In terms of mineral supplies, each of these species was shown to be quite beneficial, particularly Ni, K, P, Zn, Cu, and Mn.

Objectives of the Study

1. Research paying attention on improvement policy and understanding issues of food security and giving guidelines for designing.
2. The study aims to assess the food security status of households in Pakistan and explore its relationship with micronutrient consumption.
3. The study intends to provide evidence-based recommendations to policymakers, government agencies, and organizations working in the field of nutrition and food security in Pakistan.

The study aims to enhance the understanding of micronutrient consumption patterns in Pakistan and contribute towards the development of effective strategies to address micronutrient deficiencies and improve the overall nutritional status of the population.

2. Methodology

Source of Data and Construction of Variables

Secondary Data used in this research was taken from Federal Bureau of Statistics website labeled as HIES / HIICS 2015-16 Microdata. Following table shows the detail of variables and description of data set used in the analysis. Nominal Coding and Continuous variables with detailed descriptions are following:

Ordinary Least Squares regression (OLS) is more commonly named linear regression (simple or multiple depending on the number of explanatory variables).

In the case of a model with p explanatory variables, the OLS regression model writes:

$$Y = \beta_0 + \sum_{j=1}^{p} \beta_j X_j + \varepsilon$$

where Y is the dependent variable, β_0 is the intercept of the model, X_j corresponds to the j^{th} explanatory variable of the model ($j = 1$ to p), and ε is the random error with expectation 0 and variance σ^2.

In the case where there are n observations, the estimation of the predicted value of the dependent variable Y for the i^{th} observation is given by:

$$y_i = \beta_0 + \sum_{j=1}^{p} \beta_j X_{ij}$$

Multiple Linear Regression modeling was used for analysis.

Table 1: Variables' Description

Variable name	Description
Age of head	Age in years
Size of HH	HH Population
Regional Status	Rural=1 & 0 otherwise
Marital Status	Married=1 & 0 otherwise
KPK Origin	HH's origin as KPK=1 & 0 otherwise

Punjab Origin	HH's origin as Punjab=1 & 0 otherwise
Sindh Origin	HH's origin as Sindh=1 & 0 otherwise
Monthly Income of household	Monthly income in PKR
Livestock	HH's ownership of Livestock=1 & 0 otherwise
Wealth Index	Wealth Index of HH
Couple paid employed	Couple paid employed=1 & 0 otherwise
Maternal paid employed	Mother paid employment=1 & 0 otherwise
Paternal paid employed	Father paid employment=1 & 0 otherwise
Dependency ratio	Dependency ratio of HH
HH's cultivation of agriculture land	HH involve in cultivation=1 & 0 otherwise
B.I.S.P. received by HH	B.I.S.P. received=1 & 0 otherwise
Gender of HH head	Male=1 & 0 otherwise
BISP_Zakat_Ushar	BISP_Zakat_Ushar received=1 & zero otherwise
Head Education	HH's Head Education in years
Spouse Education	Spouse Education in years
Remittance received inside Pakistan	Remittance received inside Pakistan=1 & zero otherwise
Remittance received outside Pakistan	Remittance received outside Pakistan=1 & zero otherwise

3. FINDINGS AND DISCUSSIONS

Table 2: Estimated Results for "Iodine (mg) per capita"

List of explanatory variables	Categories	Coefficients	Standard Error	T	P>|t|
Head gender	Male	76.7548	1.861	41.251	0.000
	Female	Ref			
Residential Status	Rural	0.4904	0.711	0.690	0.490
	Urban	Ref			
Marital Status	Married	3.1275	1.007	3.105	0.002
	Otherwise	Ref			
Couple Employed	Yes	2.8528	1.381	2.065	0.039
	No	Ref			
Spouse Paid Employed	Yes	-6.4401	1.097	-5.869	0.000
	No	Ref			
Spouse Education	Continuous	-0.6554	0.070	-9.405	0.000
Dependency Ratio	Continuous	-9.2510	1.399	-6.613	0.000
Per capita income	Continuous	0.0001	$2.95x10^{-6}$	35.601	0.000
Head education	Continuous	1.5596	0.086	18.149	0.000
Livestock	Yes	12.5550	3.507	3.580	0.000
	No	Ref			
Own cultivation	Yes	12.0119	1.189	10.100	0.000
	No	Ref			
BISP Zakat Usher etc.	Yes	4.3572	0.697	6.256	0.000
	No	Ref			
Paid employed head	Yes	-6.8073	0.688	-9.889	0.000
	No	Ref			

Province Punjab	Province Punjab	16.0302	1.045	15.335	0.000
	Otherwise	Ref			
Province Sindh	Province Sindh	17.6080	1.098	16.042	0.000
	Otherwise	Ref			
Province KPK	Province KPK	5.6672	1.142	4.962	0.000
	Otherwise	Ref			
Head Age	Continuous	0.0885	0.025	3.481	0.001
Number of Household	Continuous	-3.8231	0.111	-34.524	0.000
Remittances receive out Pak	Yes	11.6406	1.303	8.931	0.000
	No	Ref			
Remittances receive in Pak	Yes	3.5432	1.128	3.142	0.002
	No	Ref			
Wealth Index	Continuous	0.4898	0.204	2.404	0.016
BISP	Yes	-8.2747	1.475	-5.608	0.000
	No	Ref			

Table 4.3 shows the impact of different factors on household's Iodine consumption using a classical linear regression model.

The estimate of "Head Gender" shows a positive effect of household's head gender on household's Iodine consumption. and the P-value shows a significant impact of head gender on household's Iodine consumption in Pakistan.

The estimate of Residential Status shows a positive impact of Rural Area on household's Iodine consumption compared to Urban. On the other hand, the P-value shows an insignificant impact of Rural Area on household's Iodine consumption in Pakistan.

On the other hand, the estimate of Marital Status shows a Positive effect of Marital Status on household's Iodine consumption in Pakistan. As a result, the P-value shows a significant impact of Marital Status on household's Iodine consumption in Pakistan.

The estimate of Couple Employed shows a positive impact of Employed Couple on household's Iodine consumption compared to unemployed household's couple in Pakistan. The P-value shows that there has a significant impact of Employed Couple on household's Iodine consumption in Pakistan.

The estimate of Spouse Paid Employed shows that there has a negative impact of the Employed Spouse on household's Iodine consumption in Pakistan compared to unemployed spouse. The P-value shows a significant impact of spouse paid employment on household's Iodine consumption in Pakistan.

The estimate of Spouse Education shows a negative effect of household's head's spouse education on household's Iodine consumption in Pakistan. The P-value shows a significant impact of Spouse Education on household's Iodine consumption in Pakistan.

The estimate of Dependency Ratio shows a negative effect on household food security in Pakistan. It means when Dependency ratio increases, household's food security decreases and vice versa. The P-value shows significant impact of Dependency Ratio on household's food security in Pakistan.

The estimate of per capita income of the household shows that there has a positive impact of Per Capita Income on household's Iodine consumption in Pakistan. When per capita income increases, household food security also increases from food insecure to food secure. The P-value shows that there is significant impact of per capita income on household food security.

The estimate of Head education of the household shows that there has a positive impact of educated head of household-on-household food security in Pakistan. When head education

increases, household food security also increases from food insecure to food secure. The P-value shows that there is a significant impact of educated heads on household food security data.

The livestock estimate shows a positive effect of livestock on household-on-household food security compared to this household with no livestock. It means that when the livestock of the household increases, household food security also increases from food insecure to food secure. The P-value shows a significant impact of livestock of households on household food security data in Pakistan.

The estimate of agriculture status shows a positive impact of agriculture land of household-on-household food security compared to these households which have no agricultural land. When agricultural land increases, household food security also increases from food insecurity to food security. The P-value shows a significant impact of the agriculture status of households on household food security data in Pakistan.

The estimate BISP Zakat Usher etc. of the household shows that there has a positive impact of BISP Zakat Usher etc. on household's Iodine consumption in Pakistan. The P-value shows a significant impact of BISP Zakat Usher on household's Iodine consumption.

The family's head employer's estimate indicates that there has a negative effect of the head employer on household's Iodine consumption. The P-value shows a significant impact of head employer on household's Iodine consumption in Pakistan.

The estimate of a Province Punjab shows a positive impact on household's Iodine consumptions. The P-value shows a significant impact of Province Punjab on household's Iodine consumption in Pakistan.

Province Sindh shows that there has a positive effect of Sindh on household's Iodine Consumption the P-value shows that there has a significant impact of Province Sindh on household's Iodine consumption.

Province KPK shows that there has a positive effect of KPK on household's Iodine consumption. The P-value shows that there has a significant impact of Province KPK on household's Iodine consumption.

Head Age shows that there has a positive effect of Age of Household's Head on household's Iodine consumption. It means as head's age increases, food security also increases. The P-value shows that there has a significant impact of head age on household's Iodine consumption.

Number of Household shows that there has a negative effect of size of a household on household's Iodine consumption. It means that as household size increases food security decreases. The P-value shows that there has a significant impact of size of household on household's Iodine consumption.

Remittances receive out Pakistan shows that there has a positive effect of Remittances receive from abroad on household's Iodine Consumption. The P-value shows that there has a significant impact of Remittances receive on household's Iodine consumption.

Remittances receive inside Pakistan shows that there has a positive effect of Remittances receive from Pakistan on household's Iodine consumption, The P-value shows that there has a significant impact of Remittances receive on household's Iodine consumption.

Wealth Index shows that there has a positive effect of wealth index on household's Iodine consumption. It means that as wealth index increases food security increases. The P-value shows that there has a significant impact of Wealth Index on household's Iodine consumption.

BISP shows that there has a negative effect of BISP receive on household's Iodine consumption. The P-value shows that there has a significant impact of BISP on household's Iodine consumption.

4. CONCLUSION

The study aimed to evaluate the micronutrient consumption in Pakistan in order to understand the reasons behind food insecurity in the country. Several factors were found to affect the food security level of households in Pakistan, including low income of the household head, lack of agricultural status and livestock possession, large household size, female-headed households, low education levels of the head of the household, high education levels of the spouse, advanced age of the household head, rural residence, and living in the Khyber Pakhtunkhwa (KPK) and Sindh regions. The study emphasized the importance of investigating the behavior of food security in order to

provide guidelines for effective policies. By identifying critical factors that influence household micronutrient consumption, the study aimed to improve and enhance nutritional outcomes at the household level. The research employed a suitable methodology, collected and analyzed numerical data, and utilized the average per capita daily milligram consumed index to measure micronutrient consumption. The findings of the study indicate that Pakistan is not considered a food-secure country due to various factors such as low income, education, and insufficient access to nutritious food. The empirical analysis confirms that Pakistan faces significant challenges regarding micronutrient consumption, contributing to its status as a food-insecure nation.

The study focuses on three essential micronutrients: Calcium, Iron, and Iodine and highlights the food security situation in Pakistan, particularly in Sindh and Baluchistan provinces, and emphasizes the importance of addressing the challenges related to food access, quality, and utilization. The study utilizes survey data from the Pakistan Social and Living Standards Measurement (PSLM) conducted in 2015-2016. It employs a multiple linear regression model to analyze the factors influencing household micronutrient consumption.

Based on the findings of the study, the following are three major suggestions to improve household micronutrient consumption and address food insecurity in Pakistan:

- 1. Enhance Income Generation Opportunities: Since low income of the household head was identified as a significant factor affecting food security, efforts should be made to improve income generation opportunities. This could be achieved through various means, such as promoting entrepreneurship, providing vocational training programs, facilitating access to credit and financial resources, and supporting small-scale agricultural activities. Increasing household income can empower individuals to purchase an adequate quantity and quality of nutritious food, thereby improving their overall food security and micronutrient consumption.
- 2. Strengthen Nutrition Education and Awareness: Low education levels, both for the household head and the spouse, were identified as contributing factors to food insecurity. Therefore, there is a need to prioritize nutrition education and awareness programs at the community and household levels.
- 3. Enhance Access to Nutritious Food: Insufficient access to nutritious food, particularly in terms of accessibility to markets, was highlighted as a significant issue. To address this, efforts should be made to improve infrastructure, such as roads and transportation systems, especially in rural areas.

Therefore, it is required attention about these most important factors to improve them and make Pakistan a food security country in the world.

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