

## THE SOCIOECONOMIC DETERMINANTS OF FOOD AND NUTRITIONAL SECURITY IN RURAL AND URBAN AREA OF PAKISTAN DURING COVID-19

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### ABSTRACT

Food insecurity and poor health is turning out to be one of the biggest global issues especially during the pandemic period. Food value chains of developing countries has drastically affected and linked with the problem of food insecurity and malnutrition during covid-19. Keeping in view the importance of this key issue, the present study aimed to investigate the impact of covid-19 on food and nutritional (macro and micro nutrition) status by using the calories and nutrition intake method in the rural and urban areas of district Faisalabad. Food security index was used to estimate the absolute food security status and Logistic Regression Model was employed to examine the effect of covid 19 on food security. Primary data set of almost 500 households were collected from the rural and urban areas. The results show that calories and macronutrient's security status was better in the urban areas while the situation of micro nutrients was better in rural areas. It was found that nearly 49 percent households in rural areas and 43 percent households in urban areas were food and nutrition secure during covid-19. The impact of covid-19 was evident in urban areas especially in low-income households and people who earn daily wages. The regression analysis showed that prevalence of disease, education, household income, family size, number daily intake meals, age of household head and land size have shown significant effects on the food and nutrition security status in both rural and urban areas.

**Key Words:** Covid -19 impacts, Food and Nutritional Security, Low-income household, Punjab

### INTRODUCTION

Climate change, food insecurity, and poor health are turning out to be the biggest global challenges and hinder the human resource development. Developing countries face the problem of food insecurity and malnutrition especially during and after covid-19 (Chollisni *et al.*, 2022). The covid-19 time period affected the global economies drastically and income of developing nations residents drop down substantially that make the situation worse. Food security and utilization are important aspect of food security, it mainly occurs by intake the un-balance diet, less information about intake the food (Panghal *et al.*, 2022). Food security is an essential element for the development, survival and welfare of the society among the different nations (Erokhin and Gao, 2020). It affects the human health, productivity and welfare of the economy and it also the hindrance in the economic development (Thompson and Amoroso, 2011). The fight against covid was not in health sector but the survival of economic growth and coping the needs of all income groups in Low- and medium-income countries also put severe marks on policy domain. The nutritional status of developing world already very bad due to low income and high population density with lack of opportunities in these countries. Especially the food value

chains and agricultural production systems affected during covid (Arita *et al.*, 2022). The pandemic make it sever and situation become worse due to closure of production process and seize of trade (Espitia *et al.*, 2022). Under-nourishment is global challenge, 10.9 percent population, almost 795 million people all around the globe are still facing undernourishment and hunger in 2015. A greater proportion of under-nourishment almost 780 million belongs to developing countries. Therefore, to remove the hunger and malnutrition remain the key consideration issue all over the world. Some region of Asia, Africa, Latin America and Caucasus rapidly overcomes this problem. But the under-nourishment rate is still higher in African and Asian countries. Out of total undernourishment population, 20 percent and 12.1 percent population belongs to Africa and Asia respectively. This situation worse in South Asian, from the total population 281.4 million (15.7%) population is undernourishment (FAO 2019).

In worldwide ranking, Pakistan is the 43<sup>rd</sup> in the gross domestic production and being agro based economy drastically prone to climatic disasters (Nasir *et al.*, 2020). The agricultural production and its value chains will be affected by changes in climatic patterns that is also a big alarm for

the production and availability of enough food in the country (Nasir *et al.*, 2019; Oleszek *et al.*, 2015). Majority of this population belongs to rural areas and depend on agriculture. The share in GDP is approximately 22 percent from agriculture sector. It is the self-sufficiency country in food availability and has the ability to produce the food at the required demand of country (Bashir *et al.*, 2012). In spite of self-sufficiency in food production 17 percent of Pakistan population is under-nourishment (FAO 2019). According to the integrated food security phase classification 12 and 35 districts of Pakistan was suffered in severely food insecure and highly food insecure situation respectively (WFP, 2014).

Approximately half population is consuming the less amount calories than recommended calories of intake per day therefore the problem is occurred in food accessibility and utilization (Ahmad *et al.*, 2010). Mostly poor countries suffer in the problem of food security in the context of balanced diet. A sufficient food intake situation does not refer the sufficient nutrition status. It is a complex phenomenon that deals with the health-related dimensions and malnutrition (WHO, 2019). It having greater importance at micro level and mostly unfavorable condition existed at household level (Maxwell and Smith, 1992). The good health can be attained by access the appropriate food that consist the balanced and adequate quantity of macro and micro nutrients according to the dietary requirements (FAO, 2014). Now-a-days people prefer to eat processed and quickly available food that is less nutritious. Food choices, preference and life style are caused the malnutrition and nutrition insecure (Rasheed *et al.*, 2022).

The entire socioeconomic and geographical factors affected food intake utilization situation of individuals, they are varying among different nations and areas (Panzai *et al.*, 2022). In Agricultural countries including Pakistan, most proportion of population are living in the rural areas. They depend upon the natural resources for livelihoods (Massuanganhe, 2008). The socio-economic factors like income, education, and market force awareness, knowledge about nutritious food, financials sources, availability, preferences and norms that may be different among individuals regarded different locations and nations. That are affects the food utilization by the household and individual level. All these aspects of food may be distinct between urban and rural areas. Therefore, the aim of this study highlights the problems of food and nutrition

security in the rural and urban area in district Faisalabad.

This study aims to estimate the micro and macro nutrients of daily food intake of households and identified the socioeconomic factors of food and nutrition security in both rural and urban areas. Make a comparison of food and nutrition security status between rural and urban households during covid-19.

## 2- METERIALS AND METHODS

Primary data were collected from rural and urban areas households from the district Faisalabad, Pakistan by using the random sampling technique. The primary data was collected from 500 house-holds and sample size selected from rural urban inhabitants. The district Faisalabad divided in two regions rural and urban, five villages from the rural areas and five regions from the urban areas were selected and further 50 households sample size were collected from each region.

Data collection survey was conducted through interviewing the respondent personally through questionnaire. A comprehensive questionnaire was designed for collection of data that covers the all aspect of food security. It was included the three major category information, personal information, daily food takes (micro and macro nutrients), food utilization, income source of the respondents and other socio-economic variables. It consists both quantitative and qualitative questions according to the need of objectives.

**Data Analysis:** Data analysis was done in two stage approaches. In the first stage food and nutrition security status was calculated of the rural and urban households of district Faisalabad. Calories intake used as a proxy for food security. It was measures by calculating the per capita per day calories intake by using the seven days recall method for food consumption at household level. The adult equivalent unit (AEU) was used for the adjustment of calculating calories. Through this it was make ensure the equal distribution of calories among different age and sex in a household (Hirvonen *et. al.*, 2020). A household were taken the 2350 or greater per-capita perday calories was considered food secure. If its value 1 consider food secure, if 0 than food insecure.

$$FS_i = \sum Cal_i - L \geq 0 \dots\dots\dots (1)$$

Where  $FS_i$ , represent the food security situations of  $i^{th}$  household ( $i=1, 2,.. .n$ ) and  $Cal_i$  is the adjusted calories intake of  $i^{th}$  households and

where L show threshold level that is 2350 Kcal which a person required daily according to National Nutrition Survey (NNS, 2011).

In the second stage micro and macro nutrients security status were calculated by using the seven days recall method of food consumption and adjusted equivalent unit was used for the equal distribution of micro and macro nutrient among the different age and sex in a household. The mathematical form of micro and macro nutrients security status as:

The mathematical equation for macro nutrients security status is:

$$\text{MAC}_{ij} = \sum \text{Mac}_{ij} - L \geq 0 \dots\dots\dots (2)$$

The mathematical equation for micro nutrients security status is:

$$\text{MIC}_{ij} = \sum \text{Mic}_{ij} - L \geq 0 \dots\dots\dots (3)$$

In the above equations,  $\text{MAC}_{ij}$  and  $\text{MIC}_{ij}$  show the security status of  $i^{\text{th}}$  macro nutrients (protein, carbohydrates, and fats) and micro nutrients (iron, zinc) of  $j^{\text{th}}$  households (1 to 200) and L is the threshold level of macro and micro nutrients. The threshold level of protein security status is 70 Gm and iron security status that was used in the current study is 15 mg (Lele et. al, 2016; NNS, 2011).

There was a situation existed, households were taking the food that calories secure but it was nutritionally insecure. Therefore, in the third stage to calculate the absolute food security status, food security index was used (Pangaribowo et. al., 2013).

The mathematical form of food security index is:

$$\text{FSI} = \text{FS}_I + \text{MAC (protein)} + \text{MAC (Fats)} + \text{MAC (Carbo)} + \text{MIC (Iron)} + \text{MIC (zinc)} / 6 \dots\dots\dots (4)$$

**FSI** is the food security index used to measure the food security level of  $i^{\text{th}}$  household ( $i=1\dots n$ ). In this study calories intake level, macronutrients (protein, carbohydrates, and fats) and micronutrients (iron and zinc) security status were calculated by using equations above mention 1, 2 and 3. Overall food security status was calculated by using the food security index. The index is defined as it is the sum of all the calories and nutrition security status and divided by the total no of nutrients and calories. If the numerical value of food index is greater than 1 the households is food secure and if numerical value 0 it represents the households is food insecure.

**Logistic Regression Model:** Food security status used as a dependent variable and per capita calories intake on daily basis used as a proxy variable of food security, which are in dichotomous form (household is food secure or food insecure). Therefore, binary logistic model was best to measure the impact of socio-economic factors on the household food security level, because food security variable is in binary form. A household was food secure with value 1 or food insecure with the value 0. The mathematical form of Logistic Regression model

$$\text{Log} \left( \frac{p_i}{1 - p_i} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots \dots \dots \beta_n X_n \quad (4)$$

In the equation  $X_1, X_2, X_3, \dots \dots X_n$  are represents the explanatory variables (socio-economic factor) and  $\beta$ etas are the coefficient of these socio-economic factors that shows the degree of change in the dependent variable.

Here  $p_i$  shows the chances of an event occurring and it is chances of the nutritionally secure of households.

$p_i$  = nutritionally secure = 1

$1 - p_i$  = nutritionally insecure = 0

The explanatory variables that are used are following

$X_1$ = Age of household, head  $X_2$ = Decision-maker-earner,  $X_3$ = Education of female,

$X_4$ = Family size,  $X_5$ = Family structure,  $X_6$ =

Income,  $X_7$ = Land size,  $X_8$ = No-of-meals daily

intake,  $X_9$ = No-of-earner,  $X_{10}$ = Location and

$X_{11}$ =prevalence of disease

### 3- RESULTS AND DISCUSSION

Table 1 shows the result of calories, macro nutrients and micro nutrients security status in both rural and urban areas of district Faisalabad. The result was shows about 7 percent households in rural areas and 75 percent households in urban areas were calories secure. The situation of macro nutrients 59 percent, 74 percent and 98 percent households were protein, fats and carbohydrates secure respectively in rural areas. In case of urban areas, 63 percent, 79 percent and 99 percent households were protein, fats and carbohydrates secure respectively. Table 1 also shows the result of micronutrients security status. The result represents that 65 percent households in rural areas and 56 percent households in urban areas were iron secure. The result was found 52 percent house- holds and 44

percent households were zinc secure in rural and urban areas respectively. The total results shows that calories and macro nutrients security status was greater as compared to micro nutrients security status. In the rural areas micro nutrient security status was greater than urban areas households. In case of calories and macronutrient security, it was greater in urban areas as compared to rural areas.

Table 1 Results of calories and nutrition security status

Security Status		Percentage		
		Rural	Urban	Total
Calories	Calories	67	75	71
	Protein	59	63	61
Macro Nutrients	Fats	74	79	76.5
	Carbohydrates	98	99	98.5
Micro Nutrients	Iron	65	56	60.5
	Zinc	52	44	48

Table 2 shows the results of absolute food security status of the rural and urban areas households. It represents 49 percent households were food and nutrition secure in the rural areas and 43 percent households were food and nutrition secure in the urban areas. It shows 51 percent households and 57 percent households were food insecure in the rural and urban

areas respectively. It was found total 46 percent households were food and nutrition secure in the district Faisalabad.

Table 2 Results of absolute food security status

Security status	Percentage		
	Rural	Urban	Total
Secure	49	43	46
Insecure	51	57	54

Determinates of household's food and nutrition security status

In this section explained the results of binary logistic regression models of both rural and urban areas. The tables explain the impact of socio-economic factors that affect the food and nutrition security status of households for both rural and urban areas in district Faisalabad. The result was explained on the basis probability value. The table shows, total nine variables were used out of which seven variables were statistically significant in the urban areas and six variables were significant in the rural areas. Only the results of significant variables were explained below.

The table 3 revealed the result of binary logistic model of rural areas that shows, age of household's head, education of females, family size, income, no. of meals and land size were have statistically significant influenced on food security status in the rural and urban areas.

Table 3 Logistic Regression Results for Rural Areas

Variables	Coefficient	Std. Error	z-Statistic	Prob.
Age of household head (Years)	-0.11	0.057	-2.06	0.03**
Decision maker about expenditure on food (Male =1, female =0)	0.65	0.95	-0.68	0.49
Education level of female (years of schooling)	0.19	0.09	2.05	0.03**
Family size (Number of family members)	-1.12	0.37	-2.96	0.00***
Family-Structure (Joint =	-2.71	1.40	-1.92	0.05
Income (Rupees)	8.64	3.32	2.60	0.00***
Land Size (Acre)	0.55	0.27	1.98	0.04**
No-of-Meals	3.29	1.44	2.28	0.02**
No-Earner	0.10	0.70	0.14	0.88
Location (Rural=0, Urban= 1)	-0.15	0.09	0.08	0.10
Prevalence of disease (Number of days face disease)	-0.65	0.89	0.75	0.000***
C	-1.56	4.31	-0.36	0.71

(\*\*\*significant at  $p \leq 0.01$ , \*\* significant at  $p \leq 0.05$ , NS for non-significant)

The result of the binary logistic model is reveals that age of the households head is statistically significant and negative impact on the household food security status in the rural areas. The coefficient value -0.1 shows that with increasing the age of one year of the household head there is a probability of decreasing the food security status is 0.1 units. There is a negative relationship between the age of household head and food security status existed that was also found the Basher *et al.*, (2013) and Wolderufael (2014). Educational level of female education is statistically significantly and positively related with the food security status of the households in rural areas. The positive value of coefficient 0.19 shows, with increasing the fem-ale education of one unit the food security status of households is increased 0.19 units. The same result were explained the Sultana and Kiani (2011) and Mahmood *et al.*, (2014) that education and awareness had the positive impact on food security

Household size has negative impact on the food security status of households in the rural areas. It is shows that food security status change by changing the family size. The coefficient value is -1.1 and the value represent that by increasing the one unit of family size the food security status is decrease 1.1 units. Income is the most important socio-economic factor that affects the food intake situation of the households. The positive value of coefficient is represented by increasing the 1 unit of income of the households the food security status increased 8.6 units in rural areas. Basheir *et al.*, and Mahmood *et al.*, (2014) also described the same result that with increasing the income level food security increased (Khan and Gill (2009); Zuman *et al.*, (2015); Funmilola, (2015) and Devi, 2022) also found the female education had the positive impact on food security in urban areas.

Land size is an important socio-economic factor in rural areas that affect the food security situation. The positive relationship between land size and food security status and like those studies the results of this study also found the significant and positive relationship between land size and food security. The coefficient value of land size is 0.5, which shows by increasing the one unit of land the food security status increased 0.5 units (Garrett and Ruel (1999); Wolderufael (2014) and Zhao *et al.*, 2022).

No of meals daily intake has positive and significant influence on the food security status

in the rural households. The coefficient value is 3.2 show food security status is increased 3.2 units with increasing the one unit no of meals daily intake.

Earning status is shows the food decision maker is earner or non-earner impact on food security situations. The earning status of the food decision maker has statistically significant and positive influence on the food security status. The coefficient value is 2.5 shows food security status increase with increasing the food decision maker earner. Sultana and Kiani (2011) also described the same result that the food security status had better with employment status as compare to unemployment. Income is the most important socio-economic factor that affects the food intake situation of the households. The prevalence of disease has negative and significant relationship that showed that if the number of days a person face disease increases the nutritional security decreased. The increase of food and medicine expenditure during disease time also increased but overall nutritional security has negative affect due to disease prevalence (Nelson *et al.*, 2022). The net income is either declined and remain stagnant but the expenditure increases due to disease prevalence that affected the consumption of food.

### Conclusions

Our findings indicate that there is significant difference of food and nutrition security among the rural and urban areas. Rural residents are relatively secure in terms of food and nutritional security. The income level also has positive relationship with nutritional security as data showed that high income groups are relatively nutritionally secure. The lower income groups are food insecure. The prevalence of pandemic has also negative impacts on households' nutritional security. It is proven statistically, difference in calories intake, macronutrients and micro nutrients are existed between the both rural and urban areas households. It was found calories and macro nutrients intake situation are better in urban areas as compared to rural areas households. In case, of micro nutrients rural areas are better food intake than urban areas. It was observed urban areas households take the food that have more calories and tastier but less nutritious. The results shows that educational level of female, income and number of meals have positive and significant impact on improving the food and nutrition security status of the households, while age of household head and family size have negative impact on food

security status in the both rural and urban areas. Number of earners and household head earning significantly and positively influence on the food security in the urban areas. Land size have significantly positive impact on improving the food security in rural areas households. Based on results it is proposed that the linkages between food availability in urban areas need to be strengthened and the policy option for household facing any disease must intake the food requirement of families. Sahat card in Pakistan is need of hour but that must cater the requirement of household in terms of food and nutritional security. The awareness and support towards sectors producing nutritional food item must be disseminated and food and nutritional camps must have reach towards lower income groups. This study captures static analytics of covid-19 and nutritional security the dynamic analysis with complete interval data sets could help health and urban planners to formulate better policies.

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