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Determinants of Food Insecurity in Pakistan: An Empirical Investigation at Household Level

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ABSTRACT

Pakistan is facing severe level of food insecurity in terms of physical and economic access. In this regard, current study will focus to empirically investigate the leading determinants of food insecurity by using HIES 2019 data set. Household Expenditures Survey (HES) method will be used to find the status of food insecurity in Pakistan. In this method, the information about the quantities and expenditure of food is used to find the incidence of food insecurity at household level. Further, logistic regression model was the most appropriate technique for analysing the determinants of food insecurity in Pakistan. This study concluded that there is negative and significant relationship between size of household, distance of drinking water and food insecurity status at household level. Whereas, the positive relationship is found between food insecurity status and income level of the households, expenditure of the household, level of family head education, age of the head and male head of the household. Study suggests that, policies should be adopted to increase income level of the household, education level (to raise literacy rate), social welfare, and employment opportunities etc. Policy makers should design policies to increase physical, social and economic access toward healthy food by prioritizing agriculture sector as the life line for sustainable development and inclusive growth in the long run.

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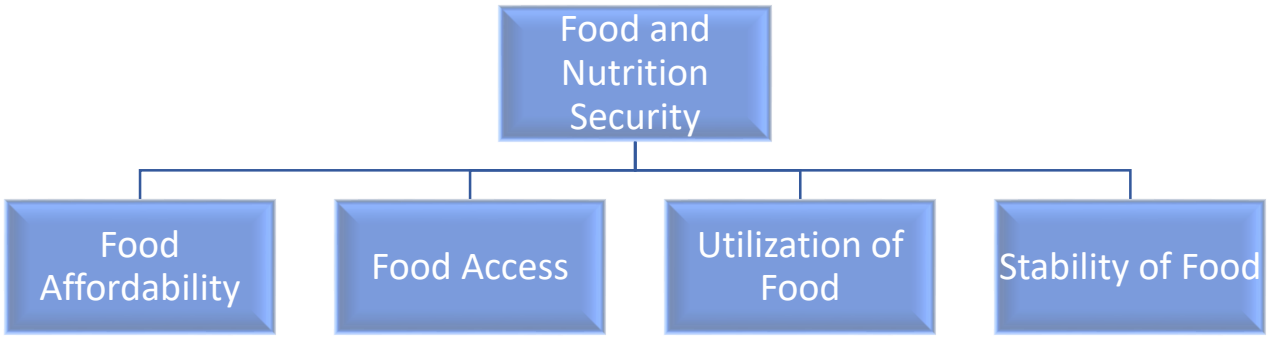
1. Introduction

The history of food insecurity can be tracked back in 1948 when the human rights declaration for the universe were introduces as the right to food as a vital component for standard of living. As theme of food insecurity continuously evolving over longer period of time. In the literature, almost 200 definition of food security available with it 450 indicators. Food insecurity consists of the four major dimensions: physical access to food, stability in food, food accessibility and the food utilization (Food and Agriculture Organization, 2006). The food system becomes more vulnerable when one or more of these four factors of food insecurity are uncertain (Zhou et al., 2019).

This study is in line with Post-2015 agenda of Sustainable Development Goals (SDGs). These goals give equal weights to food security for both developed and underdeveloped nations. All the goals are directly or indirectly linked with food security as the leading goals of sustainable development are directly linked with the concept of food security. According to the annual global reports on food crises, at the end of 2019, 135 million people across the 55 nations experienced the severe food insecurity. In these 55 countries, 75 billion of the children were experiencing stunting and 17 billion suffering from the wasting at the end of 2019 (World Food Programme, 2020).

Figure 1: Dimensions of Food Security



Sources:- FAO

Food availability dimension refers to sufficient quantity and quality of nutritious food available for all individual of a nation. Although, in Pakistan there is sufficient food available in a country but food availability problem still exists and severe concern in that area of country where armed conflicts, infertile lands, or prolonged natural disaster exist. Therefore, food distribution is biggest problem in these area (Aslam & Rasool, 2014).

According to the WFP report, among 135 million food insecure people, 73 million people living in Africa, 43 from Middle East and almost 18.5 million people from Latin America. This report also indicted that the biggest drivers of food insecurity in these nations are conflict, extreme weather and economic turbulence. In 135 million people almost 77 million in 22 countries are pushed toward food insecurity by conflict, 24 million people in 8 countries pushed toward food insecurity by economics shocks and 34 million people in 25 countries affected by extreme weather(World Food Programme, 2020).

Pakistan is a country with a lower-middle-income level, and the 6th largest country according to population. In the last decade, Pakistan faced unusual burden only due to the food insecurity or food deficiency. Although there is an improvement in the food supply or on the production of the stable food but country has experienced worse malnourishment and food insecurity in recent years. Pakistan has also faced sharp increase in food insecurity due to multiple reasons such as worst natural disasters including floods, earthquakes, and drought, conflicts and economics instability. These natural disasters caused in destruction of infrastructure, agricultural sector and also left people access to food, water and health facilities (Sleet, 2019).

According to UNICEF's (2018), about 36.9% of Pakistan household characterized as food insecure, in which 18.2 percent face severe level of food insecurity. Surprisingly, Khyber Pakhtunkhwa is comparatively more food insecure than Sindh and Baluchistan across the provinces. In 2018 monsoon season, Pakistan experienced a shortage of food, water, and fodder. In August 2018, almost 5 million people in 26 district affected by the drought.

Over the last few years, production of food increased in Pakistan. Approximately 1.4 million tons of wheat export by Pakistan in 2018. Export of total food also increase by 1.08 percent in 2018, but still food insecurity, malnutrition and hunger remain terrifyingly at highest point. According to the report of food and agricultural organization 2016, after Afghanistan, the performance of Pakistan toward reducing the malnutrion/ undernourishment and hunger is worst in this region. As per the World Food Program, 6 percent of total population in Pakistan faces severe food insecurity in Pakistan.

In this regard, the focus of current study is to measure the incidence of food insecurity in Pakistan and empirically investigated the social and economics determinant of food security at household level by using micro data. This paper is organized as follow, after detailed introduction of the theme, Section-2 gives a detailed literature review whereas Section-3 present research

methodology and theoretical framework. Whereas, Section-4 cover the methodology and discussion of estimation of results. Section-5 provides the concluding remarks and policy suggestions.

2. Review of Existing Literature

In this section on literature review, the attention has been given to find out the food security status at household level by following its determinants for Pakistan. Studies had also attempted to explore food insecurity in term of gender of head of the household, employment status and the household member numbers, education of the head of the family, region etc. This chapter reviews the relevant studies regarding the food security and its leading factors. Various studies showed that food insecurity associated with numbers of members, Education of the head of family, economic status of the head, region, education and health opportunities at household level. Determinants such as age of the household head, household size was associated negatively with food security status of the household. Studies used primary, as well as secondary information through observations, focus group discussion (FGDs) and review of documents.

Cheema and Abbas (2016) study estimate the food insecure three measure of FGT and by estimating logistic regression model, identified the factors that are contributing for food insecurity. Data for this paper has been used from Pakistan Social and Living Measurement, result showed that incidence of food insecurity is 28.63% food insecurity gap was 1.46% and negative relationship between food insecurity and education, livestock. Remittance but positively related to poverty.

Zhou et al. (2019) explored the factors those are affecting the northern area of Pakistan's food insecurity by applying random sampling technique for the collection of 294 household data through interviews. They used binary logistic regression to determine these factors. Result of this study showed that factors that determines the household food insecurity are age, gender, inflation, unemployment, education, disease, remittances, and gender played prominent role in food insecurity and male-head were food secure while the is probability of food insecurity in female-headed houses.

Hussain and Routray (2012) determined the differences between the national food insecurity line and consumption of people in Pakistan, determined good sufficiency level and also un-accessed food portions examined the economic and physical factors of food insecurity of Pakistan. This paper used secondary data by application of descriptive statistics, finding of this paper shown that Pakistan is independent in production of food but there is 30 percent gap between the availability of food and consumption by the people because of un-accessed of food due to some physical and economic factors or sometimes natural factors includes. In Pakistan Punjab and Sindh are the main food-producing areas, while Federally Administered Tribal Areas (FATA) are the food deficit areas. Food insecurity still ssurvives in almost all of the administrative units of Pakistan. Reasons for this food insecurity are illegal food movement, inefficient food procurement, and poor monitoring system of marketing and also natural disasters.

Asghar and Muhammad (2013) studied the determinant of the food security for both general and farmer households. Data for this study gathered from PSLM and empirically investigated by applying logit model used to find the probability of food insecure in food-secure households. The model fitted with 16 general households and 19 for former households. Out of nineteen variables 12 variable significant included household size, income of head of the household, number of rooms in the house, electricity connection, dependency ratio, age of the head and age square of head, and irrigation facility. But household education is insignificant for the general household model. Results of this study showed that most important factors that influenced the food insecurity at household level are included: income, education of the head of household, size of the household, income of agriculture.

Smith, Rabbitt, and Coleman-Jensen (2017) determined the common determinants of food insecurity of 134 countries by using a measure called as "cross country comparable experiential measure". They also identified the degree the common elements of food insecurity in the universal model across the ranking of development of the economics. They used series of linear probability model and the result showed that 5 characteristics are linked with the largest

food insecurity across the world across such as low income of household, less social capital, weak social networking, unemployment and less education.

Hamelin, Habicht, and Beaudry (1999) examined the household and social implications of food insecurity by 98 households from a heterogeneous population of low level of income of Quebec City and rural areas. They investigated the food insecurity and method of its prevention. Results suggested that human development aspects depend upon the food security. Conclusions underline the relevance and urgency of working toward standardized access to food.

Ishaq, Khalid, and Ahmad (2018) concluded that in Pakistan per capita dietary energy of supply exceeds its consumption. But half of its population is still food insecure. High intensity of food insecurity continuously persists in Pakistan. In this paper household expenditures survey based method used to measure food insecurity in form of dietary energy consumption from 2004 to 2016. The result of this study concluded that trends of food security fluctuating in this country at national and regional levels. The result showed that the highest food incidence in Sindh and Baluchistan while low in KPK. The study suggested that the government should take social safety net programs and emergency efforts to protect food insecure people and both economic and physical access needed to cut hunger in Pakistan and to reduce the vulnerability of people.

Arshad and Shafqat (2012) Study examined the indicators of food at district level in Pakistan and also discussed problem and issues related to supply and demand in agriculture sector of Pakistan. For this purpose, Agro-ecosystem approaches was discussed and introduced to ensure sustainability and productivity of agriculture sector of Pakistan. Conclusion of this paper provided suggestion and knowledge to agriculture adviser and other policy maker about agro-ecosystem and profit related to agriculture sectors of Pakistan and maintain land of Pakistan.

Yousaf, Zafar, Anjum, and Adil (2018) investigated the food insecurity status of both famer household and non-farmer household of Pakistan using three different measurement method including first intake assessment of diet, second scale of household for food insecurity, and last diversity scores based on household dietary diversity. For this purpose, primary data of 567 households was collected from 50 percent of farmer household and 50 percent of non-farmer household of pakistan.in this study Result was showed from different approaches as according to first method (dietary intake assessment) 38.9 percent farmer were food insecure and 45.5 % non- farmer were food insecure. As per the second method (household food insecurity access scale) 45.1% of farmers and 51.7% non-farmer household were food insecure. However, the third method shows that 57.3 percent of farmer household and 65.3% non-farmer household were food insecure. Study concluded that income, size of family and structure of family were important determinants for households.

Aslam and Rasool (2014) examined the determinants of food insecurity into three different aspects in Pakistan included availability of food, access to food and food absorption. Applied model was used in this study at household level. Sample of 90 people was collected from Lahore which is highly populated city of Pakistan. Data for this purpose was collected from questionnaire. Further Ordinary Least Square (OLS) was used. Findings of this paper showed that the R2 value was 96% and the value of F was 23. Suggestion of this study included that policies are required to increase economic access of household to food. Production of food should be increase to ensure the availability of food at household level. And suggested policies maker to make appropriate policies to ensure education and health facilities for poor household, and this will lead to improve food security level of household in Pakistan.

Sheikh, Iqbal, Qureshi, Azam, and Barolia (2020) determined the adolescent food insecurity status and its social determinants and then compared food insecurity of adolescents with household food insecurity. For this purpose, data of 799 household adolescents was collected from three different union councils of Hyderabad city of Pakistan through interview. Household food insecurity assessment scale (HFIAS) method was used to determine its result. Food insecurity was found almost 52.5 % in the adolescents as compared to 39 percent of food insecurity founded in the household. There was less food insecurity in female adolescents than male, whereas, socioeconomic determinants status was not associated with food insecurity of adolescents.

Babar, Latief, Ashraf, and Nawaz (2019) examined the situation of food insecurity with its social and economic determinants in Pakistan. In this study different methodologies were applied to analyze the food insecurity and determinants in Pakistan. To examine the incidence of food security, insecurity gap is used in this study. Logistic regression model was used. In Pakistan, almost 70% of the household which is alarming. Household head gender, saving, head of the household characteristics, income level, and other expenditure are important determinants and have significant impact food security in Pakistan.

3. Research Methodology

3.1. Food Insecurity Measurement

In this study Household Expenditure Survey (HES) method is used for the measurement of food security and insecurity at household level for the analysis of study objectives. This method contains the information about the quantities and expenditure of food. In HIES survey, data available for both food quantities and expenditure on food item consumed by the household, while data of food expenditure is only available for food item consumed away from home (Ishaq et al., 2018).

As per this method, the food insecurity level is identified based on Dietary Energy Consumption (DEC) measured by tkcal per day usage for adult in terms of equivalence. Food composition table (FCT) of Pakistan is used to obtain the caloric value of the various food items. There are two following procedures to calculate Dietary Energy Consumption (DEC) at household level. First procedure is used when data of food quantities are available in kilograms, liter/milliliter or grams. Second method is used when food is consumed away from the home or the data of the food quantities is not available or not transformable into gram EP but the data about the expenditure of the food is available (Ishaq et al., 2018).

Household expenditure survey (HES) provide the information of both expenditure and quantities of food items consumed at home and provide the information of food expenditure (monetary value) that are consumed outside the home.

As everyone in the household need different dietary energy requirement according to their age and sex. But Household Expenditure Survey (HES) provide data of food consumption at household level therefore, to account for these differences, there is need to calculated household's adult equivalent size using the following formula:

$$AE_h = \Sigma_{i=1}^{hhsize} AE_i$$

Here, $\Sigma_{i=1}^{hhsize}$is sum of members of household, AE_h is adult equivalent size
Adult equivalent of size/factor of each household members is taken from the equivalence scale that is given in the poverty reduction strategy paper Pakistan (PRSP-1) in 2003. As according to equivalent size every individual in household need different energy.

3.2. Calculation Method

For measuring the daily food equivalent for each member of the household is calculated by sum of calories calculated by procedure 1 and procedure 2 and then divide it by adult equivalent factor/size (AE) of respective household.

$$DAEtkcal_h = \frac{tcal_h}{AE_h} = (\frac{tcal_{gh} + tkcal_{kh}}{AE_h})$$

3.3. Food Insecurity Status

In this stage, we calculated the food insecurity status of the households for taking the decision whether the household is food secure or insecure by comparing the threshold level of their minimum dietary energy requirement (MDER). As per FAO (2017), the minimum dietary energy requirement (MDER) are as;

$$FS_h = \begin{matrix} 0: DAEtkcal_h < MDER \\ 1: DAEtkcal_h \geq MDER \end{matrix}$$

Here, if food security status is equal to zero means household is food insecure and if food security status is equal to one means household is food secure.

3.4. Model and Variables

This study will investigate the food insecurity status of Pakistan at household level using Household Integrated Economic Survey (HIES) 2018-19. In this study controlled variables will help to generate basic model including Food insecurity index computed food quantities consumed by household and expenditure on food. Food insecurity index is in binary form. Where 0 represent household is "food insecure" and 1 represent household is "food secure". Urbanization means respondent living in urban or rural area. Other controlled variables included Household size, gender, age and education of the respondent household. Income and consumption level of the household, water sources and distances from drinking water, numbers of rooms, and gas connection. Data for all variables composed from HIES 2018-19.

$$FI_i = \beta_0 + \beta_1 HS_i + \beta_2 Y_i + \beta_3 Hedu_i + \beta_4 Hage_i + \beta_5 Hgen_i + \beta_6 WS_i + \beta_7 WD_i + \beta_8 rooms_i + \beta_9 GC_i + \beta_{10} TEXP_i + \beta_{11} AL_i + U_t \quad (1)$$

In this model, i subscript represents different cross-sectionals. FI is food security status that is dependent variable in this study and HS is size of the household or family size, Hedu stands for education of head of respondent household, Y is overall income of the household, Hgen stands for gender of head of household, rooms stands for number of rooms in respondent house, WS stands for water sources for the household, GS stands for gas connection availability for household, WD stands for distance of drinking water for household, AL stands agriculture land holding for household and TEXP stands for total expenditure of household. We will further apply the logistic regression model to find the probability of food-insecure in food-secure households.

4. Result and Discussion

This chapter includes the discussion on findings and results of the model. Descriptive statistics of food security status and other controlled variables are as given as;

Table 1: Descriptive Statistics

Variables	#Obs	Mean	St Dev.	Mini	Maxi
Food security status	24806	.6912441	.4619896	0	1
Household size	24806	6.555045	3.277564	1	63
Gender of head	24806	1.093416	.2910201	1	2
Age of head	24806	46.21534	13.14086	11	99
Education of head	24806	6.081459	5.402213	0	18
Annual income	24806	345346.1	441259.5	0	518228
Annual expenditure	24806	347813.4	274855.2	0	276578
Num. of rooms	24806	2.476067	1.428537	1	34
Water source	24806	3.074139	2.620156	1	11
Distance for drinking water	24806	.329985	.7299877	0	5
Gas connection	24806	.576789	.5778768	1	2
Agriculture land	24806	1.942007	.2337357	1	2

Below Figure 1 showed food security status in Pakistan. Result of this table shows that more than 31% of the Pakistan population is found food insecure and 69% of the population is estimated as food secure. Above results also showed that there is same level of food insecurity status in both urban and rural areas of Pakistan. The food insecurity incidence in rural area is 32 percent, and food security incidence in urban area is 68 percent. Whereas, food insecurity incidence in urban area is 30 percent, and food security incidence in urban area is 69 percent.

4.1. Empirical Findings

By applying the logistic regression, the findings shows that household size, distance for drinking water have significant and negative association to the food insecurity status. Whereas, education level of head, gender of head, age of head, number of rooms, gas connection, water sources, annual income of household, total expenditure of the household and agriculture land holding positively related to the food insecurity of the households.

Table 2: Logistic Regression Model

Food security status	Odd ratios	Coefficients	Significance
Household size	.4430848**	-.0897888	0.000
Annual income level	.9975774**	1.98e-08	0.008
Annual expenditure	1.004777**	2.56e-07	0.000
Gender of the head	.111778**	.1059607	0.000
Age of head	1.017948**	1.253632	0.000
Education level of head	1.015225**	.0001842	0.000
Agri. land holding	8.257376**	1.70538	0.000
Num. of rooms	1.022727**	.0179055	0.000
Water sources	1.017633**	.0380261	0.000
Distance from water	.9230521**	-.0820082	0.000
Gas connection	1.147111**	.0544862	0.000

Number of observation=24806
Wald chi2(11) =6484.10
Prob>chi2 =0.0000

Result of logistic regression shows that household size, distance for drinking water have negative and significantly related to the food security status, whereas, education level of head, gender of head, age of head, number of rooms, gas connection, water sources, annual income of household, total expenditure of the household and agriculture land holding positively related to the food security status of the household.

Regression result showed that there is negative relationship between size of household/ family size and food security status at household level. According to the regression interpretation higher the number of members of a household means lower the food security level of the household. As higher family size reduced the chance of household being food insecure. Probability of food secure decrease as the increase in the number of within the household. As, more household members put pressure of the overall household resources. According to some opposite argument, food insecurity decreases as the number of member increase, as more hand to works in the family, resulted in increase the income level of the household and leads toward increase food insecurity status of the household.

As almost 90% of the households in Pakistan headed by the male. Result of regression shows that there is positive and significant relationship between male head of the household and food insecurity status of the household. As, Pakistan is male nominating society therefore, male head plays a leading role in eliminating food insecurity status of the household.

Result of the regression showed that there is positive association between income level of the household and food insecurity status of the household. As household income level increase leads to increase food security level of the household. In the simple words, higher the income level of the household higher the chance of household being food secure.

There is also a significant and positive association between food insecurity status and household age. It implies that as the age of head increase food security of household also increase. Higher the age of head, increase the chance of household being food secure. According to an opinion, food insecurity increase at the age of 35, then start decline as the age of head increases. According to the opposite agreement, as at the young age a person is more energetic and more dynamic in nature therefore earn more money. As with the passage of time his experience increase but his energy level turned low.

According to above regression result, there is positive association between expenditure of households and food insecurity status of the household. As, when the overall expenditure increase it will lead to increase in the food expenditure of the household and decrease the probability of the household being food insecure.

Result of above result showed that there is positive relationship between education of head and food security status of the household. As the level of the education of the head increase will leads to increase the chance of household being secure. Education increase opportunities for earning and empower them with more skills such as technological and entrepreneurial skills. Education increase the working efficiency and proficiency. Therefore, educated head plays a vital role in shaping other household members e.g. children.

There is negative relationship between distance of drinking water of the household and food insecurity of the household. As, the distance for drinking water increase, it will decrease the food security status of the household. More the distance less the chance of household being food secure.

There is positive relationship between food security status and agriculture land holding in this regression. As, Pakistan is agricultural country, when a household have land to cultivate major food item such as wheat, rice etc leads to enhance the level of vulnerabilities. Gas connection is also positively associated with food security status of household. It depicts that if there is gas connection available for the household, then there is more chance for the household being food secure.

The result of the regression indicating that there is positively associated between number of rooms and food insecurity status of the household. As number of rooms is taken as a proxy variable to the standard of living of the household. Therefore, more number of rooms depicts that more food secure household. Number of rooms increase is the sign of improvement in standard of living.

As water is important determinate of food insecurity at household level. The result of the regression indicating that there is positively relationship between water sources and food security status of the household.

5. Conclusion and Policy Recommendations

In current global scenario, food availability and food production are the most critical areas for ensuring inclusive and sustained development of the economies. In this regard, this study is the most relevant for the policy makers to ensure quality food for long and happy life of the masses. The focus of this study was to measure food insecurity index for Pakistan by utilizing sophisticated techniques and also analyze the leading determinants. After descriptive analysis of this study, comprehensive empirical analysis has carried out for policy design.

This study has used HIES data set for measuring food insecurity and expenditures approach for the dimensions. Controlled variable such as education and income of the household, age and gender of the head of household, household size and expenditure of the household, agriculture land, gas connection, and distance for drinking water were used as the major social and economic factors of the food insecurity. Further logistic regression model used in this study. Study revealed that income and expenditure of the household, age, gender, gender of household head has positive and strong impact on food security status of the household. Whereas, size of the family and water distance has negative and significant impact on food insecurity status of the household.

Regression result showed that there is negative association between size of household/ family size and food security status. According to the regression interpretation higher the larger the family size, leads to lower the food security level of the household. Probability of food insecurity decrease as the increase in number of members/size of the household. As, more household members put pressure of the overall household resources. According to some opposite argument, food insecurity decreases as the number of member increase, as more hand to works in the family, resulted in increase the income level of the household and leads toward increase food security status of the household.

Development of agriculture is recommended to improve food security status of Pakistan. According to the result of geographical areas, Baluchistan is in more severe condition of food insecurity as compare to other provinces. Therefore, in this area of the country special policies and efforts are needed to improve severe condition. Efforts in these areas included development in agriculture sector, more employment opportunities, smooth access to education, better infrastructure more social security programs are desired to implement for long and sustained development of Pakistan.

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