Household Food Insecurity: Empirical Evidence from Pakistan

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CERTIFICATE

This is to certify that this thesis entitled: "*Household Food Insecurity: Empirical Evidence from Pakistan*" submitted by Ahmad Bilal Babar is accepted in its present form by the Department of Development Studies, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Development Studies.

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List of Abbreviations

1.	BISP	Benazir Income Support Program
2.	FAO	Food and Agriculture Organization
3.	FIG	Food Insecurity Gap
4.	HDDS	Household Dietary Diversity Score
5.	HIICS	Household integrated income and consumption survey
6.	MDGs	Millennium Development Goals
7.	SD	Sustainable Development
8.	SDGs	Sustainable Development Goals

Abstract

Food is a basic necessity but food insecurity is still prevalent around the world especially in third world countries despite continuous efforts to cope with it. Food security is a multi-dimensional phenomenon which encompasses availability of food, access, its utilization and sustainability. This study sought to examine the overall situation and socio-economic determinants of household food insecurity in Pakistan. Multiple methodologies are employed to examine the potential determinants of household food insecurity, the incidence and depth of food insecurity in Pakistan. An index is formed to know the incidence and overall situation of food insecurity in Pakistan. Household Dietary Diversity Score and Food Insecurity Gap are used to find out the access of food and depth of food insecurity respectively. Descriptive analysis and Logistic Regression analysis are used to determine the potential determinants of food insecurity in Pakistan. Findings of the research are that Pakistan is facing a severe food insecurity condition where 70 percent of the households are food insecure which is very alarming. Household size, gender of household head, annual income of the household, age of household's head, annual savings, cash transfers (BISP in case of Pakistan), expenditures, agricultural land holdings and education of household head are found to have a significant impact on state of affairs of food insecurity in Pakistan. Findings of the study suggest that measures should be taken to: increase the income of people, increase the employment opportunities, increase the literacy level of people, decrease household size and dependency ratio and women should be empowered economically to deal with the problem of food insecurity.

Key Words: Food Insecurity, Pakistan, Logistic Regression, Food Insecurity Gap, Household Dietary Diversity

1. Introduction

In several parts of the world, for many people having three meals a day or even two is a luxury although food is a basic necessity. This injustice elucidates the concept and idea of food insecurity. The understanding of food insecurity is about people not being able to appease their hunger when they want (and what they want to eat) or in other words not knowing when their next meal will come. “Food security cannot be guaranteed and safeguarded if people cannot continuously purchase the basic food they are accustomed to” (Kakwani & Son, 2016).

The idea of food insecurity advanced with the passage of time from supply of food to access and distribution of food resources. Even with the existence of enough food resources at national level, variations always exist at regional level. In recent times the term food security does not only refers to global or national level but now it also refers to community, household and individual level. The most accepted, common and extensively used definition of food security is “Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (World Food Summit, 1996).

Above stated definition implies that four pillars of food security are there i.e. food availability, utilization, access and stability. First and the most important i.e. food availability deals with the supply side of the food equation. Food availability is determined by the production of food, food imports and the stocks. Adequate resources or entitlement to acquire safe and nutritious food is called access. Access is the major area of concern for Pakistan and other third world countries. Poverty keeps constraining the access of food for poor and limit their choices of food. The concept of utilization brings non-food items in the concept of food security. Utilization is to reach the state of nutritional wellbeing by using food through appropriate diet, clean drinking water, health care and sanitation facilities. ‘The Stability concept discusses both, food availability and accessibility dimension of food security’ (Abdul Wahab, et al, 2015). These all dimensions interact to determine the overall country’s state of food security.

The whole world is more concerned about the state of food security today. Although Pakistan can produce for itself, still Pakistan is not food secure at household level. Pakistan is sixth most populated country in the world having population of 207.774 million people (6th

population and housing census 2017). Most of the people belongs to rural areas which mostly & heavily depend upon farming to earn their living. Agriculture provide jobs to 42.3% of the country's labor force and contributes 19.5% to the GDP (Pakistan Economic Survey 2016-17). Pakistan is a leading producer of many food commodities e.g. cereals, milk and meat etc. in Asia. According to FAO average food supply is 2440 kcal/capita/day (2016) but unfortunately the percentage of malnourished populace is very high. According to FAO 41.4 million people are undernourished (2014-16, 3-year average) and 39% people live in multi-dimensional poverty according to economic survey of Pakistan (2015-16).

Eradication of hunger and food insecurity is also a centerpiece of Sustainable Development Goals (SDGs) set out by UN (United Nations). The second goal (SDG-2) aims to end hunger, reduce food insecurity, and improved nutrition and promote sustainable agriculture. Pakistan's performance to 'eradicate extreme hunger and poverty', as promised in Millennium Development Goals (MDGs), had been abysmal. Pakistan is ranked 77th out of 113 on Global Food Security Index in 2017, six out of ten Pakistanis are food insecure and almost one half of women and children under five years of age are undernourished (World Food Program, 2016). It is true that the country has been under immense pressure on footings of population increase, depleting resources and the environment; however, statistics show that food insecurity persists although food production is sufficient to feed all Pakistanis.

Evidence suggests that achievement of SDG-2 is more a problem of distribution than of production. Amartya Sen in Development as Freedom writes that we live in world of 'unprecedented opulence'. Yet, this tremendous increase in wealth coexists with tremendous amounts of 'deprivation, destitution and oppression'. He further elucidates through examples e.g. great famine of Bengal (1943-44), etc. that crisis in contemporary capitalist system is unique for coexistence of excess and shortage. It implies that scarcity is artificial and can be solved through distributional policies. In a nutshell, presence of hunger and food insecurity in a world of abundance is a market failure and it can be eradicated through appropriate distributional polices aiming at provision of basic needs to all.

It is high time to rethink how we produce, distribute and consume our food, stated UN. There is no doubt that use of technology and innovative agricultural techniques can provide help us produce abundant food to feed all, while supporting inclusive development and preservation of ecosystem. However, as mentioned above, existence of widespread hunger and food

insecurity is primarily a distributional issue i.e. policy makers need to understand patterns of sharing and consuming food prevalent in our society.

"There is enough for everyone's need but not for everyone's greed". (M.K Gandhi)

According to Gandhi's maxim, and restraints on excessive consumption imposed in every religion (UNDP, 1998), only an economic theory aiming at fulfillment of needs rather than satiation of wants can guide to path leading to a world free of abject poverty, hunger and food insecurity. Moreover, Sustainable Development (SD) is an all-dimensional phenomenon and synergies and complementarities exist between second sustainable development goal and other SDGs such as improvement in status of women, provision of basic health and education services, peace and security, physical infrastructure, climate change, etc.

Sustainable development by definition demands holistic approach, so eradication of hunger and food insecurity is also linked with improvement in status of women, provision of basic health and education, peace and security, land reforms, and alignment of policies for fair and equitable distribution of resources. Food security, although, is thought of comparatively simple idea, it is difficult to determine the potential factors that impact food security.

Food insecurity is a multi-dimensional issue hence the current piece of research attempts to fill the gap by determining the factors/determinants of food insecurity at household level using the latest Household Integrated Income and Consumption Survey (HIICS) data by employing multiple strategies. Apart from other determinants, it attempts to analyse the determinants that were not analysed by the researchers

1.1 Statement of the problem

Pakistan is facing the immense pressure of population growth, depleting resources and the environment, and at the same time facing the problems of uneven growth and development between rural and urban areas. Pakistan could not fulfill its commitments as promised in MDGs. According to Global Hunger Index, the ranking of Pakistan is 106^{th} out of total 119 countries, despite the fact that Pakistan produces surplus food that it can export (von Grebmer et al., 2017). Pakistan has ranking of 147 amongst 188 other countries in Human Development Index (HDI) 2017. National Nutrition Survey, 2011, states that 58 percent of the people of Pakistan are food insecure.

Many studies suggest that there exists a nexus between food insecurity and negative health outcomes. Seligman, et al. (2009) found relation between food insecurity and diseases like hypertension and hyperlipidemia while (Martin & Lippert, 2012) suggested that food insecurity have negative impacts on health of children. These negative health impacts lead to lower productivity which harms the human capital formation (Collins, 2005).

Socio-economic determinants of household food insecurity need to be known to allay the consequences of food insecurity, achieve food security in Pakistan to meet SDGs and improve general wellbeing of people.

1.2 Research Questions

- What is the overall situation of food insecurity in Pakistan?
- What are the socio-economic determinants of household food insecurity in Pakistan?

1.3 Objectives of the study

Key objective of the study is to investigate and analyze socioeconomic determinants of food insecurity at household level in Pakistan. The precise objectives or aims of the research are as follows:

- To assess the food insecurity position in Pakistan (Incidence).
- To calculate Household Dietary Diversity Score for Pakistan.
- To estimate the socioeconomic determinants of household food insecurity in Pakistan.

The rest of the study is organized as; section two presents brief review of the relevant literature. The data and methodology is presented in section three. The methodology and data section gives a brief account of methodology, variable construction and provides the source of data and brief explanation**.** Section four explains and discusses the results in detail whereas chapter 5 concludes the results of the study and provide policy recommendations.

2. Literature Review

The review of literature in any area of research is vital as it offers a wide-ranging impression and recap on the given field of research from the past and current, that gives research a sense of focus to know where your new research will be heading.

Food security is a multidimensional concept and there is ample literature describing issues regarding food security at both household and country level. This study, since, mainly focuses on determinants of food insecurity at household level, so mostly the literature from studies at household level are chosen but due to the importance of macro-economy, literature in this context is also reviewed.

2.1 Concept of Food Insecurity and its Aspects

Food security is a dynamic and multi-dimensional idea that has gone through substantial transformations in its conceptual lifetime. It is a supple idea as imitated in the various efforts at definition in research and policy usage. Even a decade ago, there were almost 200 definitions in published writings (Simon Maxwell & Smith, 1992). Simon Maxwell (1994) explored post-modern currents in food security and it classified three core shifts in thinking about food security since the World Food Conference of 1974: from the global and the national to the household and the individual; from a food first perspective to a livelihood perspective; and from objective indicators to subjective perception. The concept of 'Food Security' emerged only in the late 1970s, in the consultations of international food glitches at an interval of global food crisis. The preliminary attention was mostly on food supply hitches - of pledging the availability and to certain degree the price stability of basic foodstuffs at the international and national level. That supply-side, international and institutional set of apprehensions redirected the changing organization of the global food economy that had precipitated the crisis. The problems of famine, hunger and food crisis were also being comprehensively reviewed, following the events of the late 1970s. The consequence was a redefinition of food security, which acknowledged that the behavior of hypothetically vulnerable and affected people was a critical aspect. A third, possibly most important feature in amending understandings of food security was the proof that the nominal accomplishments of the Green Revolution did not automatically and promptly lead to significant drops in poverty and levels of malnutrition. These problems were recognized as the result of lack of

effective demand. Food security is a multi-dimensional phenomenon. National and international political action seems to require the identification of simple discrepancies that can be the foundation for setting the targets, thus necessitating the adoption of single, simplistic indicators for policy analysis.

As described earlier the focus of policy makers was always on the supply side of the food equation ignoring the fact that all the people have the access to food or not. To have access, availability is the necessary condition but not sufficient. It further requires consistent availability and entitlement. Stability is another aspect that is very vital to food security. Stability requires consistent supply of food at individual, household and national level. Unfortunately, in countries like Pakistan people do not have capacity to store food to avoid fluctuations (M. Ahmad & Farooq, 2010). This paper further explores the trends and state of food security in Pakistan. They analysed the per capita annual availability of food in Pakistan which shows an increasing trend and average availability of calories/capita gradually increased. Despite the fact that indicators analysed showed a positive trend, one third of all pregnant women in Pakistan were found malnourished and 25% of new born babies were found underweight in 2001-2. Hence, emphasizing only on food availability is not enough for attaining food security; other aspects of food security should not be overlooked.

2.2 Socio-Economic Determinants of Food Insecurity

Sidhu, Kaur, and Vatta (2008) analysed the determinants of food insecurity in a food surplus area i.e. Ludhiana district of Punjab state. The study comprises of both urban and rural households and households were selected through multistage sampling. They used Logit model for estimation of determinants. They found family size, household income and status of being rural and urban to be statistically significant. Analysis depicted that as the income increases, chances of becoming food insecure decreases. Greater the family size, greater the chances to become food insecure. Rural households were found producing for themselves so they were less likely to become food insecure as compared to urban households. They proposed increasing purchasing power and income generating opportunities for more vulnerable segments of the society.

Using data of 120 districts taken from SDPI (2003), (Khan, et al, 2009) examined the determinants of the three aspects of food security i.e. food availability, absorption and accessibility. Food availability means that sufficient food supplies are available whereas accessibility and absorption means that enough resources are present to access food supplies

and their utilization respectively. They used a series of models and used OLS method for estimation of coefficients. Their results show that food availability has positive relation with production of grains, poultry, meat, fish and dairy products. Livestock does not only provide food but also serves as asset that can be converted into cash when needed. Only Sindh is found to be food secure in terms of food availability. Locality also matters in terms of food accessibility. Sindh and KPK were found to be food secure in terms of accessibility. According to the study determinants of food accessibility are adult literacy, ownership of land and electrified houses. Adult literacy and electrified houses affects the food security positively whereas cultivators under acres are supposed to have less accessibility of food. In terms of absorption only Punjab and Sindh are food secure. Determinants of absorption were found to be the number of health care centers, immunization, safe drinking water and female literacy.

Sultana and Kiani (2011) probed into the potential factors that can impact the level of household's food insecurity in Pakistan. They used a logistic regression analysis. They analysed the matter with the help of data obtained from "PSLM 2007-08". Five main variables were used beyond other demographic pointers that can affect food insecurity level. These consist of: where they live, social capital, dependency ratio, status of employment and level of literacy of household head. They realized that place of dwelling and dependency ratio did not have a positive effect while literacy level of head of household above intermediate level has substantial and positive influence on food security status of household. Social capital, on the other hand, and engagement in earning opportunities do not effect household's food security, their result was not significant. Diverse strategies and programs are required to address these determinants using a holistic and incorporated approach. This study is limited to the level of literacy of household head and overlooks the impact of gender of household's head on food security.

Income plays a noteworthy part in defining the status of household being food secure or insecure. Households relying on only one source of income have more probability to be food insecure than the households having diversified income sources (Aziz, et al, 2016). It is easier for the household having inconsistent income to become food insecure as compared with household with consistent income (Iram & Butt, 2004). Economic status plays a vital role in determining the food security status but it is not the only decisive factor. Literature suggests many determinants apart from income, for example, education, dependency ratio, household size, and age of household head.

K. Ahmad and Ali (2016) suggested that the increase in population growth impact the production and availability of food, the growth in food production can decrease the food insecurity but it may not overcome the needs of the people which live below the poverty line. Other things which keep the population food insecure are the agricultural policies and distribution mechanism. The increase in the food prices is also due to the increase in input cost in the agriculture which results in the upward trend in inflation. 'Johanson Co-integration Technique' is applied to study the long run nexus among the variables whereas to determine the short run dynamics the "Error Correction Model (ECM)" was used.

Education is the best investment that can be made in third world to change their fortune. Education helps to address many issues at the same time e.g. Population explosion, health, human capital, income earning opportunities and most important of all "food security". It also improves food knowledge, food preparation skills of the food preparer and purchaser and improves purchasing efficiency. An adverse nexus exists between food insecurity and schooling (Rose, et al, 1998). They examined the household food security in USA and found that households headed by high school graduates have less probability to be food insecure. Likelihood of being food secure, in general, increases with the level of educational attainment (Maitra & Rao, 2014) .They conducted this study in slums of Kolkata, India. The results also reflect those of (Gupta, et al, 2009) which states that 50% of the poor (also food insecure) households (in slums of Kolkata) were headed by an illiterate person.

Ali and Khan (2013) suggests that livestock ownership ensures the food security in rural households of Pakistan. They further suggest that food insecurity is the function of poor access to market and poor asset base.

In developing countries, livestock has, both, direct and indirect contributions to food security. To ensure food security, provision of nutritious food is necessary. Animals are an important source of food that contains essential amino acids, micro nutrients, proteins and vitamins. Furthermore, livestock is a very good source of income for small farmers as it can generate continuous income. This income is very helpful in fulfilling day to day family needs and in purchasing agricultural inputs (Sansoucy, et al, 1995). In India, development of dairy has shown to improve consumption, income and repayment capacity (Kulkarni, Bhatta, & Kumar, 1989). In developing countries, dairy usually is labour intensive and increase in production means increase in employment. Livestock is also a source of organic fertilizer

which is of immense importance for small farmers, that can increase their income and thus consumption (Sansoucy et al., 1995).

Cash transfer programs have shown a positive impact on food security around the world. Haushofer and Shapiro (2016) suggests that monthly cash transfer increases the prospects of food security among the households instead of lump-sum cash transfers which are highly likely to be spent on durables. They found a strong nexus between cash transfers and increase in consumption.

For the poor people to have a supplementary income with their other source of earning, the government of Pakistan in 2008 introduced the Benazir Income Support Program (BISP), aiming that it will help the low-income households to ease their financial constraint. The study shows that households get their income from government or private income along with the agricultural income. The cash of BSIP received by the families, most of it was spent on food and it was a major source to achieve the food security (T. Hassan & Bibi, 2016). The data shows that there is strong positive correlation between the BISP amount and acquiring the food items.

Women have significant and considerable importance in the society due to their role in society in many ways from contribution in household, economic activities, childbearing and rearing, are the most to be affected by the food insecurity. The food insecurity may be due to the low intake of food and economic constraints but the women who are from low income households are more vulnerable to the food insecurity. According to Rose and Oliveira (1997) women of childbearing age are more food insecure due to the low intake of micronutrients.

Female headed households are more likely to be food insecure as compared to male headed households, concluded Kassie, Ndiritu, and Shiferaw (2012).They used detailed farm household survey data from 30 divisions in rural Kenya and used both descriptive statistics and econometric techniques to ensure the credibility of results. The descriptive statistics revealed that only 5% of the (MHHs) male headed households were suffering from food insecurity as compared to 11% of the female headed households (FHHs) and these results are also backed by the econometric results. The study further reveals that the determinants of food security are: farm size, land quality, distance from market and the quality of the extension workers (proxy for government effectiveness). FHHs food insecurity reduces with the reduction in distance to the market while their food security has a positive link with the

quality of land, farm size and quality of extension workers. (Maitra and Rao 2014) also agrees with the literature on feminization of poverty and concludes that female headed household are more likely to be poorer and food insecure consequently (Aziz, et al 2016; Iram and Butt 2004). In contrast to this study (Mallick & Rafi, 2010) found no significant difference of food security between male and female headed households. Ibnouf (2009) found in her study that women in rural areas of Sudan are more capable as compared to men in terms of increasing food security for their families as they can use and allocate resources in a better way.

Women who bear more responsibility in rearing the children, if they are economically dependent and belong to low income households are the most vulnerable to the food insecurity. According to (Ivers & Cullen, 2011) the women with low purchasing power, less economic opportunities and low educational level are more likely to restore to copying strategies to secure food and increase their intake.

The copying strategies to increase food intake can be the withdrawal of children from school, theft, the sale of assets for food and the sex for food (Ivers & Cullen, 2011). Women who have no other source of income adopt other strategies which are riskier and can create social, moral and health problems for them and their families. By going to the copying strategies, the women can go into abusive relationship which increases their financial constraints and resultantly increases the intensity of food insecurity.

Women are much food insecure in those cases where they belong to low income households. According to (Shariff & Khor, 2005) those women, who are more food insecure are those who are less educated, belong to lower income households and they tend to have greater number of children than women who are from food secure households.

In other cases, which are related to pregnancies, the food insecurity varies the most. During the stages of pregnancy, the food intake is the most affected. The women from low household income are much vulnerable in the later stages of the pregnancy when they cannot work and become more financially instable. Their food intake reduces which impact their health, Laraia, Siega-Riz, Gundersen, and Dole (2006). The food security can be increased if women are educated about nutrients intake.

Ivers and Cullen (2011) suggested that the food security has direct relationship with the health of a person, and in case of women it matters a lot. The women who contribute to the

household, especially those who take care of their children are more vulnerable to the food insecurity. The food security can be increased with an increase in income and attainment of better education. The financial constraint and low economic opportunities increase the food insecurity, which compel the women to restore to the risky strategies which have direct impact on their health, and compromise the living standard of themselves and their children.

2.3 Macroeconomic Determinants of Food Insecurity

Overall macroeconomic conditions of a country trickles down to the household level so it is important to study the impact of these variables on food security. Applanaidua, et al, (2013) examined the relationship between some selected macroeconomic variables and food security in Malaysia. The macroeconomic variables which they analysed were biodiesel production, government expenditure on development of rural areas, exchange rate, GDP of Malaysia, Population of Malaysia and food price index. They used Augmented Dickey-Fuller test and Phillip Perron test to check the stationarity. Vector Autoregressive Approach was used to examine the relationship between food security and the above stated macroeconomic variables. Population showed a positive sign meaning that more the population more food insecure a country will be. According to their results, the food price index and population of Malaysia were the only two variables which had significant impact on food security, while remaining macroeconomic variables had no significant influence on food security of Malaysia.

2.4 Impact of Climate Change on Food Insecurity

Pakistan's contribution to total amount of greenhouse gases is among the lowest in the world, less than 1% but Pakistan is among the most vulnerable countries of the world which will be affected by climate change. Foreign Policy magazine on 4th march, 2016 stated that "Pakistan's big threat isn't terrorism- its climate change"(NAZAR, 2016). A Gallup poll in 2007-08 ascertained that only 34% of the Pakistanis are aware of climate change but the statistics must have changed after that. Pakistanis have seen the effects of climate change first hand whether the heat wave in Karachi, the most populous city of the country, the catastrophic floods or drought in Thar. Gregory, Ingram, and Brklacich (2005) states that climate change can affect supply chain infrastructure, food prices and markets in numerous ways e.g. changes in temperature, changes in rainfall that can lead to drought or flooding and the duration of growing season etc. Janjua, Samad, Khan, and Nasir (2010) predicted based on variance decomposition analysis that climate change will cause 34% variation in wheat

production in Pakistan in coming years. The situation is very alarming as wheat is the staple food of Pakistan. Climate change is not only affecting the food security situation of Pakistan but at the global level. Nelson et al. (2010) states that the climate change will have negative impacts on food production and the most affected by this will be the developing world. Though many policies can mitigate the effects of climate change on food security, climate change single handedly can be the source of increasing 5-170 million food insecure people.

2.5 Political Instability as a Consequence of Food Insecurity

The internal conflict and armed uprisings around the world may have many causes, but the food insecurity is a potential cause to add to the instability of many states. According to (DeFeo, 2017) the Arab Spring caused uprisings in many countries like Egypt, Syria and other Arab States, but in Syria the underlying cause of instability was food insecurity.

When the government and state fails to provide the adequate food to the people then they start fighting when they are hungry, and it may result in ethnic or religious factions and fight each other. In developing countries, which are mostly dependent on agriculture these cases may be more due to the lack of agricultural policies, lack of infrastructure and weak institutions for implementing the policies.

The food and water scarcity have been underlined a concerning cause for the political instability in the developing countries, as they have no better trade policies and market mechanism to smoothly continue the supply of food. According to (DeFeo, 2017), the climate change which has impacted the developing countries the most; have affected the production of food and have resulted in increase in prices.

According to (D'Souza & Jolliffe, 2013) in those areas where there is food insecurity, are much vulnerable to the violence and instability. Such situations are the result of unequal distribution of the resources which have been seen in war torn areas like Sudan, Afghanistan, Iraq and Syria. The violence which the armed groups have resulted, make the situation much deplorable, when the government fails to intervene and those groups increase their strength by getting the support of the locals by providing the food in return (E. Hassan, 2014).

The rise of Islamic state in Iraq and Syria, the war in Sudan, the Afghan war have left people in much dire conditions where they have no access to food. The war which results in the destruction of the infrastructure also disrupts the food supplies. According to (Clarke, 2000)

the supplies of the food have also been disrupted as a military strategy to starve off the armed groups and decrease their support by the people.

The war zones have experienced the food insecurity which has resulted in mass migration. In case of war in Iraq and Syria and Afghanistan have forced people to migrate into neighboring countries which already are developing like, Turkey, Lebanon, and Pakistan. These countries are already experiencing political and social instability. Due to influx of migrants the instability can be increased which not only affect the host country but also can threaten the regional instability.

According to (The Economist, 2016) in such cases the developed countries like United States and European countries must help in trade and aid the developing countries so they can pacify the situation and minimize the threat of regional and international instability.

Pakistan has been listed the 16th fragile state and has been designated in the High List for the State failure. Pakistan is also a vulnerable country because of the demographic pressure indicator which in 2015 was 8.9-10^{2} (The Fund for Peace, 2016). Now-a-days the water scarcity in Pakistan is labeled as the most concerning may also add to the conflict between the administrative units due to the water share. If the case remains the same, it will create much instability and can be a real problem in Pakistan which can make it much fragile and instable state in the region.

The food security and its adequate supply to the people can strengthen the stability of the country both politically and socially but in other case it will result in internal conflicts, armed uprisings which may add to the instability and make the state more fragile. The authors and strategists have quoted the cases of the fragile and instable states which not only threaten their security but also affect the regional stability. To avert these all, the developing countries have the role to pacify the situation by having better trade policies and help the developing countries to overcome those problems, see (DeFeo, 2017) and (D'Souza & Jolliffe, 2013).

From the literature, it is evident that food insecurity is a multi-dimensional issue hence the current piece of research attempts to fill the gap by determining the factors/determinants of food insecurity at household level using the latest Household Integrated Income and Consumption Survey (HIICS) data by employing multiple strategies. Apart from other determinants, it attempts to analyse the determinants that were not analysed by the researchers e.g. impact of Benazir income support program on food insecurity. In particular

study will attempt to calculate the Household Diversity Score for Pakistan that is a proxy for access part of food insecurity issue. Many studies have found that there is availability of food at national level therefore assessing the extent to which people have access to safe and nutritious food can generate evidence for policy interventions to allay food insecurity in Pakistan.

3. Data and Methodology

This chapter describes the data, its source and methodologies used to fulfill the objectives of the study. Food insecurity is a multi-faceted problem so different methodologies are used to obtain better results. Rest of the chapter is organized as: brief introduction of data and its source then different methodologies are briefly described as how they are used in this research. Methodologies include index formation, food insecurity gap, calculation of Household Dietary Diversity Score and logistic regression analysis. Both independent and dependent variables are described at the end of this chapter.

3.1 Data and data sources

Household integrated income and consumption survey 2015-16) is used for analysis. This dataset relates to Household Integrated Economic Survey (HIES) which was conducted in 2015-16 under a different survey called Household Integrated Income and Consumption Survey (HIICS) which was especially designed by merger of Household Integrated Economic Survey (HIES) and Family Budget Survey. This survey adopts a stratified two-stage sample design. About 24238 households are covered from all four provinces which will help to produce more reliable results with urban and rural breakdown.

3.2 Definition of key terms

3.2.1 Food Security

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (WFS, 1996)

3.2.2 Availability

Availability means that 'sufficient food supplies are available in the locale where household is present' (Warr, Peter, 2014).

3.2.3 Access

Access can be defined as access entitlements for acquiring appropriate food for a healthy and nutritious diet. “Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live” (FAO, 2008).

3.2.4 Utilization

“Utilization is to reach the state of nutritional wellbeing by using food through appropriate diet, water (clean and drinkable), health care and facilities of sanitation. Utilization can be understood as the way the body makes the most of various nutrients in the food” (FAO, 2008).

3.2.5 Stability

The Stability concept refers to all three dimensions of food security. “At all times” in the definition denotes the sustainability dimension of food security. If food security is to be ensured, a populace, household or individual is required to always have access to appropriate and adequate food. People should not risk losing access to food because of unexpected shocks, for example crises in the economy or a climatic shock or cyclical events such as cyclical food insecurity (FAO, 2008).

3.2.6 Household

An economic unit that contains a individual living unaccompanied or a group of people voluntarily living together, having meals prepared (sharing a kitchen) or consuming from the same budget.

3.2.7 Dietary Diversity

“Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods” (Kennedy, et al, 2011).

3.3 Methodology

Food security is a multi-dimensional concept and various methods are used to assess food security. Most common of them found in literature are cost of calorie approach, Dietary intake assessment (DIA), Anthropometry, Food insecurity experienced based measurement

(FIEMS), Rapid rural appraisal and Food expenditure. Every method has its own advantages and disadvantages.

Food expenditure module uses Engel's law to assess food security status. A categorical variable is constructed that equates food security food expenditure share in total income. The problem with this approach is that most of the rural households produce at least some of the food at home. It underestimates food expenditure share because it ignores value of food produced at home. This technique can be more effective when data under consideration is only from urban households. Another technique used by food security literature is Anthropometry which is study of human body measurement. This method assesses the nutrition problems like protein-energy malnutrition and obesity. The problem with this method is that it has major potential of measurement errors. The debate over appropriate cut off points to determine abnormality also makes it controversial for assessment. These measurements are economical to obtain but researchers use this method less often because of the above stated problems. Cost of calorie approach is widely used in assessing food security and wellbeing in the third world countries. There are various problems associated with this approach for example researchers do not have consensus on what minimum threshold should be (Das Gupta 1995).

A complete analysis on food security cannot rely on only one method, keeping this in mind this research will be in four parts which are discussed in detail below.

3.3.1 Index Formation

An index has been constructed to calculate the food insecurity status of households. The index is constructed based on calorie required per day per person. Consumption data is available in detail (*Household integrated income and consumption survey* 2015-16) based on 14 days recall period. This data will then be converted to single unit i.e. per day. Quantity of food items consumed is available and is converted into calories using Food Composition Table for Pakistan (GOP 2001). The available calories to the household has been converted to per person per day. Index has been adapted from Aziz et al. (2016).

$$\boldsymbol{FSSi = \frac{DCAi}{CRi}}$$

Where FSS_i = food security status of the i^{th} household.

DCA_i = Per person daily calorie availability of the i^{th} household.

CR_i= Minimum calorie requirement of the i^{th} household per person.

3.3.2 Depth and Severity of Food Insecurity Among Households

Depth of food insecurity means that "how deeply the intake of dietary energy of food insecure individuals are deficient of their minimum needs" (FAO). Above mentioned index will provide us details about the incidence of food insecurity, while Food Insecurity Gap is being used to estimate the depth and severity of food insecurity.

Head count ratio = FIH / N * 100

Where:

FIH = No. of food insecure households

N = Total no. of households

$$FIGi = \frac{R - Ci}{\mathrm{R}}$$

Where:

FIG_i = Food insecurity gap for i^{th} household

R = Required calories

C_i = Total calories consumed per person in i^{th} household

Then Total food insecurity Gap (TFIG) can be calculated as:

$$TFIG = \frac{1}{\text{no. of food insecure household}} \sum (\mathrm{FIGi})$$

3.3.3 Household Dietary Diversity Score

To assess food access this research used Household Dietary Diversity Score (HDDS). HDDS was formulated by USAID office of food for peace. HDDS is a good proxy indicator of food access because a diversified diet is result of number of factors such as increased income, availability of food etc. and antecedent of improved health and other related indicators. HDDS calculates the different groups of food consumed. HDDS becomes more meaningful because consuming 10 different foods from the same food group (e.g. vegetables) does not

represent dietary diversity accurately. Finally, and most importantly a more diversified diet is in itself an important outcome. Following are twelve food groups used to calculate HDDS:

Table 1- Food groups in HDDS

1. Cereals	7. Fish and seafood
2. Root and tubers	8. Pulses/legumes/nuts
3. Vegetables	9. Milk and milk products
4. Fruits	10. Oil/fats
5. Meat and poultry	11. Sugar/honey
6. Eggs	12. Miscellaneous

Table 1

(Swindale & Bilinsky, 2006)

HDDS is calculated for each household using the formula:

$$\boldsymbol{HDDS = Sum(CE + RT + VE + FR + MP + EG + FS + PLN + MMP + OF + SSP + MIS)}$$

Where CE represents cereals, RT represents roots and tubers, VE represents vegetables, FR represents fruits, MP represents meat & poultry, EG represents eggs, FS represents Fish and seafood, PLN represents pulses/legumes/nuts, MMP represents milk and milk products, OF represents oil and fats, SSP represents Sugar/Honey and MIS represents miscellaneous.

HDDS is the sum of food groups consumed by the household. Values of these categories are as follows:

Item	**Value**	**Item**	**Value**
Cereals	'1' if consumed otherwise '0'	Fish and seafood	'1' if consumed otherwise '0'

Root and tubers	'1' if consumed otherwise '0'	Pulses/legumes/nuts	'1' if consumed otherwise '0'
Vegetables	'1' if consumed otherwise '0'	Milk and milk products	'1' if consumed otherwise '0'
Fruits	'1' if consumed otherwise '0'	Oil/fats	'1' if consumed otherwise '0'
Meat and poultry	'1' if consumed otherwise '0'	Sugar/honey	'1' if consumed otherwise '0'
Eggs	'1' if consumed otherwise '0'	Miscellaneous	'1' if consumed otherwise '0'

Then the average HDDS is calculated by dividing sum of HDDS with total number of households.

$$\boldsymbol{Average\ HDDS = \frac{Sum\ of\ food\ groups\ consumed}{Total\ no.of\ households}}$$

3.2.4 Logistic Regression Analysis

Keeping in view the dichotomous nature of food security variable (i.e. food secure or insecure), in the third stage Logistic Regression Analysis is used for determining the socio-economic determinants of food insecurity. Following are the variables which may be the determining factors of household food insecurity:

- Income of the household
- Age of Household head
- Household size
- Gender of the household head
- Literacy level of the household head
- Agricultural land holding
- Livestock ownership
- Savings
- Expenditure
- Distance from the source of drinking water OR source of drinking water
- Cash transfers (BISP)

So, the Logit equation can be written as:

$$\mathbf{FSS_i = \beta_0 + \beta_1 I_i + \beta_2 HS_i + \beta_3 Age_i + \beta_4 Gen_i + \beta_5 Lit_i + \beta_6 Liv_i + \beta_7 S_i + \beta_8 exp_i + \beta_9 Dist_i + \beta_{10} Cash\ transfers_i + \beta_{11} Agri_i}$$

3.4 Description of Variables

Dependent Variable:

FSS_i is calculated as a dichotomous variable. If the calorie consumption is equal to or less than 2150 calories per person then the "FSS_i" will be 1 other wise 0.

Independent Variables:

Annual income of the household (I)

Income of the household is an important determinant of food insecurity as suggested by the literature. This variable represents all the income earned by a household from all sources within a month. Bi-annual and annual data has been converted to monthly units (people linked to agriculture usually earn bi-annually).

Household size (HS)

Literature suggests a positive relation between household size and food insecurity i.e. food insecurity increases with the increase in household size. This variable can play a vital role in determining the food insecurity status of both urban and rural households.

Gender of the household head (GEN)

Gender of the household head is a categorical variable where '0' corresponds to female and '1' corresponds to male. In Pakistan, most of the households are headed by a male member so it is important to know the impact of female household head on food insecurity. The literature suggests mixed results, some scholars believe that female head of a household have a positive impact on food insecurity, for example see Kassie et al. (2012). Others, in contrast, believe that there exists a negative relation between food insecurity and female headed households

see (Ibnouf, 2009) while some scholars say that it does not make any difference whether a household is headed by a male or female member.

Literacy level of the household head (LIT)

Literacy level is also a categorical variable and is categorized in 5 different categories which are as follows:

1- No formal Education

2- Till primary

3- 6^{th} to 10^{th} Class

4- 11^{th} to Graduation

5- Masters

6- Ph.D.

Agricultural land holding

Agricultural land holding is a variable which represents agricultural land held by household in acres.

Livestock ownership (LIV)

Livestock is not just limited to earning in rural areas but it is a direct source of nutrition in the form of milk, eggs and meat. Animal dung after processing is also used as fuel in rural areas. Livestock ownership variable includes expected value of presently owned animals in rupees.

Savings (S)

Savings is equal to net savings of HH during the last 1 year in rupees.

Expenditure

This variable represents the annual expenditure incurred by households.

Distance from the source of drinking water (DIST)

The variable created is a categorical variable and it is divided into 5 categories i.e. Inside the house = 0, 0 to 0.5 Km = 1, 0.5+ to 01Km = 2, 01+ to 02 Km = 3, 02+ to 5 Km = 4 and 05+ Km = 5.

Cash transfers (BISP)

This is discrete variable and represents annual income of household from Benazir income support program (BISP) in Rupees.

4. Results and Discussion

This chapter presents the results obtained by employing different methodologies discussed in the previous chapter. Chapter starts with summary statistics that will describe the data in organized form. Chapter, then, proceeds with the results obtained from the Index formed. Chapter, then, proceeds with descriptive analysis of the determinants of household food insecurity that comprises of cross tabulations. Depth of food insecurity is then analyzed through food insecurity gap. Logistic regression analysis, then, adds on to the descriptive analysis of determinants of food insecurity by analyzing the causal relationship between food insecurity and potential factors that may have impact on it.

4.1 Description of variables

Before going to analysis, it is important describe the data for a complete picture of situation under consideration. Data includes households from all four provinces of Pakistan whereby 43.4 percent of the households belongs to Punjab, 25.5 percent from Sindh, 21.5 percent from KPK and 9.7 percent from Baluchistan. Around 33 percent data was collected from rural households whereas around 67 percent was collected from urban households. Current data shows that most of the households are headed by male members of the family i.e. around 91 percent. Individuals heading households were usually found to be more than 40 years of age (62 percent) whereas a considerable percentage of people i.e. 37 percent heads of households were between 20 and 40 years of age. Large number of households have net savings of less than Rs. 300000/- per year. More than half of the households belongs to lower income groups i.e. around 57 percent and around 35 percent belongs to lower middle income group. Table 2 shows the frequency of variables in detail.

Table 2 – Frequency Table

Variable	Description	Frequency (Percentage)
Province	KP	21.5
	Punjab	43.4
	Sindh	25.5
	Baluchistan	9.7
Region	Rural	33.3
	Urban	66.7
Gender of the Household Head	Male	90.6
	Female	9.4
Age of Household Head	Less Than 20Yrs	.8
	Between 20 And 40Yrs	37.2
	Greater Than 40Yrs	62.0
Savings	less than 50000	37.2
	less than 100000	18.9
	less than 300000	31.0
	less than 600000	8.7
	greater than 600000	4.3
Cash Transfers (BISP)	less than 10000	22.7
	less than 20000	73.3
	less than 30000	2.0
	less than 40000	.5
	greater than 40000	1.5
Annual Income	Lower Income Class	57.0
	Lower Middle Income	35.7
	Upper Middle Income	6.5
	Higher Income Class	.2
Water Source	inside the house	77.7
	0 - 0.5 km	15.2
	0.5 - 1 km	4.8
	1 - 2 km	1.4
	2 - 5 km	.6
	5 + km	.3
Agricultural Land Holdings (Acres)	less than 10	99.1
	less than 30	.6

	less than 60	.1
	less than 90	.0
	greater than 90	.1
Value of Livestock	less than 100000	17.5
	less than 1000000	76.6
	less than 2000000	3.4
	less than 5000000	2.1
	greater than 5000000	.3
Expenditures	Less than one million	97.1
	Less than two million	2.5
	Less than three million	.2
	Greater than three million	.1

Table 2

4.2 Results of Index

As discussed in the previous chapter, Index is formulated to calculate the incidence of food insecurity among households in Pakistan. Results inferred from the index are as follows:

Table 3- Index

Region	HCR(Insecure)	Total	Food Insecure (%)
Pakistan	16870	24238	70
Khyber Pakhtunkhuah	2880	5209	55
Sindh	4649	6176	75
Punjab	7353	10508	70
Baluchistan	1988	2345	85

Table 3

With the help of index the researcher explored the overall situation of food insecurity situation prevailing in Pakistan. According to the data under consideration, 70 percent of population is found to be food insecure in Pakistan. Baluchistan has the largest number of food insecure households i.e. 85 percent. Sindh houses the second largest number of food insecure households in Pakistan, whereas Punjab and KPK has 70 percent and 55 percent of food insecure households respectively.

4.3 Descriptive Analysis – Cross Tabulations

In this section, cross tabulations are formed for descriptive analysis of relation between food insecurity and independent variables. Table 4 presents relation between potential determinants of food insecurity and food insecurity status of households and is as follows:

Table 4- Cross Tabulations

Variable	Description	Food Insecure	Food Secure
Annual Income	Lower Income Class	67	33
	Lower Middle Income Class	45	55
	Upper Middle Income Class	38	62
	Higher Income Class	25	75
Gender of Household Head	Male	67	33
	Female	51	49
Household Size	Less Than Five Members	55	45
	Between Six and Ten	71	29
	Greater Than Ten Members	82	18
Age of Household Head	Less Than 20Yrs	62	38
	Between 20 And 40Yrs	69	31
	Greater Than 40Yrs	63	37
Expenditure	less than 1000	92	8
	1001- 20000	69	31
	20001- 40000	61	39
	40001-60000	48	52
	Greater than 60000	42	58
Annual Savings(Rs.)	Less than 50000	67	33
	50001-100000	66	34
	100001-300000	65	35
	30000-600000	63	37
	Greater than 600000	58	42
Agricultural land holding (Acres)	Less than 10	66	34
	11-30	45	55
	31-60	39	61
	61-90	45	55
	Greater than 90	36	64
Value of livestock	Less than 100000	64	36
	100001-1000000	66	34

(Rs.)	1000001-2000000	67	33
	2000001-5000000	58	42
	Greater than 5000000	68	32
Education of Household Head	No formal Education	67	33
	Till primary	69	31
	6^{th} to 10^{th} Class	65	35
	11^{th} to Graduation	56	44
	Masters	38	62
	Ph.D.	34	66
Cash Transfers (BISP)	less than 10000	67	33
	less than 20000	66	34
	less than 30000	54	46
	less than 40000	56	44
	Greater than 40000	61	39

Table 4

Region wise Situation

Figure 1- Cross tabulation between Region and Food Insecurity

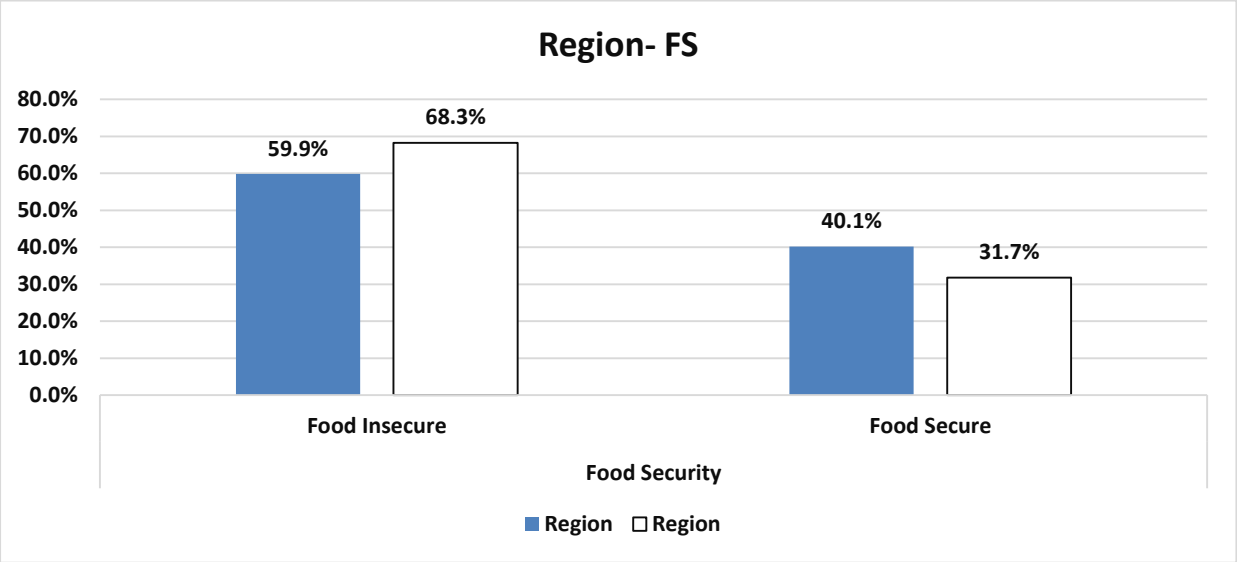

Figure 1

Figure 1 chart represents food security status with respect to rural/urban bifurcation. The analysis of current data reveals that 59.9 percent households are food insecure in rural areas where as 40.1 percent are food secure. In urban areas, a larger population is food insecure i.e. 68.3 percent whereas only 31.7 percent can be called food secure.

Relation Between Annual Income & Food Insecurity

Figure 2- Cross tabulation between Income and Food Insecurity

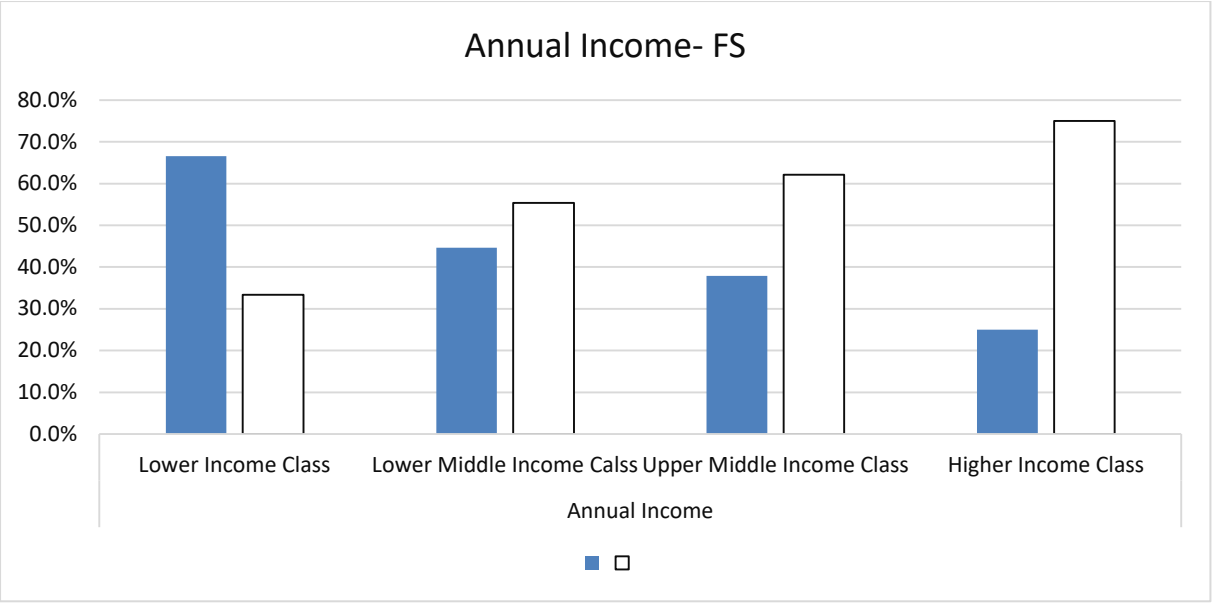

Figure 2

Cross tabulation between annual income and food insecurity status of households is represented in Table 4. 67 percent of households belonging to lower income group are found to be food insecure while only 33 percent are food secure. Households belonging to lower middle income class are found to be more food secure than the previous class i.e. 55 percent. 62 percent of Upper middle income class households are found to be food secure and 38 percent of the same category are food insecure. Households belonging to higher income class have a fewer number of food insecure households i.e. 25% only. 3/4th or 75% of households belonging to higher income class are found to be food secure.

The descriptive results show a clear positive correlation between annual income and food security status of households i.e. greater the annual income greater the probability of being food secure and vice versa.

Relation Between Household size & Food Insecurity

Figure 3- Cross tabulation between Household size and Food Insecurity

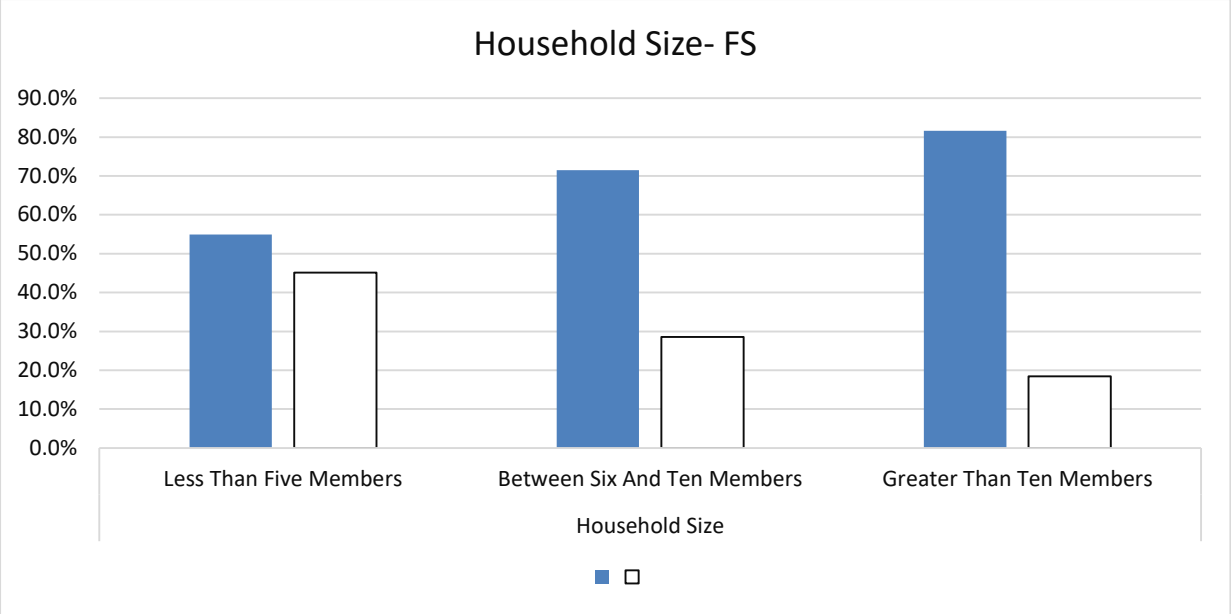

Figure 3

Table 4 represents the relation between the household size and the food security status of households. Households are divided into three categories for this purpose i.e. less than five members, between six and ten members and the third category is greater than 10 members. 55 percent of households having less than five members are found to be food insecure and 45 percent are food secure. Households having members between six to ten are found to be 71 percent food insecure. 82 percent households comprising of more than ten members are found to be food insecure whereas only 18 percent are food secure in this category.

Descriptive analysis of the data under consideration shows a negative relation between food security and size of household i.e. as the size of household increases, chances of becoming food insecure increases.

Relation Between Gender of Household & Food Insecurity

Figure 4- Cross tabulation between Gender of Household Head and Food Insecurity

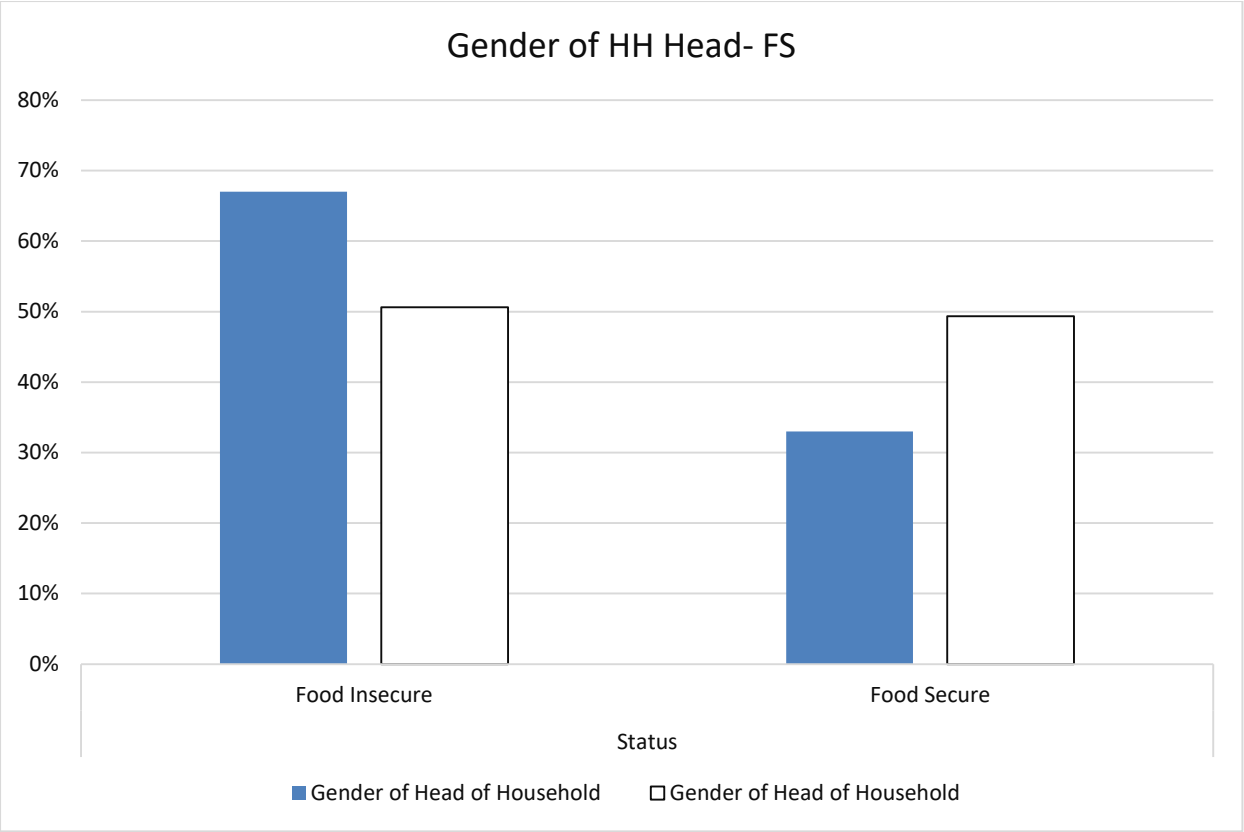

Figure 4

Gender of household head plays an important role in determining the food security status of households. Table 4 represents the cross tabulation between food security status of household and the gender of its head. The data under consideration suggests that 67 percent of households headed by males are found to be food insecure while households headed by female members are fewer in number i.e. 51 percent. So according to this data, keeping other things constant, households headed by females are less prone to food insecurity.

Relation Between Age of Household Head & Food Insecurity

Figure 5- Cross tabulation between Age of Household Head and Food Insecurity

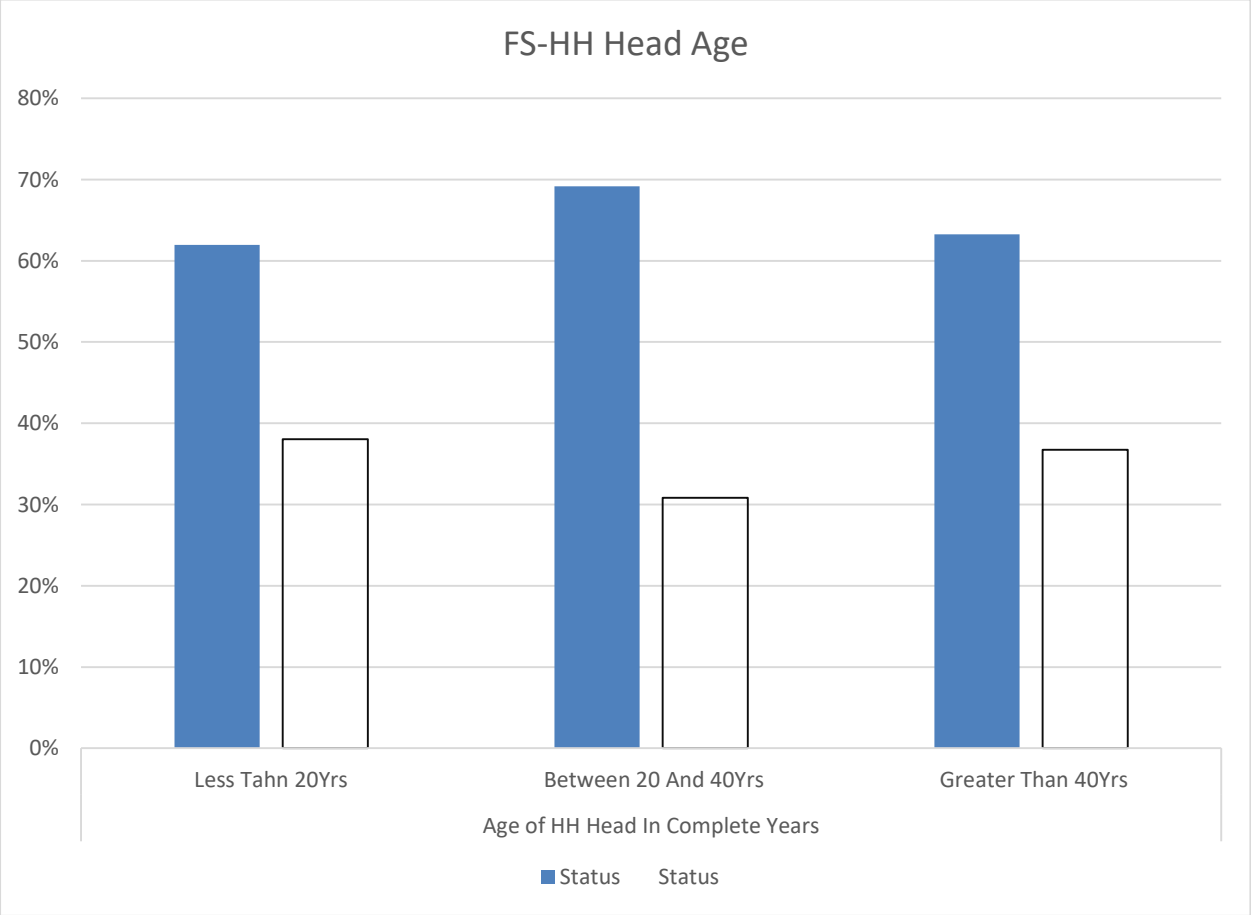

Figure 5

Table 4 represents the relation between age of household head and the food insecurity. For analysis, 3 categories are formed i.e. “household head aged less than 20 years”, “household head aged between 20 and 40 years” and “household head having age above 40 years”. 62 percent of the households are food insecure whose head is less than 20 years of age. Households whose head is between 20 and 40 years of age are 69 percent food insecure while only 31 percent are found to be food secure in this category. 63 percent of households are food insecure whose head is above 40 years of age.

Relation Between Agricultural Land Holdings and Food Insecurity

Figure 6- Cross tabulation between Agricultural land holding and Food Insecurity

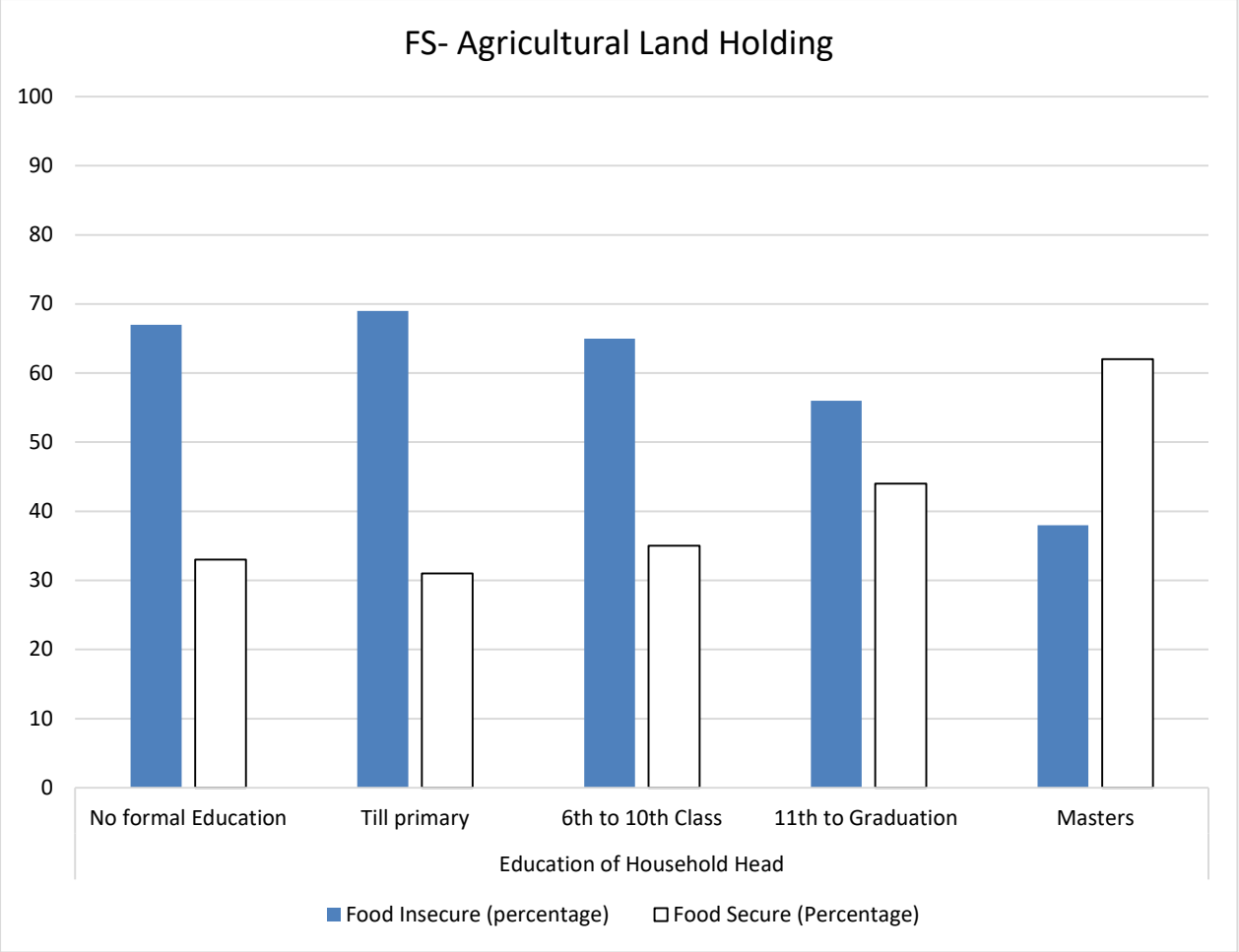

Figure 6

Households having less than 10 acres of agricultural land are found to be more food insecure than households having more than that, 66 percent of households having less than 10 acres of agricultural land were food insecure. 45 percent of households having agricultural land between 11 and 30 acres are found to be food insecure which is greater than the last category. Households having land between 31 and 60 acres are found to be 39 percent food insecure. Per data under consideration, 45 percent of households having land between 61 and 90 acres were found to be food insecure while only 36 percent of households were food insecure who own more than 90 acres of agricultural land.

Relation Between Education level of Household Head and Food Insecurity

Figure 7- Cross tabulation between literacy level of household head and Food Insecurity

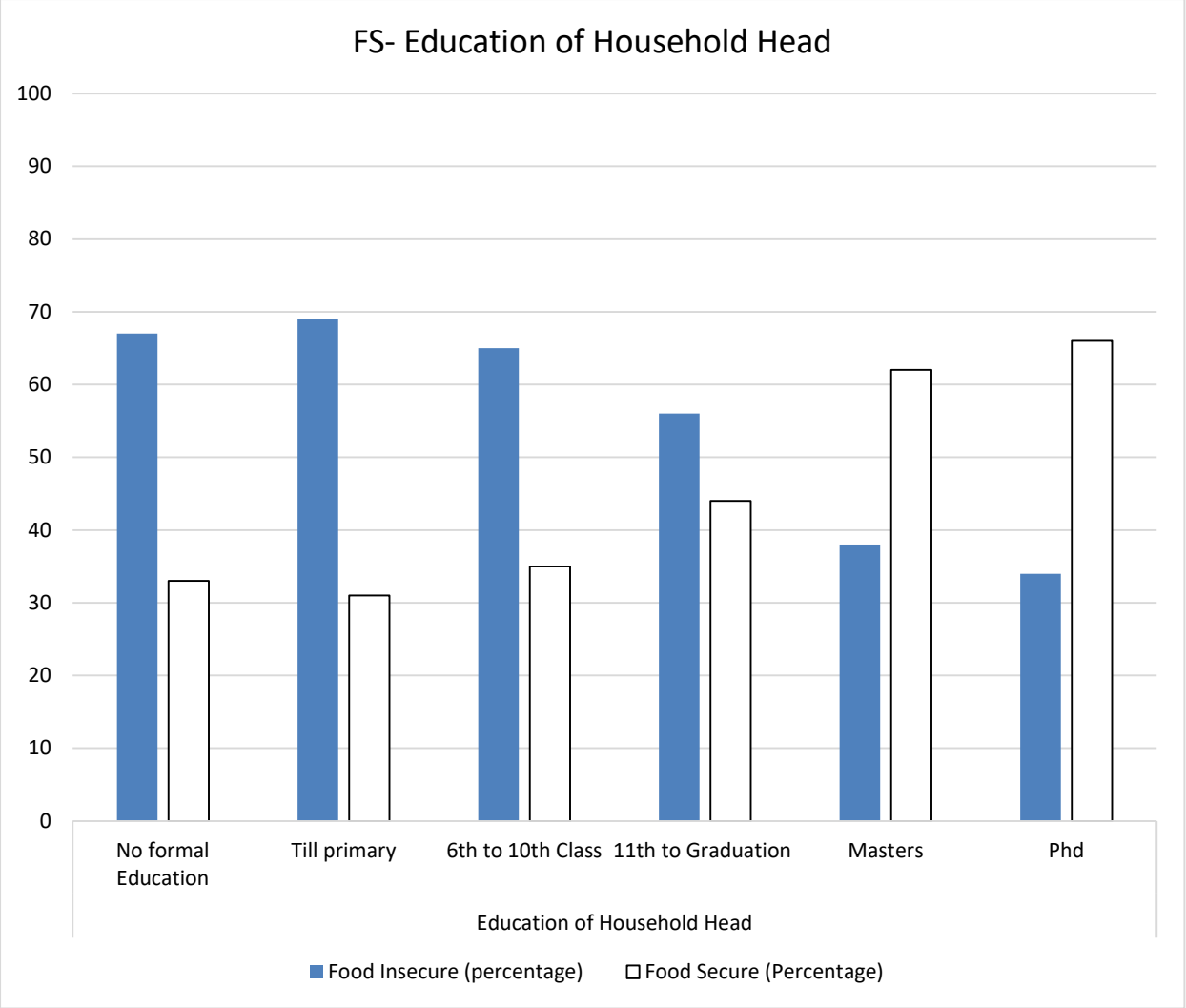

Figure 7

The above chart and table no. 4 shows a clear correlation between education level of household head and the food insecurity situation. 67 percent of the households are food insecure whose households head have not attained any formal education. Percentage of households whose heads have attained formal education till 10^{th} class are 65 percent which is slightly less than the households discussed in previous category. Households who falls in fourth category are 56 percent food insecure. The current data communicate that 38 percent of the households headed by a Master's degree holder are food insecure while the percentage of food insecure households decreases in Ph.D. degree holders i.e. 34 percent only.

Relation Between Cash transfers (BISP) and Food Insecurity

Figure 8- Cross tabulation between Cash transfers and Food Insecurity

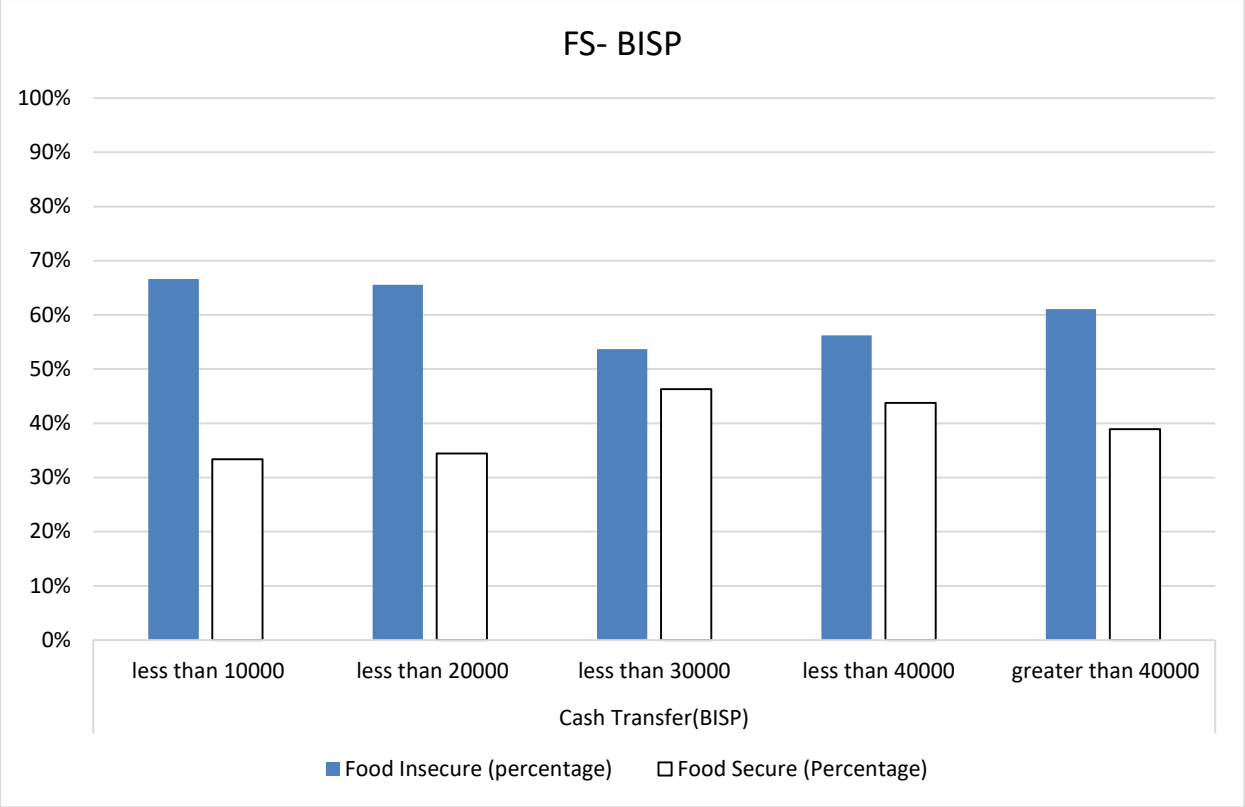

Figure 8

4.4 Depth and Incidence of Food Insecurity Among Households

Table 5 presents the Incidence (Head count ratio of food insecure households in percentage form), average availability of calories per person per day and total food insecurity gap (percentage) to determine the depth of food insecurity.

Table 5- Incidence and Depth of Food Insecurity

Region	Food Insecure (%)	Average Calorie Availability	TFIG (%)
Pakistan	70	1848	20.21
Khyber Pakhtunkhuwah	55	2135	1.27
Sindh	75	1758	24
Punjab	70	1840	21
Baluchistan	85	1481	37

Table 5

Analysis of the data under consideration suggests that 70 percent of the households in Pakistan are food insecure. On average people consume 1848 calories daily which is below the subsistence level. Total food insecurity gap (TFIG) is 20.21 percent which means that on

average food insecure households in the country falls 20.21 percent below the threshold level which is 2150 calories per person per day. Khyber Pakhtunkhuwah has the lowest food insecurity gap i.e. 1.27 percent and Baluchistan has the highest i.e. 37 percent which is alarming. Punjab and Sindh, on average, falls 21 and 24 percent below the threshold level respectively. It is unusual that Punjab is far behind Khyber Pakhtunkhuwah in terms of food security, the reasons might be that food composition of people of Khyber Pakhtunkhuwah is more proteins based that contains more calories and number of calories consumed is of great importance in this study.

Table 6- Rank of provinces according to average availability of calories

Province	Rank	Food Insecure (%)	Average Calorie Availability
Khyber Pakhtunkhuwah	1	55	2135
Sindh	3	75	1758
Punjab	2	70	1840
Baluchistan	4	85	1481

Table 6

KPK contains the lowest number of food insecure households i.e. 55 percent and ranks number 1 in food security among all provinces. Average availability of calories are 2135 calories per person per day prevails in the province. Food insecurity gap is only 1.27 percent which indicates that KPK faces a calorie short fall of 1.27 percent which is lowest among all provinces.

Punjab secured 2nd rank in being food secure among other provinces which houses 70 percent of food insecure households. Average calorie availability is 1840 calories per person per day in Punjab. Food insecure households in this province fell 21 percent below the subsistence calorie requirement.

Average calorie availability in Sindh is found to be 1748 calories per day per person and ranks no. 3 among provinces. The 24 percent caloric shortfall is faced by the people of Sindh, the province which has 14 million acres of cultivable land. 75 percent of households in Sindh are food insecure according to the data under consideration.

Baluchistan have the most number of households which are food insecure and ranks last in being food secure among all provinces of Pakistan. Average calorie availability in Baluchistan was 1481 calories per day per person. Total food insecurity gap is found to be 37 percent which is highest among other provinces. On average food insecure households in

Baluchistan fall 37 percent below the threshold level. The incidence of food insecurity is around 85 percent approximately.

4.5 Household Dietary Diversity Score

As discussed in the previous chapter, Household Dietary Diversity Score is being used as proxy for access of food in Pakistan. According to our results shown in Table no.7, on average, households eat from almost 10 to 11 food groups.

Table 7- Household dietary diversity scores

Region	Score
Average HDDS	10.61
Average HDDS (Punjab)	10.43
Average HDDS (KPK)	10.76
Average HDDS (Sindh)	10.91
Average HDDS (Baluchistan)	10.34

Table 7

Average Household Diversity Score for Pakistan is 10.61 according to the data under consideration using 14-days recall period. Sindh has the highest HDDS which is 10.91, KPK has the second highest i.e. 10.76 whereas on third position lies Punjab i.e. 10.43 and on the bottom, Baluchistan with the score of 10.34.

4.6 Logistic Regression Analysis

Among the ten determinants/factors considered in the current model, nine are supposed to have a significant relation with food insecurity status of households. Factors with significant impact includes household size, gender of household head, annual income of the household, age of household's head, annual savings, being beneficiary of BISP or not, expenditures, agricultural land holdings and education of household head. Among the discussed variables, household size has a negative impact on food security. From the analysis table below, it can be concluded that all variables except water source has significant impact on the food security status of households.

Table 8- Logistic regression results

Sr #	Variables	Coefficients

1	Constant	-3.121
		(.168)*
2	Household Size	-.217
		(.007) *
3	Gender of Household Head (Male)	.498
		(.053) *
4	Annual Income	.673
		(.065) *
5	Age of Household Head	.257
		(.035) *
6	Annual Savings	.054
		(.015) *
7	BISP	.184
		(.027) *
8	Expenditure	.383
		(.025) *
9	Water source	-.030
		(.025) *
10	Agriculture Land Holdings	.327
		(.092) *
11	Education of Household Head	.024
		(.005) *

Table 8

Note: * $p<0.05$; ** $p<0.01$

Household size and food security status of households show a negative relation which means that higher the household size, lower are the chances for household to be food secure. Coefficient of household size is -0.217. Increase in household size means that per capita income and per capita availability of food decreases and increases the likelihood of household being food insecure. Our results imply that increase in household size by one member increases the probability of being food insecure by 21.7 percent. Our results are in contrast with (Flores, 2014) which suggests that more members in the household means more labour and that resultantly can increase the food security status of household. While (Paddy, 2003) is

in agreement with our results and suggests that probability of becoming food insecure increases as the size of household increases.

Coefficient of the Gender of the household head is estimated to be 0.498. This result shows that there is positive relation between gender of household head and food security status of household. This result reveals that probability of a female headed household to be food secure is high as compared to male headed households. Descriptive analysis shows the same results. This outcome is against the expectations because females in Pakistan have limited access to resources, information, land and markets which may limit their prospects to be food secure.

Coefficient of Annual income is estimated to be +0.673 which shows a positive relation prevails between annual income and being food secure. These results express that households with greater income are likely to be food secure, higher the income, higher the chances of household being food secure. These results are consistent with (Aziz et al., 2016), (Iram & Butt, 2004) and (Asghar & Muhammad, 2013) etc.

Age of household head has positive relation with the food security status of household. Coefficient of age of household head is 0.257. This implies that as the household ages, household becomes more food secure. This may be because of income and experience increases with the age. This finding is in agreement with (Opsomer, et al, 2002) who suggested that food insecurity increases until the age 35 then starts decreasing steadily as the household head ages. (Nord, et al, 1999) also, concluded that as the age of household head increases, probability of household being food secure also increases. Contrary to the above results (Matchaya & Chilonda, 2012) suggests otherwise, as young farmers are of more energetic and dynamic nature, though less experienced, are more likely to be food secure. The reason of contrast may be the above stated research in rural areas of Malawi while we have data of both urban and rural areas.

Cash transfer programs have shown a positive impact on food security around the world. Haushofer and Shapiro (2016) suggests that monthly cash transfer increases the prospects of food security among the households instead of lump-sum cash transfers which are highly likely to be spent on durables. Results of this study suggests positive relation of Benazir Income support program with food security. Coefficient of BISP is found to be positive i.e. 0.054 and this result is significant. Haushofer and Shapiro (2013) is also in agreement with above results and their research have shown strong response of consumption to monthly cash transfers. They concluded that unconditional cash transfer has positive impact on psychological wellbeing and consumption of households in other words increases food security among households.

Household expenditure is showing the positive sign in our results, the coefficient of expenditure is 0.383 which statistically significant. Levin et al. (1999) concurs with our results and found out that increase in food expenditure increases the likelihood of household being food secure whether headed by a male of a female.

Water source shows a negative relation with the food security status of household but the results are statistically insignificant.

Food security status of household is found to be positively influenced by agricultural land holdings. Greater the agricultural land a household has, greater is the probability of being food secure. Coefficient of agricultural land holding is found to be 0.327 which is statistically significant. It can be argued that households with more agricultural land can produce more food for themselves and with more land, more income can be earned which already showed a positive relation with food security. Increase in agricultural land holding by 1 acre increases the probability of being food secure by 32.7 percent. Khan et al (2009) concurs with our results and suggests that ownership of land increases the probability of households being food secure.

Education level of head of household shows a positive relation with food security status of households. Education increases the income earning opportunities that may lead to becoming more food secure. Further in rural farm households, education empowers them with technological advancements and entrepreneurial skills. Our results agree with most of the existing literature. A negative relationship exists between food insecurity and schooling (Rose et al., 1998).

5 Conclusion and Policy Recommendations

Conclusion

Food insecurity is the major tangible peril in improvement of Pakistan's economy and general wellbeing of its people. This research suggests that Pakistan is facing a severe food insecurity condition where 70 rcent of the households are food insecure which is very alarming. State of affairs in terms of food insecurity in Baluchistan are worst among all provinces. Sindh has the second highest number of food insecure households that are around 75 percent. Punjab, slightly better than Sindh, have 70 percent of its households are food insecure. KPK contains the least number of food insecure households i.e. 55 percent.

Depth of food insecurity is estimated by food insecurity gap which is 20.21 percent for Pakistan. KPK has the lowest food insecurity gap which is only 1.27 percent. Sindh has 24 percent while Punjab and Baluchistan has 21 and 31 percent respectively.

The main objective of the research was to find the determinants of household food insecurity in Pakistan. Household size, gender of household head, annual income of the household, age of household's head, annual savings, social security benefits (BISP in case of Pakistan), expenditures, agricultural land holdings and education of household head are found to have a significant impact on state of affairs of food insecurity in Pakistan. Education opens new income generating opportunities and it also impacts the ability of household's nutritional decision making. Household size and food insecurity have a positive relation, meaning that greater the household size, greater will be the food insecurity condition. This research also reveals that probability of a female headed household to be food secure is higher as compared to male headed households. Annual income and savings also showed positive relation with food security, in other words, households having more income and savings are more likely to be food secure. This study also suggests that unconditional cash transfer programs like BISP, in case of Pakistan, can have positive impact on food security of households.

The results show that incidence of food insecurity is very high in Pakistan but has low depth as compared to its incidence and in case of KPK it is minimal.

Pakistan's performance in achieving Millennium Development Goals was abysmal but it can strive for better to achieve Sustainable Development Goals. To achieve SDGs and to improve the economy, ensuring food security is essential.

Considering the results of this study, we can make suggestions and policy recommendations to fight against food insecurity and allay its consequences.

Policy Recommendations

Following are some policy recommendations for the Government to deal with the problem of food insecurity:

- Policies be made to increase the income especially for bottom income groups who are more vulnerable to food insecurity than others.
- Cash transfer programs like BISP are beneficial to the vulnerable segments of the society so the program should be improved, and the problems involved in BISP should be solved.
- Investment should be made to improve the level of education in the country as it can solve many problems and allay food insecurity in Pakistan.
- Programs and policies to alleviate food insecurity should be introduced by the Government that targets decreasing the household size and dependency ratio.
- Livestock ownership needs to be encouraged as it increases the income and can diversify the food and thus can help in ensuring food security among rural households.
- Strategies should be geared towards increasing women's ability to generate income. Efforts should be made to increase their productivity both in paid work and domestic production, so they can increase their income without sacrificing their children's welfare, their own health and additional time.

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