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A Correlation of Socio-economic Determinants and Food Security Status in Pakistan

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ARTICLE INFO	ABSTRACT
	This study gives details of the interrelationship among important socioeconomic variables and food security status in Pakistan. The major socio-economic explanatory variables; education, livestock, poverty, receipts of foreign remittances, and female house-head status were analyzed against food security. The data was derived from Pakistan Social and Living Standard Measurement survey dataset 2019-20. A binary logistic model has been applied for the estimation of poverty and food security indices. The study results showed that education, livestock, foreign remittances, and female house-head have a positive significant impact on food security while poverty has a negative and significant impact on food security. The study recommendations are that government must focus to increase agriculture growth, increased dependence on livestock, foreign remittances, and education.

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1. Introduction

The rapidly growing worldwide demand for food has been fuelled by strong income development and in emerging countries, the population is growing. The UN estimations that the worldwide population will spread 9.3 billion by 2050 (United Nations, 2010). More than half of the increase will come from Asia. Clearly, global food security is a significant concern to the region's changing socioeconomic situations. Fast monetary growth and the growing class, especially in Asia's populated economies, is a major driver of increased food demand. By 2050, per capita income in Asia is expected to exceed $40,000, bringing the region's total population to over 3 billion people.

The combined effects of rising population and affluence will very certainly affect total food consumption. According to the FAO, worldwide food consumption per individual is predicted to increase by 0.29 per cent every year on average through 2030 (FAO, 2020). Annual growth rates could reach 0.42 per cent in food-insecure areas such as Africa and South Asia, and food consumption is already low (Table 1).

Changes in eating habits in Asia's most populous economies, such as Pakistan, India, Indonesia, and Bangladesh, have been observed, if high growth continues over the next two decades, it has significant influence on world-wide food feasting. Poverty alleviation requires a strong focus on food security. Poverty becomes a vicious cycle if it is not addressed. Malnutrition lowers efficiency, returns, and keeps persons poor. As a result, poverty is both a cause and a consequence of a lack of food security. Despite the fact that Asia has a strong economy and is widely viewed as the global development engine, the quantity of malnourished persons has continuously increased, 567 million in 2006–2008 from 526 million in 1995–1997 (FAO, 2011).

Food security is a multifaceted and difficult subject. Economic growth alone cannot ensure food security, as the Asian experience clearly demonstrates. Despite the fact that rapid expansion has helped to reduce overall poverty in the region, the sum of malnourished and starved persons has increased. As a result, ensuring food security should be a priority in the battle against poverty.

Table 1: Food Consumption and Population Growth Projections

	Average annual growth rates (%) 1970-2000			Average annual growth rates (%) 2000-2030			Average annual growth rates (%) 2030-2050		
	Kcal/Person	Population	Food Consumption	Kcal/Person	Population	Food Consumption	Kcal/Person	Population	Food Consumption
World	0.49	1.70	2.20	0.29	1.03	1.32	0.15	0.48	0.63
Developing countries	0.77	2.05	2.83	0.36	1.20	1.56	0.18	0.57	0.75
Sub-Saharan Africa	0.15	2.80	2.95	0.57	2.23	2.81	0.42	1.48	1.91
North Africa	0.00	2.57	2.57	0.17	1.56	1.74	0.09	0.82	0.92
Latin America and Caribbean	0.74	2.02	2.77	0.32	0.94	1.26	0.13	0.28	0.40
South Asia	0.47	2.23	2.71	0.51	1.29	1.81	0.33	0.53	0.86
East Asia	0.49	1.48	1.97	0.35	0.47	0.82	0.06	−0.17	−0.10
Industrial countries	1.19	0.74	1.94	0.07	0.47	0.54	0.03	0.13	0.16
Transition countries	0.41	0.80	0.49	0.28	−0.64	−0.37	0.19	−0.78	−0.59

kcal = kilocalorie, Source: Moir and Morris (2020).

Social protection and safety nets programmes can provide instant assistance to the impoverished through periods of distress. As part of automated stabilisers, such programmes should be built into the system. Inflationary pressures on food prices have a significant impact on food security. Subsidies are frequently provided by governments to artificially lower food prices. Food subsidies, on the other hand, drain budgets and aren't a feasible solution if subsidies may exacerbate current problems if food prices continue to rise owing to supply and demand market fundamentals. When food costs rise, the government might be better suited establishing food-based safety nets and other social security programmes (Gillani, Shafiq, Ahmad, & Zaheer, 2021). Cash transfers, for example, are more operative than subsidies since they induce less market alteration and cost less.

Poverty alleviation and security in food are inseparably allied. Although security in food by itself does not eradicate poverty. With 4.1 billion persons, Asia remains the world's most populous continent, accounting for more than 60 per cent of the world's total population of 7.0 billion. Between 2001 and 2019, the percentage of individuals in Asia alive on less than 1.25 dollar a day fell from 50% to 22%. However, the percentage of children who are undernourished has only decreased from 26 per cent in 2010 to 18 per cent in 2019. Hunger is also at its worst in South Asia, which is home to roughly 60 per cent of Asia's hungry, 65 per cent of its enormously poor, and 81 per cent of its underfed children. To enhance food security, a wide range of global, regional, and national policies are required, and policy options that can do so while simultaneously lowering poverty and increasing food security are the subject of this thesis. The research study has been conducted with a prime objective of that what is the inter-relationship of socioeconomic variables with food security in Pakistan.

2.   Literature Review

There appears to be agreement that growth has an impact on poverty and development among humans. It's possible that the combined effect will be fairly potent. Delgado (1998) for example, study this topic using home expenditure data from studies performed in the 1980s in Zambia and Niger. They demonstrate that the proportion of excess income consumed on non-tradable ranges from 67 per cent to 32 per cent in Zambia and Burkina Faso, respectively. The multiplier impacts of this spending on household income were also calculated. The overall impact of non-tradable activities on household earnings is determined by the mixture of effects. This effect shots out to be quite potent. A $1 rise in farm tradable revenue resulted in an increase of US$1.88 in non-tradable income in Burkina Faso, but a $1 increase in non-tradable income resulted in an increase of US$1.57 in Zambia.

The first econometric indication of a link among agrarian expansion and poverty reduction stems from India's late 1970s (Ahluwalia, 1978). Poverty decreased during good harvest years and grew during bad harvest years, according to Ahluwalia (1985). The past time issue was under examination, relatively little agricultural expansion, Datt and Ravallion (1998) is the most thorough of these studies. Disparities in poverty reduction, according to the

authors, are linked to changes in agrarian growing rates among states of India. The key benefit is that it essentially creates an experiment in which macroeconomic, sectoral, trade and social policies are kept constant while the "pure" influence of agriculture expansion on poverty reduction is separated.

A rising consensus appears to exist that government policy should be focused on "improving people's social possibilities" (Dreze & Sen, 1999). Policies of state can be classed as either market complementing under this paradigm. Agricultural regulations have traditionally been of the second type, constraining rural inhabitants' ability to grow and increase their abilities. The goal here isn't to add to the huge slope of existing development plans. The objective is a little extra modest: what reflections should drive the creation of economic and other strategies to gadget the twin-track strategy in light of the foregoing? To put it another way, what elements should lead policies to battle hunger and increase agricultural output and off-farm village actions, the ultimate goal is to improve the capabilities of the poor? Without attempting to teach a specific technique, examples of successful Programs are offered.

Munawar, Shiwei, Wen, and Khalid (2021) examined the food security of Pakistan in perspective of different factors and crop diversification. The study was carried out in Punjab province and data was collected through multi-stage random sampling. The estimation technique was OLS regression analysis. The ownership of land, education and access to credit facility were major determinants food security in rural areas. The crop diversification among farmers can expedite food security purpose.

3.   Data and Methodology

The Pakistan Social and Living Standard Measurement dataset 2019-20 is used in this study to determine food security in Pakistan. The Pakistan Bureau of Statistics collected the data through a sample survey (PBS). It is based on a national sample which comprises information on household demographics, economic circumstances, individual income levels, and expenditures. The PSLM 2019-20's survey has a total sample size of 195000 households.

Food security in a country cannot be measured by a single pointer, although food security at the house level can be examined using demographic data and socioeconomic factors that have variable effects on food security. According to the literature, food security can be quantified in a variety of ways around the world. The food insecurity measure, which was first used by Titus and Adetokunbo (2007). It categorises households into two categories: those who are food insecure and those who are not. Researchers such as Agwu and Oteh (2014), Arene and Anyaeji (2010), and Otunaiya and Ibidunni (2014) used it to assess the state of food security.

$$F_i = \frac{\text{ith household's expenditure of per capita food}}{\frac{2}{3}\text{All house average expenditure per capita food}}$$

Fi shows food security index: where Fi ≥ and Fi < 1 demonstrate food secure ith house, where as, Fi < 1 demonstrate food insecure ith house. When a head of house per capita monthly food spending exceeds or equals two-thirds of the mean per capita food expenditure, it is considered food insecure. When expenditure per capita on food goes below two-thirds of the average monthly expenditure per capita on food, however, the household faces a food security issue.

The factors of food security were measured using a binary logistic regression model. Logistic regression is a valid option when the dependent variable is binary. The elements of household food security were studied using logistic regression by Asefach and Nigatu (2007) and Sikwela (2008). The food security status of a household is estimated as a meaning of evident explanatory factors, parameters, and model's biased term in a linear combination. The model's implicit form is as follows:

$$P_{i=}g(I_i) \qquad (1)$$
$$I_i = b_0 \sum_{j=1} b_j X_{ji} \qquad (2)$$

$$F_{ins} = f\,(POV, LS, EDU, FH, FR) \qquad (3)$$

Where, Pi demonstrate the reaction for ith opinion, Ii is an unobserved underlying index for each household's ith observation, if Ii* > Ii, then the household is detected as food insecure, if Ii* < Ii then the household will be food secure. The stimulus index (Ii*) indicates the likelihood of being food insecure based on observations (Pi) and (Ii) is the index, which indicates the likelihood of a household's food security.

The empirical model reveals the factors that determine Pakistani households' food security. The generic version of the model is employed in this investigation. The labeling and construction of variables are shown in Table 2. Because binary dependent variable is food security, binary logistic regression is utilized to uncover determinants of food security. It is as follows:

$$FS_{it} = \alpha_1 + \beta_1 FR_{it}, + \beta_2 POV_{it} + \beta_3 LS_{it} + \beta_4 EDU_{it} + \beta_5 FH_{it} + \varepsilon_t \qquad (4)$$

Whereas; the Fit indicates the dependent variable's log odds, α_1 shows the intercept, $\beta_1, \beta_2, \dots \beta_N$ are the coefficients, and all other explanatory variables are treated as dummy variables. The exponential function can be used to convert logit into odds ratio for easy reading (Garson, 2011).

Table 2: Variables Measurement

Variables	Measurement
FOOD	A house is deemed food secure if the index value is less than one (food secure=1), and food insecure if the food index value is greater than one (food insecure =0).
EDU	Household head's education (if house head's literacy is inter or higher, 1; else, 0).
FH	Female head (if the family's head is a woman, 1; otherwise, 0)
POV	Poverty status (if the household is impoverished, 1; if not, 0).
LS	Ownership of animals (if a household owns livestock, 1; otherwise, 0).
FR	Foreign remittances (if a household possesses them, they are 1, else they are 0).

The odds ratio of probability compares the chances of a household being food secure to the chances of being food insecure.

4. Results and Discussions

Food security is a major concern for both emerging and developed nations. Despite having an agrarian economy, Pakistan is food secure, with agriculture accounting for 20.88 percent of total GDP and employing 43.5 percent of the workforce. Food security is an important metric for assessing individual, household, and state well-being. It reduces individual output and stifles a country's economic growth. As a result, in order to tackle this problem, it is critical to assess food security and its root causes in Pakistan. When people don't have enough safe, nutritional, and socially acceptable food to live a healthy and productive life over time, they are said to be food insecure.

4.1 Parity Indices for all Education Indicators

Figure 1 presents the parity indices for all education indicators. Literacy is at 0.71 percent, Youth Literacy is at 0.82 per cent, Primary 0.88 per cent and Secondary is at 0.89 percent.

Figure 1: Parity Indices for all Education Indicators
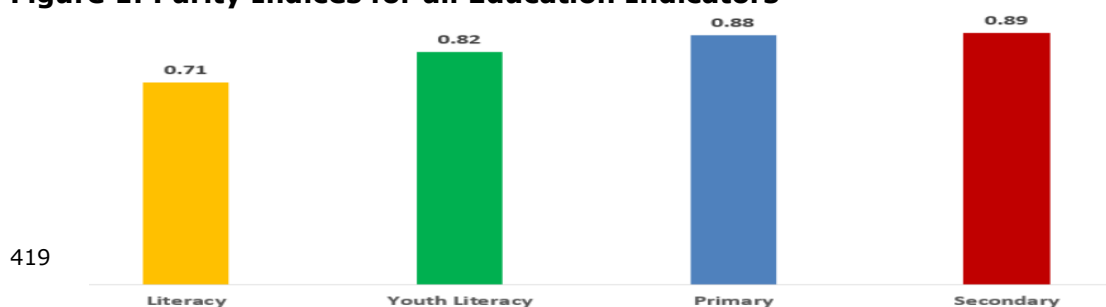
4.2   Proportion of Population living in household with access to basic Services

Figure 2 presents proportion of population living in household with the access to basic services. Access to basic drinking water services at 94 per cent of the people, Access to basic sanitation services at 68 per cent of the people. Access to basic hygiene facilities are at 54 per cent and access to clean fuel and technology at 37 per cent, and access to mobility rural context is 88 per cent and access to mobile in urban context is at 44 per cent. Access to basic education is at 19 per cent and access to basic information services at 33 per cent.

Figure 2: Proportion of Population living in household with access to basic Services
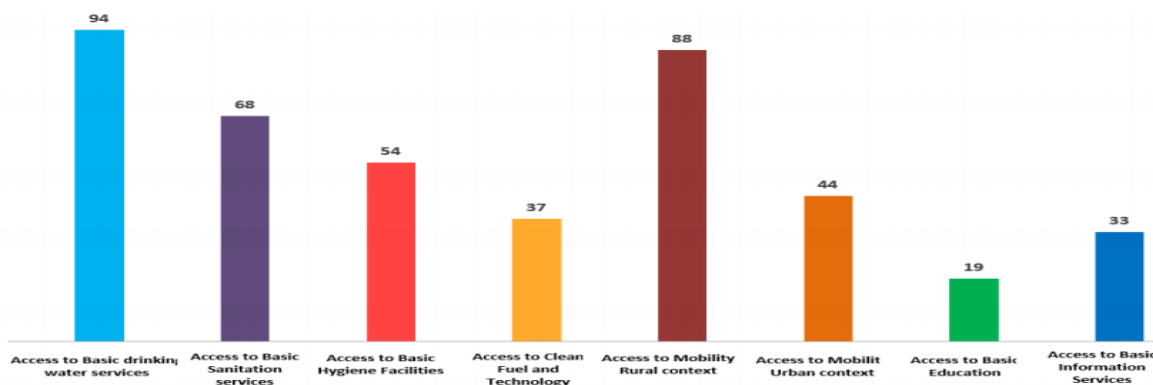
4.3   School Attendance by Province

School attendance by province wise is presented in Figure 3. School attendance is decreased from 2014-15 to 2019-20 as 62 per cent and 60 per cent respectively, only there is increase in Punjab from 65 per cent to 66 per cent. But school attendance is decreased up to 55 per cent, but Blochistan is still in at 44 per cent in both periods.

Figure 3:   School Attendance by Province
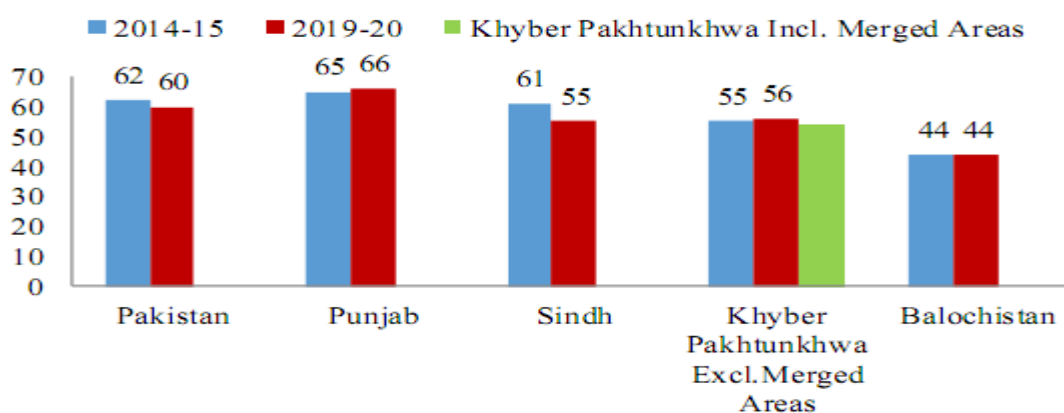
4.4   Out of School by Region

Figure 4 presents the facts about out of school by region wise in the urban and rural distribution of schools distribution. In Punjab out of school children's are 16 per cent in urban sector and 28 per cent in rural sector. In Sindh 29 per cent in urban sector and 58 per cent in rural sector. In KPK this ratio is 19 per cent in rural areas and 32 per cent in urban areas.

Figure 4: Out of School by Region
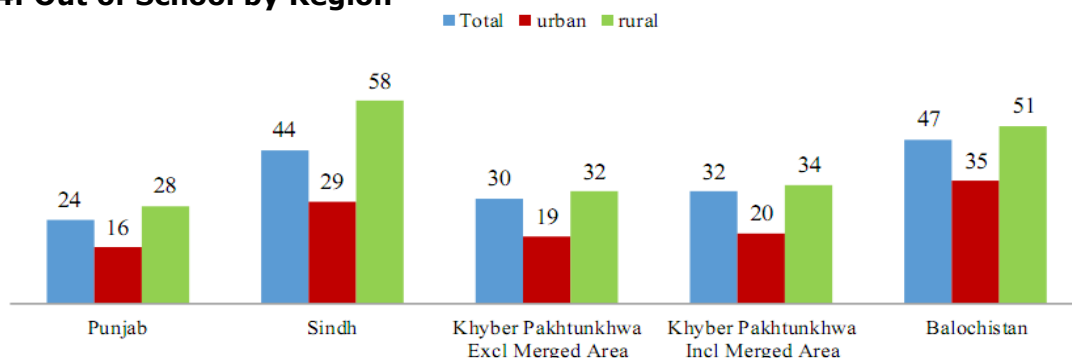
4.5   Primary Level Enrolment in Govt. Schools a percentage of Total Enrolment

Total enrolment as a primary level enrolment in Govt. schools is presented in figure 5 in Pakistan 62 enrollment was in 2014-15 and this enrollment is increased up to 64 per cent in 2019-20. This shows with increase in time and with modern technology more students are enrolled in schools and importance of education is increasing. In Punjab it increases from 56 per cent to 59 per cent, in Sindh it decreases from 64 per cent to 62 and in KPK this ratio is increased from 69 per cent to 71 per cent and in Balochistan a large no of decrease in the enrollment from 90 per cent to 83 per cent.

Figure 5: Primary Level Enrolment in Govt. Schools a percentage of Total Enrolment
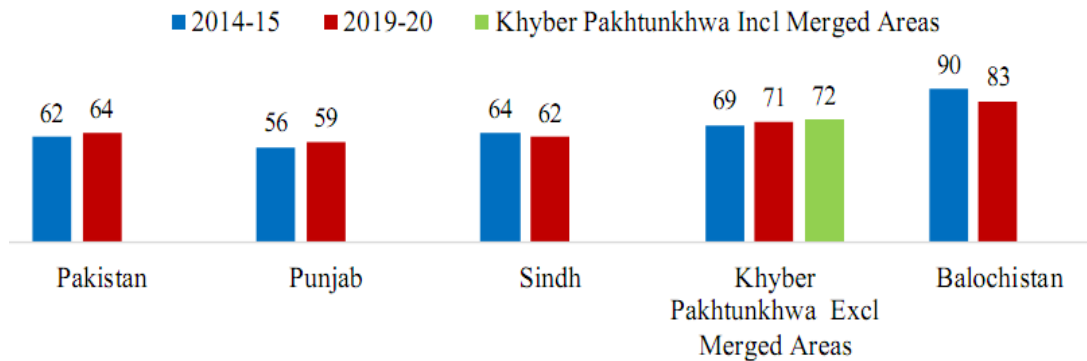
4.6   Literacy Population 10 years & older by Provinces

By province literacy in population 10 years and older is shown in figure 6 and figure shows in Pakistan literacy population ten years and old is not changed in 2014-15 to 2019-20. But there are changes in province wise literacy. Literacy rate in Punjab is increased from 63 per cent to 64 per cent. In Sindh the literacy is decreased from 60 per cent to 58 per cent and in KPK the literacy is same as 55 per cent but when we include the merged federal areas the overall literacy in KPK is 55 per cent. In Balochistan the literacy is increased from 44 per cent to 46 per cent.

Figure 6: Literacy Population 10 years & older by Provinces
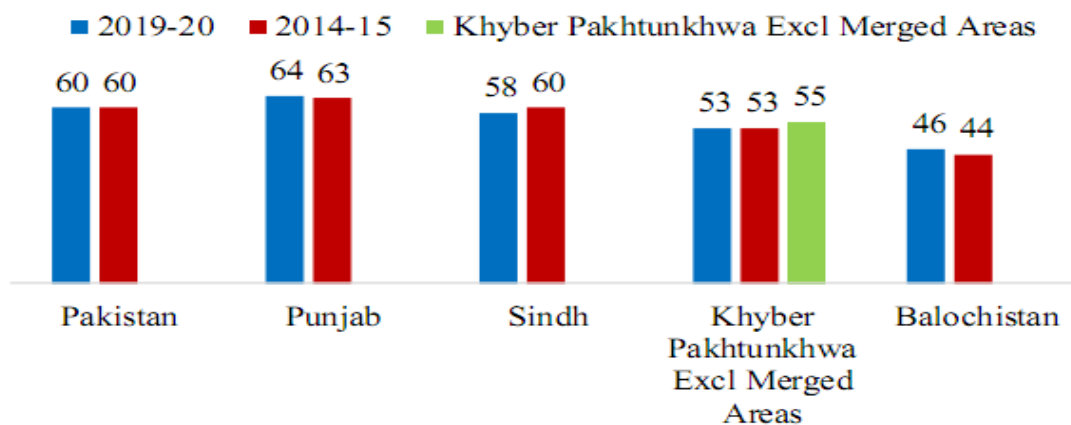
4.7   Province wise Comparison of Main Source of Drinking water

Figure 7 presents the facts province wise source of Drinking water. In in 2014-15 the province wise sources of drinking water was very better than 2019-20. And we can see from figure in 2014-15 access to tap water was 27 per cent and in 2019-20 access to tap water has been decreased up to 22 per cent.   But good thing is that the access to bottle water, tanker/truck and filtration plant has been increased. This is good sign of healthy and safe water.

Figure 7: Province wise sources of drinking water
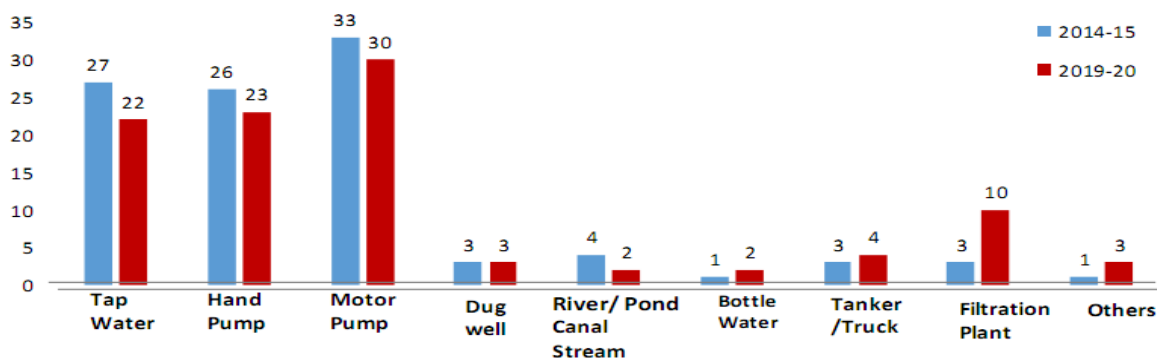
4.8 Percentage of Household with Improve Source of Drinking Water by Province

While comparing the province wise access to safe water Punjab is leading at 99 per cent water access and Sindh is at 94 per cent, KPK is at 83 per cent and KP excluding merged areas it is at 85 per cent and in province of Balochistan it is 84 per cent. And in overall Pakistan the access to clean water is at 94 per cent.

Figure 8: Percentage of Household with Improve Source of Drinking Water by Province
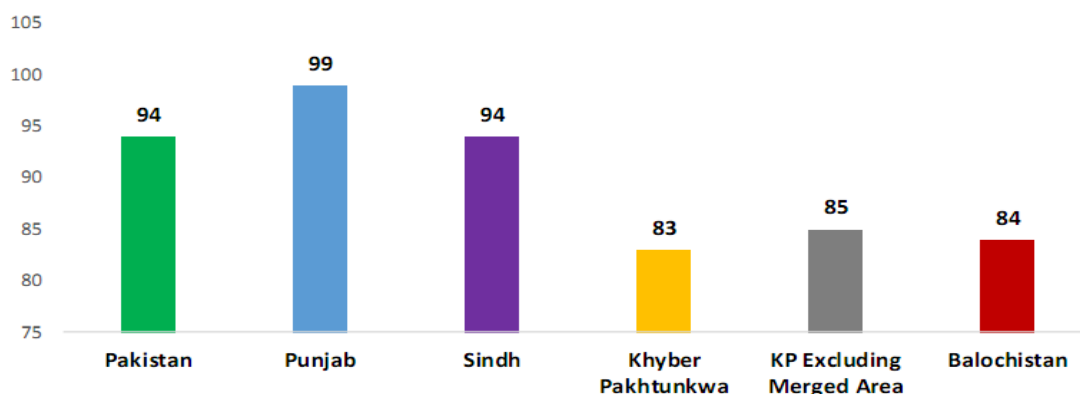
4.9 Determinants of Food Security

In Pakistan, the impact of family characteristics on food security is calculated using a logit model. The dependent variable in this study is food security, while the independent factors are household-related variables. The socioeconomic and demographic aspects of Pakistan's urban and rural areas are diverse. As a result, the probability that a home will be food secure varies by zone. The factors that determine domestic food security at the rural, urban, and national levels are investigated in this study. The answers of the logistic model are shown in Table 3.

Domestic food security is assumed to be influenced by a number of explanatory variables in Pakistan. According to the study, household heads' education, age, foreign remittance, livestock ownership, female heads, and household poverty status all play a role (p 0.05). In light of the household results and likely explanation for everyone, important regressors are indicated below. Households with heads who have a greater level of education are more likely to be food secure, according to these data, than household-heads who had never attended school or have a lower level of education.

At the national level, the direction of quantities and strange ratio of instructive categories show a negative association among food insecurity and household head education. Working efficiency, competency, income diversification, and vision are explained in the role of education, which creates a positive environment in which to teach the household children with long-term aims in order to provide a better living state than the domestic leaders who are ignorant or undereducated. As a result, schooling diminishes a family's chances of food insecurity. The findings support those of Aschalew (2006) and Tefera (2011), who found that boosting education, will help to alleviate food insecurity (FAO, 2011).

Table 3: Factors of Home Food Security in Pakistan

Variable	Coefficients	S.E.	Z-Value	Odd ratio
Education	2.21	0.12	2.58	0.12
Live Stock	1.11	0.21	1.95	0.21
Foreign Remittances	0.82	0.43	1.65	0.32
Female head	0.22	0.12	1.62	0.43
Poverty	2.38	0.91	-2.58	1.53
Constant	5.11	0.21	2.58	0.12
No. of Observations	1300			
Pseudo R^2	0.27			
LR chi2(8)	4532.11 (0.000)			
Pearson chi2(53)	123.11 (0.123)			
Model specification	Well specified*			
Overall Model Prediction	81.31			
Area below the ROC	0.80**			

Source: Authors' estimation. *Output is attached, **ROC is attached (see, Appendix-A), Note: The model satisfies all the diagnostic tests.

Livestock has a detrimental impact on household food security. When compared to not having livestock, it shows that keeping livestock increases a family's chances of becoming food secure by 1.11 times. Bashir and Schilizzi (2013) and Hussain, iftikhar Ahmad, Nawaz, and Bhatti (2019) also reported the similar results as obtained in this study. Receipts of foreign remittances from overseas are one of the utmost significant variables determining food security in Pakistani households. If a household receives foreign remittance, the odd remittance ratio can be interpreted. It has 0.32 times more likelihood of becoming food secure than individuals who do not receive foreign money. This is the belief that when remittance income rises, household expenditure would rise as well. As a result of remittances, households' capacity to consume more food expands. These findings are consistent with the conclusion of Uraguchi (2010).

Results in Table 4 showed that poverty has a large negative impact on household food security. Poverty coefficients revealed that when compared to those that are not poor, a family's chances of being food insecure increases by 41.53 times. Poverty and food security have a negative positive link in Pakistan, according to the odds ratio of poverty. Food security measurements have been used as a proxy for poverty in various research (Klaver, 2010). These findings are comparable to those of Brisson (2012) and Malik (2019).

Table 4: Household Food Security Determinants at the Urban and Rural Levels

	Urban			Rural		
	Coefficients	P-Values	Odd	Coefficients	P-Values	Odd
Education	2.01	0.00	0.16	2.00	0.01	0.11
Live Stock	0.71	0.00	0.65	0.1	0.00	0.31
Foreign Remittances	0.87	0.00	0.40	0.82	0.04	0.41
Female head	0.63	0.00	0.54	0.37	0.00	0.62
Poverty	-2.89	0.00	41..53	2-.89	0.03	23.80
Constant	3.12	0.00		2.01	0.00	
No. of Observations		700			600	
Pseudo R^2		0.33			0.27	
LR chi2(8)		1901.1 (0.00)			3112.2 (0.00)	
Pearson chi2(53)		29.70 (0.69)			60.4.22 (0.41)	
Model specification	Well specified*	Well specified**				
Overall Model Prediction	81.60	81.11				
Area below the ROC	0.80*	0.81**				

Source: Author's estimation *Appendix-B ** Appendix-C.

Because the social and economic situations in urban and rural areas of Pakistan vary, households in different places have varying levels of food security. In Pakistan, this study estimates food security factors at the regional level. The same criteria are assumed at the national level to study the determinants of food security in urban and rural areas. Table 4 presents a summary of the findings. The findings at the urban and rural levels are statistically consistent with the findings at the countrywide level. Remittances have a nearly equivalent impact on food insecurity in both urban and rural settings. Household livestock ownership, on the other hand, has a greater impact on food security in rural areas than in urban areas.

5. Conclusion

The results of this study proved a positive link between education and food security status explaining that more schooling diminishes family chances of food hunger. Livestock also showed a determinable impact on household food security. Foreign remittances are one of the utmost significant variables determining food security. The results provide evidences that if a household receives foreign remittance, family have more expenses on food consumption. It has 0.82 times more likelihood of becoming food secure than individuals who do not receive foreign money. Poverty coefficients revealed that when compared a family above the poverty line to those families that are below poverty line, the family's chances of being food secure improve significantly.

To curb the food insecurity, the stakeholders can develop strategies for improving the social and economic indicators of household. Small loans and easy credit access may be increased in rural areas so that they can buy more animals. To expand overseas remittances or workforce comminutes, the government should build cordial relations with other nations. Food subsidies and programs for nutrition are crucial policies to protect the poor rural lives. According to the findings, effective public intervention can enhance nutrition, education, and health in even low-income regions.

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