SOCIO-ECONOMIC DETERMINANTS OF FOOD SECURITY IN KHYBER PAKHTUNKHWA: A CASE STUDY OF DISTRICT CHITRAL

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CERTIFICATE

This is to certify that this thesis entitled: **"Socio-Economic Determinants of Food Security in Khyber Pakhtunkhwa: A Case Study of District Chitral"**. submitted by Mr. Hanif Ullah 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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Author's Declaration

I, Hanifullah, hereby state that my MPhil thesis titled Socio-Economic determinants of food security in Khyber Pakhtunkhwa. A case study of District Chitral is my work. I have not submitted for taking any degree from Pakistan Institute of Development Economics or anywhere else in the country/world.

At any time, if my statement is found to be incorrect even after my Graduation, the university has the right to withdraw my MPhil degree.

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Dedication

Dedicated to my father, mother, grandmother, and late grandfather

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While preparing the thesis, I have received a lot of praise, backing, and advice from many individuals; mentioning them is essential to highlight their consistent support.

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ABSTRACT

Food is one of the essential items for human survival on this planet. Consequently, achieving food security is the ultimate goal of every household and nation. Unfortunately, Food insecurity still prevails in the world and specifically in third world countries despite technological advancement and surplus food production. Insufficient and poor nutritional food have severe consequences on households' well-being, especially in less developed and rural areas where household diet primarily consists of monotonous diet and starchy stables. Food security is a multidimensional concept including availability, accessibility, utilization, and stability. The study aims to examine the overall incidence and socioeconomic variables which cause food security in the household in Chitral. A structured questionnaire is used to collect data using stratified and convenience sampling from 384 families. The dependent variable food security is measured through the food insecurity access scale and household dietary diversity score. Descriptive analysis and binary logistic regression results indicate that only 17.19% are food secure compared to 82.81% food insecure households. At the same time, only 10.42% of households have higher dietary diversity than 72.92% of people with low dietary diversity. The logistic regression results for both analyses demonstrate that Education, income, earning members, remittances, and infrastructure significantly affect household food security. Education, payment, number of earning members, and remittances positively impact households' food security. In contrast, infrastructure, as measured as households away from paved roads in a kilometre, harms food security.

Keywords: food security, Chitral, household dietary diversity score, logistic regression, food insecurity access scale

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

BISP	Benazir Income Support Program
FAO	Food and Agriculture Organization
HDDS	Household Dietary Diversity
HFIAS	Household Food Insecurity Access Scale
SDGs	Sustainable Development Goals
UN	United Nations
USAID	United States Agency for International Development

CHAPTER 1

INTRODUCTION

1.1 Introduction

Having food is one of the most critical elements for human survival on this planet. Ensuring its availability and accessibility is one of the fundamental human rights. Food security is achieved when people have physical and economic access to sufficient, safe, and nutritious food which should meet their dietary needs and food preferences for active and healthy life (FAO, 2002) As food security has been emphasized in the UN Human Rights Declaration "that everyone has the right to a standard of living adequate for the health and wellbeing of himself and his family, including food, clothing, housing, and medical care" (Zandy, 2019). If accompanied by food insecurity, poor health will increase the suffering of human well-being and productivity and severely affect individual, family, and national income. Subsequently, the world aims to achieve sustainable livelihood for households. The world requires a commitment to achieve UN sustainable human development goals of zero hunger, worthy health and well-being goals, two and three which need thoughtful conception about the concept of food security and how to curtail it. (Oduniyi & Tekana, 2020)

The definitions of food security encompass four main elements, i.e., availability, accessibility, utilization, and stability. Availability can be achieved through domestic production, food import, and food aid. Though Pakistan has surplus food production, the main hindrance is access to food, either economic access or physical access. Both are critical elements to be resolved to achieve food security. Availability plus purchasing power is required to buy food for the

household to ensure food security. The goal of utilization is to achieve nutritional well-being. It can be achieved by consuming nutritious food, having access to clean and safe drinking water, health care, and sanitation facilities. While stability can be achieved if both availability and accessibility are accomplished (Wahab et al., 2015)

Further, food security directly or indirectly relates to poverty. Food insecurity among low-income households is a common phenomenon as food insecure households don't have access to nutritious food. They usually purchase food that is of low quality (high in fat, calories but low nutrient components), which may lead to their food insecurity (Kempson et al., 2003) (Drewnowski & Darmon, 2005). As poverty is prevailing in many developing countries, poverty trends for Pakistan and its provinces show that many populations live below the poverty line in rural and urban areas. While, provincial estimates show that poverty has decreased in all regions except Khyber Pakhtunkhwa (Iqbal, 2020). Climate change has become the reality of the day and is expected to impact developing countries' food security severely. As per the study (Seaman et al., 2014), the population of developing countries mostly depends upon agriculture for livelihood and nutrition, so with rising temperature and uneven rainfall, domestic agricultural production falls, which may decrease its nutrition attainment and income and hence make household food insecure. Likewise (Masipa, 2017) finds that climate change mainly global warming impacts all the four components of food security in household level. Pakistan is not exception at all; indeed, it has been highly vulnerable to climate related problems. All these affect poor household as they don't have income and other resources to cope and mitigate against these climate related problems so pushing these people more into starvation and Food insecurity. (WFP, 2018)

Higher food expenses have deteriorated the problem, and poor households are particularly intuitive to the food price increase. Food inflation has adverse repercussions on house food

security. Almost all the poor people spend a significant chunk of their income on food, so an increase in food prices limits household fulfilment to achieve primary education and health. It also pushes households to buy poor-quality food with low nutrient value as the accomplishment of adequate nutrients is essential for the family's well-being (Mkhawani et al., 2016). Food prices have increased subsequently in recent months as the inflation rate in January was 19.5% higher than the same in preceding years (SBP, 2019). The price of wheat has increased massively with an increase of 42.13% in urban while that of 45.12% in rural areas, placing the middle and low-income group on the brink of starvation (Shah Qasim, 2020).

Food security has remained a significant challenge in the Khyber Pakhtunkhwa province as the province is importing subsidized food from other regions to meet its demand. Wheat is the primary stable food and is cultivated on the most extensive acreages; the importance of wheat can be generalized because it constitutes 60% of the daily diet of ordinary people in Pakistan. The per capita consumption of wheat is 125 kg; these indicators play an essential role in the agriculture policy of Pakistan (Memon, 2017). Although Khyber Pakhtunkhwa province is producing a certain quantity of wheat, it couldn’t meet the demand for wheat for its population. As per figures from crop statistics for 2018-19 Khyber Pakhtunkhwa, the province produces 1.327 million tons of wheat, while the demand for wheat in the area is approximately 3 million. (Crop Statistics Khyber Pakhtunkhwa, 2018-2019)

District Chitral is nested in the Hindukush and Karakorum mountain ranges and is one of the world's highest regions, ranging from 1100 meters in Arandu to 7726 meters in Tirichmir. It shares borders with Gilgit-Baltistan in the east, Afghanistan's Kunar, Badakhshan, and Nuristan provinces in the north and west, and Swat and Dir in the south, as well as a narrow strip with Swat and Dir in the south, Tajikistan is separated from it by a short section called the Wakhan

Corridor. The Lowari Pass and Shandur Top, which are generally blocked in the winter, connect Chitral to the rest of Pakistan by road. Mountains and glaciers cover 24% of Chitral, 62% by scattered rangeland, 5 % is surrounded by forest, and only 3% is available for cultivation purposes. (*Chitral growth strategy*, 2017) As per the census survey of 2017, the population of Chitral was 447,362 where the population of the male is 225,846 while that of the female is 221,515, while the indicators for education in Chitral shows a promising indicator its literacy rate of 62% is higher than the provisional average of 55%. Almost 34.56% of the population is engaged in the agriculture sector, while the ratio of 21.05% is for males while 13.06% for females. (*Chitral growth strategy*, 2017) Due to scarce rainfall agriculture sector of Chitral mostly depends upon irrigations canals fed by glaciers.

In certain union councils of Chitral, only Rabi crops are grown while the climatic conditions are not suitable for Kharif crops. In these areas, cultivation of Rabi crops starts from 1 April or mid-April, and harvest of the produce is usually done on 1st September or later depending upon weather conditions. Chitral being highly vulnerable to climate change, uncertain rains, flash floods, avalanches, landslips, and landslides, poses a significant threat to the livelihood and food security of the district. Landslide and flooding usually damage water supply schemes, roads, and other public infrastructures like powerhouses and schools. Irrigation canals fed by water from glaciers melting are the only source for irrigating lands. Flooding and landslide wash away these irrigation and water canals, placing farm households on high vulnerability. Rural people usually store certain foods for a vulnerable time, but that food cannot meet the dietary diversity needed for an active and healthy life. Storage depends upon income as poor people's income doesn’t support them to store more.

1.2 Problem statement

Food insecurity is a condition where people do not have enough hygienic and nourishing food to support proper growth and development, resulting in a vibrant and healthful life.

According to (Dowlatchahi et al., 2019), 40 million people in Pakistan are not getting enough food, while hungry people increase every year, particularly in rural areas. This thread is further aggravated by the growth rate in population, making Pakistan the sixth most populated country in the world. Up to date literature about this area gives us mixed results about the factors which shape household food insecurity status in different developed and developing countries. Massive population growth at the world level, especially in Pakistan, is accompanied by high unemployment, double-digit inflation, and climate change. The recent sugar and wheat crisis and many other factors are a genuinely challenging task for any democratic government to handle. To achieve zero hunger among its populations as indicated by sustainable development goal no 2, proper study and research is needed to shed light on the problem at the rural level is the need of the hour as ensuring healthy and nutritious food is the basic aim of the political economy in allocating scarce resources efficiently, for which this study will help to identify the determinants of food security using household dietary diversity score and food insecurity access scale in District Chitral.

1.3 Research objectives

The study's key objective is to determine the socioeconomic factors of food security in the household.

1. To evaluate socio-economic determinants of the household which have an impact on food security of the households in Chitral
2. To calculate Household dietary diversity in Chitral.

3. To explore the status of food security in Chitral

1.4 Research questions

1. What are the socio-economic factors affecting household food security?
2. What is the situation of dietary diversity in Chitral?
3. What is the status of the food security situation in Chitral?

This study aims to determine food security and household dietary diversity in an area known for snowfall and heavy avalanches, warm summer, and ice-cold in winters. In certain union councils, only a single crop remained suitable in a year due to severe climatic conditions. Cultural differences, climate variability, and unique geographical location make the study area more attractive. This study will add in literature specific to this area by firstly highlighting socio-economic determinants of food security, secondly dietary diversity of the household, and thirdly overall food security status in the study area. This study will provide a valuable policy insight to policymakers as to which factors are most critical in defining rural household food security and about the everyday food groups consumed so that nutrition intervention can be done for the betterment of the household.

To the best of my knowledge, there hasn't been any empirical study examining socioeconomic and demographic factors of household food security in Chitral. As there hasn't been any study in the locale so this study will be a beneficial contribution.

1.5 Research Gap

From the review of various research articles which are being published in various national and international journals, the determining factor of food security have been outlined as from the literature review, and it can be stated that research on food security and its determinants have been geographically limited, with most focusing on Punjab

province and none of the above authors or any other study has studied food security in Chitral. While there are mixed results about some specific socioeconomic indicators and their effect on food security, this study will focus on food security in Chitral and the socioeconomic variable that affects food security and the dietary variety status. The study area has its own unique geographical, ethnographic, and cultural characteristics so that this study will fill that gap.

1.6 Organization of the thesis

The rest of the study is organized as chapter two presents a brief description of the relevant literature. In contrast, the chapter gives detail about data and its methodology, source of the data, sampling technique used, definition of the dependent and independent variable, and a brief explanation of the study's methods. Chapters four provide information on data analysis, and lastly, chapter five includes the conclusion and policy recommendations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature assessment in any field of study is enormously important as it provides the researcher with the much-needed knowledge and understanding about the study, where it is, and how it would be in the future. So, this helps the researcher to know about his research and execute his research in the best possible direction. As the term food security is multidimensional, there are many types of research about the concept and how food security can be achieved at the global national and household level. In this chapter, we discuss the related literature about food security and its determinants

2.2 Concepts of Food Security

The world food security and its essence can be traced back to the symposium on food and agriculture in 1943, since that time, the concept has incorporated several redefinitions and modifications. In 1974 a word food conference was organized the world food conference due to an unprecedented increase in food prices and the fear that the food system would collapse altogether. Since then, this concept has diversified as different researchers have contributed in their way to the idea. Until the 1970s, food security was generally conceived as an appropriate food supply on a global and national scale, so the main focus was on having more and more production on a worldwide and national level(Maxwell, 1996). Although there was an adequate supply of food, it didn't guarantee food security at the household and individual levels. As per the UN human development report, the calorie supply of food globally was 110 percent more

than the total requirement to meet the food needs. As the adequate supply of food didn't guarantee food security, the idea of Amartya Sen of entitlement and access failure gained much popularity. The main focus was that entitlement and access failure hinder the household and individuals from becoming food secure. This theory of Amartya Sen gained much popularity and got the centre place in the food security discourse afterwards. Now the stress of food security from global and national shifted to household and individual levels. After these two major shifts in food security discourse occurred, the first is from the food-first perspective to livelihood perspective and then from objective indicators to subjective indicators (Maxwell, 2001) (Maxwell, 1996).

The Food and Agricultural Organization provided the most widely acknowledged definition of food security, which stated as, when all individuals have physical and economic access to adequate safe and nutritious food that matches their dietary needs and food choices for an active and healthy lifestyle, food security occurs (World food summit 1996). This definition incorporates four main food security dimensions: availability, access, utilization, and stability.

2.2.1 Availability

Food availability is mainly related to the supply side of food security. The concept of availability is about sufficient magnitude and standard of food at country, household, and local food outlets through self-production or imports. (Uribe, Álvarez, et al., 2010) (Russell et al., 2011)

2.2.2 Access

Households and individuals have access to enough economic resources, which will help them to buy safe, nutritious, and healthy food. (Lawlis et al., 2018) (Uribe, Álvarez, et al., 2010)

2.2.3 Utilization

It's mostly related to nutritional well-being, which the household has achieved through proper diets, health facilities, clean and safe drinking water, and proper sanitation facilities. It's also related to how the human body has effectively utilized the nutrients present in food. (Uribe, Álvarez, et al., 2010) (Lawlis et al., 2018)

2.2.4 Stability

Stability will be achieved when the previous three components are met: everyone in the population, community, households, and individuals can have food not affected by economic, political, and environmental shocks. (Lawlis et al., 2018) (Russell et al., 2011). Various elements or factors influence the term food security, so to achieve food security for individuals and households, we have to identify these factors and analyze them to see whether they affect food security positively or negatively.

2.3 Socio-Economic Determinants of Food Security

Education, income, and household size are found to be the most important factors in determining food security for both general and farmer households, according to a study based on the Pakistan Social and Living Standard Measurement (PSLM) 2007-08 survey conducted by the Federal Bureau of Statistics, Pakistan, using the Logit model. Female education was an essential factor of food security as females bear the primary responsibility for work related to food. Female households with more education always go for food with diversified choices. (Asghar & Muhammad, 2013)

(Anila Sultana, 2011) they analyzed the potential factors that can impact household food security in Pakistan. They used a logistic regression technique to investigate the matter with the

help of data obtained from “PSLM 2007-08”. Five main variables were used beyond other demographic pointers affecting food security levels. These consist of: where they live, social capital, dependency ratio, the 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. In contrast, the literacy level of the head of household above the intermediate level has a substantial and positive influence on the household's food security status. On the other hand, social capital and engagement in earning opportunities do not affect a household’s food security; their result was not significant. Diverse strategies and programs must address these determinants using a holistic and incorporated approach. This study is limited to the household heads' reading level and ignores the influence of household heads' gender on food security.

Further, the gender of the family head plays a vital role in determining household food security, and an exploratory study was conducted to examine factors that affect household food security in northern areas of Pakistan. For the estimation purpose, the binary logistic regression technique was used to identify the aspects that influence family food security. As per the study's findings, oldness, sexual category, education attainment, remittances from abroad, joblessness, inflation, assets, and disease are all significant factors that influence a household's food security. Furthermore, female-headed families are more food insecure than male-headed households. So it’s the government's responsibility to provide the female with social security allowance and other employment opportunities as they are the most vulnerable segment of society. Another important thing is that females with more education have also been found to be food insecure as the culture and traditions in the area don’t encourage females to go out and search for employment. (Abdullah et al., 2019)

Furthermore, in most developing countries where inadequate roads hinder market access, this study analyses the state of food security in small farming households, as well as the factors that influence it, such as the effect of market accessibility factors in improving food security at the family level. Through appearance-to appearance structured interviews, the data were collected from 567 rural farmer households in Punjab, Pakistan. Then the binary Logit analysis procedure was used for determining the factors which affect the family food security, family size, monthly income, food prices, health care cost. Debt is the main factor influencing household food insecurity. Market accessibility factors, including the distance of household from the market and the cost of transportation, significantly affect small farmer household food security. Easy access to the market and improved transportation facilities will increase household food security. More cheap goods would be available at the local level, so their purchasing power will increase and contribute to food security (Sher et al., 2018). Apart from this, more off-fam employment opportunities should be provided to rural people to diversify their income and increase food security (Ahmed et al., 2017). Likewise, a study was conducted to investigate the demographic factors influencing household food security in rural Punjab, Pakistan. The predicator regression technique was used to identify the characteristics impacting rural household food security. The results show that monthly income, livestock, joint family system, and educational level positively affect rural household food security. In contrast, household head age and family size have adverse effects on household food security (Sati & Vangchhia, 2017).

Similarly, food security status in district DIR lower Khyber Pakhtunkhwa finds out the determinants of the household. The pre-structured questionnaire was collected from 200 homes, and the study has used a binary logistic model for data analysis. The finding from the study shows that the employment status of household head, farm income, non-farm income were

positively correlated with food security. In contrast, the distance from the food stuff market, household size, and livestock value were inversely related to the food security status of the households. As the author had explained that in the study area, livestock is not used as a coping strategy against food insecurity, but it's kept but those individuals who don't have any other income source as they keep livestock to keep themselves engaged while keeping livestock in the study area is seen as a symbol of poverty (Sher et al., 2018).

Another study looks at the food security status of farmer and non-farmer households in rural Punjab, and it employs three measurement methodologies to do so: the DIA (dietary intake assessment), the HFIAS (household food insecurity access scale), and the HDDs (household dietary diversity score). The information was gathered using a multi-stage random sampling process from 576 rural households in 6 districts of Punjab. The binary logistic regression analysis was performed to identify determinants that affect the food security status of households, including family size, monthly income, household head education, and animal ownership. Family size affects food security negatively as feeding households with more members takes many resources, leaving very little for others (Yousaf et al., 2018). Another study was conducted in Zimbabwe to examine factors influencing household food security among smallholder farmers in the Mudzai district of Zimbabwe; the linear regression analysis was used to determine Household dietary diversity. The outcomes suggest that age, livestock ownership, and remittances impact food security. Household dietetic variety is favourably influenced by household head education, household labour size, and access to market knowledge. According to regression analysis, family size, remittance, livestock ownership, labour, and access to information related to the market all affect household food security. (Mango et al., 2014)

Similarly, another study was conducted in South Africa to evaluate food security status and socioeconomic factors which are affecting household food security, the factors were determined using the logistic regression technique, and the results from the study shows that farming experience, and household size, and the oldness of household head significantly affect food security. The study also shows that female-headed households are more food secure than male-headed households (Oduniyi & Tekana, 2020). Likewise, this study compares the home food security status of "One Home One Garden" (OHOG) beneficiaries to that of non-beneficiaries in Maphumulo, as well as the factors that influence household food security status; the study uses binary logistic regression to determine food security status, education, receiving infrastructural support, and participation in OHOG has positively directed the food security position of the household, while the income of household and access to credit negatively affect food security status of household (Ngema et al., 2018). In the interim, this examination decide factors that are related to food security in Zambia; this investigation utilizes two arranged probit model for assessment the reliant variable to quantify food security are FCS (food utilization score) and HHS (family hunger scale), the outcomes show that advanced education levels of the family head, expanding animals pay, secure land residency, growing land size, and gathering enrollment increment the likelihood of family food and nourishment security (Ngema et al., 2018)

In Pakistan, people of different cultures and ethnicities are residing, who have their food eating behaviours and choices, most studies Pakistan have primarily focused on food insecurity and dietary diversity on women and children's who are usually under the age of five, but there hasn't been any study which has investigated the ethnic and cultural dynamics of populations food and dietary practices in Pakistan, it's essential to have a complete overview about the malnutrition situation in different cultural setting and localities so that meaningful intervention can be

achieved. The goal of this study conducted by (Hashmi et al., 2021) was to determine the amount of food insecurity and dietary diversity across Pakistan's major ethnic groups in Karachi, the country's largest city. The study has been conducted among the five ethnic groups living in Karachi using the multistage random selection technique. Five hundred thirty-five houses were selected, the study has employed an FAO standardized questionnaire to quantify food insecurity and dietary diversity. The questionnaire was first translated into the local language, piloted observational study, and then used for further data collection. The study's findings are that there was no statistically significant relationship between food diversity and age, marital status, or educational level. Among the ethnic communities, those families whose ancestors had migrated from India and were Urdu-speaking communities were the most food secure. In contrast, Sindhi speakers communities were the most food secure.

Similarly, to investigate the socio-economic determinants of Dietary forms in middle and low-income countries, (Mayén et al., 2014) had conducted an organized review of the literature published during 1996 and 2013. They included a total of 33 studies from 12 middle-income and five low-income countries, and the studies were carried out in Iran (4), China (6), and Brazil (8). They concluded that urban areas are related to higher consumptions of protein, calories, cholesterol, fat, vitamins, and iron while lower intake of fibre and carbohydrates. Moreover, high socioeconomic status is also related to more consumption of fruit and vegetables, which helps in diet diversity, and quality.

In a resource-poor framework, women of reproductive age are at high risk of insufficient micronutrient consumption when there is a significant absence of food variety. Their consumption primarily consists of staple foods. However, relative evidence on diet quality is rare and measurable data on nutrient consumption is costly and hard to collect (Arimond et al., 2010)

evaluated the likelihood of modest indicators of dietary diversity, as might be shaped from huge domestic assessments, to serve as substitution gauges of the micronutrient suitability for evaluation at the population-level. Valuation of dichotomous indicators through receiver-operating characteristic study disclosed good predictive power for the most acceptable choice indicators, which is different by spot.

A study investigates the relations between women's role in agriculture in terms of diversity in agricultural production and its substantial impacts on Maternal and child dietary diversity. The study's findings conducted by (Malapit et al., 2015) illustrate a positive relation between gender work diversity in the agriculture sector and diverse maternal and child diets. For instance, the greater the women empowerment in household decision making regarding the agricultural income, the higher the food security and diary diversity would be. In other words, the variety in production, gender parity is the essential factor behind better maternal and child nutrition. The surveyed data was analyzed through the OLS regression model. The key results show a slight impact of women empowerment and production diversity, in the agriculture sector, upon the children's body mass index (BMI). Likewise, the results also depict a better co-relation between child's diverse dietary and women empowerment in the agriculture sector. To put it otherwise, the women who work or influence the agricultural decision-making process experienced good maternal nutrition. These women were also able to provide a better diet for themselves and the infants. We can conclude that women's empowerment plays a crucial role in the agriculture sector, wherein incorporating women's decisions meaningfully impacts the net household income. The diversity in production by including women in the agricultural workforce would increase the overall output and enhance the household's food security index. Resultantly, it

reduces the infant mortality rate and the vulnerabilities of malnutrition among children and adults.

In the context of third-world countries, it is imperative to diversify the agriculture sector by allowing women to work shoulder to shoulder with their male partners. By doing so, better health and food consequences could be achieved to mitigate the issues related to food security across the region.

Another study measures the statistical distribution of the social patronages in terms of the quality of dietary and food security. The study relied on the independent variables of landholding and various types of livelihood to determine the impacts of food security that are the dependent variable. The study's findings directed by (Pritchard et al., 2019) illustrate that although food security dramatically depends upon the quantity of land possession, it is not the sole determinant of food security in the context of the Global South. There are other dependent variables like the kinds of individual's livelihood that specifically influence the quality of food security to a great extent. Moreover, the finding reveals that households that adhere to farm-based livelihoods are more prone to food security than land-owning households.

Additionally, the antecedent conditions of suitable seasonal situations are vital constituents of food security across the Global South. As per the finding, the non-farm livelihood plays a crucial role in the aggregate food security of the region. The collected data were analyzed through Descriptive statistics and empirical methods whereby the results show a direct relation between food security and farm-based livelihoods. Similarly, a direct association between landholding and diverse dietary was also observed. To put it into context, the analyses of surveyed data depict that the landholding households enjoy more diversity in the diet than land-deprived ones.

Likewise, the household that relies on the farm-based livelihood is more secure in food security than the household that relies on no-farm livelihoods.

In the context of the Global South, it is vital to introduce the concepts of organic farming in the urban centres where the lack of farm-based livelihood is the major obstacle to food security. The introduction of a farm-based livelihood with modern agricultural techniques would mitigate the issue of food security and sustainability across the urban centres of the Global South. As far as the rural areas are concerned, through substantial land reforms, the disparity of landholding across different sections of the society could be reduced that would, in turn, guarantee the diversity of dietary and food security.

Another study investigates food security status and associated socio-economic factors affecting food security status in Australia using the US household food security survey module. The study uses a multinomial logistic regression model to determine factors affecting food security status age, marital status, household income, and education are significant factors affecting the family's food security (Butcher et al., 2019). Payment of the household from the farm and off-farm activities has considerable ramifications on the home food security. A family that relies on one source of income is more food insecure than a household with a diversified income source (Aziz et al., 2016). A home with more income sources has less impact of sudden shock and crisis than a household that doesn't have. (Mauceri et al., 2006)

Education has always been an essential instrument for social progress. Still, its importance and high relevance in the 21st century cannot be overlooked, as it has been the most important and influential element for any nation or individual to achieve the social progress and advancement they want to achieve. At the same time, it helps countries address issues like population growth, poverty, health issues, climate change, and food security. More educated people have better

nutrition knowledge, better cooking skills, diversified food choices, and purchase efficiency. Studies conducted by different researchers have verified these statements. (Magaña-Lemus et al., 2016) (De Muro & Burchi, 2007) Likewise, women have considerable importance in society due to their immense role and contribution in the economic activity of the household and country. Women from childbearing food production to preparation contribute much towards household food security. Women are an essential asset for the country's economy as women with more education have been positively associated with household food security. A study conducted by (Smith et al., 2003) has shown that if women had the same economic status as men, the malnutrition among under three-year children would decrease by 13%, meaning 13.4 million fewer malnourished children. An educated woman has higher nutritional knowledge, better food preparation skills, healthy food habits, efficient allocation of the family budget, and minimal food waste, contributing significantly to food security. (Savari et al., 2020) also, women with a greater level of education are more likely to serve a variety of foods, hence enhancing household food security (Olumakaiye & Ajayi, 2006)**.** Another study has shown that women who have higher income share are economically more independent and so choose a diversified diet for their household members, so increasing their food security, there is also a positive association with women being more educated and higher fruit seafood and milk product consumption as they are a good source of nutritious (Kalansooriya et al., 2020). Similarly, the importance of education in determining food security has been furthered by studies that have found a positive relationship between women's educational attainment and diversity of food consumed and hence food security.

A study was conducted to analyze the determinants which have repercussions on the food insecurity of the families in western Ethiopia. Principal data was gathered from 276 randomly

nominated houses for seven days through interviews focused on group discussions and key informants. The data were examined using descriptive statistics, the food insecurity index, and the Tobit model. Results of the data analysis demonstrate that household food insecurity is associated with the age of the household head, family size, off-farm income, and non-farm income. Households with greater family individuals are additionally expected to be energy-deprived than families with smaller family size, the rationale for this as per the author is as in case of large family size there is the possibility of more members who are economically nonproductive and fewer members who are economically productive, so this put burden on individual who is working for food availability of his households and so decreases their food security (Sani & Kemaw, 2019) while another study (Assenga & Kayunze, 2020) shows that there is a link between family food security and household size, it means that as the larger is the family, the better is the household's food security as a household with more economically active members, can provide in their farm parts and off-farm activities so increases the availability of food in household and then leads to food security.

Livestock production has been an essential contributor to sustainable food security in low-income and developing economies in rural areas where most farming systems still depend upon livestock (Godber & Wall, 2014). Livestock is the primary contributor to a household's protein consumption as it accounts for nearly a third of the world's protein consumption (Popp et al., 2010). While they are also a key source of food when floods hit crops, and other disasters (Teshome Deresse, 2020) shows those farmer households who own more livestock are more food secure than households that don't. (Nkomoki et al., 2019) they have also found a positive relationship with an increase in livestock income and food security. As livestock provide meat, milk, and other dairy products needed for households and diversify their food consumption,

households diversify their income and increase their purchasing power by selling the livestock. Another study (Jodlowski et al., 2016) has confirmed that having livestock and selling it contributes significantly to household food security by increasing food consumption and dietary diversification. While (Dumas et al., 2018) investigated the association between livestock ownership and dietary diversity and found no significant relationship as quantity of livestock holding were found very low among the households and also slaughtering of animals for own consumption was almost negligible.

(Meskerem & Degefa, 2015) investigate the determinant of a household's food security. Focused group discussion and key informants interviews were conducted from 100 randomly selected households from the Kebele administration. Factors determining household food security status were sex, age, educational status, and family size, while access to productive assets also determines food security. The education of the household member affects household food availability and utilization components through eating habits, food rationing, and saving habits. While the increase in household size puts pressure on household food consumption, the available dietary energy needed decreases.

Similarly (Adesoye & Adepoju, 2020) examine factors influencing the food insecurity status of working poor households in southwest Nigeria. Primary data were collected from 284 families for the analysis. Through the ordered probit model, factors influencing the food insecurity status of working poor households were determined. Results from the research show that income, savings, household size, and education significantly determine the food insecurity position for the families. There is also a Positive relationship between household size and food insecurity; as household size increases, household food insecurity also increases. Education is human capital; a higher level of education means there are more chances for households to earn higher wages and

get well-informed nutritional knowledge, so it lowers the probability of a household being food insecure, for a home that possesses an income saving scheme and also has regular income, the likelihood of them being food insecure decreases.

Likewise (Magaña-Lemus et al., 2016) conducted to determine the determinants of household food insecurity in Mexico. Secondary data was collected from MCS for analysis purposes, while an ordered probit model was used to analyze the data. Results show that households headed by younger, less educated heads, headed by single women, and households having disabled members are more likely to be food insecure. Also, in families that possess less income and live in rural areas, the likelihood of food insecurity is greater. A household with a disabled member is 10.7 times more likely to be food insecure than a household that doesn't. Families living in rural communities are more vulnerable than households living in urban areas.

Similarly, (Mequanent & Esubalew, 2015) factors that affect household food security were analyzed in Gomma district southwestern Ethiopia. Primary and secondary data have been used for the analysis purpose, and logistic regression was used to determine food security factors. The analysis shows that age income from non-farm/ off-farm pursuits, size of the cultivable plot, livestock, and oxen ownership positively affects food security. Also, chemical fertilizer, soil, and water conversation practices positively affect household food security. Activities such as subsidy on chemical fertilizer and providing incentives for water and soil conversation practices have been found to increase the household's food security. Another study studying the determinants of food security in Mana woreda of Jimma zone concluded that the educational status of household head, family size, use of farm input, and the number of oxen owned by household is significant factors in determining food security. Family size was negatively related to food security. As homes have more family members, it decreases the probability of having health and adequate

food for their family members, reducing the household's food security. As education is positively related to food security so arranging nutrition learning programs for the homes will help to increase food security (Mequanent Muche*, Birara Endalew, 2014)

(Olagunju et al., 2020) study the determinants of food security among rural women in Kaduna state Nigeria show that age, household size, and income are significant determinants of food security. The more the size of the household, the better will be food security status of rural women. Homes having more family members are more food secure, monthly income of rural women also contributes significantly to food security. As women empowerment in social development is essential for the economic prosperity of nations, by educating females, we can have control of population growth, increase household income, and reduce gendered inequalities. However (Feleke et al., 2005), to estimate the causes of food security in southern Ethiopia at the household level, both demand and supply-side factors significantly impact households' food security. By applying logistic regression, it's found that supply-side factors such as technological adaptation, farm size, and land quality are positively associated with food security. The demand, side factors, market access, and family size negatively affect food security, while both are significant. Technological adaptation can help the farmer produce more from the given resources and increase food availability, increasing household food security. The more faraway the market is from the households, the more food insecure he will be as lack of market information causes inefficient use of resources. In contrast, with an increase in household size, food security will decrease.

(Cheteni et al., 2020) studied dietary food diversity and food security in pastoral areas of Eastern Cape Province from 296 randomly selected households. The dependent variable used in the study was dietary diversity score and household food consumption score. Through binary logistic

regression, determinants that impact food security were estimated, results suggest that age, access to credit, gender, and household income influenced household food security status and dietary diversity. Likewise, another study examined determinants of rural household dietary diversity in Amatole and Nyandeni district south Africa, and estimates suggest that participation in irrigation schemes, education, income, livestock ownership, access to the home garden have a positive and significant impact on higher nutritional multiplicity (Taruvinga et al., 2013)

The Food and Agriculture Organization's (FAO) recommended daily energy consumption for an adult to live a healthy and moderately active life is 2,100kcal per adult per day, a global benchmark for the food poverty threshold (Giovanni, 2013).

The amount of food that an individual consumes has necessary implications on the functioning of the human body. In this sense, the average calories that any household takes are fundamental. The study of (Malik et al., 2015) shows the most calories in the diet of low-income families come from wheat, which constitutes a 52 percent share accompanied by cooking oil and fats, and dairy products. This calorie intake of the low-income families shows unhealthy dietary patterns. Secondly, the study also signifies that despite having calorie-dense food items, most households cannot meet the minimum calorie intake standards of 2350 calories per day. The per-day calorie intake of 1848 by low-income families is much lower than the official recommended measures. The study also points out that people who have income below the poverty line consume less than the standards calorie intake irrespective of residence, whether they live in a rural or urban setting.

Another longitudinal study was conducted by (Abidi et al., 2021) From February 2014 through June 2015. A total of 155 school pupils ages 7 to 14 years old from a Karachi urban school were involved in the study. On four different days for each of the four primary seasons, a 24-hour

recall was undertaken. The food items' weight, calories, carbohydrate, fat, and protein content were stated in a food composition table. Results of the study show that Carbohydrate 781 (347) Kilocalories (Kcal) was the most abundant calorie source, followed by fat 502 (277) Kcal and protein 379 Kcal (287). Carbohydrate consumption in 24 hours was highest in the fall, at 212.81 (85.37), and there was a substantial variation in carbohydrate consumption across all seasons (p-value 0.003). The consumption of the optional food group was highest (31.3%), while the consumption of nutrient-rich fruits and vegetables had the lowest (29 percent). The study concludes that there was a suboptimal consumption of fewer than 2000 calories per day among the school-going children.

Food security in rural areas is a huge issue to be investigated. Several variables cause the scenario. The current study (Khan et al., 2012) looks at the factors influencing three dimensions of food security in Pakistan's rural areas: food availability, accessibility, and absorption. A set of models is built to estimate the determinants of each component, in which each element of food security is a function of socio-economic variables. The coefficients are calculated using ordinary least square regression. According to the findings, wheat, rice, maize, pulses, oilseeds, chicken meat, and fish production at the district level has a beneficial impact on food availability. Except for Sindh, every district is more likely to be food insecure in terms of availability. Electrification and adult literacy appeared as characteristics that have a detrimental impact on food accessibility. Food absorption has been proven to be improved by child immunization, safe drinking water, and the presence of a large number of hospitals.

Similarly examines (Joshi & Joshi, 2017) household food security and finds the factors affecting it in two mountainous regions of Nepal. Because the dependent variable is dichotomous, a binary logit model was utilized. Farmland expansion contributed to increasing production of major

crops in the studied districts from 1974/75 to 2013/14. Except for potato and wheat, significant crop output growth remained below population growth in these districts. The results suggest that male-headed households, household members with both agricultural and associated occupations, age of the household head, percentage of irrigated area, quantity of animals held by the family, and owner-operator all have a favourable impact on household food security. The factors home size and travel time to the nearest market had a detrimental effect on household food security.

The nature of the topic is such that all the components of the term food security are substantial problems in Africa, and a significant amount of the research in recent years has mainly focused on Africa. Therefore there is more literature on Africa.

Based on the above discussion, we may infer that various studies on food security have been done. Still, little research has been done on household dietary diversity and its determinants in Pakistan.

CHAPTER 3

DATA AND METHODOLOGY

3.1 Introduction

In this chapter, we will be thoroughly discussing the conceptual framework, data, and methodology which have been employed in the study. A conceptual framework is fundamental for any examination as it's the basic building block of the research, where main concepts are organized to achieve the study's primary purpose. Data is also being explained; its nature and the method used in its collection with the methodology used in the study are presented coherently.

3.2 Conceptual framework

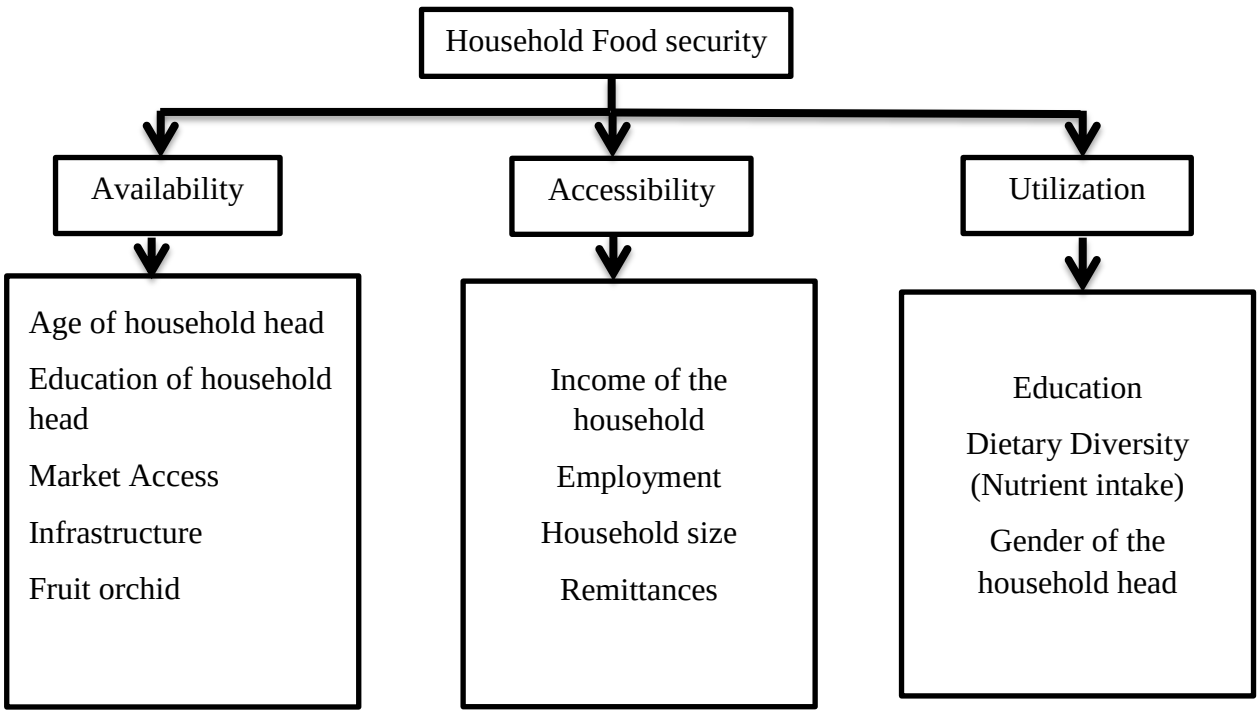

Figure 3.1 Conceptual framework

Food security is an inclusive concept as the term cover a broad spectrum and is linked with every aspect of the society directly or indirectly, several authors (Pieters et al., 2013) (Tefera & Tefera, 2014) (Bashir et al., 2012) (Jessup-Varnum, 2018) (Nnaji et al., 2021) (Drammeh et al., 2019) (Harris-Fry et al., 2015) (Yahaya et al., 2018) (Islam & Kieu, 2020) (Fikre et al., 2017) have used different potential proxy determinants and have linked it to the main parts of food security, this study has taken into considerations three main parts of food security after incorporating the proxy determinants of food security from each study we have developed the conceptual framework for this study, as has been depicted in figure 3.1. Factors such as education of the household head, age of the household head, household access to market, and infrastructure and fruit orchid are the determinants of availability component of food security. Remittances, household size, employment, and income are the potential determinants of accessibility components of food security. At the same time, dietary diversity (Nutrient intake), gender, and education are related to the utilization component of food security. We believe exploring each part by exploiting the related variables will determine the household's food security status.

3.3 Data

As per census 2017, the population of Chitral is 447,362, so to ascertain the desirable population's sample size for the study purpose, the Raosoft sample size calculator was used. At a 5% margin of error and 95% confidence interval, the recommended sample size to be used for data collection is 390. The sample frame of our study is a household from Chitral, so at the first stage stratified random sampling technique was used to divide Chitral into two subdivisions, subdivision Chitral and subdivision Mastuj which now consist of 162 and 309 strata (villages). Then by applying convenience sampling, 10 and 20 stratum (villages) are selected from each

subdivision. After that, we selected 13 households from each village using another convenience sampling, making our sample size 390. Figure 3.2 shows the sample design.

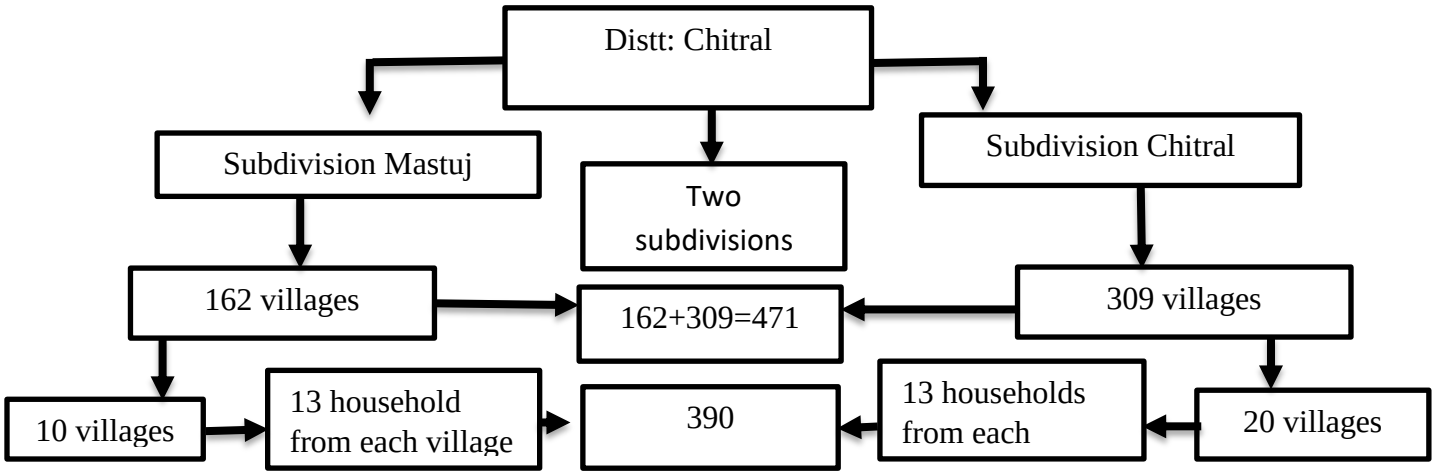

Figure 3.2 Sample Design

Therefore, we get a sample of 130 from sub-division Mastuj and 260 from subdivision Chitral. We analyze the data using Stata software, consisting of both descriptive and regression-based techniques. In the descriptive section, bar and pie charts are being used.

3.4 Definitions of key terms

3.4.1. Food security

Food security is accomplished when people have physical and financial access to adequate, harmless, and wholesome food which should match their dietary demands and food favourites for an energetic and prosperous existence (FAO, 2002)

3.4.2 Food Insecurity

Food insecurity refers to families that have been unable to obtain enough food for themselves and their family members due to a lack of financial and other resources. (Coleman-Jensen et al., 2020)

3.4.3 Household

Group of people living under the same rooftop share the same meal or consume from the same budget.

3.4.4 Dietary diversity

Dietetic variety is well-defined as the consumption of a wide range of food kinds over time. It represents the idea that expanding the variety of foods and food types in one's diet can ensure optimal nutrient intake. (Mukherjee et al., 2018)

3.4.5 Low Dietary diversity

Household consuming three or fewer food collections over a reference period (Mukherjee et al., 2018)

3.4.6 Medium Dietary Diversity

Households consuming four to five food groups over a reference period. (Mukherjee et al., 2018)

3.4.7 Low dietary diversity

Households consuming six or more food groups over a mentioned period. (Mukherjee et al., 2018)

3.5 Household food security calculation

The dependent variable of the study food security status is determined through, household food insecurity access scale and household dietary diversity score.

3.6 Household food insecurity Access Scale

Household food insecurity Access scale is designed as per FAO and USAID (FANTA) project suggestions. It is one of the most straightforward tools that were introduced to measure food security. It's a continuous measure of the degree of food insecurity experienced by households and mainly concerning access in the families during the specified period of thirty days. We have used the uniform nine questions in our research after considering their applicability in the local context, followed by their frequency of occurrence to measure household experience to different dimensions of food security. The nine incidence queries are divided into the three categories of food insecurity access.

1. Concerns and apprehensions concerning the family food supply
2. Inadequate quality (It include different varieties and household preferences for the food they want to have)
3. Insufficient dietary consumption and its bodily consequences

Household food insecurity Access prevalence is constructed for each household after incorporating their responses to the frequency of incidence question in the pre-defined time. The required minimum score for any family is 0, while the maximum score is 27. This indicator also categorizes households into four different levels of food insecurity.

1. Food secure: (having a score of 0 or 1).
2. Afraid about running out of food (having a score of 2-7)

3. Food insecurity is moderate (having a score of 8-11)
4. Severe food insecurity (having a score of >11)

The above indicators have already been converted into food secure and insecure categories for analysis. Food secure and mildly food insecure are given the code one and are considered food secure. In contrast, moderately and severely food insecure are given the code 0 and are considered food insecure (Coates et al., 2007). Furthermore, Household food insecurity access prevalence has been estimated as:

HFIA Prevalence = Number of households classified as having HFIA category four divided with the overall number of homes in the HFIA category four multiplied by 100. (Coates et al., 2007)

3.7 Household Dietary Diversity Score

The household dietary diversity score was used to assess household food access, and the number of different food groups consumed. Household dietary variety scores are a qualitative measure of the food consumed by a household for 24 hours. It's formulated by the USAID office of food for peace. The score is used to show household food access, as more diversified diets or diverse food groups consumed by any household are due to results of higher income, availability of food, etc. A more diversified diet also helps in improving childbirth weight, children's anthropometric status, and higher caloric and protein adequacy. HDDs become more critical and relevant as households consuming ten different foods from the same food group can't be categorized as diversified food. So lastly, having a diversified food is already a vital outcome itself. In this study, the sample household will be asked about the food they have consumed during 24 hours recall period. The foods and drinks which the family will mention will be coded into 1 to 12 specified food groups. The response to the questions will be 1 for food consumed

from the food group, while 0 for no food consumption. Below are the 12 food groups among which the household will tell whether he has finished any or not. (Food and Agriculture Organization, 2010) (Swindale & Bilinsky, 2006)

Table 3.1: Food groups in HDDS

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

Source:(Swindale & Bilinsky, 2006)

HDDS is calculated for each household by using the formula

HDDS= SUM (CER+RTU+VEG+FRU+MEP+EG+FS+PN+M+OI+SH+M)

Where CE represents cereals, RTU represents Roots and tubers, VEG vegetables, FRU represents fruits, MEP represents meat and poultry, EG represents eggs, FS stands for the fish and seafood, PN represents pulses, legumes, and nuts, M represents milk products, OI represents oil and fats, SH represents sugar and honey while M for miscellaneous. HDDs are a summation of the food clusters consumed by the household; the values and indicators are as follow:

Table 3.2: Food groups consumed by household

Item	Value	Item	Value
Cereals	'1' if consumed by household otherwise, '0.'	Fish and Seafood	'1' if consumed by household otherwise, '0.'
Roots and tubers	'1' if consumed by household otherwise, '0.'	Pulses / legumes / Nuts	'1' if consumed by household otherwise, '0.'
Vegetables	'1' if consumed by household otherwise, '0.'	Milk and Milk Products	'1' if consumed by household otherwise, '0.'
Fruits	'1' if consumed by household otherwise, '0.'	Oil and Fats	'1' if consumed by household otherwise, '0.'
Meat and Poultry	'1' if consumed by household otherwise, '0.'	Sugar and Honey	'1' if consumed by household otherwise, '0.'
Eggs	'1' if consumed by household otherwise, '0.'	Miscellaneous	'1' if consumed by household otherwise, '0.'

Source: Author calculation

A household's minimum score is 0, and its maximum score is 12. Homes who have consumed only three food groups during the recall period have been assigned a score of 3 which means households have low dietary diversity, while families ate 4-5 different meal categories as medium dietary diversity score while homes who have consumed food groups above six will take the value of higher dietary diversity. Dietary diversity has been converted into a dummy variable to determine the relationship of dietary diversity score with the socioeconomic variables. Those households consuming less than five food groups have been assigned a value of 0 and termed as food insecure. In comparison, families consuming five or more than five food groups have been given a value of 1 and termed as food secure. The average dietary diversity score for each

household is computed by adding the nutritional categories together for each home and then dividing by the number of food groups.

Average HDDS = Sum of food groups consumed by households / total number of households

Pakistan dietary guideline for better nutrition has developed a nutrition plan with the name "my plate" for different age groups; in the plate, the food groups are divided into six components or parts based on Pakistani diets; these food groups include 1). Cereals grains and grains products 2). Vegetables 3). Fruits 4). Milk and Milk products 5). Oil and Fats 6). Meat, Pulses, and Eggs. According to the Pakistan Dietary guideline for better nutrition, recommended calorie intake with nutrient value for different age groups. There must be 2-3 servings daily of meat and pulses, vegetables, milk, milk products, fruits, and 4-5 times consumption of cereals & grains for healthy nutrition. For children aged 3-10 years, the average recommended calories are 1296-136. Secondly, the standard recommended calories for adolescents aged 10-19 years are 1754-2298. Likely for 19-60 years, calories consumed per day should be 2167-2419[1].

3.8 Logistic Regression Analysis

The dependent variable for our study, food security, is dichotomous; a value of 1 indicates that the home is food secure, while a value of 0 indicates that the household is food insecure. So, keeping the dichotomous nature of our dependent variable, we have used logistic regression to measure the connection between socio-economic determinants and food security. Many other authors have used this technique for analysis like (Abdullah et al., 2019), (Anila Sultana, 2011), (Yousaf et al., 2018). This model is appropriate for the study as our measurable,

[1] See: Pakistan Dietary Guidelines for Better Nutrition by Food and Agriculture Organization of the United Nations and Ministry of Planning, Development and Reform, Government of Pakistan 2019 OR Visit: https://www.pc.gov.pk/uploads/report/Pakistan_Dietary_Nutrition_2019.pdf

variable food security is binary. If the household is food secure, it has a value of 1; otherwise, it has a value of 0. The model can be described as:

$$Y_i = \alpha + \beta_i X_i + u_i \qquad (3.1)$$

Where,

$Y_i = \frac{P_i}{1-P_i}$, Dependent variable,

When Yi is one, the Household is food secure

Yi is 0 the household is food insecure

$X_{i,}$It is a vector of independent variables, such as age, gender, education status, income, family size, no of earning members, fruit orchid, remittances, market access, floods, infrastructure.

$$Y_i = \alpha + \beta_1\, gender + \beta_2 age + \beta_3 education + \beta_4 income + \beta_5 family\ size + \beta_6 no\ of\ labors + \beta_7 fruit\ orchid + \beta_8 remittances + \beta_9 market\ access + \beta_{10} Floods + \beta_{11} Infrasrtucture + \mu \qquad (3.2)$$

3.9 Description of the variables

In the section below, the variables which have been used in the study are discussed in a detailed manner; both the variables dependent and independent variables are explained.

3.9.1 Dependent variable

Food insecurity access score has been formulated after categorizing household's responses to the nine occurrence questions, which give us four categories of household food security situation: (1)

food secure, (2) mild food insecure, (3) moderate food insecure, and (4) severely food insecure and then converting these categories into food secure and food insecure. Food secure and mild food insecure has been assigned a value of 1 and named as food secure, while moderate food insecure and severe food insecure has been given a value of 0 and named as food insecure. Household Dietary diversity scores have also been converted into a Dummy value of 1 and 0. Households consuming five are more food groups have been assigned a value of 1 and labelled as food secure, while households consuming less than five food groups have been given a value of 0 and marked as food insecure.

3.9.2 Independent variables

3.9.2.1 Gender of the household head

In the study sex of the household head is a categorical variable where "1" stands for male while "0" stands for female. In Pakistan and mainly in the rural area, most households are led by men. As a result, it's critical to understand the impact of female household heads on food security. Studies have come up with mixed results as per certain studies; male-headed households are more food secure while others don't agree with them as they don't see any role of the impact of gender on household food security.

3.9.2.2 Age of the household head

The household head's age is also a categorical variable and is divided into four different categories: 1 =18-36 years old, 2 =37-54 years old, 3 =55-72 years old, and 4 =73 years old and up

3.9.2.3 Education of the household head

0 =No formal Education, 1=Till primary, 2=from class 6^{th} to matric, 3=Intermediate, 4=class13^{th} to graduation, 5=above graduation

3.9.2.4 Income of the household

Average monthly Income of the household from off-farm and farm work:

1=Less than 15,000, 2 =15,000 to 30,000, 3=31,000 to 45,000, 4 =46,000 to 60,000, 5=61,000 and above

3.9.2.5 Number of members in a family

The number of individuals who are living under a single roof:

1=0 to 5 members, 2=6 to 10 members, 3 =11 to 15 members, 4=16 members and above

3.9.2.6 Number of earning members in a family:

Household members who are working as daily wagers or regular employees:

1=0 to 2 earning members, 2=3 to 4 earning members, 3 =5 are more earning members.

3.9.2.7 Fruit orchid

Fruits are an essential source of vitamins and also a source of livelihood if sold in the market. So households who hold any fruit trees in their house yard or anywhere else are coded as one, while those who don't have an assigned code of 0.

3.9.2.8 Remittance

Remittances are an alternate source of income and add to a household's income basket, increasing their purchasing power. So, families who receive remittances are coded as one while households who don't are coded as 0

3.9.2.9 Food market

The food market is a categorical variable and is measured in kilometres and hence divided into three categories. It's a place where households would get all the foodstuff needed for consumption purposes. The farther away the food market is from families, and the lesser will be their visit to the market to buy foods and other essential food-related items.

1=0 to 3 km, 2=4 to 7 km, 3=8km, and above

3.9.2.10 Flood

In rural areas, household landholding and other assets are flashed away by floods due to instant rainfalls or heavy ice melting. So households whose assets are affected by floods are coded as one otherwise, 0.

3.9.2.11 Infrastructure

It's measured as household away from paved roads or metallic road in kilometres: 1= 0 to 3 km, 2 = 4 to 7km, 3 = 8km and above.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Data Analysis

This chapter presents the findings in an organized form after employing different methodologies discussed in the previous chapters. It starts with cross-tabulation and graphical analysis, and then food insecurity access prevalence and household average dietary diversity was analyzed. Multicollinearity was measured before running logistic regression to estimate both measures' potential food security determinants.

Table 4.1: Cross-tabulation and variable description

Variable	Descriptions	Frequency		Percentage (%)	
		Food secure	**Food insecure**	**Food secure**	**Food insecure**
Gender of the household head	Male	46	160	22.33%	77.76%
	Female	20	158	11.24%	88.76%
Age of the household head	18 to 36 years	21	85	19.81%	80.19%
	37 to 54 years	24	152	13.64%	86.36%
	55 to 72 years	20	77	20.62%	79.38%
	73 years and above	1	4	20.00%	80.00%
Education of household head	No formal Education	4	156	2.50%	97.50%
	Till primary	12	68	15.00%	85.00%
	Class 6^{th} to Matric	6	65	8.45%	91.55%
	Intermediate	20	29	40.82%	59.18%
	Graduation	17	0	100%	0.00%
	Above graduation	7	0	100%	0.00%
Income of the household	Income less than 15,000	2	235	0.84%	99.16%
	From 15,000 to 30,000	9	62	12.68%	87.32%
	From 31,000 to 45,000	22	17	56.41%	43.59%
	From 46,000 to 60,000	16	4	80.00%	20.00%
	From 61,000 and above	17	0	100%	0.00%
Number of earning members in a family	0 to 2 earning members	18	305	5.57%	94.43%
	3 to 5 earning members	42	13	75.93%	24.07%
	6 and above earning members	7	0	100%	0.00%
Remittances received by a household	Yes	23	4	85.19%	14.81%
	No	43	314	12.04%	87.96%
Infrastructure	0 to 3km away from paved road	35	14	71.43%	28.57%
	4 to 7km away from paved road	21	111	15.91%	84.09%
	Eight and above km away from paved road	10	193	4.93%	95.07%

Source: Author own calculation

Before formally beginning with data analysis, it's essential to explain the data to get a complete overview of the situation. Table 4.1 presents the cross-tabulation of the dependent variable food security with independent variables. Table 4.1 shows that 97.7% of the household head who don't have any formal education are food insecure. The household head who has a learning of graduation or above, their food security is 100%. Similarly, in a household with a monthly income of less than 15,000, 99.16% of the families are food insecure. Compared to families with a monthly payment of 61,000, they don't have food insecurity. Likewise, for employability or earning members in the household, so homes with two earning members, their food security is 5.57% compared to families with six or more earning members, whose food security is 100%. Similarly, for households who receive remittances, their food security is 85.19% as compared to families who don't receive any remittances, their food security is 12.04%. Correspondingly, homes near paved or metallic roads, their food security is 71.43% compared to households far away from paved roads their food security is 4.93%.

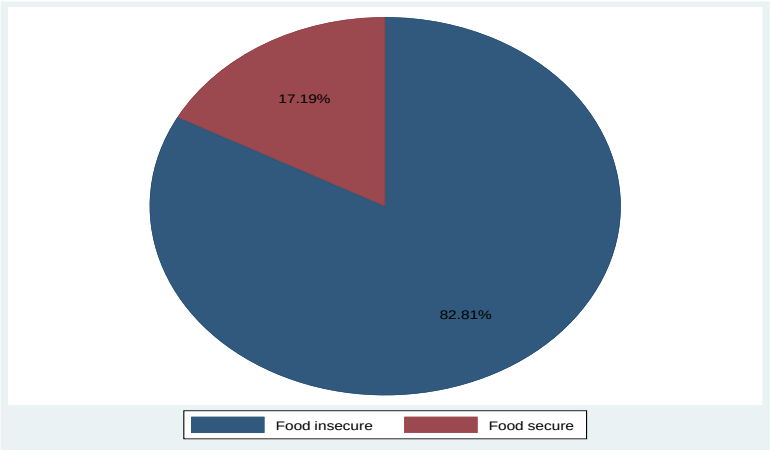

Figure 4.1 Food Security Statuses in the Chitral

Source: Author own calculation

The above figure shows the overall state of food security in the research locality Chitral. As depicted in the above figure, food insecurity affects more than 80% of the people in the research region, while the percentage of the secure population is very minimal, comprising 17.19%. So, it is possible to infer that food security is alarming and needs to be addressed on a priority and emergency basis.

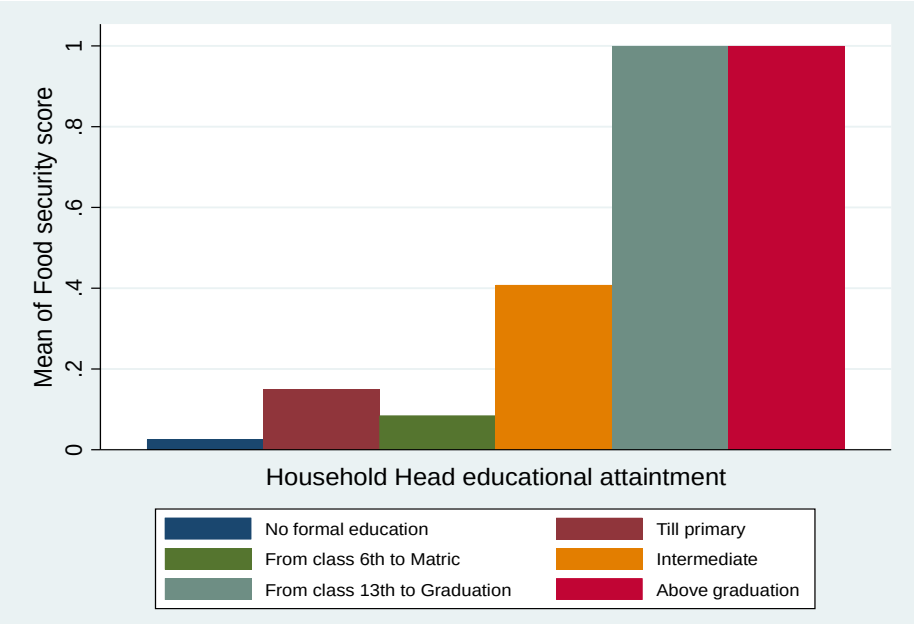

Figure 4.2 Food security score and education

Source: Author own calculation

Figure 4.2 shows the impact of education on the household's food security. The mean food security score is on the Y-axis, which offers household food security, while the coloured bar graph shows the educational attainment of the household. As can be seen, household heads who have not received any formal education are the most food insecure. In contrast, household heads who have completed graduation or have higher degrees are the most food-secure households. Being educated may increase the potential for more earning opportunities, and higher educated households may also manage to buy food baskets as per the needs of every family member. We can conclude from the figure that as education increases, household food security may also increase; this shows a direct link between food security and education.

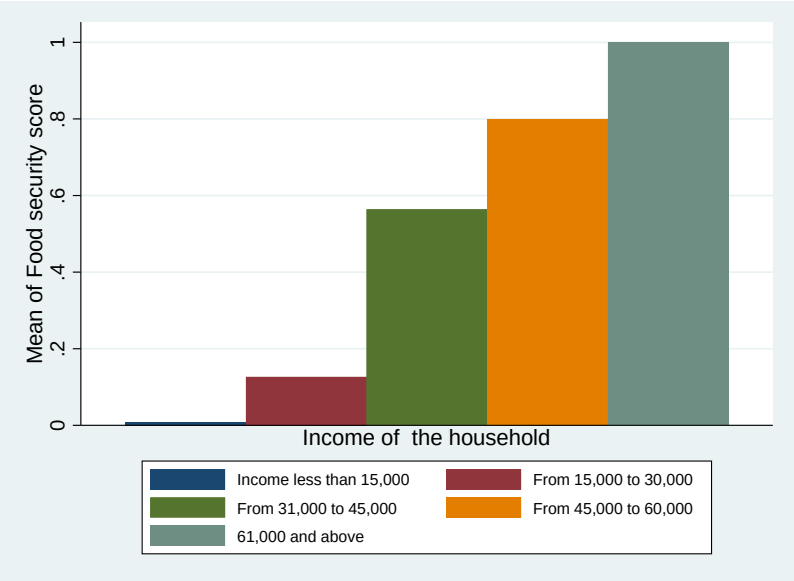

Figure 4.3 Food security score and Income

Source: Author own calculation

Figure 4.3 illustrates the effect of income on the household's food security. As we can see from the above figure, households with a monthly income of less than 15,000 are the most food insecure compared to households with more than 61,000. Income may determine the purchasing power of households. So, households with a higher income might have more ability to buy a diversified bundle of the food basket and other goods for their family. This diversity of food baskets that households have as their income increases may lead to food security. We can conclude that the income and food security of the household are directly proportional; with an increase in one unit, the other will also increase.

Figure 4.4 Food security score and Number of earning members in a household

Source: Author own calculation

Figure 4.4 shows the association between food security and earning members in the household. Households having more earning members means there is more employability. Access to food is a fundamental problem in low-income households as they rely on income from their labour to feed their households, so households, where employability is more instead of one person taking the responsibility of feeding the whole household they may be inclined to be more food secure as figure 4.4, shows that as there are more earning hands, there would be more income in household disposal which they would use to increase their food security. Figure 4.4 illustrates that households with more than five or more earning members are more food secure than households with fewer earning members.

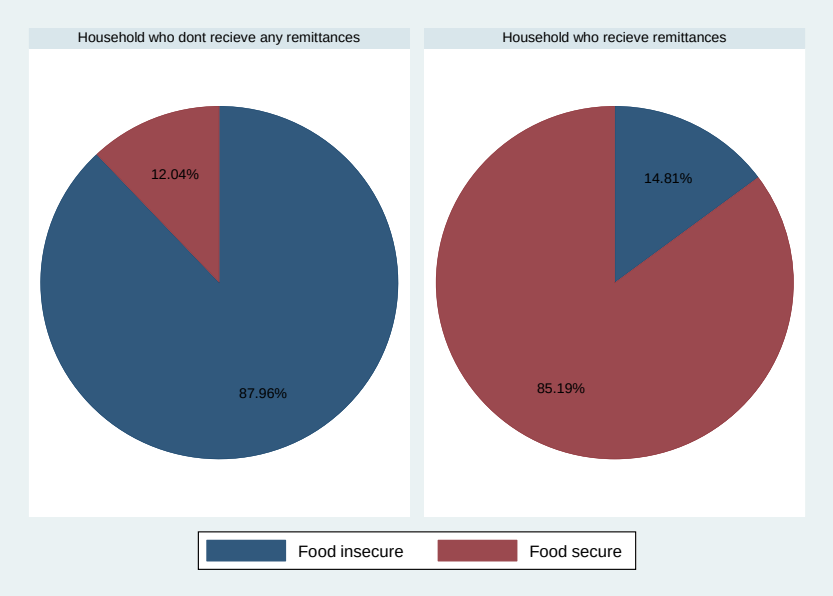

Figure 4.5 Food security score and Remittances

Source: Author own calculation

Figure 4.5 demonstrates the influence of remittances on household food security. Remittances are an alternate source of income for the household and help the family diversify their income source. At the same time, apart from this, it can also be used as a coping strategy variable at the time of uncertainty when other sources of income are not available to help the household cope with food insecurity. Being a household's income source also helps families increase their consumption expenditure. As shown in Figure 4.5, homes that receive remittances 85.19% of households are food secure. Compared to households who don't receive remittances, their food security is just 12.04%. Hence, we can conclude that remittances and food security are positively related; with an increase in one variable other variables will also increase.

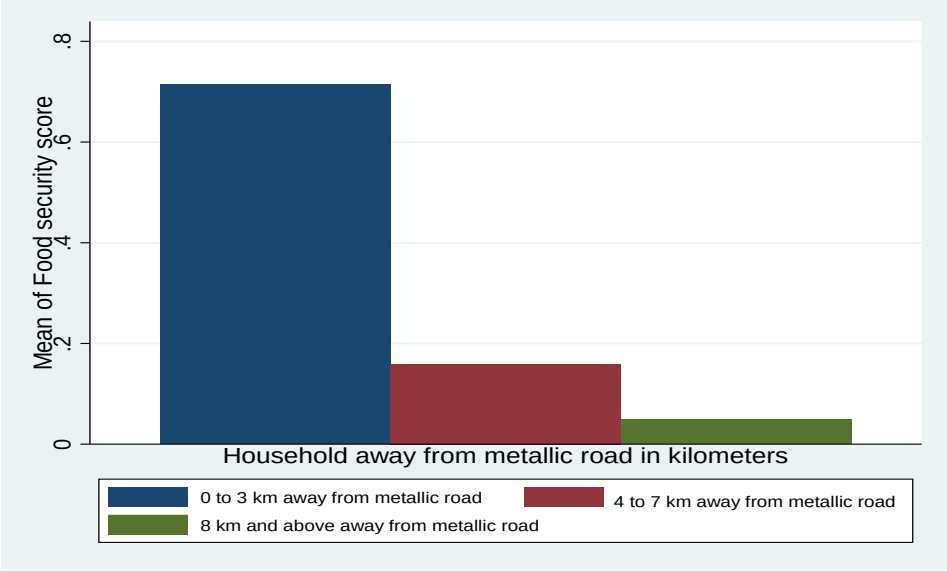

Figure 4.6 Food security score and Infrastructure

Source: Author own calculation

Figure 4.6 shows the association between Infrastructure and food security. Rural infrastructure and the predominantly provision of safe and all-whether access roads to rural areas may undoubtedly help in alleviating poverty and food security. Households who don't have access to sustainable rural infrastructure are more expected to be food insecure, as we can see from the above figure that families who live near the metallic road and have access to the safe and clean road are inclined to be more food secure than household who are far away from the metallic road. Better connectivity with downward country and the local market could lower transportation costs, as with less fuel consumption, there won't be any increase in the price of goods. Also, as road infrastructure gets better, local farmers can sell their products at a competitive price and increase their purchasing power. As the situation of roads deteriorates, the household will face difficulty transporting their goods to local and downward markets. With the increase in transportation cost and other hurdles, the commodity price in the market exceeds its cost, also the cost of transportation increases. Hence may lead to household food insecurity.

Table 4.2 Cross tabulation and variable Description

Variable	Descriptions	Frequency		Percentage (%)	
		Food secure	**Food insecure**	**Food secure**	**Food insecure**
Gender of the household head	Male	47	159	22.82%	77.19%
	Female	20	158	11.24%	88.76%
Age of the household head	18 to 36 years	21	85	19.81%	80.19%
	37 to 54 years	25	151	14.20%	85.80%
	55 to 72 years	20	77	20.62%	79.38%
	73 years and above	4	1	20%	80%
Education of household head	No formal Education	4	156	2.50%	97.50%
	Till primary	12	68	15.00%	85.00%
	Class 6^{th} to Matric	6	65	8.45%	91.55%
	Intermediate	21	28	42.86%	57.14%
	Graduation	17	0	100%	0%
	Above graduation	7	0	100%	0%
Income of the household	Income less than 15,000	2	235	0.84%	99.16%
	From 15,000 to 30,000	9	62	12.68%	87.32%
	From 31,000 to 45,000	23	16	58.97%	41.03%
	From 46,000 to 60,000	16	4	80.00%	20.00%
	From 61,000 and above	17	0	100%	0%
Number of earning members in a family	0 to 2 earning members	18	305	5.57%	94.43%
	3 to 5 earning members	42	12	77.78%	22.22%
	6 and above earning members	7	0	100.00%	0%
Remittances received by a household	Yes	23	4	85.19%	14.81%
	No	44	313	12.32%	87.68%
Infrastructure	0 to 3km away from paved road	35	14	71.43%	28.57%
	4 to 7km away from paved road	22	110	16.67%	83.33%
	Eight and above km away from	10	193	4.93%	95.07%

Source: Author own calculation

Table 4.2 demonstrates the crosstabulation of the dependent variable food security(higher dietary diversity) with the significant independent variables that impact the food security of the household. As table 4.2 shows, 2.50% of the household head who don't have any formal education are food secure or have higher dietary as compared to 100% food secure or higher dietary household with education level of graduation or above. Likewise, in households with an income of less than 15,000, 0.84% of people are food secure or have higher dietary diversity than households above 61,000; their food security is almost 100%. Similarly, in a family with fewer earning members, their food security or higher dietary diversity is 5.57%. Compared to households with more earning members, their food security or higher dietary diversity is almost 100%. Equally, 85.19% of families who receive remittances are food secure compared to 12.32% secure food households who don't receive any remittances. Correspondingly 71.43% of homes are food secure or have higher dietary diversity who live near the metallic or paved road compared to 4.93% of food secure households far away from metallic or paved roads.

Table 4.3: Food groups consumed at a different dietary level

Low dietary diversity (3 or fewer food groups)	Medium dietary diversity (4 to 5 food groups)	Higher dietary diversity (6 or greater food groups)
Cereals	Cereals	Cereals
Oil and fats	Roots and tubers	Egg
Miscellaneous	Vegetables	Meat and poultry
	Oil and fats	Milk and milk products
	Miscellaneous	Pulses
		Vegetables
		Fruits
		Oil and fats
		Fish

Source: Author own calculation

Table 4.3 shows a different combination of the food groups consumed by households in a reference period. From the analysis, it's been confirmed that households consume other food groups in different dietary levels, as the above tables show households consume three food groups in low dietary diversity, which includes Cereals, Oil and fats, and miscellaneous. Likewise, households consume from five food groups in medium nutritional variety, and the food groups include cereals, roots and tubers, vegetables, oil and fats, and miscellaneous. On average, households with higher dietary diversity primarily consume eight food groups: namely cereals, roots, and tubers, vegetables, eggs, meat and poultry, pulses, vegetables, fruits, oil, and fish. The reference period in our study was the last day before data collection.

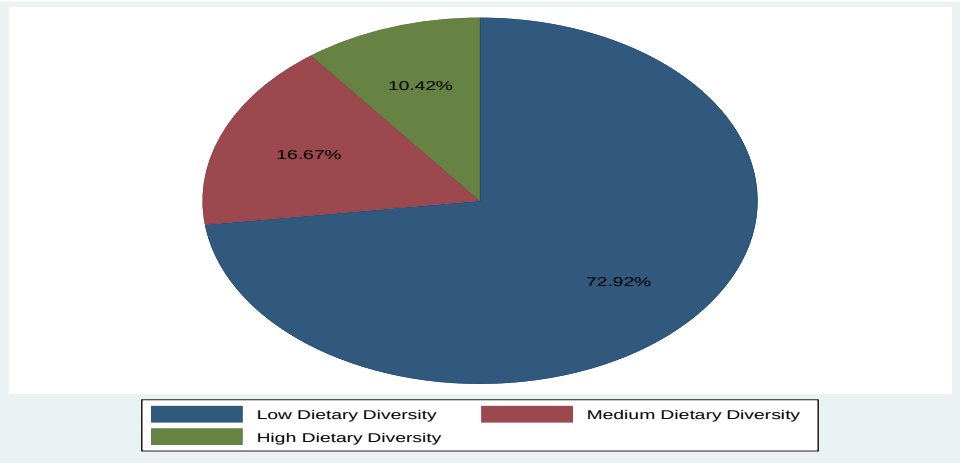

Figure 4.7 Household Dietary Diversity Score in the Region

Source: Author own calculation

Figure 4.7 illustrates the prevalence of dietary diversity in Chitral. As can be seen in figure 4.7 that 72.92% of households consumed three or less than three food groups in a single day means 72.92% have low dietary diversity, and only 10.42% of households have dietary diversity that can be seen as enough for smooth and balanced functioning of the human body. Families who are in low dietary diversity their food groups mainly consist of cereals, oil and fats and miscellaneous while households having low dietary diversity are the most food insecure as compared to households who have higher dietary diversity as dietary diversity measures household economic access to food, so family having more diversified food are linked to their economic capacity. As the dietary diversity of the household increases, the food groups they consume grow, which shows the household's financial capacity to buy a diverse bundle of food groups to meet their household need and ultimately achieve food security. As no single food has all the ingredients needed for the healthy and smooth functioning of the human body, it is proposed that a household that should consume among different food groups essential to ensure a well-balanced and healthful diet may ultimately achieve food security.

4.2 Multicollinearity test

Household food insecurity access prevalence measures households who are in severe food insecurity. 68.75% of the families were facing severe food insecurity. Our study's average household dietary diversity score was 3.54, which falls into the low nutritional diversity category.

Table 4.4: Multicollinearity test

Variable	Tolerance	VIF
Income	0.476	2.10
Education	0.605	1.65
Number of earning members	0.663	1.51
Remittances	0.704	1.42
Infrastructure	0.723	1.38
Food orchid	0.863	1.16
Household assets	0.928	1.08
Gender	0.953	1.05
Age	0.966	1.04
Number of a family member	0.976	1.03
Mean VIF	**1.34**	

Source: Author own calculation

Table 4.4 presents the results of the multicollinearity test conducted before estimating the logistic regression. A multicollinearity test is performed to check the presence of collinearity among the independent variables. The rule of thumb for multicollinearity is that the tolerances value should be less than 0.20. If VIF is greater than five, we can say that multicollinearity is a problem in the

model. As shown in Table 4.4, none of the variables has a tolerance value of less than 0.20, and also, VIF values are less than five, so we can say that multicollinearity is not a problem in the model.

4.3 Logistic regression analysis

The Hosmer-Lemeshow chi2 test was used to determine the model's fittest smaller p-value for the test indicate that the model is not a good fit, while a greater P-value indicates its good fit; the result for the test gives us a p-value of 0.9994, which shows that the model is overall a good fit. High Cronbach alpha of (0.91) for the food insecurity access scale displays that it's a good measure and hence suggests that the items have high internal consistency.

Table 4.5: Logistic regerssion results

Food Security	Coefficients	Standard error	P >/Z/
Gender	.372	.809	0.646
Age	.232	.535	0.664
Education	1.183	.437	0.007
Income	1.856	.470	0.000
Family members	-.499	.439	0.255
Earning members	3.539	.868	0.000
Fruit orchid	.638	.939	0.496
Remittances	4.077	1.369	0.003
Food market	-.369	.578	0.524
Household assests	-1.029	.963	0.285
Infrastructure	-1.318	.542	0.015

LR Chi2(11) = 293.49
Prob> Chi2 = 0.000
Pseudo R2 = 0.8329

Table 4.6: odds ratio logistic regression results

Food security	Odd ratio	Standard error	P> /Z/
Gender	1.450	1.172	0.646
Age	1.260	.674	0.664
Education	3.262	1.425	0.007
Income	6.397	3.010	0.000
Family members	.608	.267	0.255
Earning members	34.429	29.857	0.000
Fruit orchid	1.893	1.776	0.496
Remittances	58.948	80.673	0.003
Food market	.692	.399	0.524
Household assests	.358	.344	0.285
Infrastructure	.268	.146	0.015

Source: Author own calculation

Among the eleven determinants used in this study, five have shown a significant relationship with food security. Factors such as education of the household head have a significant association with food security, income, earning members in the household remittances, and paved roads are also statistically substantial. From the variable used in the analysis, education,

incomes, earning members, and remittances have shown a positive relationship with food security. In contrast, paved roads have shown negative relation with food security.

4.3.1Education and food security:

The household head's education has a good and significant association with the household's food security. The coefficient value (1.1822) and the odds ratio (3.2618) show a substantial and positive relationship between food security and education. Keeping all other variables unchanged, the odds ratio in favour of a household becoming food secure rises by a factor of 3.008 units when household educational attainment increases. We can conclude that as the education of the household head rises household becomes more food secure. This study's findings align with previous studies, which have also found a positive relationship between education and food security (Asghar & Muhammad, 2013) (Anila Sultana, 2011).

Education is essentially the root for the progress of any nation, so investment in education is considered an investment to strengthen the roots, building blocks, or software of any country. Education also has a significant impact on the productivity of any individual; being educated also increases the probability of a family being food secure, having a higher income, and so forth. As per the literature, food security and education have a two-way causal link. Being food secure has a good impact on schooling and health, while food-insecure households are more likely to have food-insecure children. During a child's early growth, food insecurity leads to malnutrition, and malnutrition in young children impacts their cognitive development, which lowers their educational achievement, and so on. (Black et al., 2013)

Education also has a significant impact on the productivity of household farms, their access to food, and their utilization. Being educated not only increases an individual probability to get better employment but provide him with the knowledge that they would use to get better

nutrition, healthy diets for their family members and young ones, so ultimately increasing the overall well-being of households (Maitra et al., 2006) With education household can get updated knowledge about technological advancement in agriculture, so educated households are in a better position to adopt modern technology in agriculture, have a better understanding about the market this will ultimately increase their productivity and may also increase the income of the household.

4.3.2Income and food security:

Incomes of the household and food security have shown a linear relationship. The coefficient value of (1.18229) and odds ratio of (6.39623) show a positive relationship of income with food security. Ceteris paribus, the odds ratios in favour of households becoming food secure increases by 6.39623 units as the income of the households increases by one unit. We can conclude that with an increase in income of the household, they have more income in their disposable to buy more diversified foods. As rural people and poor households generally spend a major share of their income on food-related items, with the increase in income, they may get more opportunities to diversify their food consumption and ultimately achieve food security. The study's findings align with those of other studies that have found a link between food security and income. (Sati & Vangchhia, 2017) (Adesoye & Adepoju, 2020)

4.3.3Earning member in the household and food security:

Employability and food security have a straightforward relationship; as the former increases, the latter follows after. The coefficient value of (3.5388) and odds ratio of (34.4280) signify this relationship. The probability of the success of a household to be food secure increases by a factor of (34.4280) as a household earning member increases. The rationale for this significant and positive relationship is that as households have more income, it may determine the quantity and

quality of the food they purchase. As employability in the family increases the purchasing power of the home, it also increases the income bundle in the disposal of the household so that they may diversify their food choice, which ultimately increases the household's food security. Due to these reasons, food procurement, social inclusion, and long-term food security can all be perceived as more sustainable and dignified with decent employment to the household. The findings agree with (Do et al., 2019) (Dzanku, 2019).

4.3.4 Remittances and food security

Remittances play a significant economic role in developing countries' economies. Over the past few years, they have been an essential source of financial development in most developing economies. Studies have shown the positive relationship of remittances on the country's growth. As we can see from the above estimation that remittances and food security are positively related, the coefficient value of (4.0766) and odds ratio of (58.9476) are both statistically significant and clearly describes the positive relationship between food security and remittances when households receive remittances, the odds ratio in favour of being food secure increases by a factor of 58.9476. This implies that Remittances diversify the income source of the poor segment of the society and mitigate households from uncertain shocks as a coping variable. As it increases household income, it provides them with an opportunity to increase their food consumption and hence achieve food security. This study is in constant with the findings of other studies that have also shown the positive relationship of remittances with food security. (Moniruzzaman, 2020) (Sulemana et al., 2019)

4.3.5 Infrastructure and food security:

Rural infrastructure in terms of better access to roads for all seasons, cold storage facilities for fruits and food products will certainly help rural people achieve food security. The logit estimation tells a negative relationship with household distance to paved (metallic) road and food security; the coefficient value of (-1.3178) and odds ratio of (.2677) illustrates this negative relationship. This infers that as the situation of roads worsens, the cost associated with farmer factor of production increases making production expensive for him, and also the cost of transportation associated with the delivery of products to market increases, making the good less competitive in the market, with high transport and wear out cost food prices go up and become cheaper for local buyer and hence decreases his food security. The study's findings are in relation to other studies that have also depicted the same results. (Ahmed et al., 2017)

Table 4.7: logistic regression results

Food Security	Coefficients	Standard error	P>/Z/
Gender	.573	.895	0.522
Age	.256	.590	0.666
Education	1.310	.490	0.008
Income	2.099	.549	0.000
Family members	-.342	.454	0.451
Earning members	4.336	1.055	0.000
Fruit orchid	.788	1.003	0.432
Remittances	4.146	1.500	0.006
Food market	-.064	.623	0.919
Household assests	-1.226	1.049	0.242

Infrastructure	-1.466	.585	0.012
LR Chi2(11) = 304.64 Prob> Chi2 = 0.0000 Pseudo R2 = 0.8569			

Table 4.8: odds ratio logistic regression results

Food Security	Coefficients	Standard error	P>/Z/
Gender	1.773	1.586	0.522
Age	1.290	.762	0.666
Education	3.707	1.818	0.008
Income	8.156	4.469	0.000
Family members	.710	.323	0.451
Earning members	76.342	80.487	0.000
Fruit orchid	2.198	2.204	0.432
Remittances	63.156	94.768	0.006
Food market	.939	.585	0.919
Household assests	.294	.308	0.242
Infrastructure	.230	.135	0.012
Source: Author own calculation			

4.4 Logistic result discussion

To measure the goodness of fit Hosmer-Lemeshow chi2 test was used. This gives a p-value of 0.9999, meaning the model is overall a good fit, the reliability of the dietary diversity score is measured through Cronbach alpha, its value is 0.7299, and we can say that the variables have acceptable internal consistency.

Five independent variables were revealed to have statistical significance and influence household food security in the study area. Each variable has been explained in detail below. Household education has a positive connection with food security and is statistically significant with a p-value of (0.008), the coefficient value of (1.310072), and odds ratio of (3.706439) express this positive relationship, so the odds in favour of household food security increases by a factor of 3.706439 as household education increases, it implies that with more education household can get better nutritional knowledge and also higher education enables a household to get better employment eventually increasing their dietary diversity and food security. This study is inconsistent with other studies that have similar findings (Taruvinga et al., 2013) (Huluka & Wondimagegnhu, 2019)

Income of the household also has a positive relationship with food security, and its p-value of (0.000) explains that it's also statistically significant, while the coefficient value of (2.098671) and odds ratio of (8.155322) endorse the positive relationship, as household income rises, the odds ratio for being food secure rises by a factor of 8.155322. The rationale for this association is that as the income of the household increases, the household would have more income to diversify their consumption bundle, which may finally add to their food security. Several studies have also confirmed this relationship, including (Cheteni et al., 2020) (Powell et al., 2017). Household having more employability also has a positive relationship with food security, while the p-value of (0.000) express that the variable is statistically significant. The coefficient value of (4.335213) and odds ratio of (76.34123) validates this positive relationship as a household earning member increases the odds ratio for the household to be food secure increases by a factor of 76.34123, which means if there are more earning hands in the family, they can all contribute and hence put less burden on household resources as compared to household having single

earning members. So households having more making hands increases the household's income in general and hence may help them achieve higher dietary diversity for their home, which ultimately leads to the family's food security. The findings are very similar to those of (Gezimu Gebre, 2012)

Remittances are an important source of income for the households and affect the welfare and well-being of the families. This study shows that remittances and food security have an optimistic relationship, as the p-value (0.006) indicates that the variable is statistically significant. At the same time, the coefficient value of (4.145593) and odds ratio of (63.15509) confirmed this relationship, the likelihood ratio for a household to be secure food increases by a factor of 63.15509 as household remittances grow, this means that remittances play an important role in household food security and dietary diversity, apart from adding to the household income they may also play the role of coping variable in uncertain times when a sudden shock hits the household. Apart from this, studies have also shown that remittances are being mostly used for consumption and meeting the basic needs of households. Hence, they strengthen the food consumption of the families. The results of the study are related to the study of (Babatunde 2018)

Infrastructure in the form of all-weather roads is essential for the betterment of local citizens, and infrastructure contributes to the development of any locality. Infrastructure, as measured through households, access to the metallic or paved road, this variable shows a negative relationship with food security, as a p-value of (0.012) shows that the variable is statistically significant. At the same time, the coefficient value of (-1.467618) and odds ratio of (.2304739) endorses the negative relationship. The odds ratio in favour of household food security decreases by a factor of .2304739; this clarifies that for households who are living far away from the metallic roads,

the transportation and depreciation cost will increase, which will increase the prices of commodities and hence decrease dietary diversity and food security of the household. The results of our study are inconsistent with the findings of (Kumar et al., 2017).

CHAPTER 5

CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Conclusion

Food security is the building block for the progress, prosperity, and economic growth of any nation, so achieving food security will not only complete our commitment to achieving zero hunger but will benefit the country in the long run as children who are food secure have high cognitive development, fewer diseases and this will undoubtedly enhance the productivity of the citizens, leading to human capital development (Cook & Frank, 2008). The definitive aspire of our study was to determine socioeconomic variables that have a consequence on food security and look into the dietary diversity status of the household in district Chitral. The prevalence of food insecurity in Chitral is very alarming as the study shows that nearly 82.81 percent of the families are food insecure, while 72.92 percent of people also have low dietary diversity, and their food consumption primarily consists of starchy staples. The education of the household head, income of the family, earning members in the household, remittances, and infrastructure have a significant impact on the household's food security for both the measure used in the study. Income increases the purchasing power of the family, and it adds to its food security, while with more earning members, there are more individual hands to share the burden of the household food budget and hence achieve more food security. Remittance plays a vital role as a coping variable. In times of distress, households who receive remittances can smooth their food consumption without distortion and hence achieve food security. While infrastructure, as measured in terms of family faraway in kilometre to the paved road, depicts a negative relationship as the roads get worsen cost associated with transportation of goods increases so

decreases the household's food security. So for Pakistan to achieve its commitment to the UN goal of zero hunger, it has to focus on the food security situation of rural areas like Chitral, which are in fatal cases. Also, this study has certain limitations, as time and financial resources were the major hurdles, and the lack of knowledge about the topic was a minor problem we faced during the study. Incorporating the results of this study, we are recommending specific policy measures and suggestions to enhance our fight against food insecurity.

5.2 Policy recommendations:

Following are some policy recommendations to deal with the problem of food insecurity.

- Social protection programs like BISP and recently launched Ehsaas programs. The program could be more efficient if they include food insecure and low dietary diverse households as a threshold to determine eligible families. Likewise, investment in education, and infrastructure development, will make rural households more food secure, as identified from the analysis.
- Rural areas have great potential in fruits, but most of them got rotten or became infected before being taken into market or self-consumption, as local people don’t have sufficient knowledge about how to preserve them. So providing training to these people regarding fruit production, protection, and packaging and providing storage facilities will not only diversify their income but will certainly ensure their food security and dietary diversity

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Appendix A

Respondent ID # _____

The following questions have been made purely for academic purpose where the researcher is trying to collect relevant data from respondents; all information will be kept confidential.

Hanifullah

Pakistan Institute of Development economics

Quaid-I-Azam University Campus، Islamabad

Socio-economic indicators

1. Gender of the household head: Please select one.
    a. [1] Male [0] Female

2. Age of the household head: Please select one.
    a. 18-36 Year old [1]
    b. 37-54 Year old [2]
    c. 55-72 Year old [3]
    d. 73 year old and above [4]

3. Education of the respondent: Please select one.
    a. No formal education [0]
    b. From class 1^{st} – class 5^{th} [1]
    c. From class 6^{th} – class 10^{th} [2]
    d. From class 11^{th} –class 12^{th} [3]
    e. From class 13^{th} – class 16^{th} [4]
    f. Above Graduation [5]

4. Average monthly Income of the household. Please select one.
    a. 0-15,000 [1]
    b. 16,000-30,000 [2]

c. 31,000-45,000 [3]
d. 46,000- 60,000 [4]
e. 61,000 and above [5]

5. Number of members in a family. Please select one.
    a. 0-5 members [1]
    b. 6-10 members [2]
    c. 11-15 members [3]
    d. 16 members and above [4]

6. Number of earning members in a family. Please select one.
    a. 0-2 earning members [1]
    b. 3-4 earning members [2]
    c. 5 earning members and above [3]

7. Do household hold any fruit orchard or fruit tree in their backyard or somewhere else.
    a. [1] Yes [0] No

8. Does Household receive any Remittances? If yes from which country?
    a. [1] Yes [0] No

9. How far is the Food Market to the household?
    a. 0-7 km [1]
    b. 8-14km [2]
    c. 15 km and above [3]

10. Have floods effect household land holdings and others assets, in the past 1 year? Please select one.
    a. [1] Yes [0] No

11. How far away is the household from metallic road? Please select one.

    a. 0-5 km [1]

    b. 6-10 km [2]

    c. 11 km and above [3]

Household food insecurity Access Scale

Now, I want to ask you about foods available in your household in the past month. I will read the possible responses first, please choose one best answer.

No.	Question	Response Options	Code
(13)	In the past month, did you worry that your household would not have enough food?	0. No (skip to No. 15) 1. Yes	
(14)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/ month)	
(15)	In the past month, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? (Resources means due to lack of money and own food production)	0. No (skip to No. 17) 1. Yes	
(16)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/month)	

(17)	In the past month, did you or any household member have to eat a limited variety of foods due to a lack of resources? (Resources means due to lack of money and own food production)	0. No (skip to No. 19) 1. Yes	
(18)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/month)	
(19)	In the past month, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food? (Resources means due to lack of money and own food production)	0. No (skip to No. 21) 1. Yes	
(20)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/month)	
(21)	In the past month, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0. No (skip to No. 23) 1. Yes	
(22)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10	

		times/month) 3. Often (>10 times/month)	
(23)	In the past month, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0. No (skip to No. 25) 1. Yes	
(24)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/month)	
(25)	In the past month, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0. No (skip to No. 27) 1. Yes	
(26)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/month)	
(27)	In the past month, did you or any household member go to sleep at night hungry because there was not enough food?	0. No (skip to No. 29) 1. Yes	
(28)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/month)	

(29)	In the past month, did you or any household member go a whole day and night without eating anything because there was not enough food?	0. No 1. Yes	
(30)	How often did this happen?	1. Rarely (1 or 2 times/month) 2. Sometimes (3-10 times/month) 3. Often (>10 times/month)	

Section C: Household dietary diversity score

Kindly tell the foods (meals and snacks) that you ate yesterday from morning to till bed, whether at home or outside the home.

Breakfast	**Snack**	**Lunch**	**Snack**	**Dinner**	**Snack**

Appendix B

Pakistan Dietary Guideline for better nutrition has suggested caloric intake of food from different food groups for specific age group populations are as follow:

Basal metabolism, growth, and physical activity all require energy, which is highest during the first six months, with boys requiring 113 kcal/kg/day at birth to 81 kcal/kg/day at six months and girls requiring 107 kcal/kg/day at birth to 82 kcal/kg/day at six months.

For babies and toddlers aged 6 to 12 months, the energy needs of this age group have been estimated to be between 80 and 82 kcal/kg/day for both girls and boys. Throughout the first and second years of life, protein requirements have been calculated to be 1.69 g and 1.25 g/kg/day, respectively.

Energy requirements for children aged 2-3 years are estimated to be around 80 kcal/kg/day, while protein requirements are estimated to be 1.1g/kg/day, with an acceptable macronutrient distribution range for protein between 5% and 20% of total energy.

Boys' average body weight and length are generally more significant than their comparable age girls in the 3-10 year age group. Energy requirements for boys and girls are estimated to be 80 kcal/kg/day and 77 kcal/kg/day at age 3, respectively, but drop to 67 kcal/kg/day and 61 kcal/kg/day by age 10. The daily protein requirements for children are estimated to be 1.2 grams per kilogram of body weight.

Energy requirements for adolescent boys and girls aged 10 to 19 years are estimated to be 55-65 kcal/kg/day and 45-60 kcal/kg/day, respectively. For teenagers, the recommended protein 98 requirements are 1.1-1.2 g/kg/day.

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The estimated energy requirements for children aged 19-60 years are 2318, 2727, and 3485 kcal/day, respectively, while the estimated energy requirements for women aged 55 kg with a BMR of 1241 and sedentary, moderate to heavy, or vigorous levels of physical activity are 1899, 2234, and 2854 kcal/day, respectively. Adults should consume 1 98 g of protein per kilogram of body weight each day.

Appendix C

As per reports from state bank of Pakistan for the first fiscal year 2021, inflation rate has remained in single digit as compared to previous year. As the report shows inflation rate is 8.08% in September 2020 as compared to previous year where it was 10.10%.