UNVEILING WOMEN EMPOWERMENT AND ITS IMPACT ON HOUSEHOLD FOOD INSECURITY ANDFOOD VULNERABILITY IN RURAL AREAS OF PAKISTAN

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Dedication

I dedicate this thesis to my husband, my children, and my parents—both biological and in-law—who have always been my biggest sources of motivation and support. Their prayers are the most important part of my success.

May Allah bless them all (Ameen)

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ABSTRACT

Women's empowerment is considered to play a crucial role in food and nutrition security (FNS). We aimed to understand the relationship between rural women's empowerment, food and nutrition security and vulnerability to food insecurity in rural areas of Pakistan. To estimate women's empowerment, we developed a Rural Women Composite Empowerment Index (RWCEI) by incorporating nine domains, fourteen sub-domains and eighty-nine indicators. Analysis of 1881 women from Pakistan Rural Household Panel Survey (PRHPS) data revealed that women were not empowered in education, awareness, and economic domains and are more empowered in mobility and time domains. The domains of traveling safely (21%), time allocated to tasks (20%), and (lack of) domestic violence (19%) were the most significant. The research utilized multilevel modeling to investigate important determinants in contextual settings and it explored how community plays a pivotal role in empowering Pakistani rural women. The study found that there is an increased probability of getting high empowerment for women who belong to the educated community. Analysis of 1879 rural households from PRHPS data found that the prevalence of food and nutrition insecurity was 33% and 50% respectively. Using the index, we employed multi-level mixed-effect regression analysis and found a positive and significant relationship between women's empowerment and food and nutrition security and mitigating the risks related to food insecurity. The proportion of households who were food and nutritionally secure in empowered households was 70% and 98% respectively. We find that about 47.58% households are facing severe to mild vulnerability to food insecurity. Moreover, communities with sufficient health facilities, educational institutions and improved infrastructure also play a significant role in mitigating the risks towards food insecurity.

The study concludes that policies should be designed by particularly focusing on women's autonomy in economic and education domains. Developing programs and policies to improve domains of women's empowerment requires a focused policy agenda, bringing together policy makers from a number of different sectors including education, economy, communications, technology and agriculture. Women's empowerment is the key to making positive changes not only in FNS, but in all aspects of health and wellbeing. Moreover, it is the avenue towards the betterment of not only in wellbeing of women but also for the amelioration of societies.

Keywords: Women empowerment, Multilevel mixed effect, community, rural, Pakistan

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LIST OF ABBREVIATIONS

AC	Adaptive Capacity
ADER	Average Dietary Energy Requirement
AE	Adult Equivalent
AIC	Akaike Information Criterion
CI	Confidence Interval
DIA	Dietary Intake Assessment
FAO	Food and Agriculture Organization
FCT	Food Composition Table
FNS	Food and Nutrition Security
GFSI	Global Food Security Index
GHI	Global Hunger Index
GOP	Government of Pakistan
GPI	Gender Parity Index
HDDS	Household Dietary Diversity Scores
HDQS	Household Dietary Quality Scores
HVFII	Household Vulnerability to Food Insecurity Index
IFPRI	International Food Policy Research Institute
KMO	Kaiser-Mayer-Olkin
KPK	Khyber Pakhtunkhwa
MDER	Minimum Dietary Energy Requirement
MDG's	Millennium Development Goals
ME	Marginal Effects

OPHI	Oxford Poverty and Human Development Initiative
OR	Odd Ratio
PARC	Pakistan Agriculture Research Council
PCA	Principal Component Analysis
PRHPS	Pakistan Rural Household Panel Survey
RNI	Recommended Nutrient Intake
RWCEI	Rural Women Composite Empowerment Index
SDG's	Sustainable Development Goals
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
VPC	Variance Partition Coefficient
WEAI	Women's Empowerment in Agriculture Index
WFP	World Food Program

CHAPTER 1

INTRODUCTION

"No nation can rise to the height of glory unless your women are side by side with you; we are victims of evil customs. It is a crime against humanity that our women are shut up within the four walls of the houses as prisoners." ***Quaid-e-Azam (1944)***

1.1.Background

1.1.1. Food and Nutrition Insecurity

Household food and nutrition insecurity is a common problem around the globe. It refers to the situation of a household's inability to secure enough food in order to meet the dietary needs for all of its members, either from their own production or through market purchases (Bouis & Hunt, 1999). Over the last decade, food and nutrition security (FNS) has gained prominence in policy and research, and is considered an important pillar for health and well-being. The International Food Policy Research Institute (IFPRI), Food and Agriculture Organization (FAO), and the United Nations International Children's Emergency Fund (UNICEF) define the term as *"when all people at all times have physical, social and economic access to sufficient food in terms of quantity, quality, variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment, adequate health, education and care"* (CFS, 2012). The term combines the features of both food security and nutrition security to emphasize that they are closely interlinked. ***Food security*** refers to the availability, access, utilization and stability of food. ***Nutrition security*** refers towards adequate nutrient intake in terms of energy, protein, vitamins, and minerals for all people at all times. Nutrition security is identified as an essential element of food security and vice versa; in fact, it is considered impossible to achieve food security without nutrition security (Hwalla et al., 2016). Because, human body requires a variety of micro and macronutrients along with enough energy to vitalize healthy and disease-free life. They are therefore considered under the same umbrella term.

Food and nutrition insecurity can lead to hunger and malnutrition. The term malnutrition includes both under-nutrition and over-nutrition. Undernutrition is characterized by inadequate vitamins, proteins and minerals and being underweight leading to wasting and stunting. Over-nutrition is characterized by being overweight or obese, that cause diabetes, stroke and cardiac diseases.

(Brazier et al., 2020; WHO, 2020). On the other hand, nutrition insecurity can result in malnutrition due to either under or over-nutrition. Despite sufficient food production globally, the number of hungry people continues to rise and currently 690 million people (8.9 percent) are suffering from hunger worldwide**.** Moreover, 2 billion of population have no access towards safe and nutritious food (FAO, 2020)**.** These are the alarming figures which demonstrate that if strong efforts are not made internationally, these statistics will continue to worsen.

Food and nutrition security remains a prominent goal in the Millennium Development Goals (MDGs) as well as in the Sustainable Development Goals (SDGs). United Nations highlighted this topical issue in two important indicators i.e. prevalence of food insecurity and prevalence of undernourishment under the SDG target 2.1 of safe and nutritious food for all people (United Nations, 2015). The developing nations are struggling to achieve this goal as they are more prone to this dilemma. However, the situation is also prevailing in some parts of developed countries like America (Hampton, 2007; Hernández-Vásquez et al., 2022; Moellman, 2019). Asia is the region reflecting highest share in the world food insecurity, with 1027.4 out of 2001.1 million people (FAO, 2020). Of the food insecure and undernourished countries of Asia, Pakistan is one of the most susceptible countries towards both food and nutrition insecurity. According to Global Food Security Index (GFSI), Pakistan is ranked at 78 out of 113 countries in 2019 (GFSI, 2019) and according to Global Hunger Index (GHI), it is ranked at 88 out of 107 countries in 2020 with 24.6 scores (GHI, 2020). Moreover, the prevalence of undernourishment in the country is 12.3% with 26.1 million undernourished people (FAO, 2020). After the Green revolution in 1980s, Pakistan became a food self-sufficient country at the national level and still sustains this status (Bashir et al., 2013). Despite that, 36.9% of the households are food insecure in the country (UNICEF, 2019). Similarly, the number of children suffering from stunting and wasting were 9.5 million and 1.8 million, respectively in 2018 (FAO, 2020).

Yousaf et al. (2018) explored the indicators of food security by employing dietary intake assessment (DIA) technique in North, Central and South regions of Punjab. They investigated that prevalence of food insecurity was soaring in South Punjab with 53.6%. Among other socio-economic indicators of food insecurity, they explained that household's income has great significance in measuring the issue. In addition, Ishaq et al. (2018) documented that prevalence of food insecurity was highest in Sindh and Baluchistan. Hussain & Routray (2012) reported that 30% of food gap exist in Pakistan, whereas 35% of available food was un-accessed because of economic, physical

and natural constraints. Bashir et al. (2018) documented 23% of sampled households were food deficient in Pakistan and in case of shocks 60% (of 23%) were exposed to risks of food deficiency (i.e., household vulnerability to food insecurity). Summary statistics about percentage of food insecurity and malnutrition (due to under nourishment) in the country is explained in Figure 1.1, which shows that Sindh and Balochistan has more severity than other provinces. Brazier et al., 2020 and Popkin et al., 2020 investigated that, when households have less access towards affordable and nutritious food, they prioritize to purchase low-cost staple foods (e.g., grains and rice) which are high in energy (calories) but low in micronutrients. This prioritization results in various micronutrient deficiencies, particularly in iron, iodine, zinc and vitamin A (WHO, 2017; Harding et al., 2018; NIPS & ICF, 2019; Brazier et al., 2020). If efforts to combat food insecurity and undernourishment are not made timely, the SDG 2 will not be achieved by 2030 in Pakistan.

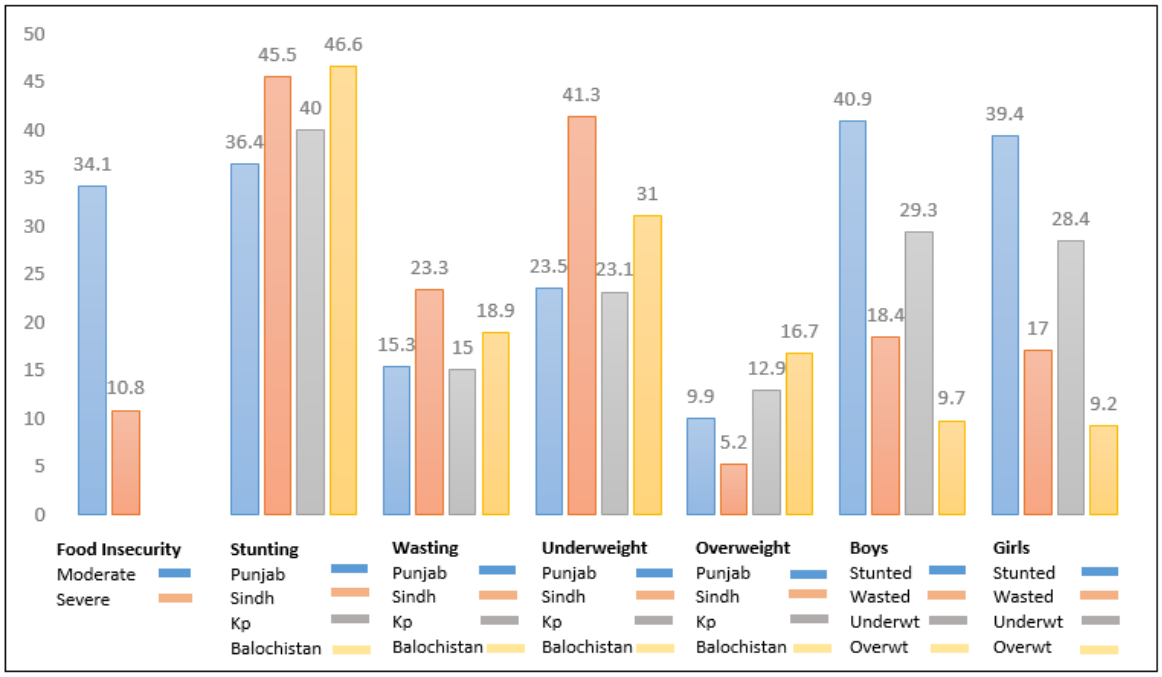

Figure 1.1. Percentage of food insecurity and nutrition insecurity in Pakistan. Source: FAO (2020)

The proper measurement of food security is very crucial in evaluating its progress in developing countries. Prevalence of food insecurity is evaluated through quantitative and qualitative measures. Quantitative measure includes calorie intake approach, while qualitative measures include dietary diversity score, food consumption score, and dietary quality scores. Calorie intake approach quantifies food insecurity by using minimum dietary energy requirement (MDER), as a threshold level, requires for a normal person, who is involved in low physical activity.

FAO has calculated MDER as 1745kcal/capita/day for Pakistan (FAO, 2017). Severe form of food insecurity also represents the prevalence of undernourishment.

Qualitative measure of food insecurity also represents household nutrition insecurity. Household nutrition insecurity refers to inadequate consumption of diversified foods, which provide basic essential nutrients that are crucial for proper growth and development of a body. In contrast to calorie intake approach, food diversity measurement approaches not only assess the quality of diet but also identify deficiencies in macro or micro nutrients among food insecure population. Sufficient food intake in terms of calories does not ensure that a person is consuming enough macro nutrients (proteins, carbohydrates, fats) and micro nutrients including vitamins (A, B, C, & D) and minerals (calcium, iron and zinc) for an active and healthy life. Furthermore, a single food is not enough to provide all the nutrients to meet the requirements of a healthy body. The situation of nutrition insecurity is quite worrisome in Pakistan. Majority of population is mainly suffering from deficiencies in protein, vitamins A & D, and minerals like iron (Alam et al., 2011; Lowe et al., 2011; Akhtar et al., 2013; NNS, 2018). These deficiencies cause severe malnutrition (Kwashiorkor), night blindness (Xerophthalmia), osteoporosis, and anaemia, respectively. In Pakistan, 51.5% of children and 27.3% of women in reproductive age are Vitamin A deficient. Similarly, 62.7% of children and 79.7% of women in reproductive age are suffering from Vitamin D deficiency. Although 28.6% children and 18.2% women are iron deficient in Pakistan (NNS, 2018). Furthermore, 97% of women are facing osteoporosis in their old age (Lowe et al., 2011). These statistics show poor nutrition insecurity in Pakistan. Household's food basket including food diversity, food variety and wide range of micro and macro nutrients is prime factor for ensuring good nutrition for the family (Bouis and Hunt, 1999; Steyn et al., 2006; Keding et al., 2012). Otherwise, vulnerability to food would increase in future. Hence, proper measurement of household food and nutrition insecurities are crucial to address the issue by policy makers.

In connection to household food and nutrition insecurities, measuring the risks of future food unavailability is also important. Food and nutrition insecurities represent the distress condition of a particular household in the current period. But it does not depict the household's status of vulnerability to food insecurity in the near future. Evaluation of present and future food insecurities together is very significant for sustainable development of a country. Vulnerability to food

insecurity approach estimates household's probability of losing access to safe, sufficient and healthy food in the coming future (Babatunde, Omotesho, Olorunsanya & Owotoki, 2008) and failure to attain certain wellbeing level (Bhalla et al., 2018). Vulnerability to household food insecurity is evaluated at three levels i.e. exposure, sensitivity and adaptive capacity (IPCC, 2001; IPCC, 2007; AntSwi-agyei et al., 2012; Ibok et al., 2019). Exposure level relates to different types of risks such as health risks, economic risks, natural disasters, etc. that threaten food availability to households. This level reflects the extent to which a household confronts danger, risk or hazard (IPCC, 2001; Fellmann, 2012; Antwi-agyei et al., 2012). Sensitivity refers to the system's degree of responsiveness towards stress conditions (IPCC, 2001). It reflects the impacts of exposure level risks on household's stress conditions such as hunger, malnutrition, disorders, diseases or mortality etc. Households respond to these shocks by making the use of their valuable assets. In a vulnerability lens, adaptive capacity refers to the ability of household to successfully adjust in case of exposure level risks (Engle, 2011). Households with high adaptive capacity can relatively cope with food vulnerability.

Vulnerability approach has two main advantages. Firstly, it is a forward looking concept (Hadley et al., 2011), because it focuses not only on the current outcomes of food insecurity but also future incidences. Lastly, it considers the risks and uncertainties that are linked with food insecurity in future (Scaramozzino, 2006). Household level risks involve health risks (disability, illness, injuries, accident), life process related risks (death, dowry, old age etc.), economic risks (unemployment, price shocks etc.) or natural disasters (flood, earthquake, drought, etc.) (Babatunde et al., 2008). These risks augment food and nutrition insecurities in the coming future by triggering different pitfalls like cut backs on food consumption, assets and savings and appearance of different types of nutritional diseases and disorders (Lovendal & Knowles, 2006).

Extant literature has evaluated the prevalence and sources of food insecurity, nutrition insecurity and vulnerability to food insecurity. These studies have investigated the role of many socio-economic factors of households including education, family size, employment, income, assets, wealth, etc., to combat the problem of food insecurity (Aziz et al., 2016; Pervaiz et al., 2017). However, recent studies have focused on women's role in resolving the issue. Women are considered an integral part in maintaining and providing food to their households (Harper et al., 2013; Sraboni et al., 2014). Hence, it is very crucial to explore the impact of women empowerment on household food and nutrition insecurities and household vulnerability to food insecurity.

1.1.2. Women's Empowerment

Women empowerment is argued as an important development goal at two fronts in the literature. First, it is a basic human right. Second, it is considered not only an important goal in itself but also crucial in achieving other SDGs, such as household food and nutrition securities (Ashraf et al., 2010; Agarwal, 2018). Women empowerment refers to the process of increasing competence among women in order to make their choices voluntarily and having potential to translate these choices into their desired payoffs (Sen, 1985; World Bank, 2000; Chakrabarti & Biswas, 2008).

Women represent 43% of agricultural labor force both globally and in developing countries (Doss, 2011; FAO, 2018), produce 50 % of the world food (FAO, 2011; Akter et al., 2017), and 60-80 % of household food in Sub-Sahara Africa by working on family plots as unpaid laborers (Karl, 2009). In Pakistan, women contribute 48.64 % share to the total population (GOP, 2018) and her share in agricultural employment is 67 % (GOP, 2019). Hence, Pakistani rural women has immense importance in the economy as food producers, income earners and custodian of food availability at the household level (Quisumbing & Meinzen-dick, 2001). Women's role in maintaining household's wellbeing is documented by her involvement in the food production and utilization at the household and community levels because she invests her earnings 10 times more than man in their family wellbeing, child nutrition, health and education etc. (Quisumbing & Maluccio, 2000; Duflo, 2012; Maertens & Verhofstadt, 2013). Therefore, outcomes of women empowerment may include, ensuring food security, maintaining nutritional status of families, reducing household vulnerability to food insecurity and more sustainable livelihood (DFID, 1999).

Women empowerment is measured using various socio-economic factors in the literature as proxy variables such as education (Das & Mukherjee, 2007), income and assets representing bargaining power of females (Soetan, 1999), and also through some direct measures such as decision making (Akram, 2017), mobility, attitudes and perception about physical and verbal abuse (Bhagowalia et al., 2012). Some studies have also focused on household decision making of women about their reproductive choices, neglecting her empowerment in other productive domains (Mahmood, 2002), but according to best of my knowledge, no single study is conducted on the measurement of women empowerment by considering all dimensions in the one go. However, multidimensional and complex nature of empowerment is difficult to measure through proxy variables because it depicts only one side of the picture. In order to

represent the true side of picture, an attempt was made by the United States Agency for International Development (USAID), International Food Policy Research Institute (IFPRI) and Oxford Poverty and Human Development Initiative (OPHI) to capture the proportion of women who are empowered in agriculture sector by considering some dimensions and developed an index named "Women's Empowerment in Agriculture Index (WEAI)" (Alkire et al., 2013). WEAI consists of five domains (i.e. production, income, resources, leadership and time) of empowerment that represent the empowerment status in agriculture sector only.

There are several indices developed in the past to determine relevant dimensions of women's empowerment in agriculture sector, some of them are: i) the "Women's Empowerment in Agriculture Index (WEAI)", ii) pro-WEAI which further developed WEAI to meet projects' impact assessment needs, iii) Women's Empowerment in Livestock Index (WELI) and iv) the Women's Empowerment in Fisheries Index (WEFI). The WEAI was originally developed as a tool to monitor empowerment of rural women under the US government initiative called "Feed the Future" (Alkire et al., 2013). The degrees of men's and women's empowerment were then measured in several nations, including Bangladesh, Ghana, Uganda, Guatemala, and Pakistan, among others (Alkire et al., 2013; H. J. Malapit et al., 2014; Sraboni et al., 2014; H. J. L. Malapit & Quisumbing, 2015). The WEAI consists of five dimensions that represent the empowerment status in agriculture sector only: (i) production (ii) resources (iii) income (iv) leadership, and (v) time use that represent the empowerment status in agriculture sector only.

As measuring empowerment status of rural women, agriculture is the basic source of livelihood for rural households (IFAD, 2011). A noteworthy methodological weakness in WEAI is that it does not capture the essence of empowerment outside the agriculture sector. An intuitive logic behind this argument is that, a woman considered empowered in agriculture sector does not necessarily mean that it is also empowered in household decision making about their children's decisions (education, medication and marriage), about her own decisions (clothing, medication and market purchases), decisions about maintaining food for family, moving inside and outside her settlement and in gaining respect from her family members. Therefore, in order to present somehow true picture of women empowerment in rural areas of Pakistan, the present study will construct "Rural Women Composite Empowerment Index (RWCEI)" introduced by Ahmad & Khan (2016) on the grounds of WEAI and will incorporate not only agriculture side but also other dimensions like household and financial decision making, mobility, education, skill

empowerment, violence, and autonomy in the construction of index. This index will then use in evaluating the impact of women empowerment on household food insecurity, nutrition insecurity and vulnerability to food insecurity in Pakistan.

1.2. Contribution and Significance of the Study

Literature available on measuring food and nutrition insecurity in Pakistan is limited especially in case of evaluating the impact of women empowerment on it. In case of Pakistan, a notable body of literature dealing with household food insecurity (Hussain & Routray, 2012; Aziz et al., 2016; Pervaiz et al., 2017; Ishaq et al., 2018; Yousaf et al., 2018), household nutrition insecurity (Lowe et al., 2011; Akhtar et al., 2013) and household vulnerability to food insecurity (Azeem et al., 2016; Bashir et al., 2018) exists, but these studies do represent a minimal part of the picture by showing only the proportion of households who are food insure, nutrient deficient and vulnerable to food insecurity. These studies are limited to descriptive statistics and none of these studies assesses the transmission channels through which women empowerment contributes to household food and nutrition security.

Different indicators were used in previous studies to examine the household food insecurity and vulnerability to household food insecurity such as, education, household size, income, calorie intake, etc. (Aziz et al., 2016; Pervaiz et al., 2017; Bashir et al., 2018) , but minor attention has been given to the indicator of women empowerment in this connection. Introducing women's role is important because women empowerment is expected to participate positively in reducing household's food and nutrition insecurities. Evidence shows that empowered rural women plays a key role to ensure food security in rural households (Sharaunga et al., 2016) and by empowering rural women, benefits will also be enjoyed by their families, countries and the whole world (Quisumbing & Meinzen-dick, 2001). Despite the intuitive link between women's role and her responsibility towards ensuring food security, it is rarely explored across rural cultural settings in Pakistan.

Moreover, women empowerment is a multidimensional and context specific concept (Mason, 1986; Kishor, 1995; Kabeer, 1999; Malhotra, Schuler & Boender, 2002; Mason, 2005; Yount, 2005), therefore, identifying various dimensions for improving food security situation and minimizing the risks of future food insecurity at the household level is necessary in designing effective and appropriate policies (Wenhold et al., 2007). The present study will fill this gap by constructing

multidimensional women empowerment index in the context of rural areas of Pakistan. However, literature on measuring household nutrition insecurity do incorporate some proxy variables for women empowerment such as, women's education, women's autonomy in agriculture, and land rights to women in determining the dietary diversity and nutrition insecurity of households (Rashid et al., 2011; Sraboni et al., 2014; Rehman et al., 2019). But literature about the impact of multidimensional nature of women empowerment on household food and nutrition insecurities is missing in case of Pakistan because little attention has been paid to estimate its impact on these areas thus, this type of useful information from the policy point of view thus remains unveiled.

The present research is also motivated by research gap on methodological side i.e., studies on household food insecurity and vulnerability usually do not take into consideration the multilevel (hierarchical) framework of the data set, and the present study aims to fill this gap through multi-level modelling at two levels (i.e., households and community). It is hypothesized that by empowering rural women of Pakistan, food availability, dietary quality, better nutrition and sustainability in terms of increasing the adaptive capacity of households to minimize the risks can be ensured at the household level.

1.3. Objectives of the Study

In the light of above-mentioned research gaps, the objectives of the present study are:

- To construct women empowerment index and assess the socio-economic determinants of women empowerment in rural areas of Pakistan
- To evaluate the effect of women empowerment on the prevalence of household food insecurity in rural areas of Pakistan
- To analyze the effect of women empowerment on the prevalence of household nutrition insecurity in rural areas of Pakistan
- To measure the effect of women empowerment on the prevalence of vulnerability to household food insecurity in rural areas of Pakistan

1.4. Organization of the Thesis

This dissertation is organized as follows: Chapter 1 discusses the introduction of the study. Chapter 2 reviews the literature regarding household food insecurity, household nutrition insecurity, women

empowerment and its impact on household food and nutrition. Chapter 3 presents the data, study areas, variables description, and research methodology. Chapter 4 reports discussion on findings of rural women's empowerments and impact of determinants on RWCEI. Chapter 5 deals with results and discussion related to household food and nutrition security and impact of rural women's empowerment on FNS. Chapter 6 contains results and discussion based on the findings from multilevel mixed effect logistic regression to estimate the relationship between rural women's empowerment and household vulnerability to food insecurity. Qualitative analysis is given in Chapter 7 and the conclusion of the study is provided Chapter 8.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

This section examines the existing literature on two fronts which are relevant for the present study. The first front supports the concept that women's empowerment helps to alleviate household food and nutrition insecurities, whereas the second front emphasizes past research findings that suggest empowered women can play a mediating role in reducing household food insecurity vulnerability.

2.1.1. Rural Women's Empowerment, Household Food and Nutrition Security

Evaluating the impact of women empowerment on the prevalence of household food insecurity is getting popularity in the literature. Women empowerment within the food security literature is considered as the basic ingredient in improving food security of their households because women have responsibilities of different household activities like purchasing, preparing, cooking and distributing food in the household (Alderman et al., 1995; Quisumbing, 2003; Quisumbing & Maluccio, 2003; Bold et al., 2013). Rural women also play important role through their involvement in agriculture sector to earn money and produce food (Croppenstedt et al., 2013; BRIDGE, 2014). Women's role in improving food security situation is examined by many researchers in the past and considered their role as a prerequisite in achieving food security globally (Akter et al., 2017). Sraboni et al. (2014) have discussed that women's empowerment in group participation and in asset control along with gender parity in the households is positively linked with food availability in terms of calories, therefore, women empowerment has a direct link in improving household food security (Harper et al., 2013; Sraboni et al., 2014). Bhandari (2017) has discussed that by improving the status of women in terms of decision making power, food insecurity can be reduced. Some studies show that men and women based on their bargaining power allocate food and non-food resources differently within a household. Hoddinott & Haddad (1995) have found that by increasing the wives share of income, budget share of food in the household increases. Furthermore, women having resources and choice along with ability to exercise choice is vital for ensuring food security of their households (Smith et al., 2003a; Drovandi & Salvini, 2004; Bhattacharya, 2006). Hence, one of the main achievements of rural women empowerment is the acquisition of household

food security. Mwaniki (2006) has pointed out that lack of women empowerment is the underlying cause of global hunger and food insecurity. Moreover, Grebmer et al. (2009) have discussed in their report that in spite of increasing per capita income of South Asian people, women's low status and gender gaps in education and health contribute to increasing food insecurity. The final report on MDG's shows that in developing nations men are more productive at farms than women, but if women are provided with easy access to resources akin to men, then hunger might had been reduced by half in the world (United Nations, 2015a).

Women are playing key roles in maintaining and ensuring good health of their families. Empowered women are those who can participate in important decisions of their family, thus influencing household wellbeing, welfare and nutritional needs (Boateng et al., 2012). Different studies showed positive and significant relationship between women empowerment and household nutrition security (Ashraf et al., 2010; Sraboni et al., 2014; Gurman et al., 2015; Tirivayi et al., 2016; Bonilla et al., 2017). Rao (2006) and Rehman et al. (2019) have reported that by giving land rights and opportunities to own agricultural land by women increase the nutritional status of their households and children. These studies have concluded that if women have control over resources (land or income), this enhances their decision making, ability, and status that impact positively on nutrition of their families. Empowering womanhood in multiple ways not only leads to raise their own nutritional status but also contributes to improve nutrition level of their families. Smith et al. (2003) have investigated that women's role is critical in nutritional status of children, because empowered women ensures for better nutrition and better care for their children and families. Rashid et al. (2011) have showed that by improving the status of women through education, it improves the dietary diversity and macronutrient security (protein) of their households. Moreover, Sraboni et al. (2014) have found that women's empowerment in agriculture ensures greater food availability and diversity at the household level. It is, therefore, need of time to create awareness about quality of diet and nutrition among household and community levels (BRIDGE, 2014b) and its noteworthy connection with women empowerment.

2.1.2. Rural Women's Empowerment and Household Vulnerability to Food Insecurity (HVFI)

As a result of learning about the positive outcomes of women's empowerment on development goals and individual well-being, (Smith et al., 2003), different studies also empirically investigate its impact on vulnerability to household food insecurity. In general, this body of literature finds that women's empowerment has a favorable impact on reducing food insecurity risks. Harris-fry et al. (2015) argued that woman could play a significant role in mitigating the effect of risk factors on household food insecurity. They documented that women land possession, relative wealth, women's literacy, media access, and women's freedom to market access all considerably reduces the risks of food insecurity in three districts of rural Bangladesh. Baiphethi & Jacobs (2009), reported the benefits of empowering rural women by saying that more food was produced for local consumption as well as for local markets. Moreover, they considered that women empowerment is the best pathway in decreasing vulnerability to household food insecurity by ensuring food availability and increasing agricultural incomes. This argument is based on the grounds that women perform a key role in the attainment of four pillars of food security especially in rural areas, such as food producers, income earners, and custodians of food and nutrition securities (Bob, 2002; Galié, 2013).

According to Mayoux (2005), investments in women's empowerment lead to improved health, poverty reduction, education, reduced food insecurity vulnerability, and economic growth. Drucza & Peveri (2018) postulates that, since the establishment of Pakistan in 1947 women's contributions were neglected in all spheres of life, particularly in agriculture. Authors argued that if women are provided with equal opportunities and privileges like men of their society, then food security and resilience in rural communities could be enhanced. Similarly, women's empowerment in the agriculture sector results in sustainable ways of feeding households by getting income from the sale of surplus produce, thereby reducing vulnerability to food insecurity (ActionAid International, 2011). Therefore, outcomes of women empowerment may include, ensuring food security, maintaining the nutritional status of families, reducing household vulnerability to food insecurity, and more sustainable livelihood. Furthermore, women's empowerment is seen as a critical component in providing the most disadvantaged households with the resources they need to secure their livelihoods and food security (Sharaunga et al., 2015).

2.2. Theoretical Framework

The analysis consists of three concepts –nutrition security, food security, and female empowerment – all of which are multidimensional with varying amounts of consensus as to the dimensions of which they comprise. Therefore, it is important to describe our conceptual model in order to understand the dimensions (and associated variables) we will be using for each. From this conceptual framework we developed variables for measuring household food and nutrition security, and Rural Women Composite Empowerment Index.

The causes of nutrition and food security are complex. We used the UNICEF food and nutrition framework that recognizes three levels of causes for food and nutrition insecurity at the household level which are defined as immediate, underlying, and basic ones (figure 2.1). We are using malnutrition as a proxy for nutrition security in this conceptual framework as overnutrition is rare in Pakistan.

Immediate causes include inadequate dietary intake and poor health status. Dietary intake is linked with two factors; "quantity" in terms of adequate calorie intake and "quality" in terms of balanced intake of macronutrients (carbohydrates, fats, and proteins) and micronutrients (vitamins and minerals). Inadequacy in both quantity and quality of dietary intake leads to loss of appetite which in turn may be a cause of infections, diseases, and sickness.

Underlying causes include poverty, lack of income, employment and, education. These causes lead to household food insecurity (in terms of access and availability); inadequate care; and lack of health facilities and a healthy environment. Inadequate care refers to poor child feeding practices, negligible support for pregnant and lactating mothers, poor attitude towards health-seeking facilities, and lack of mothers' autonomy at the household level, particularly in decision making about health and family nutrition (Quisumbing et al. 1995, Smith and Haddad 2000).

Lastly, the basic causes relate to the socio-economic conditions that affect household malnutrition. The complex linkage between economy, policy, science and technology, and resource management all play an important part in designing the macro-economic performance of a country as well as in defining the quality of the environment in which individuals are living in. These causes are considered crucial factors that are affecting food and nutrition security (Ecker and Breisinger, 2012). Women's empowerment was included in this UNICEF framework as a basic and underlying

cause. All of these causes (basic, underlying, and immediate) are important causes of food and nutrition insecurity but the contribution of women's empowerment is not well understood. And if women's empowerment got significance at all levels the dilemma of food and nutrition insecurity can be solved.

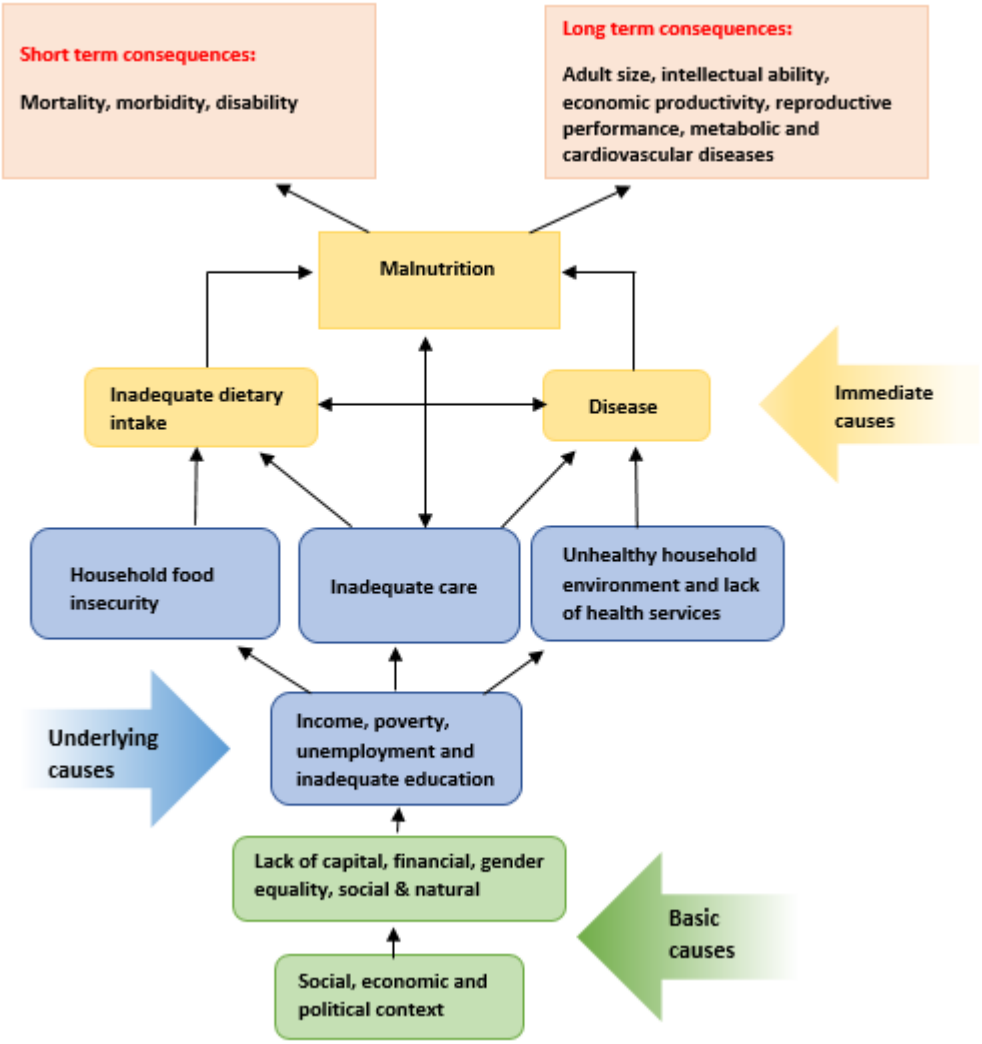

***Figure 2.1**. A conceptual framework of food and nutrition security. source: UNICEF*

Many assessments of women's empowerment have relied on a power typology founded in the seminal writings of Freire (1968) on autonomy and Lukes (1974) on power, and expressed with regard to gender and women's empowerment by Rowlands (1995, 1997) (Freire, 1968: Lukes, 1980; Rowlands, 1995; Rowlands, 1997).

This typology contrasts dominating or exerting "power over" others with creative types of empowerments such as "power within" (encompassing self-respect, identity, and a knowledge of

rights), "power to" (implementing individual goals), and "power with" (acting collectively toward shared interests). Different studies also categorize types of empowerments in different dimensions of power (Smith et al., 2003; Malapit et al., 2019; Meinzen et al., 2019; Elias et al., 2021).

In regard to power, empowerment can be framed in both positive and negative ways (as per Rowlands 1997). In a positive sense, agency occurs when people recognise their own worth and the purpose they bring to their acts (individual's internal agency, or "power within") and are able to act to achieve their objectives (instrumental agency, or "power to"), even when others or social norms oppose them. In a negative sense, it refers to actors exceeding others' agency and exerting control or "power over" their lives and resources (Kabeer, 2001). Empowerment, then, is about changes in these various forms of power, which interact and reinforce one other to produce unequal outcomes.

With regard to the Rowlands (1997), Malapit et al. (2019), Meinzen-Dick et al. (2019), and Elias et al. (2021), theory of power, it is significant to substitute nine domains of RWCEI (in addition to those in WEAI) under the classifications of power (Rowlands, 1997; Malapit et al., 2019; Meinzen et al., 2019; Elias et al., 2021). The theory categorizes power (empowerment) into four dimensions, and every dimension is important while constructing the index. Rowlands (1997) states that empowerment is a power and power may be manifested in four ways: power within, power to, power with and power over. Power within relates to self-confidence and personal strength to make decisions. In this dimension, qualification and awareness domains are included. By getting an education and awareness a woman can gain self-confidence and can make better decisions in her life (Smith et al., 2003; Malapit et al., 2019; Elias et al., 2021). Power to (instrumental agency) means individual agency, and the capability to choose and carry out activities. So, in this category, domains of economic empowerment, autonomy, and decision-making lies. Moreover, the domain of time allocation and mobility empowerment also fits under this category. Time allocation domain is about woman having enough personal time for herself, and it is possible only if work is divided among family members (Smith et al., 2003; Malapit et al., 2019; Meinzen et al., 2019; Elias et al., 2021). Mobility empowerment means that women can move freely within and outside her settlement. It simply reflects the power to use one’s time for different activities and the power to go to different (important) places. Women’s capacity for decision making is enhanced if she is financially empowered and earning money. Moreover, autonomy is also important for decisions regarding spending money to buy her own personal things or not. Similarly, capability or capacity

for performing actions is also reflected in whether she has power to make decisions about agricultural activities, household decisions and financial decisions (Smith et al., 2003; Malapit et al., 2019; Meinzen et al., 2019; Elias et al., 2021).

Power with (power to participate in collective process) perceives that empowerment is a collective process that involves the support and interaction of families, societies, organizations, and communities. The domain of political empowerment fits under this category. Politically empowerment means that is she can vote and participate in political or other organisations and is not dependent on whether her family allows her to do so or not. Power over measures the degree of strength in relationships between woman and other members of family or community. Therefore, for this category violence domain is included. Violence refers to whether the woman is facing domestic violence in her family or not. If relationship with her family members is strong, then she is considered empowered in this category of power (Smith et al., 2003; Malapit et al., 2019; Meinzen et al., 2019; Elias et al., 2021).

For Women's empowerment following theoretical framework is utilized for the construction of Rural Women Composite Empowerment Index (RWECI), depicted in figure 2.2. There are nine domains and 14 subdomains are listed in the framework, however 89 indicators are given in Table 3.2.

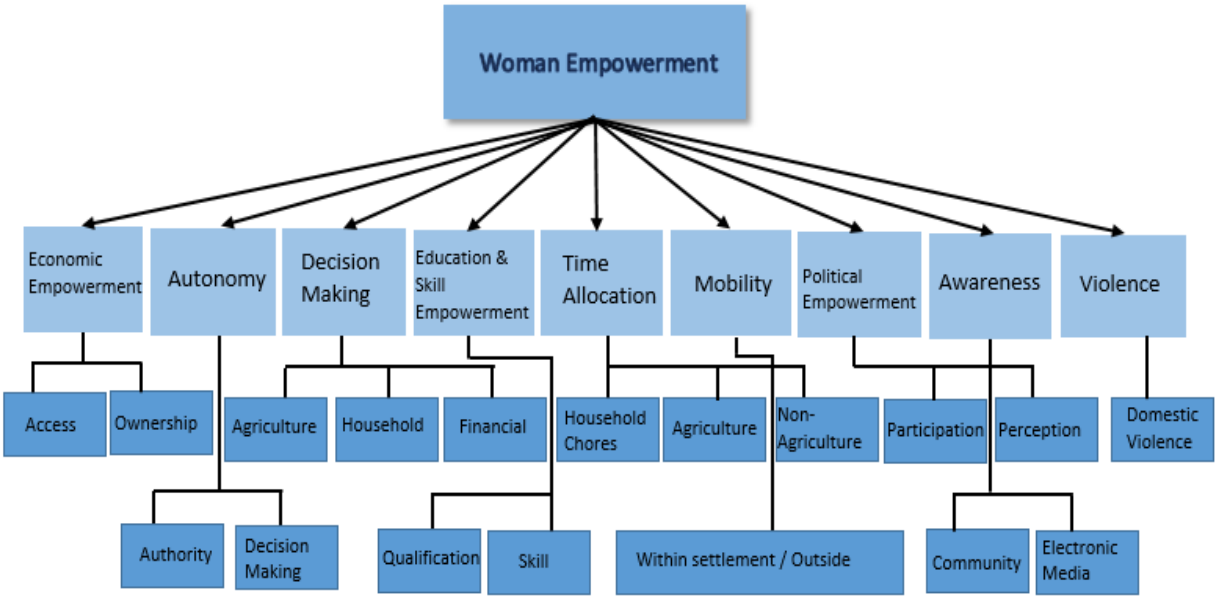

Figure2.2. *Domains and indicators of RWCEI*

Figure 2.3. shows the interlinkages between the domains of women empowerment and food and nutrition security indicators and it shows that how the women empowerment can help in the improvement of food and nutrition security at the household level. For example, different studies highlighted that economic empowerment through access and ownership, autonomy through decision making, education and no domestic violence, can be helpful in improving caloric intake of households which in turn ensures food security (Hoddinott & Haddad, 1995; Bhattacharya, 2006; Grebmer et al., 2009; Sraboni et al.,2014; Bhandari, 2017). Similarly, economic empowerment through land rights and income, education decision making helps to improve dietary quality and dietary diversity of households which in turn helps to improve nutrition security (Smith et al., 2003; Quisumbing & Maluccio, 2003; Rao, 2006; Rashid et al.,2011; Boateng et al., 2012; Sraboni et al., 2014; Rehman et al., 2019). There are also different studies which focused on the relationship of women's empowerment and vulnerability to food security. For example, economic empowerment in terms of wealth and land possessions, education and mobility empowerment, risks towards food insecurity reduces (Harris-fry et al., 2015).

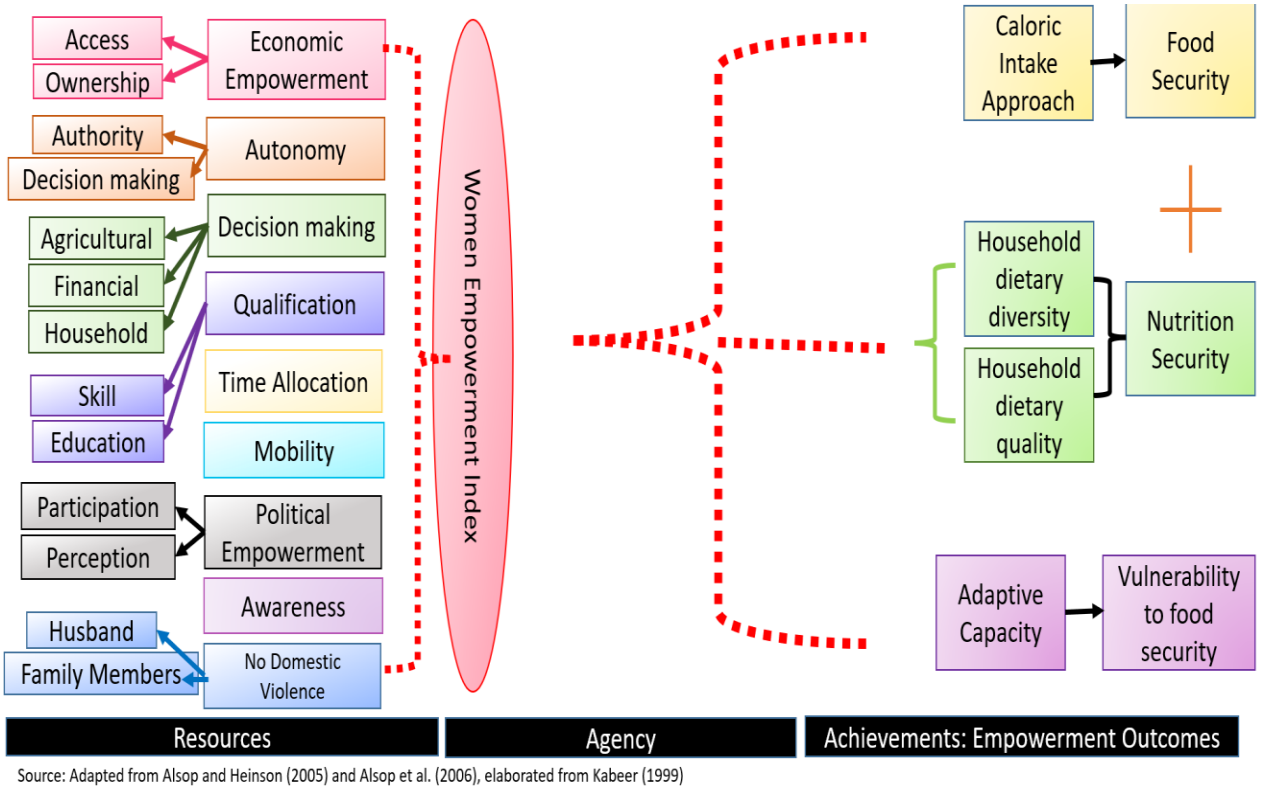

Figure 2.3. *Interlinkages between women's empowerment and household food and nutrition security and vulnerability to food security*

Source: Adapted from Alsop and Heinson (2005) and Alsop et al. (2006), elaborated from Kabeer (1999)

CHAPTER 3

RESEARCH METHODOLOGY

3.1. Data and Study Area

Data for the construction of women empowerment index, household food and nutrition insecurities, and vulnerability to household food insecurity is taken from the Pakistan Rural Household Panel Survey (PRHPS) (IFPRI/IDS 2010-2014). The PRHPS contains detailed information gathered throughout three rounds of the PRHPS. These rounds were conducted from March 2012 to June 2014 (IFPRI/IDS 2012, 2013, 2014)[1]. For this study we used data from third round of survey containing 1879 households. We compiled a data set by using women's module, male modules, household level, and community level modules of the survey. The complete dataset is available in IFPRI dataverse archive and publicly accessible at:
https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/JWMCXY
The survey was conducted in rural areas of three provinces of Pakistan i.e., 12 districts of Punjab, 2 districts of Khyber Pakhtunkhwa (KPK) and 5 districts of Sindh. Each round of the survey comprised around 2,090 households and over 13,000 people. The survey took place in 76 mouzas[2] (villages). Four mouzas were chosen at random from each of the provinces of Punjab, Sindh, and Khyber Pakhtunkhwa 19 districts shown in the Table 3.1 below:

[1] This survey period mostly overlapped with harvesting of Rabi (summer) crops and cultivation of Kharif (winter) crops. The cultivation and harvesting time in Pakistan differ slightly from province to province.
[2] A mouza is an administrative unit based on land revenue records and may correspond to a specific land with one or more settlements.

Table 3.1: List of districts and households used in the present study

District Names	Households	District Names	Households	District Names	Households
Punjab		Sindh		Khyber Pakhtunkhwa (KPK)	
Attock	112	Dadu	112	Mansehra	112
Bahawalnagar	111	Hyderabad	112	Nowshera	112
Bhakkar	112	Jacobabad	110	Total KPK	224
Dera Ghazi Khan	108	Sanghar	111		
Faisalabad	102	Thatta	112		
Jhang	111	Total Sindh	557		
Kasur	106				
Khanewal	106				
Multan	111				
Rahim Yar Khan	107				
Sargodha	111				
Vehari	112				
Total Punjab	1309				

The data mainly represents Punjab and Sindh provinces. KPK is partially considered, as some districts in KPK could not be given attention in the survey due to the law and order situation prevailing at that time. The Baluchistan province was also not included in the sample due to security issues.

3.2. Variable Construction and Methodology

The survey gathered information on various topics including income sources, employment nature, consumption patterns, assets and savings, time usage, loans and credits, economic shocks, transfers in and out, education, women autonomy, migration, health and nutrition security, food security and participation in social safety nets. The survey mainly based on women's module and data collected from 3,526 women. Minimum three women were selected for survey from each household, comprising the head or head's spouse, the eldest and youngest female (over 15 years of age). Therefore, it is hypothesized that calculations of the present study better represent empowerment level of women in rural areas of Pakistan as compared to WEAI estimations (in various countries), which includes only one main female from each household. The PRHPS used multistage stratified technique for sampling; structured questionnaires were designed and in personal interviews were

conducted for data collection. In addition to women's module, male module, household level and community level modules were also used for data collection. The present study utilized all modules in a useful manner and will adopt multi-level modelling technique at two stages for the analysis.

This section is divided into three subsections. Section 3.2.1 is about the methodology of constructing rural women's empowerment index and impact of determinants on it. This index is used as an independent variable in the other two sections. Section 3.2.2 is about the construction of food insecurity and nutrition insecurity variable and methodology to measure the impact of rural women's empowerment on household food and nutrition insecurity. Section 3.2.3 deals with the formation of food vulnerability index and methodology to estimate the impact of rural women's empowerment on household vulnerability to food insecurity.

3.2.1. Section 1: Rural Women's Empowerment

3.2.1.1.Method for Rural Women Composite Empowerment Index (RWCEI):

The methodology for the construction of rural women composite empowerment index (RWCEI) is adopted from Alkire and Foster (2011) and Alkire et al. (2013), calculations of "Women Empowerment in Agriculture Index (WEAI)". The WEAI has been developed to represent the level of women empowerment in agriculture sector and bring empowerment to the foreground of policy agenda. It was also used for calculating empowerment in various countries (Alkire et al., 2013; H. J. Malapit et al., 2014; Sraboni, Malapit, Quisumbing & Ahmed, 2014; H. J. L. Malapit & Quisumbing, 2015). WEAI consisted of five domains and ten indicators for measuring the level of women empowerment and it also includes Gender Parity Index (GPI) to compare the empowerment levels of men and women of the same household. WEAI used these two sub-indices to construct final index. The present study calculated empowerment index for women only. Moreover, the aim of WEAI is to draw comparisons among countries, contexts, and time. Since women empowerment is a multidimensional and context specific concept (Mason, 1986; Kishor, 1995; Kabeer, 1999; Malhotra, Schuler & Boender, 2002; Mason, 2005; Yount, 2005), indicators might be relevant for some regions and irrelevant for other places and times. Hence, measuring women empowerment through standard indicators is not applicable to all places and times. In case of Pakistan, the present study used indicators relevant in the context of rural areas.

Rural women composite empowerment index (RWCEI) computed on the grounds of WEAI estimations, but selection of domains and indicators are different. The present study measured

empowerment through nine domains (economic empowerment, autonomy, decision making, qualification, time allocation, mobility, political empowerment, awareness, and violence) and eighty-nine indicators (see Table 3.2) Most of the indicators included in the index are based on the literature cited in the section below.

Economic Empowerment

This domain is divided in to two sections. The first section is about the employment access of women. Since the study is about measuring the empowerment level of rural women in Pakistan, therefore, women involvement in agriculture activities are included in employment section. Most of women living in villages are doing agriculture activities on farms along with their husbands, therefore, this component in the study has great importance. The second section is about the ownership of valuable resource (i.e. valuable asset, saving, bisi[3] and bank account). K. C. Roy & Tisdell (2002); Tisdell (2002); Susilastuti (2003); Kabeer & Huq (2010) have concluded that ownership of women in family's property helps them in reducing their economic dependency upon their family members and they are capable to attain better status in their families. In the same way, Batliwala (1994); Roy & Niranjan (2004); Heaton, Huntsman & Flake (2005); Blumberg (2005); Jones, Snelgrove & Muckosy (2006) have found that paid employment/job and income generating activities increases the decision making power of females in their households.

Autonomy

Autonomy in making decisions about her own income and own expenditures is important in estimating empowerment status of a woman. Studies showed that lack of autonomy through different ways, increases the gender inequality gap (Jewkes & Morrell, 2010; Akram, 2017). Mayoux (1997, 2001) and Ahmad & Khan (2016) concluded that women's ability to use her income is an important and significant indicator of her empowerment. Therefore this dimension is considered as an important domain in the analysis of measuring empowerment level. Autonomy domain is about the respondent's power over money to spend it on her own self. A woman is considered empowered if she has power to make her decisions about own expenditures independently or jointly.

[3] A type of group savings in which individuals contribute collectively and receive a lump sum amount in return.

Decision Making

Decision making is the most important domain in estimating empowerment (Ahmad & Khan, 2016). Through this domain one can get the true picture of women status in family. The study is about rural women and her decision making power in household and agricultural activities and this represented 30 percent of her empowerment. Because women are supposed as care taker of family and household chores like purchasing, preparing, cooking and distributing food (Alderman, Chiappori, Haddad, Hoddinott & Kanbur, 1995; Quisumbing & Maluccio, 2000; Quisumbing, 2003; Bold, Quisumbing & Gillespie, 2013). Therefore her involvement in household decisions matters a lot. In order to capture the broader area of decision making, it is divided in to three sections i.e agriculture decision making, financial decision making and household decision making.

Agriculture section relates to participation of individual in agricultural decision making. Because agriculture is the principle source of income for rural people therefore this domain had significant importance in the analysis (Alkire et al., 2013). These are agricultural production output decisions. A woman is considered empowered if she makes these decisions on her own or with her partner. Second section is about financial decision making. Decisions regarding her own wage/salary, non-farm business activity and decisions about what to do with borrowed money is considred essential in this section. Third section in this domain is comprised of household decision making. It is the most imperative section because most of the empowerment of women determine from this section. As women is sole care taker of whole household in rural areas of Pakistan, so its autonomy in this regard is most important. In this section, decisions about household food, clothing, medication, small and large occasional expenses, children education and marriage were considered important in this section. In Pakistan, decisions about household expenditures are generally splited along gender lines. In rural households, women may be involved in making day to day minor decisions about small expenditures but they have no decision making power in large decisions because they have no control in overall household income. Therefore, capturing this perspective in calculating empowerment is crucial. A woman is considered empowered if she does not make any money but has control over how it is spent.

Qualification

Education is considered as main ingredient of empowerment because it brings awareness and exposure of things and in return it leads to confidence. Different studies showed that women's

education is crucial in measuring her empowerment (Ahmed & Sultan, 2004; Sridevi, 2005; Furuta & Salway, 2006; Mosiur et al., 2008; Chaudhry & Nosheen, 2009). Therefore, the present study incorporates this important aspect. There are two sections under this domain. First section consisted of ability and skills of reading, writing and do basic calculations. Second section included her qualification and trainings. Through these sections rural women's empowerment in educational domain was assessed.

Time Allocation

Assessing time allocation in different activities of life is important in measuring empowerment of rural woman. Because rural woman in Pakistan is performing multiple tasks in one time, therefore, she doesn't find any spare time for herself. By spending more time in household chores, less time is available for taking rest. Thus, workload burden reduces the time usage according to her own choice. Hence, this domain is important in capturing this important feature i.e. empowered women must have some authority to spend time according to her own will. Studies showed that if woman is spending more time in work, and find less time for herself, she would be considered disempowered and there must exist negative relationship between wok hours and empowerment (Sridevi, 2005).

This domain estimated the time spend on household chores, on agricultural activities and on non-agricultural activities. Cutoff point was adopted from Alkire et al. (2013) study, i.e. 10.5 hours[4]. A woman is considered empowered if she is not having an extreme workload of more than 10.5 hours in the previous 24 hours. In literature number of studies used this indicator for measuring empowerment status (Alkire et al., 2012; Sraboni, Quisumbing & Ahmed, 2013; Malapit et al., 2014). These studies incorporated another indicator in this domain, i.e. leisure time, but because data on this variable is missing in the survey for Pakistan, therefore, it is not included in the construction of women's empowerment index.

Mobility Empowerment

Freedom of movement is an important aspect of empowerment in one's life. Unfortunately, freedom of mobility for women was not given importance in research studies previously. Literature indicates

[4] 10.5 hours is a benchmark for time allocation used by (Alkire et al., 2013) in calculating women empowerment index

that women cannot move freely according to their own will because freedom of movement was restricted for them in many areas (Kishor & Gupta, 2004). Women in rural areas are not allowed to go alone anywhere. Moreover, delay from work's place is considered as violation of social norm in villages. Under this situation, women are not empowered even if they are employed.

This domain has importance in empowerment index unlike WEAI as it relates to the freedom and ability of movement without seeking permission from others. Travelling safely within and outside the settlements is the right of every rural woman. They can visit neighborhood market, neighboring village and field/farmland, sell products at local mandi, travel to main city, participate in religious events, visit hospitals, attend ceremonies and meetings in their areas.

Political Empowerment

This domain is considered important for the analysis because different studies pointed out the importance of political empowerment of women, as it helps woman to develop political culture that favors women community, sense of self-worth and more decision-making ability. Authors emphasized this domain of empowerment, as it is meaningful for the development of individual as well as collective wellbeing. Moreover, it is also crucial for creating opportunities that leads towards higher stages of empowerment (Bari, 2005). This domain is about women's participation and involvement in any political matter, their perception about casting vote and involvement in community groups, and, satisfaction about community group efforts.

Awareness

Awareness about any community organization in the residing area is important for women. Community organization is the platform where woman can participate in community welfare programs. If she is aware of it and has right to participate in the activities of these organizations, then she is considered empowered. This domain is given weightage in this analysis because awareness about community groups is importance for rural woman in determining her knowledge about welfare programs of her area. Different studies revealed that, because of different cultural obstructions prevailing it is extremely challenging for the women to use their rights, so there is limited impact of awareness (Blumberg, 2005; Tijani & Yano, 2007). Therefore, awareness along

with permission to exercise their rights is considered important in determining rural women's empowerment in the analysis.

Violence

This domain has an immense standing in empowerment index. Unlike WEAI, estimating women's status in relation to any kind of violence is considered important in measuring their empowerment. Sather & Kazi, (2000) discussed that majority of women were afraid of their intimate partners and about one third women had been beaten by their husbands in rural areas of Pakistan. This domain represented the keen area of inequality, degree of mal-treatment and suppression by men with whom they are living and are dependent on. Fear of husbands make woman less empowered due to injured self-esteem. Therefore, this domain has sheer importance in determining empowerment status. If a woman is facing any kind of domestic violence by her husband or any other family member then she is not considered empowered in this domain. This domain operates in inverse direction, increasing to indicate the disempowerment level of woman.

Variables under nine domains of empowerment are presented in Table 3.2. These are both quantitative and qualitative in nature. These indicators measured different facets of women empowerment. As explained earlier, women empowerment is a context specific and multidimensional concept, therefore, it is needed to estimate it by joining all variables in a compounded manner that reflect the characteristics of empowerment. For this ambition, a composite index named "Rural women Composite Empowerment Index (RWCEI)" is constructed to quantify the proportion of rural women empowerment in case of Pakistan.

Table 3.2: Assigning weights to domains and variables of rural women composite empowerment index (RWCEI)

Domains	Sub-Domains	Variables (coding: yes = 1; no = 0)	Weights
Economic Empowerment weight = $^{1}/_{22}$ Variables= 17	**Access**	**Women access to paid farm work (No. of days per annum (Rabi & Kharif 2012-2013)**	
		Sowing	**1/374**
		Weeding	**1/374**
		Harvesting	**1/374**
		Post-Harvest Activities	**1/374**
		Other Activities	**1/374**
		Women Access to paid non-farm work	
		No. of days/annum	**1/374**

		Woman access to own business (handicraft, weaving, cottage activities	
		Ownership (Yes/No)	**1/374**
		Type of Ownership (Sole Proprietor, Jointly with a household member, Jointly with an outsider)	**1/374**
	Ownership	**Ownership of Valuable Assets**	
		Agricultural land	**1/374**
		Large livestock (oxen, buffalo, etc.)	**1/374**
		Small livestock (goat, sheep, etc.)	**1/374**
		Farm equipment	**1/374**
		House	**1/374**
		Consumer durables	**1/374**
		Saving	**1/374**
		Bank Account	**1/374**
		Bisi[5]	**1/374**
Autonomy	**Authority**	**A woman can spend money to buy:**	
Weight = $^{1}/_{13}$		Food from market	**1/91**
Variables =7		Clothes for herself	**1/91**
		Medication for herself	**1/91**
		Toiletries/ cosmetics for herself	**1/91**
	Decision Making	**Would your husband or in-laws allow you to engage in a business or earn additional money from working inside your home?**	**1/91**
		Involvement in a job that brings in cash or in-kind income?	**1/91**
		The decision about the earned income?	**1/91**
Decision Making	**Agriculture Decision Making**	**Woman participation in decisions about:**	
Weight= $^{1}/_{23}$		Food crop farming	**1/552**
Variables= 24		Cash crop farming	**1/552**
		What inputs to buy for agriculture production	**1/552**
		When or who would take crops to the market	**1/552**
		Livestock raising	**1/552**
		The extent to which woman can influence decisions regarding:	
		Food crop farming	**1/552**
		Cash crop farming	**1/552**
		What inputs to buy for agriculture production	**1/552**
		When or who would take crops to the market	**1/552**
		Livestock raising	**1/552**
	Financial Decision Making	**Women decision making about:**	
		Non-farm business activities	**1/552**
		Wage/Salary	**1/552**
		Borrowing money or item	**1/552**
		What to do with the borrowed money or item	**1/552**
	Household Decision Making	**Woman decision making about:**	
		Food for household	**1/552**
		Clothing for household	**1/552**
		Household occasional small expenditures	**1/552**
		Household occasional large expenditures	**1/552**
		Renovation or maintenance of the house	**1/552**

[5] A form of group savings where individuals contribute collectively and receive a lump sum in turns.

		Girls marriage	**1/552**
		Female children education	**1/552**
		Male children education	**1/552**
		Household health care or medication	**1/552**
		Method of contraception to be used	**1/552**
Qualification	**Skill**	**Ability to:**	
Weight = $^{1}/_{71}$		Read	**1/355**
Variables = 5		Write	**1/355**
		To do basic calculations	**1/355**
	Education	Highest class attended	**1/355**
		Technical or Vocational skill	**1/355**
Time Allocation		Time spend on household chores	**1/60**
Weight = $^{1}/_{20}$		Time spend on household agricultural activities	**1/60**
Variables = 3		Time spend on non-agricultural activities	**1/60**
Mobility		Does a woman feel safe walking/traveling alone within your settlement?	**1/22**
Empowerment		Does a woman feel safe walking/traveling alone outside your settlement?	**1/22**
Weight = $^{1}/_{2}$		How safe do women feel when visiting the following places? (neighborhood market, a neighboring village, field/farmland (own) and (landlord), sell products at the local mandi, traveling to the main city, participation in religious events, hospitals, ceremonies, attend the meeting	**(1/22 *9)**
Variables =11			
Political	**Participation**	Political Participation (yes/no)	**1/120**
Empowerment		Did women vote in the previous general elections (2008)?	**1/120**
Weight = $^{1}/_{20}$	**Perception**	Did the opinions of family members influence woman vote decisions?	**1/120**
Variables = 6		To what extent do women feel her involvement in community groups and her influence in decisions affecting all villagers?	**1/120**
		How satisfied is a woman with the community group's efforts to help her community during this 12-month period?	**1/120**
		Do women think membership of any community group has changed her position in the household in any way?	**1/120**
Awareness	**Community**	Are you aware of the presence of any community organization in your area?	**1/76**
Weight = $^{1}/_{19}$	**Mass Media**	Do you listen radio, watch TV or read newspaper?	**(1/76 *3)**
Variables=4			
Violence	**Domestic**	Has your husband done something to humiliate you in front of others?	**1/120**
Weight = $^{1}/_{10}$	**Violence (by**	Has your Husband threatened to hurt or harm you or someone you care about?	**1/120**
Variables = 12	**husband)**	Has your husband insulted you or made you feel bad about yourself?	**1/120**
	Wife Beating	Has your husband ever push you, shake you, or throw something at you?	**1/120**
		Has your husband ever slap you?	**1/120**
		Has your husband ever twist your arm or pull your hair?	**1/120**
		Has your husband punch you with his fist or with something that could hurt you?	**1/120**
		Has your husband ever kick you, drag you, or beat you up?	**1/120**
		Has your husband try to choke you or burn you on purpose?	**1/120**
		Has your husband ever threaten or attack you with a knife, gun, or other weapon?	**1/120**
		Has your husband ever force you to have sexual intercourse or perform any other sexual acts with him when you did not want to?	**1/120**
	Domestic Violence (by other family members)	Did anyone else inside your household ever do any of the above-mentioned things to hurt you?	**1/120**

Inclusion of these new domains in RWCEI (as addition to those in WEAI) the relates back to the Rowlands (1997) theory of Power (Rowlands, 1997 ; P. K. Smith & Hofmann, 2016 and Lombardini *et al.*, 2017). That theory categorizes power (empowerment) into four dimensions, and every dimension is important while constructing the index. Rowlands (1997) states that empowerment is a power and power may be manifested in four ways: *power within, power to, power with and power over*. ***Power within*** relates to self-confidence and personal strength to make decisions. In this dimension, qualification and awareness domains are included. By getting an education and awareness a woman can gain self-confidence and can make better decisions in her life (Smith et al., 2003). ***Power to*** means individual agency, and the capability to choose and carry out activities. So, in this category, domains of economic empowerment, autonomy, and decision-making lies. Women's capacity for decision making is enhanced if she is financially empowered and earning money. Moreover, autonomy is also important for decisions regarding spending money to buy her own personal things or not. Similarly, capability or capacity for performing actions is also reflected in whether she has power to make decisions about agricultural activities, household decisions and financial decisions (Smith et al., 2003).

Power with perceives that empowerment is a collective process that involves the support and interaction of families, societies, organizations, and communities. The domain of time allocation fits under this category. Time allocation domain is about woman having enough personal time for herself, and it is possible only if work is divided among family members (Smith et al., 2003). ***Power over*** measures the degree of strength in relationships between woman and other members of family or community. Therefore, for this category, mobility empowerment, political empowerment and violence are included. Mobility empowerment means that women can move freely within and outside her settlement; political that she can vote and participate in political or other organizations and is not dependent on whether her family allows her to do so or not. Violence refers to whether the woman is facing domestic violence in her family or not. If relationship with her family members is strong, then she is considered empowered in this category of power (Smith et al., 2003).

3.2.1.2. Construction of Rural Women Composite Empowerment Index (RWCEI)

For the construction of the "Rural Women Composite Empowerment Index (RWCEI)" factor analysis, an important multivariate technique is employed. Multivariate analysis is useful where we

have multiple measurements of different experimental units and it is important to estimate the relationship among these measurements (Spearman, 1904). It is a statistical technique specially designed for data reduction purposes.

We are using factor analysis in this paper instead of principal component analysis (PCA) for the construction of the woman empowerment index. Factor analysis and principal component analysis (PCA) are related to each other and their aim is to reduce the dimensions of the data set, but they are not identical to each other (Bartholomew et al., 2008). Factor analysis is designed with the objective of identifying unobservable common factors (empowerment in our case) from observed variables, and PCA's objective is to provide a better approximation of the required factors (Jolliffe, 2002). PCA uses Pearson correlations for identifying important factor that contains most of the information and it is best applicable to continuous data. Another assumption is the "normality" of the input variables that they must be multivariate normal (Pearson, 1900; Pearson & Pearson, 1922 and Hotelling, 1933). When there is discrete data (binary in our case) the distributional assumptions in methods of PCA (where continuous variables are assumed) are clearly violated. In discrete data, there is a likelihood of high kurtosis and skewness. Therefore, factor analysis is employed in this paper for retaining important factor loadings and with the help of these factor loadings, an index is generated.

In order to determine that factor analysis is appropriate for a given sample two tests are required, the Kaiser-Mayer-Olkin (KMO) test and Bartlett's Test of Sphericity. The KMO value ranges between 0 to 1 and, the 0 value suggests that the sum of total correlations is less than the sum of partial correlations. This indicates that there is diffusion in correlation patterns and therefore factor analysis is not reliable in this case (Sher et al., 2019). For satisfactory proceedings of factor analysis, the threshold level of KMO value is 0.50 (Field, 2013). Bartlett's test of Sphericity uses p-value significance to ensure the presence of correlations among the variables (Chan et al., 2010).

Tetrachoric Correlations:

For factor analysis different types of correlations can be used for estimating the factor loadings as described below:

1. Pearson Correlations ---- if all variables are continuous

2. Biserial/Polyserial correlations ---- if one variable is continuous and one is dichotomous / ordered categorical
3. Tetrachoric/Polychoric correlations ---- if both variables are dichotomous/ordered categorical (Uebersax, 2000)

Factor analysis applied in this study uses tetrachoric correlations. A factor analysis of a matrix of tetrachoric correlations is more appropriate under these conditions because input variables are dichotomous in nature therefore, the Pearson correlation matrix can give misleading results when used in this context (Uebersax, 2000 & Stata, 2013). Tetrachoric correlations are also introduced by "Pearson" and he declared that it is an improved measure of correlation among binary variables (Pearson, 1900).

3.2.1.3. Multilevel Mixed Effect Ordered Logistic Regression

A multilevel mixed effects ordered logistic regression was employed in the present study to measure the probability of increasing empowerment levels, food security and nutrition security among rural households of Pakistan. Ordered logistic regression was used instead of ordinary least square (OLS) regression models for the present study because the outcome variable was in order i.e., from low to high categories of empowerment, food security and nutrition security, therefore, simple regression is not suitable. Multilevel mixed-effect model was selected for present study because it suits best for the nested structure of the data set (i.e., individuals are nested in households and households are nested in the communities). This method is used because our research is based on the premise that households are nested inside communities. This methodology captures both fixed effects and random effects at a same time. Fixed effects are homogeneous among communities as well as random effects that capture variations across communities.

However, to capture the impacts of communities on dependent variables is the crucial theme of present study, which other models do not cater that feature. To incorporate the hierarchical composition of the data set (i.e. individuals were nested in households and households were nested in the 19 communities) multi-level modelling was adopted as suggested by Kamanda, Madise, and Schnepf (Kamanda et al., 2016). Therefore, multi-level mixed effect ordered logistic regression was used to capture the impact of communities.

Determinants of rural women's empowerment were assessed. Moreover, the impact of an educated community was also tested on the likelihood of the empowerment level. Women are nested in communities, and communities play a significant part in defining a rural woman's empowerment status. To account for the hierarchical structure of the PRHPS data set, a two-level multilevel ordered logistic regression model was used. Women were nested in households (level 1), which were nested in 19 communities (level 2). We used the community as a second level instead of households because we took a single woman from each household and therefore women and households were treated as level 1.

Three models with variables of interest were fitted. **Model 0** (empty model) contains no exposure variable and only focusing on decomposing the total variance into the community components. **Model 1** comprised woman level variables (age, education, marital status, delivery at the hospital, employment status, dowry, no. of sons, access to electronic media, access to credit, and household wealth quantile). **Model 2** comprised community-level variables (educated community and poor community)

The two-level multilevel model is written as follows:

$$logit\ (\pi_{ik}) = \log\left[\frac{\pi_{ik}}{1-\pi_{ik}}\right] = \beta_0 + X_{ik} + \mu_{0k} \qquad (3.1)$$

Where π_{ik} is the probability of empowerment for the i_{th} woman in the k_{th} community. X_{ik} is the vector of covariates corresponding to the i_{th}woman in the k_{th}community, β_o is the vector of unknown parameters, and $\mu_{ok}$is the random effect at the community level. It is assumed that the intercept, or average likelihood of becoming empowered, varies randomly among women and communities. The fixed effects (measures of association) are expressed as odd ratios (OR) with a 95% confidence interval (95% CI). The random effects (measures of variation) are expressed as variance coefficient. We used the post estimation command to determine the p-value of variance in the software Stata 15 package.

Dependent Variable

The outcome variable (RWCEI) is the likelihood of a woman being determined by all socio-economic indicators of woman empowerment at the individual level, and at the community level.

0. No Empowerment

1. Medium Empowerment
2. High Empowerment

Independent Variables

This section provides the list of independent variables used for the analysis. Table 3.3, provides a description, method of measuring, and reference of previous studies that used these variables:

Table 3.3: Description of Explanatory Variables Used in the Analysis of Rural Women's Empowerment

Variables	Description	Measurement	Previous Studies
Age	Age of respondent elder female of the household	No. of Years (Continuous variable)	(Mason, 1986), (Frankenberg & Thomas, 2001), (Mostofa, Tareque, Haque & Islam, 2008), (Mahmud, Shah & Becker, 2012), (Adekoya, Adelakun & Fawole, 2013), (Alkire et al., 2013), (Akram, 2017), (Kamanda et al., 2016), (Sell & Minot, 2018), (S. Hussain & Jullandhry, 2020)
Education	Schooling of the female respondent from Kacchi Pacci (0) to secondary and higher education	No. of years in schooling (Continuous variable)	(Kishor & Gupta, 2004), (Parveen & Leonhäuser, 2004), (Sridevi, 2005), (Allendorf, 2007), (Alkire et al., 2013), (Noureen, 2015), (Goldman & Little, 2015),(Akram, 2017)
Marital Status	The respondent woman either married or single/divorced/widowed	Married =1; otherwise =0	(Ahmad et al., 2017), (Hussain & Jullandhry, 2020)
Dowry	Goods or money received at the time of marriage by female	Yes=1; No=0	(Jejeebhoy, 1998), (Bates, Ruth, Islam & Islam, 2004), (Parveen, 2007)
Delivery at hospital	Proxy for health care	Yes=1;No=1	(Antai, 2009)
No. of Sons	Female preference for sons	Continuous variable	(Akram, 2017), (Sraboni & Quisumbing, 2018), (Javed & Mughal, 2018)
Employment Status	Female respondent involved in primary or secondary occupation (Agriculture, non-agriculture, Private, business entrepreneurship)	Yes=1; No=0	(Aluko, 2015), (Oladokun et al., 2018)
Access to Credit	Woman having a say in decision making about credit	Yes=1; No=0	(Amin, Becker & Bayes, 1998), (Swain & Wallentin, 2009), (Addai, 2017)
Mass Media Exposure	Women listen to Radio, TV or read the newspaper	Yes=1; No=0	(Mahmud et al., 2012), (Gupta & Yesudian, 2006), (Akram, 2017), (Baig et al., 2017)
HH Wealth Index	Information about household and livestock assets, house ownership and quality of house material, sanitary condition, quality of water, and source of energy used by the household	4 quantiles generated by using PCA	(Alkire et al., 2013), (Anderson & Eswaran, 2009), (Hanmer & Klugman, 2016)

Educated Community	The proportion of women with secondary or higher education in a community	A community in which at least 5% of women are educated (secondary or above) is considered as an educated community	(Kamanda et al., 2016), (Ekbrand & Halleröd, 2018)
Poor Community	The proportion of women living in poor households	A community in which above 40% of women belongs to poor households is considered a poor community	(Kamanda et al., 2016)

3.2.2. Section 2: Rural Women's Empowerment, Household Food and Nutrition Security

3.2.2.1. Rural Women's Empowerment and Household Food Security

Pakistan Rural Household Panel Survey (PRHPS) (IFPRI/IDS 2010-2014) collected information on a variety of food items and household consumption during the recall period of 7 days listed in the food security section of the household questionnaire.[6] Consumption list contains basic food items that are considered necessary for the dietary requirement of Pakistani people. In this part (food security) of questionnaire, respondents were asked to recall all the food items and drinks that their family had consumed during the previous week. The survey questionnaire includes a detailed food consumption data, which is a popular method to assess the situation of food security at the household level. The questionnaire includes food items consumed from own farm production, through market purchases, food gifts, and transfers. These food items are then converted into kcal according to food consumption table of Pakistan (GoP, 2001). Food security status of each household is calculated through daily calorie intake approach.

Status of Food Security

To estimate the food security of households, per capita calorie intake is calculated for each selected household in each region through dietary intake assessment (DIA) approach and Food Security Index (FS) was constructed. Quantities of food items are converted into grams from kg's or liters and then into calories with the guidance of food consumptions table for Pakistan (GoP, 2001). Food consumption tables provide calories amount of every food item in 100 grams of edible portion. Therefore, for each food item, per gram calories are computed. The data of food items is based on

[6] These household questionnaires included two further questionnaires i.e., male and female questionnaires that are designed to collect individual and household level information from (main male and female) respondents separately.

the 7-days recall period; therefore, household daily calorie intake is obtained by dividing the weekly data by seven and converted into single unit i.e., kcal per day to obtain household daily calorie availability. Calculated calories are then adjusted according to gender and age of household members by using caloric adjustment table and expressed in adult equivalent units.

Per Adult Equivalent (AE) Calorie Availability

Energy requirement depends on sex and age of person and therefore it varies across households. To account for these changes adult equivalence scale is used. The quantity of calorie availability i.e., kcal/day of each household is expressed in adult equivalent units by dividing daily household calorie availability by adult equivalent units. Households are analyzed based on equivalence scale to adjust household size (per capita units) on the basis of age and gender of household members. This method is useful because it measures actual food consumption by each household member along with their dietary quality. Furthermore, it also identifies individuals and households who are at risks. The adjustments of per capita units according to adult equivalence scale is important otherwise it underestimate the actual per person caloric requirement by overlooking the difference caused by household composition (Claro et al. 2010; Qaim and Kouser 2013).

Adult Equivalent size of household is calculated by using the following equation:

$$AE_h = \sum_{i=1}^{hhsize} AE_i \qquad (3.2)$$

Adult equivalent number (AE_i)[7] for each household member is calculated from calorie requirement scale for each age group mentioned in the Pakistan dietary guideline issued by the collaboration of government of Pakistan and FAO in 2018 (FAO & GoP, 2018) for measuring food security (see Table 3.4). Adult equivalent size/factor compares every person's energy needs from each household with that of an adult male with moderate activity. Adult equivalent size (AE_h) is estimated by summation of adult equivalence numbers of individuals at household level. It allows DIA comparisons among households by controlling sex-age differences.

[7] Adult equivalent size/factor compares every person's energy needs from each household with that of an adult male with moderate activity i.e. 2251 kcal per day.

Table 3.4: Adult Equivalent Scale to Calculate Daily Calorie Requirements with Respect to Age and Gender

Age (Years)	Body Weight (Kg)	Calories*(kcal)	AE Conversion Factors
Children			
0-6 months	6.0	524	0.2327
6-11 months	8.9	708	0.3145
1-3	12.1	1022	0.4540
4-6	18.2	1352	0.6006
7-9	25.2	1698	0.7543
Boys			
10-17	49.7	2824	1.2545
Girls			
10-17	46.7	2326	1.0333
Men			
18-59	65	3091	1.3731
60 and over	65	2496	1.1088
Women			
18-59	55	2408	1.0697
60 and over	55	2142	0.9515
Pregnant (+278)[8]			
12-17	-	2604	1.1568
18-59	-	2686	1.1932
60 and over	-	2420	1.0750
Breastfeeding (+450)[9]			
12-17	-	2776	1.2332
18-59	-	2858	1.2696
60 and over	-	2592	1.1514
National Average[10]		**2251**	1.0000

Source: Pakistan Dietary Guidelines for Better Nutrition by FAO and GOP (2018)

There are different threshold levels designed for estimating the dietary intake, used by various researchers at different times. For the present study, benchmark given by Food and Agriculture Organization (FAO) in 2014 for Pakistan i.e., 2251 Kcal/capita/day is used as a normative reference for sufficient nutrition, called average dietary energy requirement (ADER). Calorie requirement per

[8] Additional 278 kcal is required for pregnant women according to Pakistan Dietary Guidelines for Better Nutrition and it is with the collaboration of FAO and Government of Pakistan.
[9] Additional 450 kcal is required for lactating women according to Pakistan Dietary Guidelines for Better Nutrition and it is with the collaboration of FAO and Government of Pakistan.
[10] According to FAO, Average dietary energy requirement for Pakistan is 2251 in 2014.
http://www.fao.org/economic/ess/ess-fs/ess-fadata/en/#.YCvWh2j7TIU

capita is divided by ADER to obtain adult equivalent factors for every age group. Then it is multiplied by the number of household individuals in each age category by corresponding AE factors and sum the number of AE to obtain the total number of AE for each household.

Total calorie availability per day per adult equivalent $TC\ (tkcal)_h$ at household level "h" is measured by dividing the total calories of every household from AE size of respective household "h".

$$TC(tkcal)_h = \frac{tkcal_h}{AE_h} \qquad (3.3)$$

To estimate the household's food security status, $TC\ (tkcal)_h$ is compared with minimum dietary energy requirement (MDER). MDER is the threshold level defined by FAO[11] i.e. 1745 kcal per capita per day. It is the minimum amount of calorie requirement that is necessary to meet adequate energy needs of a person. It is assumed that when household is not capable enough to meet the MDER, it is unable to sustain its health and therefore it falls in food insecurity group. MDER is reported in calorie requirement per capita per day, therefore to convert it into calorie requirement per adult equivalent per day following formula is used in the analysis:

$$MDER = \left(\frac{1745 * N}{\sum AE_h}\right) \qquad (3.4)$$

N is the total sample size of households and $\sum AE_h$ is the summation of household adult equivalent factor. Food security status of households is calculated through equation 3.5 by accounting the difference between recommended and actual caloric intake.

$$FS_h = TC(tkcal)_h - MDER \qquad (3.5)$$

Where; FS_h is the food security status of h^{th} household, $TC\ (tkcal)_h$ is total calorie intake of h^{th} household per day per adult equivalent and $MDER$ is recommended threshold level per adult equivalent of food security for Pakistani population. A household unit is declared food secure if FS_h is greater than and equal to "0". Furthermore, from the analysis point of view, ordered logistic regression is employed because FS_h (dependent variable) is categorical variable. Probability of a

[11] http://www.fao.org/economic/ess/ess-fs/ess-fadata/en/#.YCvWh2j7TIU

household to fall into food security group is obtained by logistic regression and impact of women empowerment on household food security is estimated through key independent variable "RWCEI". Furthermore, impact of community characteristics is assessed via multi-level modelling at two levels (households and community).

Suppose household food security and rural women's empowerment have a linear relationship, food security status is determined through multi-level binary logistic regression at two levels as;

$$FS_h = \alpha_o + \beta_i RWCEI_i + \gamma_h y_h + \delta_k z_k + \varepsilon_r \quad (3.6)$$

Where; FS_h is the food security status of "h" households it equals one for food insecure households and zero for food secure.

In eq. (3.6), α_o is the intercept term, β_i is the coefficient of rural women composite empowerment index $RWCEI_i$, γ_h are coefficient of all household determinants, y_h is the vector of socio-economic attributes of h^{th} households, δ_k is the coefficient of all community level determinants, z_k is the vector of all community level characteristics of k^{th} community and ε_r is the error term. Eq. (3.6) can be rewrite as probability of a household to become food insecure or secure by using the logistic distribution function as narrated by (Gujarati & Porter, 2009).

$$P_h = E(FS_h = 1 | RWCEI_i + y_h + z_k) = \alpha_o + \beta_i RWCEI_i + \gamma_h y_h + \delta_k z_k \quad (3.7)$$

Where; P_h shows the probability of h^{th} household to experience food security situation, $RWCEI$ is the key independent variable, y_h and z_k are vectors of household and community level characteristics. $FS_h = 1$, shows that the household is food secure, and equation (3.7) can be written as;

$$P_h = E(FS_h = 1 | RWCEI_i + y_h + z_k) = \frac{1}{1 + e^{-(\alpha_o + \beta_i RWCEI_i + \gamma_h y_h + \delta_k z_k)}} \quad (3.8)$$

For simplicity equation 3.8 can be rewritten as;

$$P(FS_h) = \frac{1}{1 + e^{-\theta_j}} = \frac{e^{\theta_j}}{1 + e^{\theta_j}} \quad (3.9)$$

Equation 3.9 is cumulative logistic distribution function, $P(FS_h)$ is the probability of h^{th} household to become food secure and θ_j is the vector of explanatory variables.

$$1 - P(FS_h) = \frac{1}{1 + e^{\theta_j}} \qquad (3.10)$$

Where; $1 - P(FS_h)$ in equation (3.10) exhibits the probability of h^{th}households to become food insecure from secure.

$$\frac{P(FS_h)}{1 - P(FS_h)} = \frac{1 + e^{\theta_j}}{1 + e^{-\theta_j}} = e^{\theta_j} \qquad (3.11)$$

Equation 3.11 represents the odd ratio i.e. ratio of the household's probability of food secure to the probability of food insecure. This equation can be converted into logit model by taking the natural logarithm, as;

$$L_h = ln\left[\frac{P(FS_h)}{1 - P(FS_h)}\right] = \alpha_0 + \beta_i RWCEI_i + \gamma_h y_h + \delta_k z_k + \varepsilon_r = \theta_j \qquad (3.12)$$

Where L_h is the natural log of odd ratio and it is linear in both explanatory variables and coefficients. It represents how the log odds changes in favor of food security as respective variable changes.

3.2.2.2. Rural Women's Empowerment and Household Nutrition Security

Healthy food and good quality of diet is usually associated with diversified diet and adequate amount of nutrient intake. Three main facets of nutrition insecurity i.e., dietary diversity and dietary quality is estimated by considering a household level as a unit of analysis. Household dietary diversity scores (HDDS) and household dietary quality scores (HDQS) serve as a qualitative measures that exhibit household's diversity among food items and food groups along with quality of diet (FAO, 2010). These are simple tools which clearly exhibits the dietary quality of households (Hatloy, Torheim & Oshaug, 1998; Torheim et al., 2003). HDDS is examined by adding the number of food groups and HDQS is measured by using recommended nutrient intake (RNI) as a threshold level. Different indices were developed in the past to measure dietary diversity and food variety e.g. Healthy Eating Index (Kennedy, OHLS, Carlson & Fleming, 1995), Diet Quality Index (Haines, Siega-Riz & Popkin, 1999) and Chinese Diet Quality Index (Stookey, Wang, Ge, Lin & Popkin, 2000).

The present study calculated dietary diversity scores and dietary quality scores at the household level to measure the nutritional status and relationship of rural women's empowerment with these measures in rural areas of Pakistan. Pakistan Rural Household Panel Survey (PRHPS) (IFPRI/IDS 2010-2014) collected information on a variety of food items and household consumption during the recall period of 7 days. There are 19 different types of foods and beverage items listed in the food security section of the household questionnaire. List contains basic food items that are considered necessary and essential for the dietary requirement of Pakistani people. In this part (food security) of questionnaire respondents were asked to recall all the food items and drinks that their family had consumed during the previous week. These food items are then categorized into 12 food groups (Table 3.5). The data on these specific food items in a food list were collected from 2090 households located in 76 mouzas (villages).

Next 24hr data is employed for the estimation of household food quality. To measure that either household is consuming the right amount of nutrients the study estimated macronutrients (proteins) and micronutrients including vitamins (A, B, and C) and minerals (calcium, iron, iodine, and zinc) in their diet plans, and utilized the Pakistan dietary guidelines with FAO standards for daily recommended allowances of these nutrients according to different age groups (FAO & GoP, 2018). Each type of nutrient is converted into standard milligrams equivalents according to the food composition table (FCT) for Pakistan (GoP, 2001). The daily intake of all household members was summed up and compared with the recommended daily nutrient intake (RNI) by age, sex, and physical condition (pregnancy and lactation) of household members. These nutrients are selected for the study because they are considered as a priority concern in diets now a days in South Asian countries (H. A. Harris-fry et al., 2018) an in Pakistan generally (Lowe et al., 2011; Akhtar, Ahmed, Ahmad et al., 2013; Akhtar, Ahmed, Randhawa et al., 2013).

Household Dietary Diversity Score (HDDS)

Household dietary diversity score (HDDS) represents the number of food groups consumed over the period of seven days. However, there is no universal agreement on how many food groups should be included in the scoring system (FAO, 2010). Twelve food groups are proposed by FAO to measure the nutritional security at the household level (FAO, 2010). Food consumption score (FCS) developed by the World Food Program (WFP) to measure the HDDS (WFP, 2008) was used in the present study. It measures the scores by assigning weights to food groups consumed by a

household during the seven days. Eight food groups were deduced from twelve food groups, used by the present study on the grounds of nutritional attributes and proposed by FAO to measure the nutritional security at the household level (FAO, 2010). These food items examined during the survey and also found in literature depending on local food habits. List of these groups is given in the table below.

The food consumption score was calculated using standard weights for each food group, and a continuous variable with a range of 0 to 112 was generated. Starches, pulses, fruits, vegetables, meat, dairy, sugar and fats are among these food groups. The formula, based on these groups, with the standard weights, is:

$$FCS = (Starch\ Staples * 2) + (Pulses * 3) + (Vegetables * 1) + (Fruits * 1) + (\text{Meat/Fish/Eggs}*4) + Milk/Dairy * 4) + (Fats * 0.5) + (Sugar * 0.5) \quad (3.13)$$

The reason for assigning unequal weights was that every food group did not have equal importance in calculating the total scores because of different nutritional attributes. For example, fats and sugar have less significance in a healthy diet as compared to milk, meat, and pulses. Therefore, accounting for these differences was crucial in estimating the true picture.

Table 3.5. Food Groups Used for Household Dietary Diversity Score

Food Groups	
Plant Origin	
Cereals and grain products	Wheat, Rice, Sorghum, Maize, Millet, Barley
Tubers and Roots	Potato, Turnip
Legumes, Nuts and Seeds	Pulses, Beans, Lentils, Peas, Nuts and Seeds
Vegetables	Vitamin A rich vegetables, dark green leafy vegetables, other vegetables
Fruits	Vitamin A rich fruits, other fruits
Animal Origin	
Meat	Organ meat, flesh meat, poultry
Eggs	Chicken eggs
Fish and other sea foods	Fresh and dry
Milk and milk products	Milk, cheese, yogurt, butter
Others	
Oils and fats	Ghee, butter, vegetable oils
Sweets	Sugar, honey, gur, sweetened soda, juice drinks, chocolate, candies, cookies, cakes
Spices, condiments, and beverages	Salt, pepper, condiments, tea and coffee

Source: FAO, (2010) and Keding et al. (2012)

Household Dietary Quality Score (HDQS)

Household Dietary Quality Score (HDQS) is a good measure to calculate the nutrition security of households because people are consuming just cereals in their diets and not include fruits and vegetables, milk and milk products, so their diet remains deficient in essential micro and macronutrients (Brazier et al., 2020; Popkin et al., 2020). Therefore, the required amount of nutrients is essential for a healthy and active human body. To measure that either household is consuming the right amount of nutrients the study estimated macronutrients (proteins) and micronutrients including vitamins (A, B, and C) and minerals (calcium, iron, iodine, and zinc) in their diet plans, and utilized the Pakistan dietary guidelines with FAO standards for daily recommended allowances of these nutrients according to different age groups (FAO & GoP, 2018). Each type of nutrient is converted into standard milligrams equivalents according to the food composition table (FCT) for Pakistan (GoP, 2001). The daily intake of all household members was summed up and compared with the recommended daily nutrient intake (RNI) by age, sex, and physical condition (pregnancy and lactation) of household members.

Conversion factors are used to convert all nutrients into single unit milligram for analysis. In this study all these nutrients are considered as important one that cause significant deficiencies that results malnutrition and under nutrition in especially rural people of Pakistan. Therefore, daily intake of all household members is summed up and recommended daily nutrient intake summed up for comparison. Those households who fell below the recommended threshold level are considered nutrient-deficient households and they are consuming poor quality of diet. And those who lied above the threshold level are considered nutrient-rich households as they were meeting their nutrient requirements and consuming good quality of diet.

$$HDQS_h \geq RNI_h = 1 \qquad (3.14)$$

$$HDQS_h < RNI_h = 0 \qquad (3.15)$$

$HDQS$ is the score of households $'h'$, and it equals one when its score is equal to or greater than recommended nutrient Intake (RNI_h), and it is calculated for each household.

$HDQS$ is the score of households h, and it equals to one when its score is equal to or greater than recommended nutrient Intake (RNI_h), and it is calculated for each sampled household. The scores

of households are calculated by dividing the total nutrient intake of households tNI_h by adult equivalent factor AE_h of household.

$$HDQS_h = \frac{tNI_h}{AE_h} \qquad (3.16)$$

Household members are summed up according to adult equivalent factors as mentioned earlier to account for age and sex difference. Adult equivalent size (AE_h) is calculated by summation of adult equivalence numbers of individuals at household level. It allowed nutrient comparisons among households by controlling sex-age differences. After creating the nine macro and micronutrient variables, we then developed a household dietary quality index through principal component analysis (PCA) and used this index as a dependent variable in the analysis (Lee et al., 2016).

3.2.2.3. Key Independent Variable

Rural Women Composite Empowerment Index (RWCEI)

We developed the "Rural Women Composite Empowerment Index" (RWCEI) based on the studies of Alkire et al. (2013) and N. Ahmad & Khan (2016). The present study measured women's empowerment through nine domains and eighty-nine indicators. Different questions are used in measuring these domains. Answers to all questions are summed up and cut off of 30% was used as a threshold level to identify a woman empowered in each domain. A binary variable was generated for each domain i.e., either a woman was empowered in a particular domain or not (1=empowered, 0=not empowered). From all of these nine domains, an index was calculated by using factor analysis with tetrachoric correlations[12] that represented a somehow true picture of woman empowerment in rural areas of Pakistan. Studies investigated that factor analysis is a useful technique for the construction of index (Sinharoy et al., 2019).

[12] A factor analysis of a matrix of tetrachoric correlations is more appropriate when input variables are dichotomous (Uebersax, 2000 & Stata, 2013).

3.2.2.4. Control Variables:

Table 3.6. Description of Explanatory Variables used in the Analysis of Household Food and Nutrition Security

Variables	Description	Measurement	Previous Studies
RWCEI	Rural women composite empowerment index	Index (0.055 - 1.999) Continuous variable	(S Sharaunga et al., 2016) (Bashir et al., 2013)
Household Size	Number of household members in an family	Continuous variable	(Qaim & Kouser, 2013) (S Sharaunga et al., 2016), (Azeem et al., 2016) (Bashir et al., 2013), (Farzana et al., 2017),
Occupation of HH	Household either involved in agricultural occupation or not	Agricultural occupation =1; otherwise =0	(Azeem et al., 2016), (Farzana et al., 2017), (Sraboni et al., 2014)
Unemployment to employment ratio	Ratio of non-earning to earning members of a household	Continuous variable	(Hahn, Riederer & Foster, 2009)
HH Employment Status	Head of HH involve in primary or secondary occupation (Agriculture, non-agriculture, Private, business entrepreneurship)	Yes=1; No=1	(Savari et al., 2020)
HH Food Expenditures	Expenditures on daily food items	Continuous variable	(Ishaq et al., 2018b)
HH Wealth Index	Information about livestock assets, house ownership and quality of house material, sanitary condition, quality of water and energy source	4 quantiles generated by using PCA	(Alkire et al., 2013), (Hanmer & Klugman, 2016)
Educated Community	Proportion of women with secondary or higher education in a community	A community in which at least 5% of women are educated (secondary or above) is considered as educated community Yes=1; No=1	(Kamanda et al., 2016), (Savari et al., 2020)
Healthy Community	Number of health facilities available in a community (private pharmacy/drugstore, doctor, lady health worker, private clinic, trained midwife, public dispensary, basic health unit, traditional healer, traditional birth attendant etc)	A community in which above 15 health facilities were present was considered healthy community Yes=1; No=1	(Antai, 2009)

3.2.2.5. Multi-Level Mixed-Effect Logistic Regression

We had three dependent variables in the analysis and nature of all variables was different. We used ordered logistic, linear, and binary logistic regression for FS, HDDS, and HDQS respectively. To incorporate the hierarchical composition of the data set (i.e. individuals were nested in households and households were nested in the 19 communities) multi-level modelling was adopted as suggested by Kamanda, Madise, and Schnepf (2016).

Three models are used for comparison. **Model 1** is the food security (FS) model and it focused on calorie intake by the households. **Model 2** is the dietary diversity model (HDDS) and it focused on a number of food groups consumed by the households. **Model 3** referred to the dietary quality (HDQS) and it described nutrient intake by the households.

The two-level model is written as follows:

$$logit\ (\pi_{ik}) = \log\left[\frac{\pi_{ik}}{1-\pi_{ik}}\right] = \beta_0 + \beta_i RWCEI_i + X_{ik} + \mu_{0k} \qquad (3.17)$$

Where π_{ik} is the probability of household FNS for the i_{th} household in the k_{th} community. $RWCEI$ is the key independent variable and X_{ik} is the vector of covariates corresponding to the i_{th}household in the k_{th}community, β_o is the vector of parameters and $\mu_{ok}$is the random effect at the community level. The intercept (average probability) of being food and nutrition secure was assumed to vary randomly across communities. The fixed effects (measures of association) were expressed in odds ratios (OR) and 95% confidence interval (95% CI). The random effects (measures of variation) are expressed as variance coefficients. We used the post estimation command to determine the p-value of variance.

3.2.3. <u>Section 3:</u> Rural Women's Empowerment and Household Vulnerability to Food Insecurity

Vulnerability is generally defined as the extent of system's tolerance towards hazards when they experience harm (Ibok et al., 2019). Food vulnerability means, household's capability to cope up with food related shocks in a stressful condition in order to sustain their food requirement. These shocks influence households differently in different magnitudes. Index method is employed in the present study to define the status of vulnerable households. Index is depended on three domains i.e., exposure, sensitivity, and adaptive capacity. This index is somehow a new approach in

economics to measure household vulnerability to food insecurity (Ibok, Osbahr & Srinivasan, 2019), inspired by sustainable livelihood framework (IPCC, 2007; Hahn, Riederer & Foster, 2009).

3.2.3.1. Construction of the Household Vulnerability to Food Insecurity Index (HVFII)

Households' vulnerability to food security is examined at three levels i.e. exposure, sensitivity and adaptive capacity (Ibok, Osbahr, and Srinivasan 2019 ; IPCC 2007 ; Antwi-agyei et al. 2012 ; IPCC 2001). **Exposure** level relates to food related shocks, and it threaten food availability of households. This level of shock reflects the extent to which a household faces risk, danger or hazard (IPCC, 2001; Antwi-agyei et al., 2012; Fellmann, 2012). Households respond to these shocks by making the use of their valuable assets. In a vulnerability lens, household's ability to react is called its **adaptive capacity**. Adaptive capacity can be defined as "the capability of household to successfully accommodate to the impact of food related shocks through coping mechanisms" (Engle, 2011). Those household having high adaptive capacity stand stronger in case of shocks occurrence and likely adjust to food vulnerability. **Sensitivity** refers to the system's degree of responsiveness towards stress conditions (IPCC, 2001). It reflects the effects of food shocks such as hunger, malnutrition or mortality etc. on households and it is used in the formation of index because it shows accumulative or previous results of food insecurity on households (Ibok et al., 2019). Finally, household's response towards a shock is classified into several outcomes. These outcomes are utilized to categorize households into various groups of vulnerability. These categories are highly vulnerable, mild vulnerable and not vulnerable to food insecurity.

The conceptual framework of Ibok, Osbahr, and Srinivasan (2019) is employed for the present study in the estimation of household vulnerability to food insecurity in Pakistan. There are three domains in the design of HVFII, i.e.: exposure, sensitivity and adaptive capacity. Table 3.7 categorizes the HVHII components and related indicators from the Pakistan Rural Household Panel Survey (PRHPS) (IFPRI/IDS 2010-2014).

Table 3.7. Domains and indicators used for the household vulnerability to food insecurity index (HVFII)

Domains	Indicators	Description of Variables
Exposure probability of covariate shocks occurring	Health Shock	• Illness / Accident / Disability of main earning member of the household • Medical expenses due to illness or injury • Death of main earning member of the household
	Unemployment Shock	• A member lost job • Expecting a job but couldn't find employment • Lowered income of any member

		• Bankruptcy • Loss of assets • Unusual increase in rent • Unusual increase in other prices • Dowry payment • Family dispute on property
	Natural Disaster	• Flood • Drought • Crop Insect/disease outbreak • Epidemic • Earthquake • Fire • Storm
	Food price shock	Increase in price of major food items consumed
	Civil conflict shock	• Loss of Harvest due to natural calamities • Theft of livestock • Kidnapping • Violence against women • Honour killing • Murder • Dowry/Cost of marriage
Sensitivity Previous/accumulative experience of food insecurity	Malnutrition	Length/height-for-age (stunting)
	Child mortality	Total number of children dead in each household
	Hunger	Total number of days' households gone without eating any food
Adaptive capacity how household respond, exploit opportunities, resist or recover from food insecurity shocks	Wealth Index	• Agricultural Assets • Mobility Assets • Livelihood Assets • Housing structure characteristics
	Access to infrastructure	• Household distance to nearest major road (km). • Household distance to nearest market (km). • Time taken to walk one way to the water source from household dwelling (minutes).
	Livelihood activities	• Total income of household from savings, property's rent and income of other types • Estimated revenue from non-farm businesses • Total yield of crops harvested (kg)
	Household literacy	Cumulative years of schooling for household heads or closest individual[13] in the household.

In the next step weights for these indicators and domains are assigned by using Principal Component Analysis (PCA) (Gbetibouo et al., 2010 ; Madu, 2012). Finally, HVFII scores computed by using aggregation method as shown in the following equation:

[13] If the household head lacks education, this is the next person in line, who has the highest level of education and at least five years of schooling. If more than one person has the same educational qualifications, the person who is the most senior in age is used.

$$HVFII_h = \sum AC_h - [\sum E_h + \sum S_h] \quad (3.18)$$

Where, E_h is the index of exposure domain, S_h is the index of sensitivity domain and AC_h is the index of adaptive capacity. Households with negative or lesser HVFII composite values were more vulnerable to food insecurity as compared to those households who have positive and higher HVFII composite scores. Higher the composite score of HVFII, lower is the vulnerability towards household food insecurity.

HVFII Threshold:

A household may be vulnerable to food insecurity, yet simply stating that it is vulnerable is insufficient. Thus, a household is considered vulnerable if its adaptive capacity would be insufficient and remain unable to adjust it successfully in the stressful conditions of exposure and sensitivity. HVFII threshold defined for the present study is where household's adaptive capacity is greater than combined impact of exposure and sensitivity. For this estimation each domain is given equal weight of 0.33, i.e. each domain represents 1/3 dimension of vulnerability (Ibok et al., 2019).

When;

$$if: (E_h + S_h) > AC_h, household\ is\ vulnearble\ to\ food\ insecurity$$
$$if: (E_h + S_h) < AC_h, household\ is\ not\ vulnerable\ to\ food\ insecurity$$

Control Variables

In addition to rural women composite empowerment index (RWCEI), several other control variables associated to socio-demographic indicators of household and community level have been used in the statistical analysis. Table 3.8 contains a list of all the control variables, along with their descriptions and literature support.

Table 3.8. Description of Explanatory Variables Used in the Analysis of Household Vulnerability to Food Insecurity (HVFII)

Variables	Description	Measurement	Previous Studies
	Household Predictors		
Sex of HH head	Female headed households	(Female=1, Male = 0)	(Azeem et al., 2016), (Clement et al., 2019), (Eshetu & Guye, 2021)
Age of HH head	Age of head in years	Continuous variable	(Azeem et al., 2016) (Eshetu & Guye, 2021)
Household Size	Number of household members in an family	Continuous variable	(S. Sharaunga et al., 2016), (Azeem et al., 2016), (Eshetu & Guye, 2021)
Number of children in HH	Number of all children residing in one household	Continuous variable	(Ekbrand & Halleröd, 2018)
Employment status of HH	Head of HH involve in primary or secondary occupation (Agriculture, non-agriculture, Private, business entrepreneurship)	(Yes =1, No =0)	(Savari et al., 2020)
Agriculture employment	Household either involved in agricultural occupation or not	(Yes = 1, No = 0)	(Sraboni et al., 2014), (Azeem et al., 2016), (Farzana et al., 2017)
Non-farm employment	Household either involved in non-farm occupation or not	(Yes = 1, No = 0)	(S. Sharaunga et al., 2016) (Eshetu & Guye, 2021)
Dependency ratio	It is the ratio of dependents that are not in the labour force (ages 0 to 14 and 65+) and those typically in the labour force (ages 15 to 64)	Continuous variable	(Hahn, Riederer & Foster, 2009)
Total land (Acres)	Agricultural land owned by household	Continuous variable	(Clement et al., 2019), (Eshetu & Guye, 2021)
HH Wealth Index	Information about livestock assets, house ownership and quality of house material, sanitary condition, quality of water and energy source	4 quantiles generated by using PCA	(Alkire et al., 2013), (Hanmer & Klugman, 2016), (Clement et al., 2019)
Participation in social safety net programs	Household receiving benefits from programs like, BISP, PRSP, NRSP, PPAF, Bait-ul-mal, Zakat, Edhi, Punjab Food Support Program, PM's Youth Employment Program etc.	(Yes =1 , No = 0)	(Scaramozzino, 2006), (Eshetu & Guye, 2021)
HH Food Expenditures	Expenditures on daily food items	Continuous variable	(Scaramozzino, 2006), (Ishaq et al., 2018b)
	Food and nutrition security predictors		

Food Consumption Scores	Scores generated on the basis of food groups consumed by household	Continuous variable	(Ibok et al., 2019)
Food security status	Adequate amount of calories consumed compared by minimum dietary energy requirement (MDER)	(Food secure =1, otherwise = 0)	(Ibok et al., 2019)
Household dietary quality Index	Index created by employing 9 macro and micronutrients and compared with recommended nutrient intake	(adequate consumption of macro and micro nutrients = 1, otherwise = 0)	(Holland & Rammohan, 2019)
Community Predictors (N=19)			
Basic Health Units	Number of health facilities available in a community (private pharmacy/drugstore, doctor, lady health worker, private clinic, trained midwife, public dispensary, basic health unit, traditional healer, traditional birth attendant etc)	A community in which above 15 health facilities were present was considered healthy community (Continuous)	(Scaramozzino, 2006), (Antai, 2009)
Educated Community	Proportion of women with secondary or higher education in a community	A community in which at least 5% of women are educated (secondary or above) is considered as educated community (Yes =1 , No = 0)	(Kamanda et al., 2016), (Savari et al., 2020)
Number of schools in community	Primary schools, lower secondary, secondary and upper secondary schools	Continuous variable	(Scaramozzino, 2006)
Number of improved infrastructures in community	Improved road, bridge, market, water supply, electricity and irrigation conditions in last year	Continuous variable	(Scaramozzino, 2006), (S. Sharaunga et al., 2015), (Eshetu & Guye, 2021)

CHAPTER 4

RESULTS AND DISCUSSION-RURAL WOMEN EMPOWERMENT

4.1. Introduction

This chapter present results for the assessment of rural women empowerment and its indicators. Firstly, the summary statistics of indicators used to assess women's empowerment are reported. The status of rural women's empowerment by proportion of domains explaining it is then analyzed. Domains wise distribution of rural women's empowerment shows the percentage of rural women who are empowered in each category. Further women are also divided in to empowered and dis-empowered category for each indicator. Section 4.2.3 presents the results based on factor analysis and regression analysis.

4.2. Descriptive Statistics

In terms of mean, minimum, maximum values, standard deviation, frequencies, and percentages, Table 4.1 provides the descriptive statistics for all variables included in the analysis of measuring the impact of determinants on rural women's empowerment.

Table 4.1. Descriptive Statistics of Variables Used in the Analysis of Rural Women's Empowerment

Variables	Mean	Std. Dev	Min	Max	Frequency	% age
RWCEI	2.2977	1.0712	1	4		
0					440	23.39
1					883	46.94
2					116	6.17
3					442	23.50
Age	42.8639	12.832	15	88		
Education	0.1191	0.8371	0	12		
Marital Status (Yes)	0.9239	0.2651	0	1	1,738	92.40
Dowry (Yes)	0.8783	0.3271	0	1	1,652	87.83
Delivery at hospital (Yes)	0.1122	0.3157	0	1	211	11.22
No. of Sons	2.3174	1.8713	0	11		
Employment Status (Yes)	0.2717	0.4449	0	1	511	27.17
Access to Credit (Yes)	0.9197	0.2718	0	1	1,730	91.97
Mass Media Exposure (Yes)	0.3562	0.4790	0	1	670	35.62
HH Wealth Index						
Poor	-	-	-	-	-	-
Middle	0.2472	0.4315	0	1	465	24.72
Rich	0.2519	0.4343	0	1	474	25.20
Richest	0.2515	0.4339	0	1	473	25.15
Educated Community (Yes)	0.4279	0.4949	0	1	805	42.80
Poor Community (Yes)	0.5072	0.5001	0	1	954	50.72

Authors' calculations based on data from PRHPS (IFPRI/IDS 2014)

Table 4.1 displays estimates of rural women's empowerment in Pakistan. According to estimates, overall, 23 % of rural women are disempowered in all domains. The eldest woman in our sample is of age 88 and about 92% of rural women were married in our sample. One can clearly notice that 50% of sampled rural women belong to poor community, it means that they don't have access to basic facilities in their respective communities. Statistics shows that only 27% sampled women were employed, it means that 73% of rural women don't have income resources to spend money according to their will in household's food expenditures. Statistics also shows one interesting insight that rural women don't visit hospitals for their delivery cases, only 11% rural women go hospitals. It means that they also don't visit medical facilities for other health care issues. These figures exhibit poor status of rural women.

4.2.1. The proportion of domains explaining rural women empowerment

Figure 4.1 shows that mobility (20%), time allocation (20%), and violence[14] (20%) domains contribute the most to women empowerment in rural Pakistan. We observed that in these domains they are pretty much empowered and jointly they are 60% empowered in these domains. Whereas economic empowerment (1%), qualification (1%), and awareness (3%) (about community organizations and access to electronic media) domains got the least significance. The reason behind this is that rural women are generally uneducated and don't have any kind of vocational pieces of training, therefore they are not empowered in this domain. Moreover, they don't have any access to credit and ownership of assets, along with no exposure to electronic media and community organizations, that's why the study finds them un-empowered in economic and awareness domains. Jointly these domains contribute less than 5% to empowerment status.

14 This domain operates in the inverse direction, increasing to indicate the disempowerment level of a woman. Therefore in order to make a direct relationship with women empowerment we took women who didn't face domestic violence in this domain.

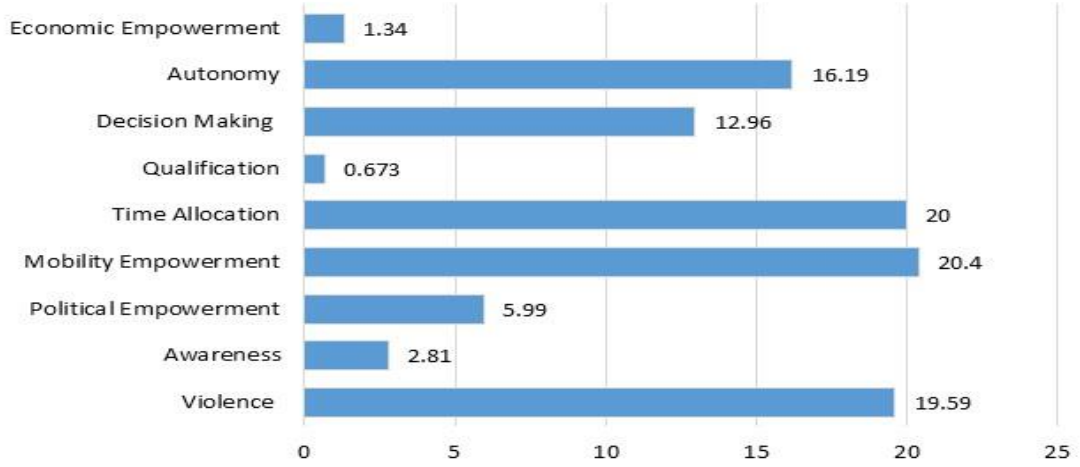

Figure 4.1 Proportion of domains explaining RWCEI in Rural Pakistan. Source: Author's calculations

4.2.2. The proportion of empowered and dis-empowered rural women in the sample

This section provides an overview of the proportion of women who were empowered in different categories. We divided four categories of RWCEI into two categories to show a clear picture of empowerment and dis-empowerment. The empowerment category contained high and medium empowered women (of RWCEI) and the disempowerment category contained low and no empowered women (of RWCEI). Results show that women belong to a younger age had a lower likelihood of receiving empowerment status. Women with lower socio-economic status (women with no education, who were not married, not employed along with not ownership of any kind of asset and lived in poor wealth quantile) had a lower likelihood of getting empowerment. Women who did not deliver their children in hospitals, which means they didn't have access to basic health facilities had a low probability of receiving empowerment status. Moreover, women who had no exposure to mass media like TV, Radio, or Newspaper had a low likelihood to fall in the empowerment category.

There is an interesting result of dowry in this table that is exactly according to the norms of rural societies of Pakistan i.e. women who brings dowry at their marriage are considered to be empowered and results are aligned with this concept (Noureen, 2015). Women with no dowry had a lower likelihood of getting empowerment status. Women who had not to have access to money at home, which means they couldn't make purchases according to their own will be remarkably lower (less than 5%) chances of getting empowerment. Similarly, women who belonged to poor households had a low probability of becoming empowered. Results indicate that with the increase

in the number of sons, women had greater chances of getting empowerment in rural areas of Pakistan.

Table 4.2. Proportion of Empowered/Dis-Empowered Women in Rural Areas of Pakistan

Variables	Empowerment Status		
	Yes Empowered *(High, Medium)* **n (%)**	**No Not Empowered** *(low and No Emp)* **n (%)**	**Total N %**
Age			
Younger	61 (19)	256 (81)	317 (100)
Middle	240 (31)	527 (69)	767 (100)
Elder	257 (32)	540 (68)	797 (100)
Education			
No Education	528 (29)	1296 (71)	1824 (100)
Primary or Secondary	30 (59)	27 (41)	57 (100)
Marital Status			
Yes	538 (31)	1200 (69)	1738 (100)
No	20 (14)	123 (86)	143 (100)
Delivery at hospital			
Yes	71 (34)	140 (66)	211 (100)
No	487 (29)	1183 (71)	1670 (100)
No. of Sons			
0-4	400 (26)	1117 (74)	1517 (100)
5-11	158 (43)	206 (57)	364 (100)
Employed			
Yes	207 (41)	304 (59)	511 (100)
No	351 (26)	1019 (74)	1370 (100)
HH Wealth Index			
Poor	111 (23)	369 (77)	480 (100)
Middle	130 (28)	333 (72)	463 (100)
Rich	169 (36)	305 (64)	474 (100)
Richest	148 (32)	316 (68)	464 (100)
Mass Media Exposure			
Yes	288 (43)	382 (57)	670 (100)
No	270 (22)	941 (78)	1211 (100)
Ownership of Assets			
Yes	177 (31)	390 (69)	567 (100)
No	381 (29)	933 (71)	1314 (100)
Access to Credit			
Yes	556 (32)	1174 (68)	1730 (100)
No	2 (1)	149 (99)	151 (100)
Dowry			
Yes	503 (30)	1149 (70)	1652 (100)
No	55 (24)	174 (76)	229 (100)
Poor Households			
Yes	258 (27)	696 (73)	954 (100)
No	300 (32)	627 (68)	927 00)

4.3. Statistical Analysis

4.3.1. Factor Analysis

Nine domains selected from the literature were subject to factor analysis to develop a better understanding of women's empowerment in the context of rural Pakistan. KMO value for the sample is 0.5 i.e., equal to the threshold level and meets the required criteria for factor analysis. Bartlett's test of Sphericity in this study shows a significant value of chi-square (1814.56) at a significant p-value (0.000), which suggests that the population correlation matrix is not an identity matrix. Both tests show there is sample adequacy for factor analysis and strengthens the appropriateness of the use of factor analysis in this study.

The tetrachoric correlation matrix is used in factor analysis. The basic aim is to construct a set of new factor loadings out of an initial set of input variables. The loadings are chosen so that the constructed loadings (factors) satisfy two conditions: firstly, the factors are uncorrelated, and secondly, the first factor loading absorbs maximum possible variation from the set of input variables, the second factor absorbs remaining variations left from the first factor and so on. So, for the present study first factor is used in the construction of the index (Table 4.3). Literature shows that studies also used the first factor for the construction of the index (Alesina & Perotti, 1996 & Ali et al., 2013).

Weights are generated by using the first factor loading (Table 4.3). These weights are then multiplied with nine domains to create a composite woman empowerment index i.e. (RWCEI). The main idea behind using the factor analysis is to give unequal weights to all domains, unlike WEAI, in which equal weights are assigned to the domains for the construction of the index. The main crux of the study is to find out which domain is contributing more to determining empowerment status for a rural woman.

$$RWCEI = (0.046 * Eco\_Emp) + (0.081 * Autonomy) + (0.044 * Decisio\_Making) + (0.014 * Qualification) + (0.055 * Time\_Allocation) + (0.556 * Mobility) + (0.050 * Political\_Emp) + (0.052 * Awareness) + (0.10 * Violence)$$

Table 4.3. Results of Factor Analysis

Domains	Factor Loading	Weights
Economic Empowerment	0.1470	0.0464
Autonomy	0.2570	0.0811
Decision Making	0.1394	0.0440
Qualification	0.0445	0.0140
Time Allocation	0.1751	0.0552
Mobility	1.7599	0.5557
Political Empowerment	0.1589	0.0502
Awareness	0.1660	0.0524
Violence	0.3191	0.1007
Sum	3.1669	1.0000
Eigen Value	3.391	
Variance %	61.47	
Kaiser-Meyer-Olkin method of sampling adequacy	0.5	
Bartlett's Sphericity Test:		
Approx. Chi-Square	1814.556	
d.f	36	
Significance	0.000	

Weights are used to generate empowerment scores of rural women.

$$s_i = w_1 d_{1i} + w_2 d_{2i} + w_3 d_{3i} + \cdots\cdots\cdots\cdots + w_9 d_{9i}\ , (2)$$

Where $d_i = 1$, if the woman "i" has adequate achievement in domain "d" and $d_i = 0$ otherwise, and w_d is the weight attached to each domain. Woman empowered in all domains has a score equal to 1. These scores are further used in making four categories of RWCEI as follow:

Table 4.4. Categories of Rural Women Composite Empowerment Index (RWCEI), based on Factor Loadings

Status	Categories	Scores range
No Empowerment	0	0 – 0.7556
Low Empowerment	1	0.7580 – 0. 8367
Medium Empowerment	2	0.8386 – 0.8429
High Empowerment	3	0.8451 – 1.000

4.3.2. Multi-level Mixed-Effects Ordered Logistic Regression

To identify individual and community level characteristics that explain women's empowerment in rural areas of Pakistan we used multilevel mixed-effect ordered logistic regression with categories of women empowerment as a dependent variable. The ordered logit model is used because the dependent variable is a low to a high categorical variable, in which "0" indicates no empowerment and "3" represents high women empowerment. We used marginal effects to present results that explain the probability of an outcome to happen with respect to particular independent variables. When the dependent variable is in ordinal form marginal effects is a useful procedure to interpret the results (Shockley et al., 2020). Marginal Effects give the average change in probability when the explanatory variable increases by one unit. Marginal effects were computed for this study by using the fourth response category because we are interested in the high empowerment category of women. However, fundamental results are the same for both the third and fourth categories (i.e., medium, and high empowerment).

Table 4.5 shows the findings from three models, comprising coefficients and marginal effects with their respective standard errors in parenthesis. The total variance in high empowerment associated with the community level was initially estimated using the empty model (Model 0) which contains no variables and only partitions the total variance in high empowerment. The variance was significant across the communities (τ= 0.479, ρ = 0.01). It means that variation in empowerment achievement is occurring due to the community levels, indicating that differences in communities are explaining the likelihood of high empowerment to some extent. As shown by the variance partition coefficient (VPC), the intra-community correlation is 8.9% in the table.

Individual-level characteristics were introduced as women level covariates in Model 1 and their slopes were allowed to vary to explore their effects across communities. With the introduction of women's age, education, marital status, and dowry the likelihood of being high empowered was increased, as they were statistically significant variables and had a positive relationship with women empowerment. Different studies considered age as an important determinant of women empowerment and they revealed that, as age increases women improve her knowledge and build self-confidence to cope up with daily matters, which leads them towards high empowerment (Mason, 1986; Jejeebhoy & Sathar, 2001; Mostofa et al., 2008; Hussain & Jullandhry, 2020).

Moreover, Sell & Minot (2018) and Kamanda et al. (2016), suggested that as the age and education of females increases, empowerment enhances, and education influences positively on decision-making ability of women. Our results augmented this argument by showing that with the increase of 1 year in age and education, the probability of increasing high empowerment was 0.3% and 2% respectively. Moreover, Noureen (2015) pointed out that education is not only a prerequisite for achieving empowerment in Pakistan but also it plays a significant role in removing domestic violence from society.

Table 4.5. Results from Multi-Level Mixed Effect Ordered Logistic Regression

Variables	**Model 0** *(Empty Model)*		**Model 1** *(Individual level Characteristics)*		**Model 2** *(Community level characteristics)*	
	β (SE)	**ME[15] (SE)**	**β (SE)**	**ME (SE)**	**β (SE)**	**ME (SE)**
Fixed Effects						
Individual Characteristics						
Age			0.018***	0.003***	0.018***	0.003***
			(0.004)	(0.001)	(0.004)	(0.001)
Education			0.138**	0.020**	0.135**	0.020**
			(0.065)	(0.009)	(0.066)	(0.010)
Marital Status			1.831***	0.270***	1.841***	0.267***
Yes			(0.204)	(0.034)	(0.204)	(0.034)
Dowry			0.275*	0.041*	0.277*	0.040*
Yes			(0.159)	(.024)	(0.159)	(0.023)
Delivery at Hospital			0.257*	0.038*	0.255*	0.037*
Yes			(0.155)	(0.023)	(0.155)	(0.023)
No. of Sons			0.101***	0.015***	0.101***	0.015***
0-11			(0.026)	(0.004)	(0.026)	(0.004)
Employment Status			0.673***	0.099***	0.675***	0.098***
Yes			(0.114)	(0.018)	(0.114)	(0.018)
Access to Credit			2.900***	0.428***	2.912***	0.423***
Yes			(0.235)	(0.044)	(0.236)	(.043)
Mass Media Exposure			1.071***	0.158***	1.067***	0.155***
Yes			(0.107)	(0.018)	(0.107)	(0.018)
HH Wealth Index						
Poor			1	1	1	1
Middle			0.241*	0.036*	0.234*	0.034*
			(0.142)	(0.021)	(0.142)	(0.021)
Rich			0.329**	0.049**	0.313**	0.045**
			(0.149)	(0.022)	(0.150)	(0.022)
Richest			0.317**	0.047**	0.295*	0.043*
			(0.161)	(0.024)	(0.161)	(0.024)
Community Characteristics						

[15] ‘‘ME" indicates the marginal effect of the variable on the probability of the fourth outcome of the dependent variable, which is supportive of the high empowerment of rural women.

The proportion of women living in poor households in the community (Poor Community)				-0.169 (0.445)	-0.024 (0.065)
The proportion of women with secondary or higher education in a community (Educated Community)				0.652* (0.379)	0.095* (0.054)
Region of Residence					
Punjab		0.518 (0.536)	0.076 (0.079)	0.585 (0.602)	0.085 (0.087)
Sindh		0.301 (0.593)	0.044 (0.087)	0.648 (0.769)	0.094 (0.111)
KPK		1	1	1	
	Empty	Individual -level		Community-level	
Random Effects					
Community Level Variance (SE)	0.479***	0.452***		0.522**	
VPC (%)	(0.171) 8.9	(0.164) 6.5		(0.214) 7.1	
Model Fit Statistics					
AIC	4373.503	3907.269		3907.152	
Wald chi2	-	376.83		378.74	
(Prob > chi2)	-	0.000		0.000	
Log-Likelihood	2182.7514	1935.6346		1933.5761	
Observations	1881	1881		1881	

Note: Intercept cut points are excluded from the output
Model "0" contained no variables, Model "1" included individual-level characteristics, and Model "3" was adjusted for community-level characteristics.
Abbreviations: β= Coefficients, SE= Standard Error, ME= Marginal Effects, AIC= Akaike Information Criteria.
*= p <0.1, ** = p <0.05, *** = p <0.01
Data Source: Pakistan Rural Household Panel Survey (PRHPS) (2014)

Chances of getting high empowerment increases by 27% on average in married women as compared to unmarried/divorced/widowed. In Pakistan, different studies also explored the same relationship (Ahmad et al., 2017; Hussain & Jullandhry, 2020). They found that married women have good decision-making power, and she can better participate in household decisions. Moreover, they concluded that married women feel comparatively more empowered due to participation in household matters like spending on clothing, health, and furniture, etc.

Similarly, the impact of dowry is also positive, and it showed that women who get dowry at their marriage had more probability i.e., 4.1% on average of getting high empowerment as compared to those who didn't get dowry. Our results are in line with different studies that pointed out the importance of dowry given by parents at the time of marriage (Bates et al., 2004; Parveen, 2007). These studies revealed that dowry is considered as financial security for women, and with this security, she felled empowered. Moreover, Bates et al. (2004) declared that a lack of dowry was the prime cause of low status, powerlessness, and vulnerability of women in their husbands' house.

Figure 4.2 provides a visualization of the marginal effects and standard errors of this model. It is clear from the figure that positive marginal effect of age, education, being married (as compared to being unmarried), and had dowry (as compared to hadn't dowry) as the estimates (marked with a dot) is above zero (marked with a vertical line) and the 95% error bars on each side of the estimates (horizontal lines) do not cross the zero line.

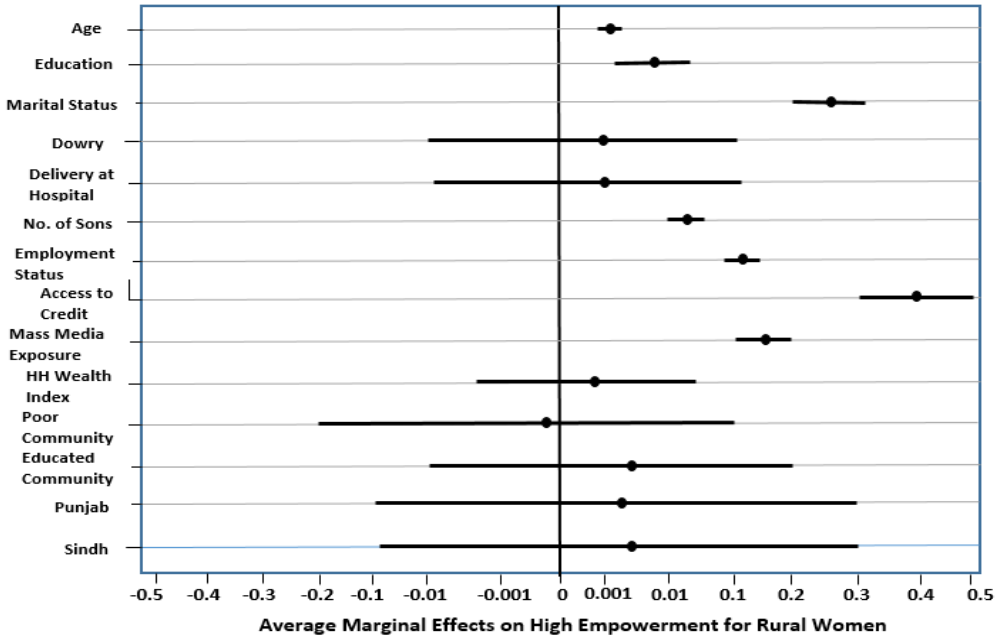

Figure 4.2. Predictors of "high women empowerment": average marginal effects from the multilevel ordinal logistic regression model

Table 4.5 provides one very interesting insight about empowerment status i.e., women who gave birth to their children at hospitals (private or government) had a greater probability i.e., 3.8% of being high empowered as compared to those who gave birth to their children at homes. Delivery at the hospital is a very useful variable to assess the healthcare outcomes of rural women. Mostly rural women don't seek medical care for themselves and tried to solve their problems at home, therefore their health is compromised and neglected which leads to low empowerment. Healthy women can take better care of their children and family. Therefore, hospital delivery is considered an important determinant of women's empowerment. Antai (2009) also supports this argument by saying that role of hospital delivery is an important preventive measure against maternal and child health outcomes. There is a myth in rural areas of Pakistan that a woman who has more sons as compared to her daughters is considered to be a more empowered woman. Sons are supposed to be the pillar of their families, help them in monetary terms, and support in their old ages. Javed & Mughal,

(2018) concluded women's preference for sons and investigated that with an increase in the number of sons, women's participation in household decision-making increases. Our finding also supported this argument by indicating that there are chances of increasing high empowerment by 1.5% if a woman gave birth to one more son. In Pakistan, Akram, (2017) also identified the link between a number of sons and women empowerment, and his study showed that there is a positive relationship between them and with the increase in the number of sons, women decision making at the household level increases and overall empowerment enhances.

Results show that empowerment status can be well defined by women's economic empowerment. In this study, we used variables, employment status, and access to credit for explaining the economic wellbeing of women. These two variables are highly significant and have a positive relationship with the high empowerment of women. A woman who was employed had 10% more chances of getting high empowerment on an average as compared to unemployed women. Similarly, women having access to credit had a 43% more probability of getting high empowerment as compared to the women who don't have any access. The same is the case with household wealth. With the increase in household wealth, there are more chances of women's high empowerment. This study supports the argument laid by Aluko (2015) that by providing economic power to women, women's status improves, and in turn, it contributes to community development. Oladokun et al. (2018) strengthen the argument by saying that asset ownership improves economic empowerment and helps to sustain unforeseen shocks. Moreover, they concluded that employment status and education play a catalyst role in asset ownership, which leads towards the improved status of women.

Communication is very important for upraising women's status and mass media can play a better role in this. Studies investigated that women's growth in education and employment is attributable to media. In today's world, mass media, print, and electronic media, and social media play a vital role in transmitting information that can help in reshaping people's behaviors, attitudes, and thinking styles of societies (Narayana & Ahamad, 2016; Premlata & Jukariya, 2018). Shockley et al. (2020) demonstrated that social media usage has a positive and significant impact on gender attitudes especially increased support for female leadership at the community level. Media has highlighted women's rights and tried to reshape people's opinions about women's entitlements. Results from Table 4.5 support these arguments and display that there are 16% more chances of high empowerment for women who used mass media as compared to the women who don't have

exposure. A woman who listens to the radio, watch TV, or read a newspaper is directly linked to the world, she is aware of circumstances prevailing outside, so she is more empowered. Figure 4.2 also shows that the effect of employment status, access to credit, and mass media exposure is positive and significant, with estimates being above zero as well as within the 95% error bars.

In comparison to Model 0, the variation in high empowerment in Model 1 also remained significant across communities (τ=0.452, ρ =0.01). The variance of high empowerment across women and across communities was explained by women level characteristics i.e., 6.5% indicating that a portion of the high empowerment clustering within areas is attributed to the community's composition by women's characteristics.

It is discussed by many researchers that women empowerment is a context-specific concept (Mason & Smith, 2003; Akter et al., 2017). Therefore, in order to assess the impact of contextual variation on women empowerment, we finally introduced "Model 2" which incorporated community-level variables i.e., proportion of women who are educated (secondary or higher) and the proportion of women living in poor households in a community. Rural women belong to the community in which the proportion of educated women was higher had a high likelihood i.e., 10% of getting high empowerment as compared to those communities in which there was no secondary or higher education. The intuition behind this concept is that an educated community influences positively on women's empowerment which in turn affects children's wellbeing. This result is in line with Kamanda et al. (2016) which state that with an increase in the proportion of mothers' education in the community, children's education also improves. But on the other side women who live in a poor community had lower chances of getting high empowerment i.e., 2.4%. According to our results, this variable is not statistically significant, which means that living in a poor community had no role in the empowerment status of rural women. In comparison to Model 1, the community level variation remained significant (τ= 0.522, ρ= 0.05), with VPC 7.1% indicating that community variations in the likelihood of high empowerment were partly due to the composition of the communities by community-level characteristics. Successively lower values of Akaike Information Criterion (AIC) with each subsequent model (Table 4.5) shows that each model improves significantly from the previous model and indicates the goodness of fit of the respective model employed in the present analysis.

Achieving rural women’s empowerment is not only a goal in itself, but it also links other SDGs like ending poverty and hunger, improved nutrition and healthy lives, quality education, and sustainable economies. The present study reiterates the need of revitalizing women's empowerment in order to attain sustainable and peaceful economies which in turn lead towards sustainable development around the globe (Arestoff & Djemai, 2016; United Nations, 2019; Hussain & Jullandhry, 2020).

CHAPTER 5

RESULTS AND DISCUSSION- RURAL WOMEN'S EMPOWERMENT AND HOUSEHOLD FOOD AND NUTRITION SECURITY

5.1. Introduction

Governments are often encouraged to introduce the policies to reduce the incidence of food and nutrition insecurity at household level. But these policies will not work until government is not well aware of the causes of food and nutrition insecurity. Therefore, to reduce these insecurities an in-depth analysis of different channels by which the people caught into this trap is essential. We have checked one channel by assessing the role of rural women's empowerment in this scenario.

This chapter present results for the estimation of household food insecurity and household nutrition insecurity. The summary statistics of food insecure and nutrition insecure households were assessed in section 5.2. Section 5.3 reports the assessment of rural women's empowerment in reducing the prevalence of food and nutrition insecurity. This assessment is based on the results from multi-level mixed effect analysis, which also incorporates the role of communities' in analyzing the situation.

5.2. Descriptive Statistics

Descriptive statistics for this section are presented in Table 5.1. The results show that 54% of the sampled households are involved in agricultural occupation, while 85% of household's heads are earning through employment and only 25% of households are in rich category of the wealth quantile. In our study, around 44% communities have a proportion of women with secondary or higher education, and 44% communities have basic health facilities for their members. Furthermore, Table 5.1. highlights that only 33% of households are experiencing high food security. Maximum food consumption scores are 107 out of 112 and minimum are 5.5. Moreover, 50% prevalence of undernourishment is observed in terms of macro and micro nutrients in the sampled households. Our results indicate that vitamin A is rich in their diets but there was minimum intake of iodine (1%).

The share of each group in the diets are reported in Figure 5.1, which shows that major share in the diets of rural people was from sugar, fats/oils and starch, and their diets are deficient from healthy food items like fruits, pulses and meat. Our findings are in line with the Brazier et al., (2020), which states that because of low income and limited access to affordable nutritious food, families placed

emphasis on purchasing low cost food items like grains and rice, that are rich in starch but low in micronutrients. This in turn results in various micronutrient deficiencies, especially of iodine, iron and zinc.

Table 5.1. Summary Statistics of the Sampled Households and Communities for Household Food and Nutrition Security Analysis

Variables	Mean	Std. Dev.	Min	Max	Freq.	Percentage
Household Level Variables						
Women Empowerment	1.683	0.351	0.055	1.999		
Family Size	7.257	3.322	2	37		
Household Occupation (Agriculture)	0.500	0.500	0	1	1,020	54.23
Unemployment to employment ratio	3.331	2.304	0	11		
HH Head employment status (Employed)	0.852	0.355	0	1	1,603	85.22
Household food expenditures	5.560	0.552	1.168	8.462		
Wealth Index						
Poorest	0.250	0.433	0	1	471	25.04
Poorer	0.247	0.432	0	1	465	24.72
Middle	0.252	0.434	0	1	474	25.20
Rich	0.251	0.434	0	1	473	25.15
Food Security						
Food Insecurity	0.308	0.462	0	1	627	33.33
Mild Food Security	0.308	0.462	0	1	627	33.33
High Food Security	0.308	0.462	0	1	627	33.33
Calorie supply (kcal/day/AE)	1843.234	1209.316	428.0024	42178.51		
Nutrition Security						
Food Consumption scores	67.01	14.08	5.5	107		
Prevalence of undernutrition	0.505	0.500	0	1	931	49.49
Macro and Micro Nutrients						
Protein intake (mg/day/AE)	0.682	0.466	0	1	1,280	68.23
Calcium intake (mg/day/AE)	0.211	0.408	0	1	395	21.06
Iron intake (mg/day/AE)	0.779	0.415	0	1	1,461	77.88
Iodine intake (mg/day/AE)	0.011	0.103	0	1	20	1.07
Zinc intake (mg/day/AE)	0.094	0.292	0	1	176	9.38
Vitamin A intake (µg RE/day/AE)	0.954	0.209	0	1	1,790	95.42
Vitamin B intake (mg/day/AE)	0.700	0.458	0	1	1,314	70.04
Vitamin C intake (mg/day/AE)	0.366	0.482	0	1	687	36.62
Community level variables						
Educated Community	0.438	0.496	0	1	825	43.86
Healthy Community	0.485	0.499	0	1	831	44.18

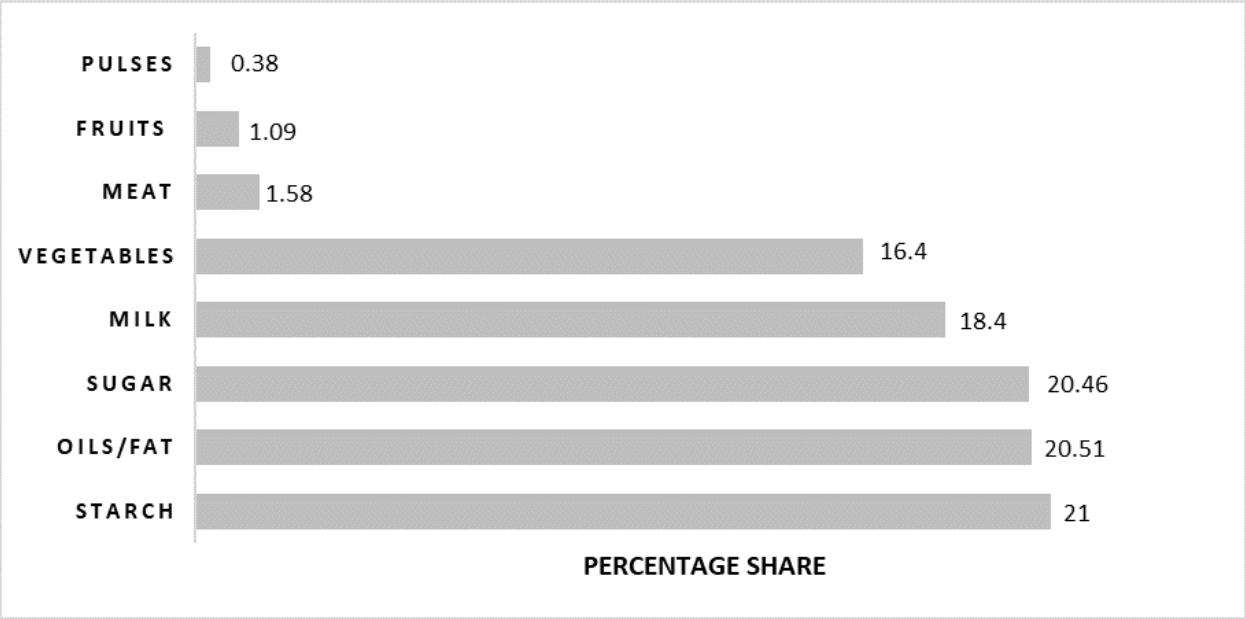

Figure 5.1. Percentage share of eight food groups in the diets of rural households. Source: Authors own calculations

5.3. Statistical Analysis

5.3.1. Impact of Rural Women's Empowerment on Household Food and Nutrition Security

We adopted the multi-level mixed effect regression models to explain the relationship between food security, nutrition security and women's empowerment. Such type of models are useful when data is nested within groups (Austin & Merlo, 2017). In our case, households were nested in 19 communities a two-level multilevel logistic regression was employed with households at level 1 and communities at level 2. Results for food security are presented by using caloric intake as response variable and nutrition security are presented by using dietary diversity and dietary quality as response variables in model 1, 2 and 3 respectfully. The fixed effects (measures of association) are expressed both in coefficients and odds ratio (OR) with their respective standard errors (SE) and 95% confidence intervals (95% CI) in parenthesis. The random effects (measures of variation) are expressed as Variance Partition Coefficient (VPC). The odd ratio explains the probability of an outcome to happen with respect to particular independent variables. It gives the percentage change in probability when an explanatory variable increases by one unit and is a useful method to interpret the results (Austin & Merlo, 2017).

Table 5.2 shows the results from all three models. We used three different multi-level models depending on the nature of dependent variables. As food security variable has three categories (1=food insecurity, 2= mild food security and 3=high food security), we used ordered logistic regression. For representing nutrition security, we had two variables i.e., household dietary diversity scores (HDDS) and household dietary quality scores (HDQS). For HDDS we used linear regression because this dependent variable is in continuous form and we adopted binary logistic regression for HDQS because of dichotomous nature of this variable. The total variance(τ) in food and nutrition security associated with the community level was initially calculated by using the null model for all dependent variables which includes no variables and focus only on decomposing the total variance in community components. The variance for all models was significant across the communities i.e., Model 1: τ= 0.379 ρ =0.01, Model 2: τ= 26.296 ρ = 0.001, Model 3: τ= .365 ρ =0.01 and variance partition coefficient (VPC) or intra-community correlation explains that 9.7%, 13.2% and 9.9% variation in the variables of food and nutrition security is explained by variation in communities respectively. It means that variation in the status of food and nutrition security is occurring due to the community levels, indicating that differences in communities are explaining the likelihood of improving food and nutrition security.

Table 5.2. Results from Multi-level Mixed-Effect Models of Food Security and Nutrition Security

	Food Security		**Nutrition Security**		
	Caloric Intake (Model 1)		***HDDS (Model 2)***	***HDQS (Model 3)***	
Predictors	**Coefficient (SE)**	**Odd Ratio (95% CI)**	**Coefficient (SE)**	**Coefficient (SE)**	**Odd Ratio (95% CI)**
Fixed Effect Household Predictors (N=1879)					
RWCEI	0.529**	1.698**	2.481*	0.684**	1.981**
	(0.255)	(1.030-2.799)	(1.432)	(0.299)	(1.103-3.559)
Family Size	-0.408***	0.665***	-0.167*	-0.444***	0.641***
	(0.022)	(0.636-0.695	(0.100)	(0.028)	(0.607-0.678)
Household	0.462***	1.587***	0.028	0.513***	1.669***
Occupation	(0.116)	(1.264-1.992)	(0.673)	(0.137)	(1.277-2.184)
Agriculture=1					
Unemployment to	-0.036*	0.965*	-0.235**	-0.098***	0.906***
employment ratio	(0.022)	(0.924-1.007)	(0.127)	(0.026)	(0.861-0.954)
Head employment	0.448***	1.565***	1.392*	0.404**	1.497**
status	(0.141)	(1.187-2.063)	(0.836)	(0.169)	(1.076-2.084)
Yes=1					

	Food Security		Nutrition Security		
	Caloric Intake (Model 1)		*HDDS (Model 2)*	*HDQS (Model 3)*	
Predictors	**Coefficient (SE)**	**Odd Ratio (95% CI)**	**Coefficient (SE)**	**Coefficient (SE)**	**Odd Ratio (95% CI)**
Household food expenditures	2.241*** (0.136)	9.406*** (7.201-12.285)	7.859*** (0.658)	1.547*** (0.151)	4.696*** (3.493-6.314
Wealth Index					
Poorest	1	1	1	1	1
Poorer	0.097 (0.148)	1.102 (0.825-1.471)	1.289 (0.874)	0.121 (0.174)	1.129 (0.802-1.588)
Middle	0.084 (0.156)	1.087 (0.802-1.475)	4.033*** (0.927)	0.153 (0.184)	1.166 (0.812-1.674)
Rich	0.336** (0.165)	1.399** (1.013-1.934)	6.569*** (0.985)	0.596*** (0.196)	1.814*** (1.234-2.667)
Region of residence					
Punjab	0.963 (0.807)	2.618 (0.538-12.747)	1.168 (3.082)	0.444 (0.839)	1.559 (0.301-8.064)
	1	1	1	1	1
KPK	1.406 (0.926)	4.079 (0.664-25.065)	3.861 (3.906)	1.195 (1.059)	3.303 (0.414-26.355)
Sindh					
Community Predictors (N=19)					
Educated Community	0.909** (0.439)	2.481** (1.048-5.878)	3.031* (1.714)	1.385** (0.596)	3.994** (1.242-12.843)
Healthy Community	0.579** (0.292)	1.785** (1.006-3.166)	2.832** (1.405)	1.121*** (0.426)	3.069*** (1.333-7.067)
Random Effect Community Level					
Variance (SE)	1.174* (0.634)		27.445*** (11.033)	2.059* (1.131)	
VPC (%)	20.05		15.75	17.44	
Model Fit Statistics					
AIC	3412.635		**14794.18**	**2045.773**	
Wald chi2	429.75		**329.19**	**300.31**	
(Prob > chi2)	0.0000		**0.0000**	**0.0000**	
Log-Likelihood	-1690.318		-7381.088	**-1007.887**	

Note: Intercept cut points are excluded from the output
For Model '1', '2' and '3' we used ordered, linear and binary logistic regressions respectively.
Abbreviations: SE= Standard Error, CI= Confidence Interval, VPC= Variance Partition Coefficient, AIC= Akaike Information Criteria.
*= p <0.1, ** = p <0.05, *** = p <0.01

Table 5.2 presents results for three models of food and nutrition security by employing RWCEI as key independent variable, household level characteristics along with community level covariates and their slopes were allowed to vary to explore their effects across communities. Our results demonstrate that women's empowerment (RWCEI) increases the likelihood of high food security and nutrition security as the variable is statistically significant and had a positive relationship in all models. Different studies considered women's empowerment as an important determinant of food and nutrition security at household level, and they revealed that it is positively linked with food availability in terms of calories and nutrients, therefore, women empowerment has a direct link in improving household food and nutrition security (Sraboni et al., 2014). Our results augment this argument by showing that women's empowerment is associated with an increase in caloric intake, higher dietary diversity and quality. Empowered women had an increased probability of 70% for maintaining household food security, it means that empowered women can play a pivotal role through her authorities in increasing household caloric intake. Similarly, by increasing 1 unit of RWCEI, dietary diversity increases by 2.48 units and there is 98% probability that household's dietary quality is ensured with women's empowerment.

Employment status of household head is a significant variable in defining the status of household food and nutrition security. It ensures that household had enough income to maintain the consumption patterns, moreover, income growth through employment is important for the household nutrition both in terms of quantity (calories) and quality (nutrients) (Van den Broeck et al., 2020). Our results support this argument by indicating that employed household head had 57% higher probability of explaining higher level of food security than unemployed head, and with each additional member of family, probability of moving towards high food security decreases by 34%. Yousaf et al., (2018), reported that as family size increases, food security deceases. Similarly, there are 50% chances of achieving dietary quality through nutrient intake if household head is employed and addition of new member in a family is associated with 36% lower probability of dietary quality. Same is the case with HDDS as the scores increases by 1.392 units if household head is employed and decreases by 0.16 units for a new additional member in a family.

Agricultural occupation of a household had a positive impact in improving food and nutrition security. The hypothesis is that households involved in agricultural farming have more opportunities to get diversified food because they can grow different types of fruits and vegetables

in their own farms instead of purchasing from market with money. Our results demonstrate that with agricultural farming as an occupation, households had 59% of higher probability of achieving high food security as compared to the non-agricultural livelihoods. Similarly, the probability of nutrient intake increases by 67% with agricultural occupation. However, agricultural occupation had no impact on dietary diversity of households, potentially because it does not ensure the daily consumption of adequate food groups. However, if a household has earning members and have enough income, then it can spend money on purchasing food items to meet dietary requirements of its family members. This hypothesis is captured by household's expenditures on food items in the model. Previous studies investigated that, households involving in agricultural occupation have good food choices and more food expenditures, moreover, with income from agricultural activities they start investing on quality of food, and preference about healthy nutritious food increases as compared to less healthy food (Sraboni et al., 2014; Aziz et al., 2020). Our findings are aligned with these studies and show positive and significant relationship between expenditures on food items and caloric intake, dietary diversity, and dietary quality. With unit increase in expenditures probability of high food security and dietary quality increases by 9.4 and 4.7 odds respectively and dietary diversity by 7.85 units.

Dependency on earning members by non-earning members of the family is captured by unemployment to employment ratio in the model and results show that it has a significant negative impact on the household food and nutrition security. With an increase of more non-earning members, ratio increases and with unit increase in ratio, the probability of getting high food security decreases by 4%, nutrition security by 0.235 units and 10%, through dietary diversity and quality respectively. Similarly, household wealth had a positive and significant impact in improving food and nutrition security of rural households. Our results show that fourth category (i.e. rich) of wealth quantile is significant only in all models, while first three quantiles are insignificant. Our results are in-line with Harris-Fry et al., (2015), that at lower wealth levels only basic necessities are fulfilled and as wealth increases people start spending on health and lifestyles. So in our case results show that only rich households had 40% higher probability of high food security, 6.56 units increase in dietary diversity and 81% more likelihood of dietary quality.

To analyze the impact of contextual variation on household food and nutrition security, we finally introduced "Level 2" in the model, which incorporated community-level variables i.e., proportion of women who are educated (secondary or higher) and the number of health facilities in a

community. Households belong to the community in which the proportion of educated women was higher had a higher likelihood i.e. 150 % of getting high food security as compared to those communities in which there was no secondary or higher female education. Similarly, educated community increases the dietary diversity and quality in household's diets. The hypothesis is that an educated community influences positively on women's empowerment which in turn affects the knowledge about adopting the nutrient rich consumption patterns and healthy diets for family. This result is aligned with Kamanda et al. (2016) and Woldemicael & Tenkorang, 2010) which state that with an increase in the proportion of mothers' education in the community, maternal and children's health seeking behavior improves. Moreover, Sinharoy et al., (2019) argued that women's schooling was positively and significantly associated with individual and household diets. Household's well-being, healthy diets and better lifestyle are also associated with health facilities in a community. Because, these facilities can provide awareness about quality diets and helps households to seek better health practitioner at the time of need. It reduces the prevalence of food insecurity from the community and helps in promoting healthier environment (AHA, 2017).Therefore, it is necessary to have as many as facilities as possible in a community. Our results indicate that if a community has at least 15 small health facilities in the form of private pharmacy/drugstore, doctor, lady health worker, private clinic, trained midwife, public dispensary, basic health unit, traditional healer, traditional birth attendant etc. then there is 79% higher probability of getting high food security as well as dietary diversity increases by 2.832 units and 200% more chances household's dietary quality.

For the sake of robustness, we adopted a model discrimination approach which involved comparing the model diagnostics with, and without, the community variables. For this purpose, we dropped our community variables from all models in order to check that either our models are better fit without contextual variations or not. We compared AIC values between original and reduced models and we find that original models performed better with contextual variations as AIC values are lower in these models.

Moreover, we have also checked for endogeneity and omitted variable bias for the analysis. Variations can simultaneously affect the probability of household FNS and the RWCEI index. For example, an improvement in the access and quality of public education can raise incomes and hence reduce FNS; also, it can increase women's education and raise the RWCEI index. For this purpose, we have checked that either income and education are correlated with each other or not and we

found that they are correlated, then we dropped income variable and used wealth index instead of income variable. Similarly, we have checked correlation matrices for all independent variables and dropped correlated ones and used alternative ones. In this way a statistical approach is used to indicators choice that involves calculating the correlation between potential indicators and including the less correlated ones to minimize redundancy.

CHAPTER 6

RESULTS AND DISCUSSION-RURAL WOMEN'S EMPOWERMENT AND HOUSEHOLD VULNERABILITY TO FOOD INSECURITY

6.1. Introduction

This chapter presents the results for relationship between rural women's empowerment and household vulnerability to food insecurity. Food insecurity is subject to different risk factors, that will cause severe food insecurity in near future. There are different coping strategies for mitigating the risks related to food insecurities. We have explored the role of rural women's empowerment in this scenario. Firstly, the summary statistics of vulnerable and non-vulnerable households are presented in section 6.2. Section 6.3 deals with the results-based estimation technique named multi-level mixed effect regression to check the impact of rural women's empowerment in mitigating the risks towards food and nutrition insecurities.

6.2. Descriptive Statistics

The descriptive statistics of the sampled households and communities are presented in Table 6.1. Results indicate that 33% of households are facing high vulnerability to food insecurity. Most of the household's women in our sample are empowered in allocating time for herself, can go independently in/out their settlements and are not facing domestic violence. But they are facing disempowerment in financial terms and in education. A clear picture of the contribution of all domains in making women empowerment index is depicted in figure 6.1. Household characteristics show that average age of head is 47.416, and only 4% are female-headed households in the sample. Moreover, we have found that 51% of households are doing agricultural farming and 28% of households are receiving benefits from participating in social safety net programs. In addition, approximately 50% of households are not consuming adequate calories, macro-nutrients and micro-nutrients.

Community characteristics show that average number of health facilities in a community are 17 with approximately 50% of communities with improved infrastructure. Moreover, proportion of educated women are 43% and approximately 50% of communities have primary, secondary or upper secondary schools.

Table 6.1. Summary Statistics of the Sampled Households and Communities for Household Vulnerability to Food Insecurity Index (HVFII) Analysis

Variables	Mean	Std. Dev.	Min	Max	Freq.	Percentage
Dependent Variable HVFII						
HVFII	2.191	0.906	1	3		
Highly vulnerable to food insecurity	0.333	0.472	0	1	627	33.33
Mild vulnerable to food insecurity	0.142	0.349	0	1	268	14.25
Not vulnerable to food insecurity	0.524	0.499	0	1	986	52.42
Rural Women Composite Empowerment Index (RWCEI)						
Women Empowerment	0.774	0.168	0	.99968		
Economic Empowerment	0.061	0.239	0	1	124	6.11
Autonomy	0.735	0.442	0	1	1,491	73.48
Decision Making	0.588	0.492	0	1	1,193	58.80
Qualification	0.031	0.172	0	1	62	3.06
Time Allocation	0.907	0.290	0	1	1,841	90.73
Mobility Empowerment	0.926	0.262	0	1	1,879	92.61
Political Empowerment	0.272	0.445	0	1	552	27.21
Awareness	0.128	0.334	0	1	259	12.76
Violence[16] (disempowerment)	0.889	0.314	0	1	1,804	88.91
Household Level Predictors						
Female headed households	0.046	0.209	0	1	94	4.61
Age of HH head	47.416	13.392	19	94		
Household Size	7.263	3.324	2	37		
Number of children in HH	3.933	2.557	0	26		
HH Head employment status (Employed)	0.844	0.363	0	1	1587	84.37
Agriculture employment (Yes)	0.515	0.499	0	1	1049	51.47
Non-farm employment (Yes)	0.101	0.301	0	1	205	10.06
Dependency Ratio	1.191	3.491	0.004	81		
Total land (Acres)	1.793	4.949	0	90.006		
Wealth Index						
Poorest	0.250	0.433	0	1	471	25.04
Poorer	0.247	0.432	0	1	465	24.72
Middle	0.252	0.434	0	1	474	25.20
Rich	0.251	0.434	0	1	473	25.15
Participation in social safety net programs	0.285	0.452	0	1	581	28.51
Household food expenditures	5.537	0.773	1.168	8.462		
Food and Nutrition Security Predictors						
Food Consumption Scores	67.01	14.085	5.5	107		
Food security status	0.524	0.499	0	1	987	52.42
Household Dietary Quality Index	0.505	0.500	0	1	950	50.51
Community level predictors						
Basic Health Units	17.792	12.422	3	49		
Educated Community	0.436	0.496	0	1	821	43.62
Number of schools in community	0.438	0.496	0	1	818	43.79
Number of improved infrastructures in community	0.496	0.500	0	1	927	49.57

16 This domain operates in the inverse direction, increasing to indicate the disempowerment level of a woman. Therefore in order to make a direct relationship with women empowerment we took women who didn't face domestic violence in this domain.

6.3. Statistical Analysis

6.3.1. Impact of Rural Women's Empowerment on Household Vulnerability to Food Insecurity

To identify the relationship between women empowerment and vulnerability to household food insecurity we employed multi-level mixed effect ordered logistic regression. This approach is adopted because our analysis is based on the assumption that households are nested within the communities, and it provides fixed-effects that are homogenous across communities and random-effects that capture differences among the communities. The ordered logit model is used because the dependent variable is a low to a high categorical variable, in which "0" indicates high vulnerability and "2" represents no vulnerability. Table 6.2 presents the empirical findings by using women empowerment (RWCEI) as a key independent variable along with other control variables and vulnerability to household food insecurity (VHFII) as dependent variable. When the dependent variable is in ordinal form, marginal effects is a useful procedure to interpret the results (Shockley et al., 2020). It gives the average change in probability when the explanatory variable increases by one unit. Marginal effects are computed for this study by using the third response category as we are interested in the non-vulnerability of household food insecurity.

We fit three multi-level ordered-logistic regression models. First, null model (Model 1) is calculated without including any household or community level predictors. It incorporates community-specific random effects and partitions the total variance in non-vulnerability (i.e. third category of VHFII). The variance is significant across the communities (τ= 1.239, ρ = 0.01). It means that variation in the achievement of non-vulnerability of household food insecurity is occurring due to the differences in community levels, indicating that differences in communities are explaining the likelihood of decreasing vulnerability to some extent. As shown by the variance partition coefficient (VPC), the intra-community correlation indicates that 23.9% of variation in non-vulnerability is explained by variation between communities, and remaining 76.1% is attributable to variation between households. The second model contained 16 household predictors in addition to community-specific random effects and their slopes were allowed to vary in order to explore their effects across communities (Model 2). And the third model comprised both household level and community level predictors in addition to community-specific random effects (Model 3)

Results from Model 2 and Model 3, indicate that rural women's empowerment (RWCEI) increases the likelihood of non-vulnerability and help in reducing the risks of food insecurity at the household level, as the variable is statistically significant and has a positive relationship in both models. Women in rural areas play multiple important roles throughout the process of food production to food preparation and serve as agricultural entrepreneurs who dedicate their lives to maintain food and nutritional security of their families and communities, and ensure the continuity of food supply in times of economic distress (Galié, 2013; Das & Singh, 2020). Das & Singh (2020) concluded that empowerment of rural women is crucial to ensure self-reliance for mitigating the risks towards shocks in the future. Our results augment this argument by providing empirical evidence that probability of reducing vulnerability has increased with rural women's empowerment by 9.6 % and 8.4% in both models, respectively. It means that empowered women can play a pivotal role through her all domains (described above) in mitigating the risks of household food insecurity. Moreover, it is also evident from the previous studies that empowerment of rural women in all aspects, economic, political, social, familial, psychological and legal capabilities can help to achieve sustainable livelihoods (Mosedale, 2005; Das & Singh, 2020).

Azeem et al. (2016), demonstrated that female-headed households consume more food in terms of calories than male-headed households. Our results are further supporting the earlier finding by generating empirical evidence that, household's food and nutrition security improves and vulnerability to food insecurity reduces in the presence of female-headed household. We find that there is 8.5% and 7.8% probability of increasing non-vulnerability (or decreasing vulnerability) to food insecurity for female-headed than male-headed households in both models respectively. Similarly, age of household head also plays a significant role in reducing the vulnerability to food insecurity. Our results suggest that as age of head increases by one year, there is increased probability of getting non-vulnerability status. Because as people grow older they accumulate assets, gain experiences and adopt effective strategies to cope with shocks, reducing their household's susceptibility to food insecurity (Mthethwa & Wale, 2021). Furthermore, there is the possibility of receiving a retirement pensions and other advantages as one grows older, meaning that this knowledge and acquired assets enable households to build resilience to shocks and begin spending for a better standard of living. Additionally, it is evident from the study of Akter et al.

(2017) that, if household's head is female, then she will invest 10 times more of their earnings than men do in their family's well-being, including child health, nutrition and education.

Table 6.2 shows that the coefficient of family size, number of children in household and dependency ratio is negative and statistically significant implies that as number of family members or children increases or there is increase in dependency ratio, the probability of non-vulnerability to food insecurity decreases. Because when families grow they have more number of non-working people being fed by few working members, more mouths rely on limited income to survive, less savings for future investments and ultimately lower resource and food consumption per capita (Tawodzera, 2011; Sharaunga et al., 2015). Our results are in-lined with food availability theory of migration, which states that as family size increases, food availability decreases and it will lead towards lower resilience to food insecurity, hence vulnerability increases (Habtewold, 2018; Eshetu & Guye, 2021).

Household's head employment plays an important role in mitigating the risks on household food insecurity. Results from model 2 and 3 suggest that, with an employed household head there are 10.4% and 9.4% more chances of reducing vulnerability and gaining non-vulnerability status, respectively. An employed person has more income to spend money on purchasing food items to meet household's dietary requirements. Similarly, household wealth had a positive and significant impact on non-vulnerability to food insecurity. Our results are aligned with Harris-Fry et al., (2015) study, which shows that at lower levels of household wealth only basic necessities are fulfilled and as wealth increases people start spending on healthy food items and better lifestyles. So in our case results show that richest households have 20.6% and 17.3% higher probability of experiencing non-vulnerability status which is more than middle income and poor households. Our analysis presents empirical evidence that participation in safety net programs helps in reducing the problems of experiencing food insecurity. Our findings are consistent with Yehuala et al. (2018) and Eshetu & Guye (2021), studies that by participating in safety net programs, probability of experiencing non-vulnerability increases by almost 10% than without participation.

Our findings demonstrate positive and significant relationship with agricultural employment and insignificant with non-farm employment. Results indicate that, households involved in agricultural occupation has 5.6% and 4.4% more, probability of reducing the resilience towards vulnerability to food insecurity. The rationale behind the concept is that, families who are involved in

agricultural farming can easily grow different types of fruits and vegetables at farms and ultimately have more opportunities to get diversified and easily accessible food than persons who are involved in non-farm employment. Furthermore, Aziz et al. (2020) investigated that, households involved in agricultural occupation had good food choices. They spend their agricultural income on purchasing food items and investing in high quality food and make more food expenditures. As the food expenditures increases, there are less chances that households experience food insecurity and hence risks towards food insecurity also reduces. Our findings are aligned with these studies and show that with unit increase in food expenditures probability of getting non-vulnerability to food insecurity increases by 4.7% and 3.4% in both models, respectively. Similarly, Table 6.2 also shows that as food and nutrition of household improves in terms of caloric intake, food diversity and adequate consumption of macro and micro nutrients, vulnerability to food insecurity decreases. Agricultural land got huge significance in rural areas of Pakistan and considered as decisive ingredient of crop production. Which in turn determines the resilience towards household's food insecurity. Different studies have observed the negative relationship between land size, food insecurity, and vulnerability to food insecurity (Asenso-Okyere et al., 2013; Sani & Kemaw, 2019; Eshetu & Guye, 2021). Our study also confirms these findings by stating that as land size increases, vulnerability to food insecurity decreases.

With the introduction of community level predictors in the third model we intend to introduce contextual variations in our analysis. As it is evident from literature that communities play a pivotal role in shaping the societies. Similarly, dynamic communities also play a significant role in minimizing the risks and shocks towards food insecurity. Moreover, better communities can also play a crucial role in solving the issue in hand. Our findings demonstrate that community with basic health facilities and improved infrastructures, like improved roads, market facilities, water supply, electricity and irrigation facilities help in reducing the vulnerabilities towards food insecurity. As improved infrastructure, facilitates the whole process of food production from input market purchases to output market sales. And basic health units create awareness among people about healthy eating practices and helps in dealing with the illness caused by hunger and malnutrition. Which in turn reduces the risks of health shocks towards food insecurity. Similarly, education is associated positively and significantly in mitigating the vulnerability. Our results show that with increase in the number of schools in the community along with proportion of educated women, probability of experiencing non-vulnerability increases by 4.2% and 13.9 %,

respectively. The hypothesis is that an educated community improves the knowledge about adopting the nutrient rich food and how to save money for healthy consumption patterns for family. This result is aligned with Kamanda et al. (2016) and Woldemicael & Tenkorang (2010), which state that with an increase in the proportion of mothers' education in the community, maternal and children's health seeking behavior improves, which in turn helps in reducing the resilience towards food insecurity.

In comparison to Model 1, the variation in non-vulnerability to food insecurity in Model 2 (τ=1.028, ρ =0.01) and Model 3 (τ=1.671, ρ =0.05) also remained significant across communities, with VPC 17.7% and 22.9 %, respectively. These results indicate that community variations in the likelihood of non-vulnerability are partly due to the composition of the communities by community-level characteristics. Consecutively, lower values of Akaike Information Criterion (AIC) with each following model shows that each model improves significantly from the previous model and indicates the goodness of fit of the respective model employed in the present analysis.

We performed robust analysis to examine the impact of some different assumptions on our analysis. We adopted two approaches for sensitivity and uncertainty analysis: one-at-a-time approach that used alternative data type of dependent variable (i.e. continuous scores instead of categories) and a model discrimination approach that dropped crucial control covariates to examine their impact in analysis (Ibok et al., 2019). We found that execution of original ordinal logistic regression is superior than linear one and we compared AIC values between original and reduced models and we investigated that original models performed better with all crucial covariates, as AIC values are lower in these models.

Table 6.2. Multi-level Mixed-Effect Ordered Logistic Regression Estimates for the Relationship between Rural Women's Empowerment and Household Vulnerability to Food Insecurity

Variables	**Model 1** *(Null Model)*	**Model 2** *(Individual level Characteristics)*	**Model 3** *(Community level characteristics)*
	ME (SE)	**ME (SE)**	**ME (SE)**
Fixed Effects			
Women Empowerment Index (RWCEI)		0.096 (0.058)*	0.084 (0.052)*
Household Predictors (N=1868)			
Sex of household head (Female = 1, Male = 0)		0.085 (0.047)*	0.078 (0.042)*

Age (Head)	0.009 (.0008)***	0.008 (0.001)***
Family size	-0.0096 (0.005)*	-0.008 (0.005)*
Number of children in household	-0.025 (0.006)***	-0.022 (0.006)***
Household head employment (Yes =1, No =0)	0.104 (0.031)***	0.094 (0.028)***
Agriculture employment (Yes = 1, No = 0)	0.056 (0.024)**	0.044 (0.022)**
Non-farm employment (Yes = 1, No = 0)	0.019 (0.037)	0.021 (0.033)
Dependency ratio	-0.009 (0.003)***	-0.008 (0.003)***
Total land (Acres)	0.012 (0.003)***	0.009 (0.003)***
HH Wealth Index		
Poor	1	1
Middle	0.057 (0.027) **	0.045 (0.024) *
Rich	0.105 (0.029) ***	0.083 (0.028) ***
Richest	0.206 (0.034)***	0.173 (0.034)***
Participation in social safety net programs (Yes =1 , No = 0)	0.106 (0.022)***	0.097 (0.022)***
Food expenditures (log)	0.047 (0.019) **	0.034 (0.017)**
Food and nutrition security predictors		
Food Consumption Scores	0.003 (0.0007) ***	0.003 (0.0007)***
Food security status (Food secure =1, otherwise = 0)	0.076 (0.028)**	0.062 (0.025)**
Household dietary quality Index (adequate consumption of macro and micro nutrients = 1, otherwise = 0)	0.052 (0.028)*	0.045 (0.025)*
Community Predictors (N=19)		
Basic Health Units (Numbers)		0.005 (0.003)*
The proportion of women with secondary or higher education in a community (Educated Community)		0.139 (0.072)**
Number of schools in community		0.042 (0.025)*
Number of improved infrastructures in community		0.036 (0.021)*
Region of Residence		

Punjab		0.155 (0.137)	0.103 (0.155)
Sindh		0.132 (0.153)	0.144 (0.173)
KPK		1	1
Random Effects	Empty	Individual-level	Community-level
Community Level	1.239 ***	1.028 ***	1.671 **
Variance (SE)	(0.423)	(0.365)	(0.713)
VPC/ICC (%)	23.9	17.7	22.9
Model Fit Statistics			
AIC	4496.105	4215.099	4176.12
Wald chi2	-	263.07	268.69
(Prob > chi2)	-	0.000	0.000
Log-Likelihood	-1624.3664	-1459.6533	-1437.0625

Note: "ME" indicates the marginal effect of the variable on the probability of the third outcome of the dependent variable, which is supportive of the non-vulnerability to household food insecurity. AIC= Akaike Information Criteria.
*= p <0.1, ** = p <0.05, *** = p <0.01

CHAPTER 7

REVIEW OF POLICIES FEEDBACK/INTERVIEWS

Pakistan is an agricultural country that yields enough food to meet the population's food consumption needs. Our earth is growing at a faster rate than our ability to feed it. In the pace of swiftly changing climatic circumstances, we have to feed people with less water and less farming land. Faced with dwindling resources, properly feeding the population will necessitate increasingly innovative and dependable methods of food production. Agriculture, fortunately, is the world's oldest and most versatile industry. We might obtain some ideas for how to modify the future of our food system if we look back at some of humanity's oldest cultivation methods.

We are encountering variety of challenges because of our limited resources. Undernutrition indicators are disturbingly high, according to the National Nutrition Survey (NNS 2011). Food insecurity affects over 58 % of households. Anemia and calcium deficiency affect half of adult women, and nearly two-thirds are vitamin D deficient. About 15% of kids under the age of five have serious or moderately acute malnutrition that necessitates immediate medical attention, and one-third of youngsters are underweight. Furthermore, more than two-thirds of kids are affected by stunting, a standard indication of chronic malnutrition.

Considering the foregoing scenario, we've designed this chapter to provide insight into the various policies and research projects undertaken by experts and stakeholders from various ministries and renowned institutions. The main goal is to figure out what kind of activity is going on in the field of food security, nutrition security, and women's empowerment. We visited different ministries especially focussing on Ministry of National Food Security and Research (MoNFSR), Ministry of Planning, Development, and Special Initiatives (MoPD&SI), Ministry of Planning, development and Reform (MoPDR), and Ministry of Human Rights (MoHR) and conducted interviews with specialists on the subject.

7.1. Policies related to Food and Nutrition Security

In Pakistan, various policy initiatives are being implemented to ensure food security, including the establishment of the Ministry of National Food Security and Research (MoNFSR), the implementation of social safety nets and poverty reduction programmes, the provision of agricultural subsidies, and the establishment of the Pakistan Agriculture and Research Council

(PARC) to achieve sustainable agricultural production for food and nutrition security. The federal government has also formed the National Food Security Commission (NFSC), which is chaired by the Prime Minister, to design a national policy for the long-term resilience of food and nutrition security and agricultural expansion.

In 2013, Pakistan joined the global Scaling Up Nutrition (SUN) program, and a national Scaling Up Nutrition (SUN) secretariat was established in the Planning and Development Division. All provincial' governments have formed a SUN secretariat within their respective Planning and Development Departments. In conjunction with the World Food Program, MoNFSR is establishing the Zero Hunger Program to increase food security in Pakistan's targeted districts. Moreover, with UNICEF assistance, a national Infant and Young Child Feeding (IYCF) plan was designed and approved in 2015.

Multi-Sectoral Nutrition Protocols have been proposed in all provinces. The Punjab government has been providing Rs. 1,000 per household under the Punjab Food Support Scheme to help deserving families meet their food needs. It has helped one million low-income people so far. The fourth component of the KP Health Integrated Reforms Program, nutrition, is being implemented at a cost of Rs 20 million out of Rs 14.11 billion. In Baluchistan, a “Mother and Child Nutrition Program” has been launched in seven districts. The "Nutrition Support Program" and "Nutrition Sensitive Agriculture" projects in Sindh were launched at a cost of Rs. 582.00 million for three districts.

The following are the key features of Public Sector Development Programs (PSDP) programmes in the health sector:

7.1.1. Sehat Sahulat Programme

The Pakistani government has launched the "Sehat Sahulat Programme," a significant health-care effort with the goal of paving the way for Universal Health Coverage (UHC) in the nation. The program is not only a social health-protection initiative that is paving the way to achieving the "National Health Vision 2016-2025," but it is also a game-changer because it allows the government to provide medical service to the public from both public and private hospitals. In a nutshell, it is a programme for the poor that allows them to obtain necessary medical services in a timely and swift manner without incurring any financial commitments. The Sehat Sahulat Program is being carried out in phases, with the first phase (2016-2018) involving 38 districts and 3.2

million people. The project is implemented in 91 districts in the second phase (2019-2020), delivering assistance to 8.5 million families, and the number of participants is growing by the day.

7.1.2. "Ehsaas" Programme, Family Planning and Primary Healthcare Programme (FP&PHC)

The FP&PHC project, which has been strengthened by the Ehsaas Program, is attempting to control rising population. Pakistan has a 3.7 % Total Fertility Rate (TFR) and a 34.0 % Contraceptive Prevalence Rate (CPR) (PSLM, 2018-19). Pakistan has shown that it is committed to the encouragement of family planning. Each province has developed its own family planning strategy. The government is ensuring a variety of techniques that are freely accessible throughout the country and has educated mid-level providers in both the public and private sectors to offer IUDs and implantation. In addition, as part of its social movements, the government is cooperating with family seniors and religious figures to encourage acceptance of family planning. The governments of Punjab, Sindh, and Khyber Pakhtunkhwa have created health centres especially for adolescents. To maintain a strong national commitment, the government is working to expand regional coordination in order to reach 6.7 million new contraceptive users and increase CPR to 50%.

7.2. Policies related to Nutrition Security

Nutrition is regarded as a foundation of human development. It is a cross-cutting topic that is strongly linked to nearly all the SDGs. Malnutrition stifles growth and has negative implications for the human body. Focusing on nutrition is one of the most effective ways to combat hunger, stimulate economic growth, and provide wealth to the people and the country. Nearly one out of every nine individuals on the planet are hungry, and one out of every three is overweight. Malnutrition is a double burden in most countries, including Pakistan. According to the 2018 National Nutrition Survey (NNS), 40% of children under the age of five are stunted, 18% are wasted, and 29% are underweight. Overweight children under the age of five account for 9%. In Pakistan, more than half of adolescent girls (57%) and 42 % women of reproductive age are anaemic.

7.2.1. Nutrition Interventions/Activities

The interventions/activities listed below are being implemented at the national and provincial levels to combat malnutrition and its repercussions.

7.2.1.1.National Initiatives/Programs

- Around 1,006 wheat flour mills and 2,333 micro feeders are covered under the Food Fortification Program (Flour, Edible oil, and Salt) across the country.
- The Ministry of National Health Services, Regulations and Coordination (NHSR&C) has developed a nutrition-specific PC-1 "Tackling Malnutrition Induced Stunting in Pakistan" charging Rs 312 billion to resolve malnutrition and stunted growth among kids in 67 high-burden malnutrition districts across the country.
- For promotion and awareness across all demographic groups, an Urdu version of the revised "Pakistan Dietary Guidelines for Better Nutrition" has been published.
- The National Nutrition Thought Management Program (NNTMP) is being developed with the goal of educating and sensitizing all demographic groups on nutritional awareness and dietary choices in order to minimize malnutrition, especially among disadvantage groups.
- MNMIS (Multi-sectoral Nutrition Management Information System) is being created as a multi-sectoral source of data that will measure nutrition indicators physically and financially.
- The National Nutrition Forum (NNF) meets on a regular basis, and steps have been done to promote nutrition through policy planning, collaboration, and research and development.
- The following activities are carried out under the Scaling Up Nutrition (SUN) Networks: discussions of the National Steering Committee (NSC) on Early Childhood Development (ECD). The NSC is a top level inter-ministerial collaboration and decision-making body who provide strategic vision and guiding ECD initiatives.

7.2.1.2.Provincial Initiatives

- Punjab is implementing the Stunting Reduction Program, Human Capital Investment Program, and Ehsaas Nashonuma Program.

- The Integrated Nutrition Gain "Stunting Prevention and Rehabilitation in Khyber Pakhtunkhwa (KPK SPRING) programme is being implemented in four districts (Bannu, D.I Khan,Tank, and Nowshera). A new Rs 7.0 billion initiative called "Integration of Health Services Delivery" is being implemented across the province. Newborn, maternal, child health and nutrition will be the emphasis of the initiative.
- In Sindh, a Rs 5.6 billion Accelerated Action Plan (AAP) for stunting, malnutrition and reduction is being implemented in 23 Sindh districts where the rate of stunning is above 40%.
- Balochistan Nutrition Programme for Women and Infants has now been launched in seven districts of Balochistan.

7.3. The Ministry of National Food Security and Research (MoNFSR)

This ministry is developed in 2011 with main theme to ensure food security in rural areas. This ministry is well known for devising policies to ensure food and nutrition security in the areas of food availability, access, utilization, and stability. Moreover, they also ensure efficient and modern food production and distribution systems in the country. Specific aims for devising food security policies are to alleviate poverty, eliminate hunger, endorse sustainable systems for food production, making agriculture more profitable, productive, competitive and climate resilient. Based on these objectives we interviewed food security and wheat commissioner at this ministry. Ministry has main focus on first pillar of food security i.e., food availability. According to a ministry representative, ensuring food supply will naturally ensure the remaining pillars of access, utilisation, and stability. In addition, the ministry has a special focus on Pakistan's rural areas. Tools for support in rural economy are:

- Price mechanism support program (Minimum support price)
- Cash subsidies on agricultural inputs including seeds, fertilizers
- Incentives on agricultural implements
- National food security and agriculture policy with objective to food secure Pakistan
- Procurement policy

With the support of the Pakistan Agriculture Research Council (PARC), the Ministry imports seeds of hybrid crop varieties from various nations in order to boost productivity on limited cultivable land, ensuring food security and revenue generation. For nutrition security, the Ministry proposes a biofortification method, which entails developing seeds with larger percentages of micro and macronutrients. Furthermore, the ministry began a programme in conjunction with flour mills, in which they grind wheat and mechanically add zinc and iodine to wheat flour in order to supply people with nutritious wheat. According to the National Nutrition Survey (NNS), which was conducted in partnership with the World Food Program (WFP), there was 18.5 percent food insecurity in 2014-15, which is consistent with ministry data derived by PARC.

Furthermore, the spokesman stated that while the ministry does not work on gender in this perspective, but they keep consideration on how much food is required based on Pakistan's entire population. Provinces purchase wheat from PASSCO by demonstrating their population and the amount of wheat they require. The Federal Committee on Agriculture (FCA) set goals for crop acreage and productivity. The provinces were then asked how much of the target they could meet. He continued further to stress that wheat is a staple crop that every household need, and that if there is a shortage of wheat, they will have to import it. According to the representative, the main factor for the gap is that cultivable land is limited, and the population is rising exponentially. Furthermore, he claims that cultivable land is diminishing every year because of housing society construction. Another reason is that research is not at the same level as it is elsewhere in the world. Vertical farming[17] is used in countries like Australia and Turkey to enhance production on a small plot of land. In Pakistan, such technology is not available. Small to medium land holdings occupy 87 percent of agricultural land. Small land holdings are defined as land that is between 5 and 12 acres in size, and all subsidies are aimed at these small holdings. However, the cost of production has risen to the point where it is no longer profitable to cultivate crops in Pakistan, particularly for small farmers. In today's world, Pakistani agriculture is barely surviving. One of the key elements contributing to food insecurity, according to the representative, is the cost of production. However, people will cultivate crops like sugarcane, maize, and rice since they are more profitable, whereas wheat and cotton are not. He also mentioned that food losses contribute to the prevalence of food

[17] Vertical farming is a type of agriculture in which crops are planted on top of others instead of in horizontal lines. Growing crops vertically saves space and results in increased crop production per square foot of area used.

insecurity, and that perishable goods have a higher rate of food losses. In this situation, the middleman is acting adversely; he exploits farmers and gets more commission from the supply chain. Controlling food losses, which contribute to food insecurity, is crucial. Small helicopters, similar to those used in Nepal, that can transport perishable commodities into the market every half hour should be introduced. Wheat subsidies are another one more step toward ending food insecurity. Through intervention, the government ensured a subsidised wheat pricing. Provincial governments are responsible for incidental costs as well as charges for grinding (600/100kg of stack) and assured to offer 20 kg wheat flour for Rs.1100. In this approach, the government strives to avoid the role of middleman, and this is the ministry's intervention in the area of food security.

Representative adds that they are attempting to meet the targets with limited resources, and that prior year's progress has been satisfactory. According to him, the population demand for rice is 3.4 billion people, but they are producing more than 8 billion, as well as maize and sugar cane. Every year, minimum support prices and procurement policies are implemented. However, there is some miss management on the part of provinces.

Challenges:

- The cost of production is extremely high, particularly when it comes to agricultural inputs like fertiliser. He stated that the ministry should be granted at least regulatory control over the items that they subsidise.
- Furthermore, there are political concerns in regulation that persists. For example, the urea need is 6 million tonnes, and last year's output exceeded the requirement, but there is no record of residual urea and no documentation of miss management after the requirement is met. Similarly, if sugar production is 7 million tonnes and demand is 6.6 million tonnes, where does the rest go? There are challenges of missmanagement at provincial levels.

Suggestions:

- The production cost should be kept as low as possible. If agriculture becomes more affordable, ultimately overall production expands, ensuring availability, access, utilisation, and stability.
- Mechanized methods should be introduced to control depleting resources (e.g., water).

Spokesman claims that we are better than other countries in many aspects. There is currently no food security crisis. We have adequate reserves to feed the country. We have a rice crop surplus of more than 50% that we can export. Maize and sugarcane, on the other hand, are plentiful. However, there is a cotton shortage that needs to be addressed, and we should also concentrate on the wheat production to avoid imports. And this is something that can be accomplished with the help of intervention.

7.4. Policies related to Women Empowerment

Pakistan's population is made up of 48 percent women, who represent the country's potential. Women's status in Pakistan is not universal, however, because gender is interwoven with other forms of social exclusion. There is tremendous variation in women's status across classes, regions, and the rural/urban gap due to unequal socioeconomic growth and the impact of tribal, feudal, and capitalist social institutions on women's lives. The government is fully aware of its constitutional obligations to preserve women's rights and help them achieve their full potential in all aspects of life, including social, political, economic, and personal. In 2020-21, the government implemented several initiatives aimed at improving gender governance by empowering women financially and strengthening the social security net to fulfil the needs of women in the most disadvantaged groups of the population, as well as eliminating gender-based abuse.

7.4.1. Initiatives under Ehsaas Program:

- **Ehsaas Interest-Free Loan Initiative:**

This scheme involves Rs 42.65 billion that will affect 16.28 million individuals in 100 districts across the country. Women account for half of the loan recipients. In April 2021, 38,119 borrowers received interest-free loans totaling Rs 1271.66 million, with 20,370 of them being women.

- **Ehsaas Amdan (Income) Programme**:

The major purpose of this program is to give the most vulnerable people opportunity by providing minor income-generating resources. In Pakistan, the initiative is being executed in 375 rural union councils across 23 districts. The initiative will deliver 200,000 capital resources to qualified households (60% of which are women), benefiting 1.4 million people around the country.

- **Ehsaas Kafaalat Program**:

It is a new cash-transfer project that provides monthly payments of Rs. 2,000 to seven million underprivileged women in this country via saving bank accounts and improved mobile phone accessibility. The initiative has benefited more than 5 million females.

- **Ehsaas Nashonuma Program:**

This program was launched which uses special nutrition meals to combat stunting in mothers and children. This project is implemented in 33 locations across nine of the poorest regions, and it is being carried out in conjunction with the World Food Program. Pregnant and lactating women (PLWs) and children under the age of two would be provided with specialized nutritional meals as well as quarterly financial aid of Rs. 1,500 for boy children and Rs. 2,000 for girl children. The Ehsaas Nashonuma also includes immunization, awareness sessions, and prenatal and postnatal care.

- **Waseela-e-Taleem:**

This programme has been in place for the past eight years and now covers 50 districts, having undergone a major technological overhaul. All organizational arrangements have been made to extend Waseela-eTaleem Plus to 148 districts across the country, benefiting 4 million primary school students. Girls' stipends have been raised to Rs. 2,000 every quarter, while boys' stipends have been raised to Rs. 1,500 per quarter.

7.4.2. Empowering Women Initiatives:

- The SBP has created a policy called "Banking on Equality: Reducing the Gender Gap in Financial Inclusion." It intends to promote women-friendly business practices by introducing a gender perspective into the financial sector through designated pillars and particular strategies.
- In order to motivate women to engage in the economy, the State Bank of Pakistan (SBP) has raised the financing limit under its Refinance and Credit Guarantee Scheme for Female Entrepreneurs from Rs 1.5 million to Rs 5 million. The goal of increasing the financing limit is to boost women's financial inclusion because more women entrepreneurs are attracted to use concessional financing to start new businesses or expand the room of their present businesses.

- As per the WBL Survey 2021, Pakistan improved its entrepreneurship score from 50 to 75 points on the Woman, Business, and the Law (WBL) index.
- In order to empower women, the following legislations were passed in 2020-21:
  - (i) The Zainab Alert, Response, and Recovery Act, which takes effect in 2020
  - (ii) The Domestic Violence Against Women (Prevention and Protection) Act 2021 in Khyber Pakhtunkhwa.
  - (iii) ICT Rights of Persons with Disabilities Act of 2020[18]

"Women Income Generation and Self-reliance Program" (WINGS):

This program was developed by the Punjab Social Protection Authority (PSPA) in conjunction with the Department for International Development (DFID) of the United Kingdom. The WINGS project will be sponsored by a £36 million DFID grant, which includes a £28.5 million fund for financial support and a £7.5 million grant for technical support. The overall project cost is £35.7 million, which comprises a £28.5 million DFID grant and £7.2 million in co - financing from the Punjab government. By aiding 63,000 severely disadvantaged women in Punjab in transitioning from social assistance to sustainable livelihoods, affluence, and self-sufficiency, the project intends to enhance women's constructive inclusion and economic empowerment. It will work with the Punjab government to create government designed distribution channels and government initiatives that will allow women who depend on social safety net programs to participate in earnings activities, attain capital assets, and receive aid in trying to access financial and social facilities, enabling them to completely escape from poverty.

Punjab Human Capital Investment Project (PHCIP)

Punjab Social Protection Authority has created this project, which would address the issue from the earliest stages of life. This project will get USD 200 million from the World Bank. The major goal of the Punjab Human Capital Investment Project (PHCIP) is to improve poor and vulnerable households' access to excellent health care, as well as their economic and social inclusion in

[18] Source: (i) M/o Planning, Development & SPI (ii) State Bank of Pakistan

Punjab's designated districts. The following are the three primary actions that will be carried out as part of this project:

(i) Health Services Quality and Utilization:

This program is designed to address malnutrition and is centered on the first 1000 days of life (i.e. the time from pregnancy to two years of age). Poor pregnant and breastfeeding mothers will be rewarded with financial allocations to increase their use of Health Nutrition and Population (HNP) services (skilled birth, pre and post-natal care, immunization, growth examining, counselling, and awareness) under this section.

(ii) Economic and Social Inclusion:

Education, expertise, microfinance, and capital transfer will all help adolescents and teenagers become more productive members of society. Programs for childhood education will also be included in this section.

(iii) Social Protection and Service Delivery Platform:

This component aims to close Punjab Social Protection Authority (PSPA's) current institutional, technological, and resource shortcomings, as well as build a strong social protection delivery platform. To keep track of significant projects and beneficiaries' the existing PSPA beneficiary database and programme dashboards would be improved.

Zewar-e-Taleem Program

The Punjab Social Protection Authority (PSPA) has launched the Zewar-e-Taleem Scheme, a cash assistance program. for young women enrolled in public schools in 16 low-literacy districts. If they achieve the school's attendance criterion of 80 percent, over 571,313 girls get Rs.1,000 per month. The goal of this effort was to increase school enrollment and retention while also addressing nutritional needs, which are particularly important for teenage girls. Students in grades 10 and 11 are immediately dropped from the program at the end of the academic year. Students who have dropped out of school are likewise not eligible for the program.

Nayee Zindgi Program

The PSPA has developed the "Nayee Zindagi Program" for acid attack victims as part of the "Punjab Ehsaas Program." The program's goal is to rehabilitate acid attack casualties through

surgical treatment and psychiatric counselling in order to help them reintegrate into society. Specialized Healthcare & Medical Education Department will provide these services. Supporting acid attack victims through institutional arrangements in numerous industries might be a huge step toward legitimizing their socioeconomic circumstances. With a budget of Rs. 200 million, the victims of the horrific crime of throwing acid would be financially supported and properly healed at the government's expense, including skin grafting therapy, skill-building, and interest-free financing for monetary assistance.

Sarparast Program for Poor Widows & Orphans

PSPA launched the "Sarparast Program," which provides social aid and monetary help to impoverished and underprivileged widows' families in order to improve their well-being and social position. It also addresses the Ehsaas Strategy's overarching goal of lifting lagging areas. Sarparast is a program that will provide dignified social support to Punjab's poor widows. The Sarparast Program for supporting destitute widows and orphans would be an important part of Punjab's Ehsas Program, with an initial budget of Rs 2 billion.

Helpline – 1099 for Legal Advice on Human Rights Violations

The Ministry of Human Rights has set up a Helpline – 1099 for legal help on violations of human rights, with a special focus on women's privileges. The Helpline's goal is to resolve concerns of human rights breaches by providing legal advice, grievance-redress mechanisms, and recommendation services to victims of crimes.

Helpline (1043)

The Punjab Women's Toll-Free Service 1043 is open 24 hours a day, 7 days a week. The Punjab commission manages and supervises the helpline team, which consists of women telephone mediators, three legal representatives, supervisors, and managerial staff to respond to complaints and queries about harassment in the workplace, discrimination against women, land disputes and inheritance rights, domestic abuse, day-care centers, hostels, and other amenities for females workers, quota for females in public service jobs, skill enhancement prospects, and various other financial issues.

BOLO Helpline (0800-22227)

The Directorate of Social Welfare and Women Empowerment, Government of KPK, has established the BOLO Helpline 0800-22227 for sufferers of Gender Based Violence (GBV) and individuals with disabilities at the provincial level. The pilot period of the program is available in the districts of Peshawar, Nowshera, Swat, Mardan, Swabi, and Abbottabad, with the goal of ensuring accessibility and convenience of services to people who survived of gender-based violence, expanding program to enhance GBV feedback services and providing survivors with critical support, and developing a repository of victims to enable the section to plan for future GBV programming and tracking.

COVID-19 Impact on Family Planning Services

The global pandemic of COVID-19 had a significant influence on public health, welfare, and economy. Human and financial capitals are shifted from important health program to react to outbreaks during such situations, potentially leading to an increase in maternal and new-born mortality and morbidity, a rise in the number of unplanned births, and gender-based violence. Recent research suggests that provision of services for deliveries, family planning services, and other health services has been interrupted, resulting in higher chances of maternal morbidity, mortality, poor new-born outcomes, higher unfulfilled demand, and family planning methods discontinuation.[19]

7.5. Ministry of Planning Development and Special Initiatives (MoPD&SI)

Ministry of Planning, Development and Reform:

In this ministry, there is a separate wing of SGSs that deals with all 17 goals. On goal 5 of gender equality, we met with specialist from this wing. The focal person and project manager of United Nations Development Program (UNDP) discuss that there are numerous forms of violence against women, but it's crucial to note what the reporting procedures are and how swiftly the perpetrators will be punished. In terms of reporting, not only the victims, but also their relatives, have been willing to report and provide all types of proof and reason over time.

Spokesperson argues that there are numerous reasons of women disempowerment at rural level. One of the main reasons is that brought up of child from beginning is improper. Secondly early childhood marriages is the factor that contributes. Thirdly, during drought seasons, households

[19] Pakistan situation analysis 2020

prefer to feed male members of the family while neglecting female health concerns. Representative from the ministry continues by adding that there is interlinkages of early childhood marriages with education and health. Moreover, women are not involved in decision making in each sector of life. Cultural and social norms are also significant in designing policies. Every sector is intertwined with the others; therefore we can't look at each one separately. It is a viewpoint of representative that, individual projects will not work up to the mark unless they are integrated with other projects. Based on these grounds ministry has developed multi-sectoral nutrition strategy to link up different sectors.

Pakistan Multi-Sectoral Nutrition Strategy (PMNS) 2018-2025:

In response to the situation, the Pakistan Multi-sectoral Nutrition Strategy (PMNS) was developed, which reflects the government's and other stakeholders' determination to grab opportunity to advance and enforce proven intervention strategies to reduce the human, social, and economic burden of malnutrition; as well as to honour commitments and meet targets set forth in Pakistan Vision 2025 and international agreements such as the Global WFP. The National strategy highlights main objectives as: Integrate provincial initiatives with national aims and international obligations, as well as enable and support standardized national reporting in response to global commitments.

A multi-sectoral response: one that allows each sector to capitalize on their specific responsibilities and roles to enhance nutrition while also seeking collaboration and linkages with other sectors - is now widely recognised as necessary to reduce the incidence of malnutrition. Both "nutrition-specific" and "nutrition-sensitive" techniques are included in a multi-sectoral matrix of initiatives, as shown in: Nutrition-specific interventions are primarily done through the health sector, with the primary goal of providing treatment and prevention approaches to address critical factors of malnutrition.

A multi-sectoral response - one that allows each sector to focus on their distinct responsibilities and roles to promote nutrition while also seeking cooperation and linkages with other sectors - is now widely recognized as necessary to reduce the impact of malnutrition. Both "nutrition-specific" and "nutrition-sensitive" techniques are included in a multi-sectoral spectrum of initiatives, as follows: Nutrition-specific programs are mostly done through the health sector, with the primary

goal of providing treatment and prevention services that address specific issues related to undernutrition.

Likewise, nutrition-sensitive programs are carried out by sectors whose primary goal is not always better nutrition, but whose actions have the ability to increase the nutritional intake of their recipients; notably by focusing the primary and fundamental drivers of malnourishment. The following are the primary nutrition sensitive treatments and topic capacities:

- ***Agriculture and Food Security:*** Increasing agronomic output and dissemination, embracing nutrient-dense crops, establishing drought mitigation and prevention, and other measures can boost family incomes, improve access to a diversity of foods items, and enhance food security.
- ***Education:*** Investments in nutrition and health facilities in the education sector, coordinated with all related stakeholders and sectors, such as in-school meals, deworming, or micro-nutrient dietary supplements, as well as educational and skills development, will enhance nutrition and health status and, as a result, improve children's school attendance and performance.
- ***Gender Equality:*** It has been shown that keeping girls in school longer delays marriage age and enables young ladies to be more educated, skilled, and empowered moms. All of these elements play a role in improving children's and teenagers' nutritional health. Men must also be involved to build up opportunity for females at the domestic level.
- ***Social Protection & Welfare:*** Nutritional status of beneficiaries improves significantly when social protection programs create defined objectives and include specific and verified nutrition offerings, and overall project welfare goals are more likely to be met. Poverty and hunger can also be managed through cash transfer programs or health insurance policies.
- ***Food Safety and Quality:*** Government entities and commercial food suppliers can work together to improve food quality and safety, and nutritive values by improving regulations, tracking, and monitoring mechanisms for good hygiene food preparation and better packaging, as well as providing a legal regime and law enforcement to allow fortified salt, flour, oil, and other prepared and nutrient dense foods.

In Pakistan, there is no emphasis on women's freedom; there is discrimination, violence, and harassment in workplaces, bus stops, and other places. Spokesperson claims that economic empowerment for women is very crucial to address; women make significant contributions to the economy, but their efforts are not rewarded financially, particularly in the informal sector. Change always starts at the bottom, that it is a bottom-up process, and policy cannot be made by sitting in a room and waiting for it to be implemented. You must collaborate with the entire society. Change cannot be achieved in a 2 to 4 year time frame; it is a long-term and ongoing process. Something needs to be done at the household level, and in this case, awareness is key. The need to work on livelihood is critical; after that, households will begin to grasp health and education. Planning commission developed National Gender policy framework (NGPF) to address the gender inequality gaps.

The government is dedicated to decreasing gender disparities and providing equal prospects for women and adolescent girls to reach their full potential, thrive, and contribute to economic success under this framework. The federal and provincial governments will embrace and reflect these gender-specific policy initiatives in their upcoming programmes and budgetary allocations. Commission will make gender-based budget report, develop gender focused action plan, and will made assessments against action strategies and targets fixed in this perspective. At both the educational and employment levels, there is a gender disparity. There are 9.7 million girls of primary school age are out of school. Even though there are 72 million females in the working age group, only 14 million (20%) are in the workforce. Representative shared that efforts are being made to endorsing gender favorable work environment within all federal ministries and departments in 2022-2023. Gender Parity has been a top focus for the Ministry of Planning, Development, and Special Initiatives (MoPDSI). A multi-channel collaborative exercise involving ministries, provincial authorities, topic specialists, international donors, academia, researchers, professionals, and youth advocates was performed across the country. The National Gender Policy Framework illustrates priority areas for gender and development that are focused.

National development framework (NDF):

Ministry of Planning, Development and Special Initiatives is preparing a National Development Framework (NDF), which will guide priorities for investment and to carve out roles and responsibilities at the federal and provincial levels. The Central Development Working Party

(CDWP) with Planning Commission set the guidelines for “Draft of the gender policy framework”, i.e., a initial research study on making public sector workstations conducive for women. The federal government's investment priorities will be guided by the Planning Commission. There are overlapping in business standards, moreover, roles and duties at the federal and provincial levels must be well defined. The "Draft of the Gender Policy Framework" highlighted the need of providing opportunities for women and girls, as well as empowering them in decision making and acknowledging their presence in all aspects of life. He believes that a national gender perspective is required. He stated that the significance of gender must be understood across ministries and provinces because gender indicators are inadequate. He stated that action plans for gender programming would be devised, as well as a showing of their commitment to this vital issue. The Planning Commission will release a yearly report on the "Status of Gender" in Pakistan, he said. Quarterly assessments and surveys will be conducted to determine success in making the workplace more welcoming to women, he said. He also remarked that sectoral guidelines and ministry-specific guidelines should be produced. Clarity is required in a number of areas, as well as the nature of projects.

7.6. Ministry of Human Rights (MoHR)

We visited Ministry of Human Rights (MoHR) and met with Deputy Director there. She explained us that various laws and policies aimed at empowering women have been enacted in recent years, and we can easily see the difference between today’s situation and that was in last ten years ago. Urban women in particular, are increasingly more empowered and striving for advancement. They are making use of their legal rights to promote and protect her. The following sections discuss some of these measures and rights:

Rights of women

The government is dedicated to promoting and protecting women's rights through political and economic empowerment, as well as the elimination of violence and prejudice against them.

Legal Measures:

Several laws have been approved in recent years to combat hazardous practises and nullify discrimination and violence against women, including the Anti-Rape (Criminal Laws Amendment) Bill and Anti-Honour Killings (Criminal Laws Amendment) Bill 2016; the

Protection of Women from Harassment at Workplace Act 2010; Criminal Law Amendment Act 2011 (Prevention of Acid Crime); Prevention of Anti-Women Practice Act 2011; and the Protection of Women (Criminal Laws Amendment) Act 2006

The Anti-Rape Bill and the Anti-Honour Killings Bill were passed in October 2016 to address the issue of honor killings and to amend existing laws to raise rape convictions. Families of murdered would only be entitled to forgive a criminal guilty of death penalty in cases of honour killings under the new regulations, but the murderer would still be sentenced to a punishment of 25 years in jail.

The KP Removal of Custom of Ghag Act, 2013, is one of the legislations created by the provinces for the protection and advancement of women's rights. The Baluchistan Domestic Violence (Prevention and Protection) Act, 2014, The Punjab Protection of Women Against Violence Act 2016 and The Sindh Domestic Violence (Prevention and Protection) Act 2013.

Anti-violence and anti-discrimination measures for women

- The Human Rights National Action Plan centers on ending gender-based abuse.
- The National Commission on the Status of Females is a key player in combating violence towards women. The National Police Bureau's Gender Crime Cell (GCC) gathers and processes statistics on domestic abuse.
- The Harassment Act 2010 established offices at the national and provincial levels in Provinces of Sindh and Punjab to examine cases of workplace harassment.
- Twenty female police stations have now been constructed to provide women victims with quick access to justice.
- 26 women crisis centers have been established across the country to provide shelter and legal aid to women victims of violence.
- The Ministry of Human Rights has created a National Policy on eliminating abuse Against females. It offers mechanisms for preventing, responding to, safeguarding, and recovering victims of gender-based assault. In the context of gender-based violence, it also develops collaborative procedures among the responsible authorities.

- The Ministry of Human Rights performed a study that led to the development of the Males Participation Model, which seeks to eradicate gender-based abuse.

Empowerment on the political and economic levels

- A National Policy for Women's Development and Empowerment was established in 2002, with the goal of promoting gender equality in long term development strategies.
- Women's Empowerment is also a priority of the 11th Five-Year Plan (2013–18). Females 's empowerment and financial development have been given a budget of Rs 2.7 billion.
- Women have 60 seats in the national legislature, 17 seats in the Senate, and 17% of seats in provincial assemblies. Women competed for general positions as well as seats allotted for minorities in the elections. 228 women hold seats in national and provincial governments, out of 1170 total.
- In accordance with the Beijing Platform for Action, 30 percent of positions in the 3 levels of local authorities are allocated for choosing women candidates.
- The federal government has set aside a 10% reservation for women in Central Superior Organizations. Women's employment quotas in Sindh have recently been increased from 5% to 15%. Punjab increased the quota to 15% in 2013 and granted a three-year age relaxation.
- The Govt's Decent Work National Program comprises a plan and action strategy to guide the development of decent work, including gender equality as a central focus.
- A huge proportion of female farmers have been offered loans to obtain agricultural credit schemes for the agriculture industry through Zarai Taraqiati Bank Limited's programmes, in addition to various loans.

Representative added that goal 5 of SDG's i.e., "Gender Equality" is interlinked with other goals like zero hunger, education, and health etc. and it has an overall impact. Women specific schemes are not found at federal level, yet they exist at provincial level. However, how much share should be given to women quota is defined, but approach is inclusive at federal level. She stated that in the past, the Ministry of Human Rights exclusively worked with women and children, but now it works with the elderly, transgender persons, and disabled people. As a result, any policy or rule enacted by the ministry is for everyone, referred to as a vulnerable group. This group has five

categories i.e., women, children, transgenders, disables and senior citizens. She stated that after the provincial governments became autonomous and began to assume responsibility for their provinces, the federal government's stance has changed slightly in comparison to the provincial governments. Women's issues are addressed by the provincial government's "Women Development Department" and commissions. In the yearly plan of the Planning Commission, there is no special scheme for women's issues; however, this women's group is merged with other vulnerable groups. Similarly, past economic surveys included a separate chapter on women, but now they combine women in population, labour force, and employment specific schemes at the federal level.

She added that, women comprise approximately half of Pakistani population and majority of them are physically weak and malnourished, therefore all nutrition programs are designed with the motive to focus on this group. There are various initiatives that focus on women as a key beneficiary, and the influence of all of these programmes can be seen and felt in larger cities when compared to the previous 10 years. Women's behaviour and culture are changing; for example, harassment was a major issue in the past but is now less prevalent; honour killings and acid crime are also at an all-time low in the country. In big cities, women become financially independent, and their food-related challenges are resolved as well.

Representative added that impact of every policy comes up after 8-10 years and in the next generation. When a legislation is enacted, 50-60% of that law is implemented by the population because people embrace it and stop doing things that are against the law. According to the World Economic Forum's "Gender Parity Gap" study, Pakistan ranks 152 out of 156 nations worldwide. Pakistan, she claimed, is ranked last in the world for gender equality. This is due to a couple of factors. One major factor is that we have no idea how to represent Pakistan on a global scale. Ministry of human rights launches research in this perspective recently and Punjab parity report comes in the reaction. Pakistan Bureau of Statistics (PBS) also made gender parity index. But the report that Pakistan made had no impact internationally. The issue is that indicators are not based on international standards and are different from them. To depict the gender parity gap, the PBS and the World Economic Forum use different measures. She went on to say that we should choose our indicators based on international standards to make comparisons easier. She added that while the country is doing a lot of work, it isn't representative because it doesn't meet international

criterions. She went on to explain that Pakistan's planning is excellent, but there are no resources for implementation and no strategy for doing so.

7.7. Conclusions:

- Federal government's working is inclusive and did not work on women specifically after 2011. Moreover, it's a job of provincial government. Because there is diversity in cultures so it's a duty of provinces to works according to their own circumstances.
- Policies are not made on international grounds. Pakistan has different benchmarks and is not compatible with international standards
- There is no gender marker or checklist to measure gender equality in the country. There are hundreds of policies related to everything but, implementation is not there. There should be awareness about implementation plan. Policies should be made with collective inputs, in the same way implementation should also be collective. You can find thousands of things in chunks, but when you are not making efforts collectively then it lost its influence. Neither there is policy implementation nor program implementation collectively.
- Reforms are also very important in every sector, there is need of time to link and upgrade old systems with new ones. Like in educational reforms, quality of education, teachers training, addressing dropout ratios, work on enrolment. According to the representative, education is the main thing to be handled. She added that, our implementation strategies are wrong, it can be improved but we don't make strategies to improve it, we just make policies and direct towards implementation.
- There is also governance issue in devising policies, when government changes, priorities also change. There should be sustainability and consent of all stake holders while designing policies.
- Representative argues that, by empowering rural women many things can be improved, including household food security. If it is possible to address all challenges that women are facing in this society then definitely food security can be ensured.
- When the government creates a policy, it does not consider the influence that policy would have on other sectors. The idea is to make policy by bringing together all sectors and

policymakers from all venues, resulting in policies that are effective, focused, and long-term.

- We should learn to live with challenges and problems, because it is not possible that challenges will end one day. First, we have to think either it is possible to achieve zero hunger and zero gender inequality. According to them it is not possible to achieve zero target, but still, it is possible to achieve betterment, and we should focus our ground realities.

CHAPTER 8

CONCLUSIONS

Women's empowerment has become a multifaceted and context-specific notion in recent years. To convey the genuine picture of attaining power, it is now necessary to comprehend the key characteristics of women empowerment. The ultimate aim can be achieved by examining the entire process, which begins with freedom of movement to conduct activities and ends with actual participation in household and personal decision-making. To examine the whole process of empowerment, a quantitative assessment is crucial (Kabeer, 2001; Kishor & Gupta, 2004). Various researchers, scholars, and policymakers have tried a holistic assessment of women empowerment in light of this fact. Women empowerment in rural Pakistan was studied not only in terms of its multidimensional nature (domains: economic empowerment, autonomy, decision-making, qualification, time allocation, mobility, political empowerment, awareness, and violence), but also in terms of its context-specific essence (i.e., the role of communities).

By analyzing the 1881 women's data, the study identified that rural women had almost no empowerment in four domains and these are economic empowerment, qualification, political empowerment, and awareness. Collectively these domains represent only 11% of rural women empowerment, which is too low. They were facing challenges in these four domains. The study revealed the important determinants of rural women empowerment and found that age, education, marital status, dowry, no. of sons, and delivery at hospital enhances women empowerment in rural areas. Moreover, the study found a strong relationship between employment status and access to credit. A woman who was employed had a greater empowerment level. Mass media exposure also plays a significant role in empowering rural women. The study focuses on community-level characteristics to captures the contextual variation in women empowerment. Results showed that educated communities play a pivotal role in empowering rural women of Pakistan.

From the past many years, food and nutrition security and women's empowerment have been at the forefront of international and national policy agenda. Despite long-held interest in increasing household food and nutrition security, there is a limited understanding of the factors affecting it. Women's empowerment is found to be one crucial factor in determining whether a household is food and nutrition secure or not. We have illustrated that it is crucial to understand the complex associations between food and nutrition security and the multiple domains of women's

empowerment. Our research adds important insights into the domains of women's empowerment that impact food and nutrition security. Through rural women's empowerment, the probability of increasing nutrition security in terms of nutrient consumption is more (98%) relative to the food security in terms of caloric intake (70%). Moreover, an educated community plays a positive role in empowering rural women. The study indicated that rural women are disempowered in education, mass media awareness and credit access.

In developing countries like Pakistan, food insecurity and the uncertainties relating to food acquisition become a concerning problem for policy makers of this decade. There are different risk factors with which rural people are confronting with. For the mitigation of these shocks the present research explored the impact of rural women's empowerment on vulnerability to food insecurity. In the literature, role of women's autonomy and power in minimizing the influence of risks on food security is a less explored arena. Rural women act as food producers, revenue earners, custodians of natural assets, and guardians of family food and nutrition security, therefore empowering them is intrinsically related to building food systems and combating hunger and malnutrition. Our study is aimed to guide researchers and policymakers dealing with food insecurity and its vulnerability issues by providing ample empirical evidence. While measuring women's empowerment we focused on using maximum dimensions instead of using proxy variables for it. To the best of the researcher's knowledge, this is the first study to directly evaluate the causal mechanism underlying the impact of women's empowerment on food insecurity and vulnerability.

In light of the findings, the present study proposed some key recommendations to strengthen the status of women in rural areas. First, equal participation of women is realized as an important aspect in household decision making. Second, educational opportunities need to be expanded in rural areas. As we found that women represent no empowerment in the qualification domain and we explored that with the increase in the education level, women empowerment increases. Moreover, the study investigated that an educated community plays a positive role in empowering rural women. Therefore, educational programs and vocational pieces of training needs to be introduced, the girl's dropout ratio from schools needs to be addressed and the focus of schooling outcomes should be on gender equity in rural areas of Pakistan. Third, there is a need for public awareness campaigns via mass media/print and electronic media/social media for behavioral and attitudinal change in reshaping society's thinking about women empowerment.

The present study contributes to the existing works of Women Empowerment in Agriculture Index (WEAI). Although we employed our own model based on the grounds of WEAI, we got a useful insight to review PRHPS data in an innovative way that the methodology provides. By looking specifically at gender-related issues through this approach provides new frameworks and enlighten important evidence for future studies and policymaking. Developing programs and policies to improve domains of women's empowerment requires a focused policy agenda, bringing together policy makers from a number of different sectors including education, economy, communications, technology and agriculture. Highlighting the significance of women's empowerment as an important SDG goal, and the precursor of other SDG's, further research on exploring the predictors of empowerment is justifiable. Women's empowerment is the key to making positive changes not only in FNS but in all aspects of health and wellbeing.

There is an important policy message in this research: empowering of women in rural areas can result in households that are more food and nutritionally secure. The rural women composite empowerment index we developed can enable policy makes to have a nuanced understanding of the domains in which policy to increased are required and be used to measure progress. For example, in this study the domains of access to education, credit and mass media need more policy solutions.

This study concludes that women's empowerment has a positive and significant impact on reducing the vulnerability to household food insecurity. Moreover, to deal with contextual variations in estimating the issue in hand, multi-level mixed-effect logistic regression is used. This methodology enables us to evaluate the impact of communities in minimizing the risks relating to food insecurity. The results reveal that basic health facilities, schools, infrastructure, and educated women of communities plays a pivotal role in reducing the vulnerabilities. Study also employed some socio-economic control variables, that are most likely to impact vulnerability to food insecurity, and we find that by improving the consumption patterns in terms of diet quality and quantity, by making expenditures on food items and by participating in social safety net programs, vulnerability reduces.

However, efforts on numerous fronts may be required to reap the potential benefits of women's empowerment, including education, autonomy in economic decision-making, awareness, and political empowerment, because rural women in the country face disempowerment in these

domains. In addition, women's empowerment is particularly crucial for women's wellbeing, and for those women who left alone after divorce, a husband's migration, or death. As a result, empowerment in the areas of education, finance, and decision-making allows women to live self-sufficient lives in the face of traumatic incidents, rather than depending on her relatives or her husband's family to help them. Our findings support all efforts/programs designed to encourage and promote women's empowerment.

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