Research Article

Food Nutrition Security Status During Pandemic Covid-19 in Punjab, Pakistan

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Abstract | This research assesses the impact of COVID-19 lockdown on the accessibility/affordability components of the basic food nutrition in Punjab. The fear for another lockdown as a result of spread of new COVID-19 variants agitated this empirical study on the impact on food nutrition security to recommend appropriate measures to reducing the negative impact. Data of 250 respondents was randomly selected from 19 districts during and immediately after series of lockdowns. Descriptive and inferential statistics was used in analysing the data. The result reveal that 78% of the respondents witnessed COVID-19 case in their community or know a COVID-19 patience. On the inaccessibility to food nutrients, there was significant difference between the rural and urban respondents except on the carbohydrate foods. Compared with pre-COVID-19 era the respondents experienced higher prices of food and foodstuff. The findings can be utilized to provide required comprehensive measures to reduce the adverse impact on food nutrition security in case of another lockdown.

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Introduction

It has been over five years since the first COVID-19 lockdown in 2020. Despite the developments in its containment and vaccine administration, the fast-spreading respiratory virus continues to ravish economies in the world. Since it was first reported in December 2019 in Wuhan – China by the World Health Organization (WHO), there have been over 501.8 million confirmed cases and 6.2 million deaths (Worldmeterss, 2022). The first confirmed case of the virus in Pakistan was detected on 26th February 2020. The government of Pakistan initiated the first nationwide lockdown on 1st April 13, 2020.

The country has experienced three notable waves of COVID-19 cases; the first wave (May – July 2020), the second wave (November - December 2020), and the third wave (March – April 2021). Since April 2021, the infection and death rate has been subsiding. As it continues to spread, the virus that causes the COVID-19, the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) has been evolving since its first inception in China. It has now mutated into different variants and sub-variants with different intensity in terms of transmission, severity, and difficulty to detect. The current treacherous variants circulating in the world include the Omicron variants and sub-variants, and the delta variant (WHO, 2022). These variants have opened new leave of threats derailing the recovery and resilience-building policy from the 2020 lockdowns and containment measures thereby devastating the trajectory to food security of less developed and developing countries like Pakistan.

The World Food Summit (1996) food security definition stressed not just on 'food' but the sufficient quantity and quality of 'food nutrients that meet dietary needs and food preferences of the people. The attainment of this clause was interjected during the COVID-19 lockdowns in many countries. Just like many developing countries, before the emergence of the pandemic, Pakistan has been struggling to be food secured. According to the Food and Agricultural Organization of the FAO (2020), the hunger, food availability, food access and food utilization has worsened since the advent of the pandemic. For instance, the 3-year average (2017-2019) prevalence of undernourishment was 12.2% but has risen to 12.9% for 2018-2020 year-average; likewise, the gross domestic product per capita, PPP reduced from $4,739.5 to $4,622.8 indicating reduction in purchasing power which in turn affects access to food indicator.

Against the background of these challenges, this research aims to provide empirical evidence on how the lockdowns affected food nutrition security of Punjab Province of Pakistan. The food nutrition security of two groups (rural and urban households) were investigated. Researches have shown that the impact of COVID-19 on rural and urban households differs due to infrastructures, proximity to farms and/or literacy level (Ahmed, 2022b; Souch and Cossman, 2020). Specifically, the research shall identify the food nutrition households find challenging to access/afford during the lockdowns; identify the differences (if any) between the rural and urban households; and base on the findings, provide recommendations for COVID-19 variants containment policy that are precise to the regions.

Materials and Methods

Study area

The study area for this research is Punjab province of Pakistan, which is largest in population having almost 53% of country's total population (GoP, 2021). Punjab is also the most industrialized province of Pakistan, containing manufacturing industries like textiles, electronic equipment, surgical appliances, metal, processed foods etc. Punjab has 36 districts and wheat and cotton are major crops of these districts, other crops include; rice, sugarcane, maize, millet, pulses, oilseeds, vegetables and fruits. Livestock and poultry are also integral part of agricultural sector of the province (Govt. of Punjab, 2020). Agriculture is core of Punjab's economy, while industries also have considerable contribution. Punjab is performing foremost position in agricultural products, as it supplies nearly 68% in national grain produce annually (GoP, 2018).

Data collection and analysis

Using structured online questionnaire, primary data were collected from 250 households in Punjab. The households were randomly selected from 19 districts (Figure 1) including Bahawalnagar, Bhakkar, Chiniot, Dera Ghazi Khan, Faisalabad, Gujranwala, Hafizabad, Jhang, Khushab, Lahore, Layyah, Mandi Bahauddin, Multan, Muzaffargarh, Okara, Pakpattan, Sahiwal, Sargodha, and Sheikhupura. The collection of data was done during and immediately after the 2020/2021 lockdowns. All preventive measures of the National Command and Operation Control (NCOC) was adhered to accordingly while collecting the data. The structure of the questionnaire includes demography of the households, awareness to COVID-19 preventive measures, access to basic food nutrition, affordability of food provisions and the supports received from entities during the difficult times.

The data collected are subjected to descriptive and inferential statistics. Comparative Student's T-test analysis was applied to determine the difference (if any) in the difficulties accessing the basic food nutrition between the rural and urban household.

This is particularly important to the development of policies as each region could experience the impact of the pandemic differently as seen in Souch and Cossman (2020) and Ahmed (2022a). It is expected that the households from both regions experienced the impact differently, but further question remains as to the direction of the impact between the regions. Hence, this research hypothesizes the following: Null hypothesis (Ho): mean difference equals zero. Here, there is no difference in the difficulties accessing basic food nutrition during the COVID-19 lockdown between rural and urban households. Alternative hypothesis (H1): mean difference not equal to zero. Here, it states that there is a difference between the urban and rural households. The basic food nutrition to be used in the test include carbohydrates (wheat, rice, maize, oats, millets, barley and etc.), proteins (meat, fish, milk, eggs, yogurt, and beans etc.), minerals and vegetables (tomato, potato, onion, cabbage, peas, and okra etc.), vitamins (fruits including citrus, mango, apple, guava, pear, peach, banana, and melon etc.), clean water, and prices of food provisions (beverages, tea, soft drinks, and juices etc.).

Results and Discussion

General characteristics of respondents

Table 1 presents the socio-economic and cultural background of the respondents. The respondents were mostly male (99.6%) as it is a norm for male to lead the family. Only one female household head was observed in the in the study area. About 86.4% of the respondents are rural dwellers and others (13.6%) urban dwellers. Overall, the age range of the respondents were from 18 to 73 years with an average age 34 years. The respondents attained an average of 6 years of education. The highest household size observed was 20 and minimum 1. On average, the respondents have about 7 persons per household.

The primary (main) occupation of most of the respondents is farming and they account for about 76.4% of the total respondents followed by salary employees (9.2%), skilled self-employed (7.2%), professional self-employed (3.6%), daily wage respondents (2.8%) and two pensioners or retirees account for 0.8% of the respondents. The occupation also shows that the income of most of the respondent is tired to the success of their agricultural output. Any distortion on this will greatly affect the food security of the population in terms of availability and affordability of food.

Table 1: *General characteristics of respondents.*

Variable	Mean	Min.	Max.
Age	34	18	73
Education in years	11	0	18
Household size	6.8	1	20
	Category	Frequency	Percentage
Gender	Female	1	0.4%
	Male	249	99.6%
Marital status	Single	104	41.6%
	Married	145	58%
	Divorce	1	0.4%
Residential region	Rural	216	86.4%
	Urban	36	13.6%
Primary occupation	Daily wage	7	2.8%
	Farming	191	76.4%
	Pensioner	2	0.8%
	Professional self-employed	9	3.6%
	Salary employee	23	9.2%
	Skilled self-employed	18	7.2%

Source: *Field survey data 2020/2021.*

Figure 1: *Map of Punjab and the surveyed districts.*

COVID-19 awareness, perception and adherence to prevention rules

The awareness, perception of respondents to the danger of the COVID-19 pandemic is very important as it has dynamic impact health, economic, social and political life of people. Figure 2 depicts the behavior

of the respondents towards the pandemic.

The perception of the respondents was observed between two groups: The respondents that witnessed COVID-19 case in their community or know a COVID-19 patience, and the respondents who did not witness any COVID-19. About 78% of the respondents reported witnessing COVID-19 case while on 22% did not witness. Among the respondents that witnessed it, 33.2% believed they cannot be infected by the virus. In other words, they believe their body system is strong enough to withstand the virus while the remaining 33.2% believed they can be infected. Despite the believe or perception of this group (witness of COVID-19), most of them adhered to wearing facemask rule imposed by the government as seen in the wearing and not wearing facemask ring in Figure 2. On the second group (respondent who did not witness any COVID-19 case), the study observed that regardless to not witnessing the COVID-19 case, some respondents (8%) believed the virus can infect them while 14% believed otherwise. In the face of not witnessing the any COVID-19 case and believe or not believing the infectiousness of the virus, most adhered to wearing facemask as preventive measures. This credit could be given to the quick and nationwide orientation and taskforces monitoring adherence to the preventive rules (GoP, 2022).

The lockdown food security challenges

Affordability of food and foodstuff: To assess the affordability of food and foodstuff, the household heads were asked to compare earlier with current prices. The respondents responded in three (3) price levels: high – when the current price is higher than the previous price before the lockdown; moderate when the prices of the two periods are relatively the same; and 'low' when previous price is higher than present price. Table 2 presents the response of the two households on the price level during the lockdown in the study area.

Table 2: *Household perception on prices of food and foodstuff.*

Price of food and foodstuff	Rural	Urban	Total
High	56.8 %	8.0 %	64.8 %
Moderate	6.4 %	2.4 %	8.8 %
Low	23.2 %	3.2 %	26.4 %
Total	86.4 %	13.6 %	100 %

Source: *Field survey data 2020/2021.*

Generally, the respondents (64.8%, 8.8% and 26.4%) considered the prices during the lockdown high, moderate and low respectively compared to the prices before the lockdown. This indicate that majority of

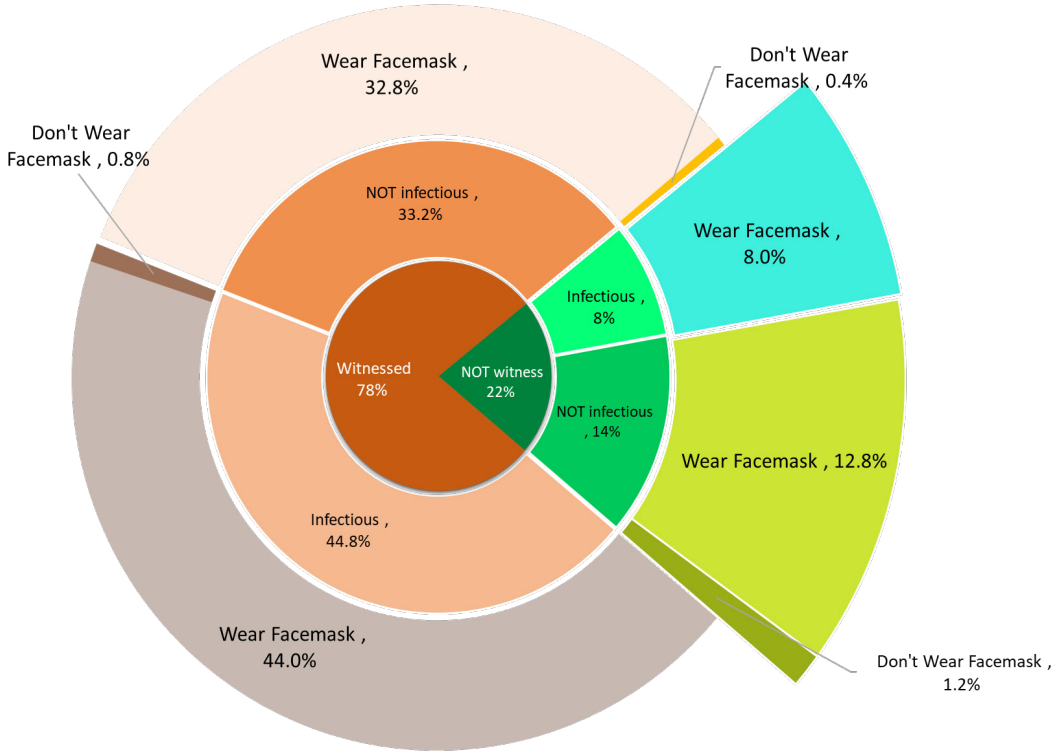

Figure 2: *COVID-19 awareness, perception and adherence to prevention rules.*

Table 3: *T-test comparing rural and urban inaccessibility to clean water.*

Region	Mean	Std. Err.	Std. Dev.	T-value	Degree of freedom
Rural	2.3009	0.08473	1.2434	–3.1264	42.6981
Urban	3.0588	0.22713	1.3244		
Combined	2.404	0.08098	1.2804		
Difference	-0.7579	0.24242			
95% Confidence interval H_o: mean difference between rural and urban = 0					
H_1: mean difference ≠ 0					P-value = 0.0032
H_1: mean difference < 0					P-value = 0.0016
H_1: mean difference > 0					P-value = 0.9984

Source: *Field survey data 2020/2021.*

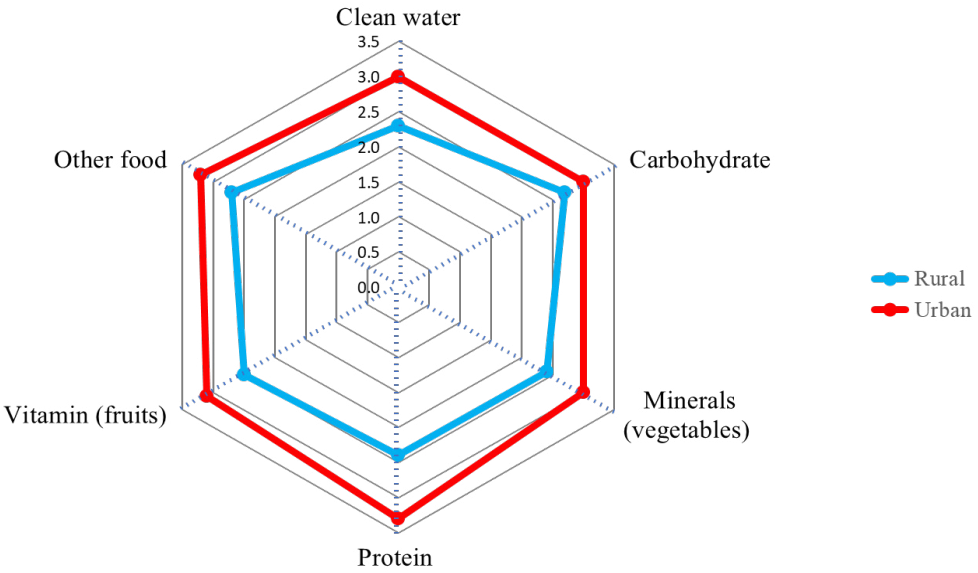

Figure 3: *Difficulties in accessing basic food nutrition by rural and urban households.*

the households in both regions observed high price level during the lockdown. Specifically, out of the 64.8% that reported observing high prices, more (56.8%) were rural households and then the urban households (8%). On the other extreme, the respondents (26.4%) who experienced low prices of food and foodstuff, 23.2% were from rural households and 3.2% from urban households. Fewer households considered the prices to be moderate.

Accessing Basic Food nutrition: Pakistan initiated her first nationwide lockdown on 1st April 13, 2020. Pakistan experienced three (3) notable and other minor waves of COVID-19 cases, some more in some counties than the other and of which initiated complete and partial lockdown protocol for weeks. During this lockdown, markets, businesses and shops were closed except essential services, added to this is the strict movement of people. The combination of these coupled with loss of daily wages or income as affected the accessibility of household to basic food nutrition. To determine the food nutrition security, household heads were asked to rate based on a 5-point Likert scale (1 = very easy, 2 = easy, 3 = neutral, 4 = difficult, and 5 = very difficult) the easiness/difficulties of accessing the important food nutrients.

Figure 3 depicts the inaccessibility to basic nutrition by the two households. The wider web-line of the urban households compared to the rural household indicates that on average the urban dwellers experienced more difficulties than the rural dwellers in accessing basic food nutrition during the lockdown. This could be as a result of decreased purchasing power and unavailability of livelihood sources due to pandemic lockdown throughout the country especially in Punjab province (Shahzad *et al.*, 2021; Saqlain *et al.*, 2021; Asian Development Bank, 2020). Contrary to similar research carried out in Niger State, Nigeria (Ahmed, 2022c), the response of the households to the difficulties in accessing these food nutrients were

much higher compared to the Punjabi respondents.

Comparative analysis of food nutrition security by the regions

To determine if there was significant difference in the inaccessibility of the basic food nutrition between rural and urban households, Student's t-test analysis was applied. The result from this analysis will help researchers and policymakers to prioritize decision decisively. The null hypothesis (H_o) of the research states that there no difference between rural and urban households while the alternative hypothesis (H_1) states that there is a difference between the two regions. The result will determine how the government can justly prioritize support to the regions of high need to regions of low need. The results of the t-test are presented in Tables 3, 4, 5, 6, and 7.

Access to clean water

Table 3 presents the t-test result on inaccessibility to clean water between rural and urban dwellers during the lockdown. The result rejects the null hypothesis (H_o) that there is no difference between rural and urban regions on the inaccessibility to clean water. Furthermore, it also revealed that the urban dwellers experienced more difficulties in accessing clean water than the rural dwellers as shown by the significant level of the p-value (0.0016) for the alternative hypothesis (H_1: mean difference < 0).

Access to carbohydrate food

The result of the t-test analysis between the rural and urban region on the inaccessibility to carbohydrates in Table 4 reveal that there is no significant difference between rural and urban region given the p-value (0.2427) of the alternative hypothesis (H1). In other words, the result failed to reject the null hypothesis that there is no difference between rural and urban regions on the inaccessibility to carbohydrates.

Access to protein food

On the accessibility to protein food during and immediately after the lockdown between the rural and urban dwellers. Table 5 presents the t-test analysis and it result evidenced that there is difference in the inaccessibility to basic protein food. Therefore, the result rejects the null hypothesis there is no difference. The urban dwellers experienced more difficulties in accessing protein food.

Table 4: *T-test comparing rural and urban inaccessibility to carbohydrates.*

Region	Mean	Std. Err.	Std. Dev.	T-value	Degree of freedom
Rural	2.69444	0.08453	1.2423	– 1.1844	43.5918
Urban	2.97059	0.21728	1.2669		
Combined	2.732	0.07885	1.2467		
Difference	– 0. 2761	0.23314			
95% Confidence interval H_o: mean difference between rural and urban = 0					
H_1: mean difference ≠ 0					P-value = 0.2427
H_1: mean difference < 0					P-value = 0.1213
H_1: mean difference > 0					P-value = 0.8787

Source: *Field survey data 2020/2021.*

Table 5: *T-test comparing rural and urban inaccessibility to proteins.*

Region	Mean	Std. Err.	Std. Dev.	T-value	Degree of freedom
Rural	2.69444	0.085001	1.24925	– 3.4861	43.7922
Urban	3.26470	0.21655	1.26272		
Combined	2.564	0.08091	1.27924		
Difference	– 0. 811	0.23264			
95% Confidence interval H_o: mean difference between rural and urban = 0					
H_1: mean difference ≠ 0					P-value = 0.0011
H_1: mean difference < 0					P-value = 0.0006
H_1: mean difference > 0					P-value = 0.9994

Source: *Field survey data 2020/2021.*

Table 6: *T-test comparing rural and urban inaccessibility to minerals (vegetables).*

Region	Mean	Std. Err.	Std. Dev.	T-value	Degree of freedom
Rural	2.3935	0.0819	1.2038	– 2.6522	42.1832
Urban	3.0294	0.2253	1.3139		
Combined	2.48	0.0782	1.236		
Difference	– 0.6359	0.2397			
95% Confidence interval H_o: mean difference between rural and urban = 0					
H_1: mean difference ≠ 0					P-value = 0.0112
H_1: mean difference < 0					P-value = 0.0056
H_1: mean difference > 0					P-value = 0.9944

Source: *Field survey data 2020/2021.*

Table 7: *T-test comparing rural and urban inaccessibility to vitamins (fruits).*

Region	Mean	Std. Err.	Std. Dev.	T-value	Degree of freedom
Rural	2.4907	0.08037	1.1812	– 2.8893	45.5659
Urban	3.0882	0.19054	1.11103		
Combined	2.572	0.07511	1.1876		
Difference	– 0. 59745	0.2068			
95% Confidence interval H_o: mean difference between rural and urban = 0					
H_1: mean difference ≠ 0					P-value = 0.0059
H_1: mean difference < 0s					P-value = 0.0029
H_1: mean difference > 0					P-value = 0.9971

Source: *Field survey data 2020/2021.*

Access to minerals (vegetables)

Table 6 presents the t-test result on the inaccessibility to mineral (vegetables) during and immediately after lockdown. The result evident that there is significant difference between the rural and urban on the inaccessibility and that the urban dwellers experienced more difficulties in the accessibility. Thus, the result rejects the null hypothesis that there is no difference between the regions.

Access to vitamins (fruits)

The result in Table 7 reveals that there is difference on the inaccessibility to vitamins (fruits) between the rural and urban region. In order words, the result rejects the null hypothesis that there is no difference between the regions. The gap in the difference shows that the urban experience more difficulties in accessing the food nutrition during and immediately after the lockdown.

Conclusion and Recommendations

The COVID-19 pandemic lockdown has left scares in households and nations at large. It been over two years now, but the virus continues to threaten nations as it keeps evolving into vaccine-evasive variants. This research aims at providing empirical evidence on how the lockdowns affected food nutrition security in Punjab Province of Pakistan and then provide plausible recommendations to mitigating the adverse impact on household in case there is possible lockdown for the new variants circulating in countries.

The major findings in this research include the followings: the respondents are the household heads who are majorly male. Most of the respondents are farmers by occupation residing in the rural area. Other major occupations salary earners, and skilled self-employees. On adherence to facemask wearing, most of the respondent observes the rules. The study compared the rural and urban households to determine if the respondents in both regions experienced differently the adverse effect of COVID-19 pandemic on accessibility to food nutrients during the lockdown. The result shows that there was significant difference between the rural and urban on the inaccessibility to clean water, protein food, minerals (vegetables), and vitamins (fruits). Only the inaccessibility to carbohydrate foods showed no significant difference. The urban respondents experienced more difficulties than the rural respondents. Based on the findings, and the likelihood of initiating another lockdown for the new variants, it is recommended that the campaign on the new variant threat should be increase. If the lockdown should prolong, the government should

initiate food assistant program especially to the vulnerable in the urban regions. Cash transfer or input assistant to farmers should be encouraged to sustainable supply of food.

Novelty Statement

COVID-19 had a significant impact on food nutrition security in Punjab, Pa-kistan. The current study explored factors causing food insecurity during the COVID-19 pandemic, emphasizing the urgency of policy interventions to address such challenges in the future.

Author's Contribution

Muhammad Yaseen: Conceptualization, methodology, supervision, writing original draft.
Abdul-Gafar Ahmed: data curation, formal analysis, investigation, writing original draft.
Muhammad Luqman: data curation, formal analysis, methodology, validation.
Ahmed Saifullah Ahmed and Sami Ullah: formal analysis, methodology, visualization, writing review and editing.
Ayuba Abdulsalam: Investigation, methodology, writing review and editing.
Usman Saleem: formal analysis, writing review and editing.

Conflict of interest
The authors have declared no conflict of interest.

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