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Food insecurity and mental health of women during COVID-19: Evidence from a developing country

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Abstract

The coronavirus (COVID-19) outbreak has caused significant psychological pressure, with women being more likely than men to have experienced negative impacts. The situation is acute in poor areas in developing countries due to income loss and resulting in food insecurity. This study examines the association between food insecurity and the mental health of women during the COVID-19 pandemic using panel data from two waves of 2402 household surveys first conducted after three weeks of the lockdown in Bangladesh. Food insecurity was measured using the Food Insecurity Experience Scale (FIES) while the Perceived Stress Scale (PSS) was used to assess stress levels. Descriptive statistical analyses including mixed-model linear regression were performed. About 58% of the household became more food insecure between the two waves of surveys, conducted within a span of three to four weeks, while 35% maintained stability. PSS score were found to be significantly associated with increasing food insecurity. PSS score increased by 3·12 points with a negative change in FIES scores (95% CI: 2·65; 3·58, p-value 0·00) while an unchanged FIES score was associated with a 1·39 point increase in PSS score (95: CI: 0·95; 1·84, p-value: 0·00). This indicates deterioration of psychological wellbeing as food insecurity prolonged. This study offers important insight into the mental health of women in a developing country in the context of COVID-19. The results have implications for policies around food security and the overall wellbeing of women in the time of any crisis.

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Introduction

During any crisis, be it health or economic[1,2] or environmental[3,4] people tend to suffer an increased level of stress, anxiety, and other psychological problems that threaten their overall wellbeing. During health crises such as the *Severe Acute Respiratory Syndrome (*SARS) outbreak in the early 2000s, the H1N1 influenza pandemic in the late 2000s, and the Ebola outbreak in the last decade, people suffered psychological disorders including a high level of stress, anxiety, and depressive symptoms. In West Africa, Ebola survivors experienced a number of psychological distress including depression, anxiety, anger, grief, guilt, flashbacks, sadness, worthlessness, substance addiction, suicidal tendencies, and self-stigmatisation.[5]

Experts call for early planning, research, and supportive measures in order to tackle the impact of COVID-19 on mental health, particularly due to the isolation it may cause.[6] Previous studies show that prolonged isolation may result in a number of psychological problems including acute stress, post-traumatic stress symptom, psychological distress, depressive symptoms, stress, and emotional disturbance, and can have a lasting psychological impact.[7] Apart from the heavy human cost COVID-19 pandemic has led to a global economic crisis, to a large extent due to lockdown and disruption of economic activities that ensued, and massive public health and social safety cost. Experts predict income loss and food insecurity in countries where poverty is widespread and are reliant on the informal sector.[8] A strong positive association was found between income and experience of food insecurity, and common mental disorders among women in low and middle-income countries.[9] In this study, we present evidence from rural areas of Bangladesh where we examined the association between food insecurity and the mental health of women during COVID-19. We also examined awareness about coronavirus among women and their compliance with the health directives, and their association with food security and mental wellbeing.

Methods

Study design and sample

This is part of a larger study to understand the health and wellbeing during COVID-19. A total of 9,847 rural households (response rate 78%), chosen at random from a panel of households interviewed during the pre-COVID-19 period, were surveyed (wave 1) in the southwest region of Bangladesh, about 260 km from the national capital Dhaka, between 14 April and 3 May 2020, three weeks after a lockdown was imposed. These households have very similar characteristics and are representative of rural household surveys by the Bangladesh Bureau of Statistics.[10] A subsample of households with female respondents were re-surveyed (wave 2)

following three to four weeks the first survey to understand their mental health and monitor any changes in food security status as the lockdown continued. A total of 2402 women (response rate about 95%) from the same number of households were surveyed in wave 2. Surveys were conducted over the phone in compliance with COVID-19 preventive measures. Enumerators hold at least a bachelor's degree and previously collected similar data in the study area. Additional training was provided on telephone interviewing. Oral consent was obtained prior to the interview as obtaining written consent was not feasible due to COVID-19 health directives imposed by the government during the lockdown. Calls were scheduled at times that were nominated as most convenient by the participants. Ethics approval was obtained from Monash University, Australia (Project ID: 24746). Reporting of evidence has been guided by the STROBE statement.[11]

Outcome variables

We examined two important and immediate concerns mentioned frequently during the pandemic: food insecurity as a proxy for the financial stress of the poor people, and mental health. By observing household over time during the lockdown we examined potential association between food insecurity and the mental health outcome among women. Food insecurity was measured using the Food Insecurity Experience Scale (FIES).[12] The mental health data were collected during wave 2 using the Perceived Stress Scale (PSS) and was adapted to use in Bangladesh.[13] In addition to food insecurity and mental health, we attempt to measure knowledge level on COVID-19 (16 items), attitude level to COVID-19 (10 items), and income loss experienced due to COVID-19.

Statistical Analysis

We examined the knowledge level based on True-False (0-1) dichotomous responses. The attitude level was examined dichotomising participants' responses to Yes-No (0-1). Scores on these for each participant were calculated by summing up scores for all items of two scales separately. Food security scores were measured on dichotomous responses, Yes-No (0-1), and by summing up scores on all items to obtain a total score. A change in food security status between wave 1 and wave 2 was measured by subtracting the wave 2 value from wave 1. A negative change in values was defined as food security conditions worsen over the period of two surveys, a positive change indicates an improvement, and a zero-score defined as no change. A 10-item PSS was used to measure mental health status. Each item was measured on a 5-point scale between 0 and 4. Thus, the total score lay between 0 and 40, the higher the score the more the level of perceived stress. However, in our analyses we have also analysed PSS

score by dividing it into four ordinal categories low (1-10); moderate (11-20); high (21-30); and very high (31-40). To capture the mental health status, we asked respondents PSS items about the time frame of "in the last 7 days".

Participant characteristics were summarised using descriptive statistics: frequency and percentages for dichotomous variables; mean and standard deviation for continuous variables. We also performed a descriptive analysis of knowledge and attitude level, and PSS scores. Three mixed-effects linear regression modelling was used to assess the relationship between changes in FIES scores and knowledge level, attitude status, and PSS score. Another mixed-effects linear regression model was used to evaluate the relationship between PSS score and categorized food security status change (negative change, no change and positive change). A mixed-effects ordinal logistic regression was also conducted to see the relationship between ordinally categorised PSS score and categorised food security status. Each model included a village-level fixed effects to adjust for the correlation of outcomes within the village; the models also adjusted for participants' age and educational level.

Role of funding sources

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Result

The average age of the respondents was 38 years (SD ± 8 years), and 993 (42%) participants were above 40 years of age. On average, the respondents had eight years of formal education (SD ± 3 years), and about 90·74% of participants (2,647 out of 2,402) could read and write. The median monthly income was 7,803 BDT, and 829 (35%) participants reported that their food security status worsens over the pandemic period. The average number of family members is 4·34 (SD ± 1·3 persons).

A descriptive overview of knowledge, perception, and stress level

The descriptive statistics containing the 35 statements are shown in Supplement 1, Supplement 2, and Table 1. The category of statements was grouped as follows: Knowledge Level on COVID-19 (KLC-19) comprised 16 statements, Attitude Level on COVID-19 (ALC-19) comprised nine statements, and Perceived Stress Scale (PSS) comprised of ten statements. In the following section, we have discussed the item-wise descriptive statistics of KLC-19, ALC-19, and PSS.

Knowledge Level on COVID-19 (KLC-19)

In the statements of "*People of all ages can be affected by this virus"* (KLC-19:1), *"Coronavirus spread from one person to another"* (KLC-19:3), *"There is no vaccine for this virus"* (KLC-19:5), and *"We can be saved if we stay at home"* (KLC-19:7), more than 90% of the participants mentioned those statements as true statements (Supplement 1). Importantly, in the statements of "*The person who is affected should be blamed or ostracized"* (KLC-19:8), and *"Whoever comes to this country from abroad spreads this virus"* (KLC-19:11) 79% and 88% participants respectively mentioned these two as true statements. However, 59% and 65% of participants disagreed with the following two statements: "*If anyone dies due to coronavirus, he/she cannot be buried in this village"* (KLC-19:6) and "*If you sin, you get corona virus"* (KLC-19:9). Forty-five percent of the participants agreed with the statement that "*Anyone who gets affected by corona will die"* (KLC-19:2), while 56% agreed that "*If anyone in the para (community) gets affected, all other people in the para will also get affected"* (KLC-19:4). About half of the participants believe that "*This virus is curse"* (KLC-19:10). A similar proportion (45%) agreed to the following statements: "*I won't make any marital relation with a coronavirus affected family"* (KLC-19:12), and "*No one will make marital relation with us if anyone from my family gets corona"* (KLC-19:13). Forty percent of participants thought getting infected with the virus would affect their prospect for employment in the future (KLC-19:14). Finally, a very small proportion of participants (2%) agreed with the following two statements "*People who are poor, gets this virus"* (KLC-19:15), and "*People who are rich, gets this virus"* (KLC-19:16).

Attitude Level on COVID-19 (ALC-19)

In wave 2, almost all the participants (99%) mentioned that they washed their hands more often (ALC-19:4) and 90% participants reported using a mask when went outside (ALC-19:7) (Supplement 2). More than 95% of participants mentioned that they felt anxious to go outside (ALC-19:2) and when someone came to their house (ALC-19:3). About 86% of participants mentioned that they got anxious while interacting with friends and relatives (ALC-19:1). About 81% of participants mentioned that they did not go outside except necessary works (ALC-19:5), wherein, only 47% mentioned that they kept at least 1.5 metre distance from others when outside (ALC-19:6). Additionally, only 43% of participants mentioned that they did not hug or handshake with anyone (ALC-19:9) and 33% mentioned that they used tissue or handkerchief to cough or sneeze (ALC-19:8).

Perceived Stress Scale (PSS)

Table 1 shows that nearly, 40% of participants mentioned that they could solve their problem (PSS: 4), things were going as they wanted (PSS: 5), and they knew that had control over everything (PSS: 8). On the other hand, about 15% of participants mentioned that in the last seven days they often thought that they did not have control (PSS:2) and got angry on things they could not control (PSS: 9). Sixteen percent participant mentioned that in the last seven days they often got angry (PSS: 1), 27% mentioned they often got panic (PSS: 3) and 24% thought that their problem was getting out of control (PSS: 10). However, when participants were asked how often they thought that they could keep up with everything only 27% mentioned that they could do it often (PSS: 6) and when asked how often could manage their irritated feeling only 23% answered that they could do it frequently (PSS:7). When divided into categories about 45% of participants reported having moderate stress while about 42% reported high stress.

Results from regression analysis

The distribution of KLC-19, ALC-19, and PSS score was normal among the study population. The mean value of KLC-19, ALC-19, and PSS scores were 10·05 (SD ± 261), 6·80 (SD ± 1.39), and 19·39 (SD ± 4·41) respectively. In addition, regarding the issues related to changes in food security condition over the time period more than half of them, 1389 out of 2402 (58%), showed a negative change or deterioration, whereas 850 (35%) showed no change and the rest of them showed positive change. Figure 1 shows the difference in various food security status between two waves and a significant difference in participants' proportion was observed with the food secure, mild insecure, and moderate insecure groups.

Effect of change in food security status on KLC-19, ALC-19, and PSS scores

A negative change in food security status over the pandemic period was associated with the increased PSS score by 3·12 (95% CI: 2·65; 3·58, p-value 0·00) wherein, a static condition in food security status over the pandemic period was associated with increased PSS score by 1·39 (95: CI: 0·95; 1·84, p-value: 0·00) when compared with improved food security status (Table 2). When comparing between wave 1 and wave 2 surveys and performing a mixed effect linear regression model, significant negative association was observed between the PSS score and change in food security status (Coefficient: -1.15, 95% CI: -1·30; -0·99, p-value: 0·00) (Table 3). The association between the change of FIES score and PSS score remained the same when PSS scores were divided into categories and a mixed effect ordinal regression analysis was

performed (Supplement 3). However, the effect of change in food security status over KLC-19, ALC-19 score was non-significant (Table 3).

Discussion

This research examined the association between food security and mental health of women in the rural areas of Bangladesh. Studies that investigated mental health in relation to food security in rural areas of Bangladesh focused on depression and food and nutrition status[14] and depression and anxiety symptoms of women and their families in relation to food insecurity and intimate partner violence.[15] The general awareness around who could contract coronavirus, how it spreads, and a vaccine not being available to prevent infection seemed to be high among the participants (Supplement 1), likely a result of public awareness effort by both government and non-government organisations, and the use of electronic and social media. There were still misperceptions at a high level. Half of the respondents were against the burial of a person who died of coronavirus. Also, perceptions about people who were infected with the virus, overseas returnees, or travellers' role in spreading the virus, and the perceived consequences of infection demonstrate misconceptions. While this is true that in absence of proper measures for containment such as quarantining patients and isolating others who came into contact with an infected person can spread the virus, our findings indicate that infected individuals may experience stigma in the community. Stigmatisation may work in two ways: stigmatising others who are infected (e.g. blaming/ostracising, unwilling to consider for matrimony) on one hand, and fearing stigmatisation on self or family (e.g. fearing less prospect regarding matrimony and employment). Therefore, there is a need for more effort in public awareness about coronavirus, preventive measures, and consequences of infections based on scientific evidence.

Promisingly, we found positive attitude towards maintaining hand hygiene (99%), wearing face masks outside the home (90%), and going outside only when it was necessary (81%) with a significantly high proportion of respondents practicing these to keep themselves safe from the infection s). However, these responses to be interpreted with caution as they are self-reported and might have social desirability bias. On the contrary, fewer respondents were able to maintain a 1.5 metre distance from others in the outside (43%) and maintain cough and sneeze etiquette (33%). This, on one hand, suggests a possible low level of compliance around and lack of awareness of the importance these critical preventive measures, on the other hand, indicate the challenges people perhaps facing to comply with some of the measures in a densely populated, resources poor setting like Bangladesh.[16] Food insecurity were found to be associated with loss of income as the pandemic hit and the lockdown set; consequently, the

concern over managing household finance outweigh concern over health.[17] It is assuring that only a fifth of the respondents could not follow the 'stay at home'. Women's caregiving responsibilities at home and an additional burden of care during the pandemic may have played part in this instance.[18] On the contrary, with widespread loss of livelihood health becomes less of a priority for some and may make it harder for them to stay home with no or very limited income and increasing food insecurity.[19] Thus, this is not to imply a lack of concern for health as a significant proportion of respondents reported of being worried about crowded places, having visitors in their house, and interacting with relatives and friends.

This study makes an important contribution to the study of women's mental health in relation to food security in rural, resource-poor settings in the context of the COVID-19 pandemic. Evidence on mental health problems are scarce in Bangladesh and such problems are often not considered serious health problems, and due to the stigma attached to mental health problems, the extent of the problem is often underreported.[20] Women are more vulnerable than men to have mental health problems, in both urban and rural settings.[20] In our sample, majority of the respondents reported moderate to high perceived stress. Most respondents reported becoming upset because something unexpected happened; feeling nervous or anxious; not being able to cope with things they had to; being angered by things that were outside of their control; and feeling of not being able to overcome accumulating difficulties "Sometimes" or "Fairly often" or "Very often" (Table 3). About 67% reported "Never/Almost never" or "Sometimes" being able to control irritations in their lives. The gender-based inequities in Bangladesh result in women having lower access to resources, lower decision-making power, and disparities in legal, economic, and political institutions that put women in a uniquely vulnerable position in times of crises.[21] These factors are likely to negatively impact the mental health of women in rural settings where gender norms are expected to be more rigid, and recognition of mental health need and access to mental health care is low.

We detected a negative correlation between change in food security status and PSS score, which means that worsening the food security status is increasing the perceived stress level (Figure 1). These findings give strength to the evidence that mental health problems are prevalent among people who are socially disadvantaged, especially women in Bangladesh, regardless of their family size.[22] Food insecurity was found to be associated with anxiety and depression among women in rural areas of Africa.[23] Evidence of food insecurity affecting the mental wellbeing of women is also available in the context of other developing countries.[24,25] Food insecurity was found to be linked with a higher risk of mental illness in both women

(18·4%) [95% CI 16·7 – 20·1] and men (13·5%) [95% CI 11·9 – 15·2] which may be even high because of social isolation.[26] A review conducted on the evidence of psychological effects of quarantine from ten countries found that longer (i.e. >10 days) duration of quarantine and inadequate supplies can lead to poorer mental health outcomes.[7]

These pieces of evidence need to be interpreted in the context of prolonged lockdown in resource-poor settings. We collected the PSS data when Bangladesh had been into lockdown for more than six weeks. While lockdown can help prevent the spread of disease, it can impose a significant financial burden on individuals. In Bangladesh, millions experienced income loss due to massive disruption in economic activities.[27] People in developing countries, particularly the poor, appeared to have been bearing the manifold burden of COVID-19 at health and economic front including poverty and food insecurity [19] which can lead to common mental illness.[9] Mental health impacts overall health and wellbeing to a great extent. To a varying degree, acute and chronic stress can impact the immune system.[28] Therefore, a higher risk of having an elevated level of stress due to food insecurity and exacerbation of that due to social isolation may make women more vulnerable to the coronavirus and other health problems.

Currently, there is limited mental health service, in magnitude and reach.[20] There are some NGO initiatives of providing tele-counselling during the COVID-19 pandemic.[29] However, such services that incur a cost might not be suitable for poorer groups who do not have enough resources to buy food, even if they felt the need to seek help. From a public health point of view, it is critical to have evidence on the COVID-19 pandemic's effect on the mental health for the most vulnerable groups so that necessary support services can be developed, relevant policies can be formulated, and resources can be allocated towards mental health care. Thus, there is an urgent need for immediate support to ameliorate food insecurity and for more research to generate evidence highlighting the need of the marginalised women living in rural areas of Bangladesh, to inform and support policymakers with necessary insights.

Our study contributes new evidence on the change in food security status or women living in rural areas using FIES and PSS at two time-points after the COVID-19 pandemic induced lockdown was imposed and examines the implication of this change on their mental health i.e. stress level. As the sample households share similar characteristics and thus representative of rural households in Bangladesh, the results can be generalizable to rural household in other parts of the country. Our findings can offer insight into the mental health status of women in similar low income, resource-poor settings. Our study is not free of limitations. Due to the

pandemic, we do not have any counterfactuals, thus, are unable to examine any causal relationship. This is the first study that used PSS in the context of rural Bangladesh. Thus, there is scope for further research for scale refinement. However, our findings did not differ significantly with existing literature on Bangladesh, though very limited. This study seeks to contribute to addressing this critical evidence gap.

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Table 1: Frequency of the statement related with Perceived Stress Scale (PSS)

	In the last 7 days, how often	Never/Almost never (%)	Sometimes (%)	Fairly often/Very often (%)
PSS: 1	have you been upset because of something that happened unexpectedly?, n (%)	676 (28)	1344 (56)	382 (16)
PSS: 2	have you felt that you were unable to control the important things in your life?, n (%)	1233 (51)	804 (33)	365 (15)
PSS: 3	how often have you felt nervous and stressed?, n (%)	516 (21)	1240 (52)	646 (27)
PSS: 4	have you felt confident about your ability to handle your personal problems?, n (%)	430 (18)	1032 (43)	940 (39)
PSS: 5	have you felt that things were going your way?, n (%)	432 (18)	988 (41)	982 (41)
PSS: 6	have you found that you could not cope with all the things that you had to do?, n (%)	657 (27)	1087 (45)	658 (27)
PSS: 7	have you been able to control irritations in your life?, n (%)	687 (29)	1164 (48)	551 (23)
PSS: 8	have you felt that you were on top of things?, n (%)	417 (17)	1040 (43)	945 (39)
PSS: 9	have you been angered because of things that happened that were outside of your control?, n (%)	1161 (48)	950 (40)	291 (12)
PSS: 10	have you felt difficulties were piling up so high that you could not overcome them?, n (%)	636 (26)	1189 (50)	577 (24)

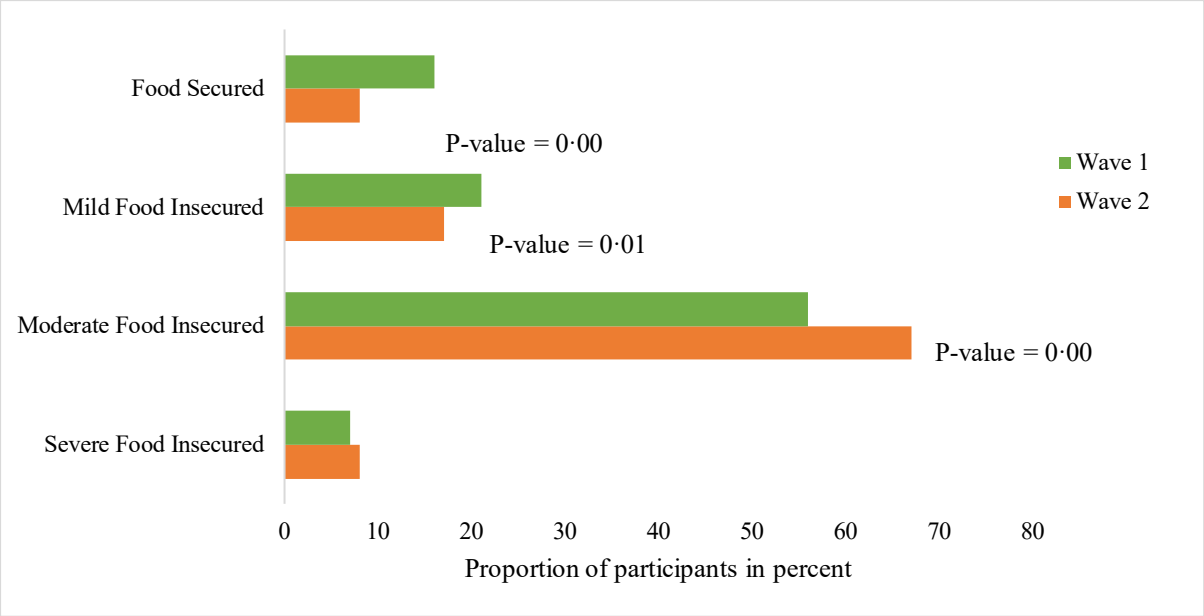

Figure 1. Food security status across wave 1 and wave 2

Table 2: Change of PSS score in relation with food security change status

FIES status	PSS score (mean, ±SD)	Change in PSS score (95% CI)	p-value
Positive change	17·60, ±4·59	Ref	Ref
No change	19·11, ±4·26	1·39 (0·95, 1·84)	0·00***
Negative change	20·84, ±4·01	3·12 (2·65, 3·58)	0·00***

*Mixed model linear regression was applied
**Models were adjusted for participants' age and educational level and clustering was done at the village level
***p-value <0·05 considered as significant

Table 3: Effect of change in food security (FIES) on KLC-19, ALC-19 and PSS scores

	Change in FIES Score	95% CI	p-value
PSS Score	-1·15	-1·30; -0·99	0·000***
KLC-19 Score	0·06	-0·04; 0·16	0·231
ALC-19 Score	-0·04	-0·09; 0·02	0·178

*Mixed model linear regression was applied
**Models were adjusted for participants' age and educational level and clustering was done at the village level
***p-value <0·05 considered as significant

Supplement 1: Frequency of the statement related with Knowledge Level on COVID-19 (KLC-19)

	Knowledge items	False, n (%)	True, n (%)	Don't Know, n (%)
KLC-19: 1	People of all ages can be affected by this virus	29 (1)	2362 (98)	11 (0·5)
KLC-19: 2	Anyone who gets affected by corona will die	1263 (53)	1082 (45)	57 (2)
KLC-19: 3	Corona virus spreads from one person to another	21 (1)	2374 (99)	7 (0.5)
KLC-19: 4	If anyone in the para gets affected, all other people of the para will also get affected	1009 (42)	1347 (56)	46 (2)
KLC-19: 5	There is no vaccine for this virus	70 (3)	2226 (93)	106 (4)
KLC-19: 6	If anyone dies due to corona virus, he/she cannot be buried in this village	1415 (59)	797 (33)	190 (8)
KLC-19: 7	We can be saved if we live at home	55 (2)	2334 (97)	13 (1)
KLC-19: 8	The person who is affected should be blamed or ostracized	455 (19)	1898 (79)	49 (2)
KLC-19: 9	If you sin, you get corona virus	1555 (65)	367 (15)	480 (20)
KLC-19: 10	This virus is curse	834 (35)	1164 (48)	404 (17)
KLC-19: 11	Whoever comes to this country from abroad spreads this virus	234 (10)	2105 (88)	63 (3)
KLC-19: 12	I won't make any marital relation in future to the corona virus affected family	1146 (48)	1083 (45)	173 (7)
KLC-19: 13	No one will make marital relation with us if anyone form my family gets corona	1125 (47)	1046 (44)	231 (10)
KLC-19: 14	If I am affected, no one will give me jobs in the future	1208 (50)	952 (40)	242 (10)
KLC-19: 15	People who are poor, gets this virus	2286 (95)	57 (2)	59 (2)
KLC-19: 16	People who are rich gets this virus	2300 (96)	37 (2)	65 (3)

Supplement 2: Frequency of the statement related with Attitude Level on COVID-19 (ALC-19)

	Attitudinal items	No, n (%)	Yes, n (%)
ALC-19:1	Getting more anxious while interacting with friends and relatives	331 (14)	2071 (86)
ALC-19:2	Getting anxious when someone is coming to the house	89(4)	2313 (96)
ALC-19:3	Getting anxious in going to the crowds	65 (3)	2337 (97)
ALC-19:4	Wash your hands more often	18 (1)	2384 (99)
ALC-19:5	Do not get outside except it is necessary	454 (19)	1948 (81)
ALC-19:6	Keep at least 2 feet distance with others in the outside	1261 (53)	1141 (47)
ALC-19:7	Use mask if go outside	246 (10)	2156 (90)
ALC-19:8	Use tissue or handkerchief to cough or sneeze	1601 (67)	801 (33)
ALC-19:9	Do not hug or handshake with anyone	1363 (57)	1039 (43)

Supplement 3: Change of PSS score in relation with food security change status

FIES status	Change in PSS score (95% CI)	p-value
Positive change	Ref	Ref
No change	1·64 (1·32, 2·03)	0·00***
Negative change	3·34 (2·66, 4·19)	0·00***

*Mixed model ordinal regression was applied
**Models were adjusted for participants' age and educational level and clustering was done at the village level
***p-value <0·05 considered as significant