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The impact of COVID-19 on nutrition among COVID respondents in Unnao region

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Abstract
The COVID-19 Pandemic is a major health crisis in the life of millions globally. The purpose of this study was to assess the impact of COVID-19 on nutrition among the COVID respondents in Unnao region. COVID-19 lockdown has affected the dietary habits and nutritional patterns of the different countries affected. COVID-19 has imposed a new set of challenges for the individuals to maintain a healthy diet. A proper diet and good nutritional status are considered impact elements for an optional immune response to prevent infections. Sample consisted 100 COVID-19 positive respondents 50 male and 50 female between age group of 21-50 years who were residing in Unnao city. Self-structured questionnaire was developed for collecting data from respondents. The data concerning dietary intake of the respondents were collected using 24 hour recall method and purposive random sampling. The energy consumption was found 2204 K Cal, Protein 48 gm, Fat 23.1 gm, Iron 20 mg/d, Vitamin A 716 mcg/d, Vitamin C 57 mg/d, Zinc 18 mg/d, Thiamine 2.6 mg/d, Riboflavin 3.2 mg/d, Niacine 16.3 mg/d, Vitamin B12 1.77mg/d. The Protein, Fat, Vitamin A, vitamin-C and Calcium was found lower as compared to Recommended dietary allowances. Intake of all nutrients except for energy and Vitamins B was higher than recommended dietary allowance. Whereas Zinc was found to be adequate in diet.

Keywords: Nutrient intake, dietary habits, vitamin-C, vitamin-A, folic acid, riboflavin, zinc, thiamine, niacin

Introduction
The recent outbreak of corona virus disease 2019, caused by a new zoonotic severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) is great threat to public all over the world. It is mandatory to attain and maintain good nutritional status to fight against virus. The relationship between immunity and nutrition is well known and It's role in corona virus disease 2019 is also being paid great attention. All groups are affected by the COVID-19 pandemic, the elderly, and those with underlying medical conditions are at higher risk.
A proper diet and good nutritional status are considered important elements for an optional immune response to prevent infections. Thus poor diet and deficiency of these nutrients will increase the disease burden.
Healthy eating pattern seem to optimize the immune system functions and contribute to a lower probability of COVID-19 contagion and to recover better in those who have suffered it. Dietary strategies reduce inflammation and risk of chronic disease could reduce risk of severe disease and mortality from COVID-19. Certain nutrients such as vitamin A, B related vitamin (folic acids, vitamin B6 and B12) Vitamin C and minerals Fe, Zn are important for proper immune functions.

Methodology
A community based survey was carried out among COVID respondents of Unnao city to assess their macro and micronutrients status. The data concerning dietary intake of the respondents were collected using 24 hour recall method. Data concerning dietary habit was obtained from the respondents by questionnaire-cum interview and purposive random sampling method. The nutrient intake was compared with Recommended Dietary Allowance (RDA) of ICMR (2020). The study was conducted during the study period of 2021 to 2022 with the sample size of 100 respondents. Data was analyzed statistically using the MS Excel 2010. Frequency, standard deviation, z test, mean and percentage. The level of significant was taken at $p<0.05$ for the study.

Observation and Assessment Nutrient intake

Table 1: Energy, Protein and Fat consumption of COVID respondents according to gender

S. No	Gender	Percent	Energy (kcal/d)		Protein (gm)		Fat (gm)	
			Mean	SD	Mean	SD	Mean	SD
1	Male	50	2353	560	50.9	9.8	28	8
2	Female	50	2050	377	45.9	7	23	5.8
	Total	100	2201	497	48	9.1	25	7.4
	Z		-15.847		-0.3464		3.8251	

Table 1. shows the energy, Protein and fat consumption of COVID respondents according to gender 2353.0 K cal of energy with SD 560, 50.9 gm of Protein with SD9.8 and 28 gm of Fat with SD respectively were take by male COVID respondents Whereas 2050 K Cal energy, 45.9 gm Protein and 23 gm Fat were consumed by female COVID respondents and means significant differences (according to gender) were found at 5% level of significance with value Z. It was observed that Majority of the respondents were consuming legumes and cereal based food on daily basis such as oatmeal, finger millet, rice, wheat, chick pea, lentil, soya beans, etc. The protein consumption of COVID respondents was found low because half of the respondents were consuming vegan diet so they were not consume high quality proteins in their diet such as eggs, meat, fish and poultry. COVID respondents were not including healthful fat in a regular meal, such as monosaturated and polysaturated fats. Fat deficiency were seen in those COVID respondents who were belonging to under nutrition especially 31 to 40 year age group respondents.

Yousef N *et al*. (2021) studied relationship between the nutritional status of patients with COVID-19 and their disease course. They found their study malnutrition was highly prevalent (85.7%) among the patients who died as a result COVID-19. Study found that poor nutritional status was significantly associated with poor prognosis and high mortality. Above studies support our study.

Table 2: Calcium, Phosphorus and Zinc consumption of Respondents according to Gender

S. No	Gender	Percent	Calcium (mg)		Phosphorus (mg)		Zinc (mg)	
			Mean	SD	Mean	SD	Mean	SD
1	Male	50	446	98	382	132	17	5.9
2	Female	50	452	100	410	154	11.6	6.2
	Total	100	450	99	398	144	14	6.6
	Z		-2.6541		-1.4650		4.8891	

The data pertaining in table 2. reveals that calcium, phosphorus and zinc consumption of COVID respondents according to gender, 446 mg Calcium with SD 98, 382 Phosphorus with SD 132, 17 mg Zinc with SD 5.9 were consumed by male COVID respondents followed by 452 mg Calcium with SD 100, 382 mg Phosphorus with SD 154, 11.6 mg Zinc with SD 6.2 were consumed by female COVID respondents in the study area ad means significant, at 5% level of significance with value Z. Respondents were not regularly including dairy products like milk, cheese, ad Yougurt, dates, kiwi, oranges etc. in their diet.

zinc is essential antioxidant and adequate functioning of the immune system, it cant not be produced or stored in the body, need to be supplemented through diet, majority of the respondents were not regularly including zinc rich food in their diet such as pumpkin seeds, chickpeas, apple, orange etc.

Table 3: Iron and Folic acid consumption of Respondents according to Gender

S. No	Gender	Percent	Iron(mg)		Folic acid (mg)	
			Mean	SD	Mean	SD
1	Male	50	22.5	6.9	318	105
2	Female	50	17.5	7.3	366	100
	Total	100	20	7.5	342	104
	Z		4.4270		-3.4867	

Table 3. reveals that iron and folic acid consumption of COVID respondents according to gender, 22.5 mg iron with (SD. 6.9) consumed, male COVID respondents followed by 17.5mg of iron were taken by female COVID respondents in the study area and means significant difference (According to gender) were found with value Z at 5% of significance. According to gender folic acid consumption of COVID respondents were found 318 mg with SD 105 were consumed by male COVID respondents whereas 366 mg with SD 100 were consumed by female COVID respondents in the study area and mean significant difference (According to gender) were found. Foalte associate were suffering with viral and bacterial infections so respondents should include enough amount of foalte rich foods such as Spinach, greenpeas, broccoli, eggs etc.

Table 4: B Vitamins consumption of Respondents according to Gender

S. No	Gender	Percent	Thiamine B1 (mg)		Riboflavin B2 (mg)		Niacin B3 (mg)		Pyridoxine B6 (mg)		Cobalamin B12 (mg)	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	Male	50	2.9	1	3.4	1	19.7	5.8	2.5	1.4	2.3	1.33
2	Female	50	2.2	0.7	2.3	0.8	16.2	3.7	1.1	0.8	1.7	1
	Total	100	2.5	0.9	2.8	1	16.2	5.9	1.8	1.3	1.7	1.3
	Z		8.7698		8.5760		5.0385		8.9421		8.9651	

Table 4. Reveals the Thiamine, Riboflavin, niacin, Pyridoxine and Vitamin B12 consumption of COVID respondents according to gender. 2.9 mg thiamine with SD 1 were consumed by male COVID respondents followed by 2.2 mg of thiamine were taken by female COVID respondents in the study area and means significant differences (according to gender) was found with value Z at 5% level of significance. According to gender Riboflavin, niacin, pyridoxine and Vitamin B12 consumption of COVID respondents were found 3.4 mg Riboflavin with (SD 1), 19.7 niacin with (SD 5.8), 2.4 mg pyridoxine with (SD 1.4), 2.3 Vitamin B12 with (SD 1.33) were consumed y male COVID respondents. Whereas 2.3 mg Riboflavin with (SD 0.8), 16.2 mg niacin with (SD 3.7), 1.1 mg pyridoxine with (SD 0.8) and 1.7 vitamin B12 with (SD 1) were taken by females COVID respondents in the study area and mean significant differences (according to gender) were found thiamine, riboflavin, niacin, pyridoxine ad vitamin B12 with value z at 5% level. Majority of the respondents were consuming rich foods such as flax seeds, fish, oatmeal, peanuts etc. in their diet. Riboflavin deficiency were not seen in most of the respondents they were taking enough riboflavin rich foods such as spinach, yogurt, cheese, carrot, beans etc. Respondents who were pure vegan were having lack of niacin and due to low immunity level chances of infections were high. Respondents were not taking Vitamin B12 rich foods in their diet such as eggs, fish, Chicken, dairy products.

Elham *et al*. reveals that Vitamin B12 is one of the dietary requirement necessary in the treatment of coronavirus patients. Sign and symptoms of Vitamin 12 deficiency are similar to those of coronavirus infections. Recovered COVID patients need to be checked for Vitamin B12 deficiency and treated time to prevent deterioration.

Deficiecy of pyridoxine in COVID respondents effect immue system So the respondents were easily affected by infectious disease. Peanuts, oats, soya beans, banana, oranges etc are pyridoxine rich foods

According Im JH *et al*. (2020) [5] carried out a nutritional status of Patients with COVID-19 in South Korea. Vitamins B1, B2, B12, foalate, and zinc level were measured in 50 hospitalized patients with COVID-19. All COVID-19 patients with respiratory distress were classified as nutrient deficient.

Table 5: Vitamin A and Vitamin C consumption of Respondents according to Gender

S. No	Gender	Percent	Vitamin A (mcg)		Vitamin C (mg)	
			Mean	SD	Mean	SD
1	Male	50	491	132	22.8	11.9
2	Female	50	566	108	26	11
	Total	100	529	125	24	11
	Z		4.512		2.967	

Table 5. shows the Vitamin A and Vitamin C consumption of COVID respondents According to gender, 491 mcg Vitamins A with SD. 132, 22.8 mg Vitamin C with SD 11.9 consumed by male COVID respondents followed by 566 mcg Vitamin with SD. 108, 26 mg Vitamin C with SD 11 were consumed by the female COVID respondents in the study area and means significant difference were found vitamin A ad Vitamin C with value Z at 5% level of non-significant. Vitamin A is one of the immunity booster Vitamin and due to low intake of Vitamin A in their diet they get easily affected by corona virus. Green leafy vegetables such s Spinach, Broccoli, Kale Carotene and fiber rich foods must be included in the diet for preventing Vitamin A deficiency. Vitamin C is a antioxidant that is important for the production of collagen and play crucial role in immune response. Vitamin C deficiency is associated with Increase susceptibility to infection and increased risk of pneumonia. Some of the respondents were indulged in smoking which increases the high Vitamin C requirement. Citrus fruits such as Oranges, guava, kiwi, papaya, and tomato may prevent Vitamin C deficiency.

Table 6: Correlation coefficient between Anthropometric measurements and nutrients intake

Nutrient Intake	Height (cm)	Weight (kg)	BMI (kg/m2)
Energy	0.649	1.000**	-0.432
Protein	0.986**	0.773	-0.910**
Fat	0.914*	0.906*	-0.779
Calcium	-0.270	-0.903*	0.013
Phosphorus	0.789	0.055	-0.921*
Zn	-0.623	-0.999**	0.400
Iron	0.294	-0.527	-0.530
Thiamine	0.666	1.000**	-0.451
Riboflavin	-0.868	-0.945	0.711
Niacin	-0.927*	-0.892	0.799
B12	0.127	-0.664	-0.378
Follic Acid	0.937*	0.351	-0.995*
Pyridoxin	0.602	0.997**	-0.376
Vitamin_A	-0.998**	-0.613	0.979*
Vitamin_C	0.517	0.985**	-0.279

* &** Significant at 5% & 1% respectively

Table 6. Shows the correlation coefficient (r) between anthropometric measurements and nutrients intake of COVID respondents was found significantly correlated with Fat, Calcium, Phosphorus, Niacin, folic acid, at 5% level of significance. Whereas Energy, Protein, Thiamine, Pyridoxine was found significant at 1% level of significance. Furthermore, Calcium, Zn, Riboflavin, Vitamin A, Niacin was negatively correlated with Height of the COVID respondents. The weight of the COVID respondents was found to be significantly correlated with Fat at 5% level And Weight of the significantly correlated with Energy, Thiamine, Pyridoxine at 1% level, whereas weight of the respondents were found negatively correlated with Calcium, Vitamin A, iron, B12, Niacin, Riboflavin at 5% level and Zinc was negative correlated at 1% level. The BMI of the COVID respondents were found to negatively correlated with Energy, Protein, Fat, iron, Thiamine, Vitamin B12, Pyridoxin and Vitamin C.

Table 7: Distribution of COVID Respondents on the basis of food habits

		Male		Female
	Frequency	Percent	Frequency	Percent
Vegetarian	18	18.0	23	23.0
Non Vegetarian	32	32.0	27	27.0
Total	50	50.0	50	50.0

Table 7. Indicates the distribution of COVID respondents according to food habits. Maximum 32.0 percent male COVID respondents were non vegetarian while 18.0 percent were vegetarian respectively whereas 27.0 percent female COVID respondents were non vegetarian and 32.0 percent were vegetarian.

Table 8: Distribution of Respondents on the basis of meal pattern

Meal pattern				
	Male		Female	
	Frequency	Percent	Frequency	Percent
Twice	6	6.0	3	3.0
Thrice	32	32.0	37	27.0
Four time	12	12.0	10	10.0
Total	50	50.0	50	50.0

Table 8. Indicates the distribution of COVID respondents according to meal pattern. 32.0 per cent male COVID respondents were consuming three meals per day, 12.0 per cent were consuming four time meal per day and 6.0 per cent were consuming two meals per day followed by 37.0 percent female COVID respondents were consuming three meals per day, 10.0 percent were consuming four time meal per day and 3.0 percent were consuming two meals per day.

Conclusion

Result of the study revealed that half of the respondents were taking vegan diet furthermore, the protein, fat, Vitamin A, Vitamin C and Calcium found lower as compared to reecommended dietary allowances. Intake of all nutrients except energy and B Vitamins was found higher than Recommended dietary allowance whereas Zinc found to be adequate in diet. It is concluded that adequate nutrients intake and healthy lifestyle is necessary for combating the deadly novel corona virus in order to live a healthier and happiest life.

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