

Assessment of Variation in Nutrient Intake and Health Status of Women Due to COVID-19 Pandemic: A Cross-sectional Study

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ABSTRACT

Background: The economic position of a family has been influenced by Coronavirus disease 2019 (COVID-19) outbreak which ultimately affects the nutritional status of women. The COVID-19 pandemic acts as a hurdle to obtain a balanced diet required to maintain the good health of women. The present study aims to understand the deterioration of the nutritional status of women by evaluating the changes in dietary patterns of women due to the COVID-19 pandemic and measuring the body mass index (BMI) of women. **Materials and Methods:** A cross-sectional study was conducted on 315 non-pregnant women of reproductive age (18–49 years) at TB Hospital of Nagaur, Rajasthan, India. The nutritional status of women was evaluated by assessment of variation in nutrient intake due to the COVID-19 pandemic along with measuring the BMI of enrolled women. The study was conducted from January 01, 2021, to June 15, 2021. **Results:** The mean age of participants was 31.82 years (SD, 8.97). The family income of 20% of participants has been decreased during the COVID-19 pandemic. The frequency of intake of green vegetables and fruits was decreased in approximately 30% ($P < 0.001$) women, while the intake of meat, fish, and egg has increased in all non-vegetarian participants. The BMI of 65% of women has been falling in normal, 26% in overweight, 4.4% in underweight, and 4.1% in obese category. **Conclusion:** The current women's BMI and change in dietary intake indicate that the nutritional status of women has been deteriorating comparatively, which further leaves an impact on the coming generation also. It opens up a scope of research at other deprived places in our country.

Keywords: Body mass index, Coronavirus disease 2019, Dietary intake, Nutritional status, Women of reproductive age
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INTRODUCTION

The Coronavirus disease 2019 (COVID-19) outbreak has led to an increase in unemployment globally,^[1] which is also responsible for deteriorating public health and food insecurity, especially among the disadvantaged population.^[2,3] The decline in household income due to the COVID-19 pandemic affects the availability and affordability of nutritious food (such as vegetables, fruits, and milk), increasing the risk of maternal and child malnutrition.^[4-6] Social distancing, stay-at-home rule, and lockdown result in the paucity of the locally available nutritious food even. The impact of these socioeconomic consequences of the COVID-19 outbreak is prominent over women's health.^[7] Women of reproductive age (WRA) in India were already facing the risk of malnutrition from the past three decades.^[8-10] Previous studies reflect that women have been facing chronic deficiency of macro-and micro-nutrients in India.^[11] The risk of malnutrition in mothers has been gradually increasing due to the COVID-19 pandemic.^[3,12]

As a result of the continuation of various phases of COVID-19, the socio-economic condition of our country is steadily corroding. The inequalities in the economic status of people lead to an increase in health disparities and reinforce the deterioration of maternal and child health.^[13,14] In the long term, the ripple effect of these COVID-19 consequences will multiply the intensity of the threat to the global health system.^[15] Considering the adverse outcomes of COVID-19, it is necessary to assess the current nutritional status of WRA to mitigate the effect of the current health disaster and design proactive health interventions to tackle the expected consequences in the future. The present study aims to assess the variation in nutritional status of WRA by estimating the changes in dietary patterns in women due to the COVID-19 pandemic and

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by measuring the women's current body mass index (BMI). It can help in understanding the pace of change in the health status of women in our country during the present adverse situation of the COVID-19 outbreak.

MATERIALS AND METHODS

Study Design

A hospital-based cross-sectional study was conducted among WRA (18–49 years) at District TB Hospital, Nagaur, Rajasthan. This Hospital is a government hospital located in Nagaur city of Nagaur district, where women from both rural and urban areas come to avail the medical facilities. A total of 325 WRA (non-pregnant women) were selected randomly, out of which 315 women were interviewed successfully.

Inclusion and Exclusion Criteria

The women of the reproductive age group (18–49 years) at the time of participation in the present study were included. The women who were suffering from any infectious diseases or severe disease/disorder were excluded. The women who have been on any long-term medication or treatment were also excluded. Pregnant women were excluded from the study because it is an entirely different physiological condition that requires additional dietary intake compared to non-pregnant women.

Data Collection

The data collection period was from January 01, 2021 to June 15, 2021. Approval to conduct this study was obtained from TB Hospital, Nagaur, Rajasthan. Before starting the interview, written informed consent was taken from and provided to each participant. A mixed-method approach was used to assess the variation in nutrient intake and the related information regarding the variation, if any. The semi-structured schedule was used to collect the quantitative and self-reported qualitative data. All participants have completed the all three sections of the schedule used for interviewing which include.

Sociodemographic information

The age, marital status, education, and family income of participants, and information about changes in family income due to the COVID-19 pandemic (if any reported by the participants) were noted down.

Nutrition-related information

The food frequency schedule was self-reported by participants. It provides information regarding the change in nutrient intake habits of participants before and after the COVID-19 pandemic and other related information about it.

Anthropometric measurements

The height (in cm) and weight (in kg) of participants were measured to calculate their BMI (kg/m^2).

Statistical Analysis

The sociodemographic characteristic, the variation in family income due to COVID-19, and BMI of the study population was analyzed in Table 1. The BMI of women was computed by dividing the weight (in kilogram) by the squared height (in meters) of the woman^[16] using MS Excel 2012 [Table 1]. The mean value, standard deviation, frequency, and the rounding off were also computed using MS Excel 2012. The changes in consumption patterns of various dietary items before and during the COVID-19 Pandemic were analyzed using Pearson's Chi-square test using STATA 13.1 [Tables 2 and 3].

RESULTS

Characteristics of Population

The participants' response rate was almost 97%, as 315 out of 325 participants were successfully interviewed. The mean age of the

Table 1: Sociodemographic characteristics, income change, and BMI of the study population

Characteristics	Frequency	Percentage*
Mean age (SD)	31.84 (± 8.459)	
Age group (in years)		
18–30 years	162	51.4
31–40 years	86	27.3
41–49 years	67	21.3
Marital status		
Unmarried	125	39.7
Married	176	55.9
Widow	8	2.5
Divorced	6	1.9
Education		
Illiterate	16	5.1
Primary education	24	7.6
Secondary education	71	22.5
Higher education	204	64.8
Monthly family income (in Rs.)		
\leq Rs 50000	68	21.6
50001–100000	148	47
>100000	56	17.8
Do not know	43	13.7
Decrement in family income		
Minor change	43	13.7
Major change	19	6
Increment in family income		
Minor change	13	4.1
Major change	2	1
BMI		
Underweight	14	4.4
Normal weight	206	65.4
Overweight	82	26
Obesity	13	4.1

BMI: Body mass index, SD: Standard deviation. *The value of percentage is rounded off up to one place of decimal. BMI classification was done according to report of a WHO expert committee (1995)^[17]

study population was 31.84 years (standard deviation: 8.45). The majority of the population was made up of married women (56%), about (40%) of the women were unmarried, and 14 women were either divorced or widows. Out of the total married/divorced/widowed women, 40% women have two children, 39% have three children, followed by one child (approx. 23%). Only five of them have four children. Most of the respondents (230, 84%) had some level of education. Only 5% of the participants were illiterate. More than half of the population (53%) had a secondary level of education or above. After completing the secondary education, any professional degree or certification course (running or completed) was included in the higher education category. The monthly family income of most of the participants (47%) lies between 50 K and 1 lakh. The lowest monthly family income reported was 25 K.

Changes in Income Due to COVID-19

The family income of 75% of the total participants remained unaffected by the COVID-19 outbreak. Some participants of the joint family (15%) reported that the consolidated income of their family was constant as it was adjusted by secondary sources of income. Most of the participants (87%) possessed agricultural land, which was serving as a permanent source of income in the poor economic conditions caused by COVID-19. Many participants (28%) owned cattle which provide milk and milk products for daily consumption; in addition, it contributes to their family income. Out of the total, 62 participants were facing the adverse impact of the

Table 2: Variation in diet intake pattern due to COVID-19 pandemic

Frequency of diet intake	Milk and milk products (%)	Fruits or Juice (%)	Green Veg. (%)	Non-green Veg. (%)	Meat/fish (%)	Eggs (%)
Daily						
Before	290 (92.1)	249 (79)	195 (61.9)	310 (98.4)	2 (0.6)	25 (7.9)
After	277 (87.9)	190 (60.3)	139 (44.1)	314 (99.7)	8 (2.5)	36 (11.4)
Weekly						
Before	20 (6.3)	40 (12.7)	63 (20.0)	4 (1.3)	10 (3.2)	10 (3.2)
After	23 (7.3)	85 (27)	120 (38.1)	1 (0.3)	14 (4.4)	0
Monthly						
Before	2 (0.6)	21 (6.7)	39 (12.4)	1 (0.3)	10 (3.2)	1 (0.3)
After	9 (2.9)	36 (11.4)	42 (13.3)	0	0	0
Occasionally						
Before	3 (1.0)	5 (1.6)	18 (5.7)	0	0	0
After	6 (1.9)	4 (1.3)	14 (4.4)	0	0	0
Pearson's Chi-square test	$P < 0.001$	$P < 0.001$	$P < 0.001$	$P < 0.001$	-	-

Table 3: Pattern of change in diet intake and income during the COVID-19 pandemic

Diet items/pattern	Increase in intake (%) [*] (n=315)	Decrease in intake (%) [*] (n=315)
Milk or milk products	9 (3)	25 (8), $P=0.023$
Fruits or juice	34 (11)	95 (30), $P < 0.001$
Green vegetables	60 (19)	94 (30), $P < 0.001$
Non-green vegetables	2 (1)	-
Eggs	11 (3)	-
Meat	14 (4)	-

*The decimal value of percentage is rounded off to the nearest whole number. Pearson's Chi-square test was applied to assess the variation in intake of milk, fruits, and vegetables

COVID-19 pandemic on their income, out of which 41 participants had a major impact on their family income. Only two participants had a higher increase in their family income, whose profession was related to pharmaceuticals. A total of 14 participants got a marginal increase in their family income because their spouses were handling more work than before as some employees had lost their job due to the COVID-19 outbreak.

Distribution of BMI in the Study Population

In accordance with World Health Organization (WHO) (1995),^[17] BMI of an individual was categorized into five groups as follows:

1. Underweight (<18.50 kg/m²)
2. Normal weight (18.50–24.99 kg/m²)
3. Overweight (25.00–29.99 kg/m²)
4. Obesity (30.00–39.99 kg/m²)
5. Morbidly obese (>40.00 kg/m²).

The BMI of all participants was categorized according to the above-mentioned WHO standard. Among the total study population, 65.4% of women were of normal weight, 4.4% were underweight, 26% were overweight, and 4.1% were obese. The prevalence of overweight was 21.6% higher among WRA in comparison to the prevalence of underweight.

Frequency of Diet Intake before the COVID-19 Pandemic

Majority of women (77%) consumed ≥ 3 meals a day, while 23% of women consumed only ≤ 2 meals a day. Of 315 women, 279 (89%) participants were vegetarian, and 36 (11%) participants were non-vegetarian (eating meat, fish, and eggs). Out of 36 non-vegetarian participants, 14 were ovo-vegetarian or eggetarian (vegetarian eating eggs but not meat). The frequency of intake of various commonly used nutritious foods in Nagaur before the COVID-19

pandemic is mentioned in Table 2. The daily intake of milk/milk products was >90%, daily intake of fruit was 79%, and daily intake of green vegetables was reported by 62% women. Daily intake of meat/fish was found to be rare in the study population.

Frequency of Diet Intake during the COVID-19 Pandemic

The frequency of daily intake of green vegetables, fruit, milk, or milk products by participants was reduced after the COVID-19 pandemic. As an alternative to green vegetables, several other forms of curries or non-green vegetables (made up of cereals, pulses, and edible seeds) were consumed by the participants. The daily intake of these non-green vegetables has been increasing among all the participants. The consumption of meat, fish, and eggs was increased in all non-vegetarian participants.

Pattern of Change in Intake of Diet Intake during the COVID-19 Pandemic

As shown in Table 3, the percentage decrease in the intake of green vegetables and fruits was more than 30%. It can be said that the intake of green vegetables and fruits decreased in approximately one-third of the population. The reduction in consumption of milk was marginal (8%). The consumption of meat and fish increased in 31% of non-vegetarian women while the consumption of eggs increased in 64% of non-vegetarian women. However, if we see the consumption of non-vegetarian food in the total population, it increased slightly (only by 3–4%). An increase in intake of these food items was also reported by some participants but the number of participants was very low.

Variation in Nutrient Intake of WRA Due to the COVID-19 Pandemic

The decline in the consumption of green vegetables is replaced with other remotely available food items such as pulses, cereals, and non-green vegetables. In Rajasthan, non-green vegetables such as Gatte ki sabzi (made by using gram flour), Papad ki sabzi, Bhujia ki sabzi, curry (made using curd and gram flour), curry of lentils, chickpeas, and black gram, etc. are also commonly eaten as an alternative to green vegetables. Some of the participants reported that they sometimes cooked dry form of seasonal vegetables. The consumption of these non-green vegetables has increased with the decrease in the intake of green vegetables. The participants reported that cereals and other regularly available

food items (in nearby local grocery shops) have been subduing the inadequacy of milk, fruits, and green vegetables in their diet. The increase in intake of snacks and sweets was reported by few participants.

The consumption of milk and milk products was found high among WRA in Nagaur because Cattle rearing is common in the participant's households. However, due to the regulation of social distancing, the participants reported a slight decrease in buying and selling of milk or milk products, green vegetables, fruits, and juices, as compared to the pre-COVID days. The cost of fruits was relatively high earlier, which has increased even more during the COVID-19 pandemic that women with low economic status cannot buy it easily. In addition, the family income of 20% of the participants has also declined due to the COVID-19 pandemic. Gender-based disparity in the allocation of expensive food items in a household, access to leftover food, and low decision-making power of women were among the main social reasons for the limited consumption of these food items by WRA.

The COVID-19 pandemic positively affected the frequency of meat-fish and egg intake in women. The participants who consume eggs have started eating them more than earlier (pre-COVID) as its shops were located nearby. They also believe that non-vegetarian foods (such as meat, fish, and eggs) are hot by nature, and eating hot foods is helpful to fight against COVID-19. Inlined with the government's advice for citizens-"to eat healthy for boosting immunity," majority of WRA were aware of the consumption of a healthy diet. Some of the participants reported that they have increased the frequency of intake of healthy diets than before [Table 3]. They understand that the frequent intake of fruits, milk, green vegetables, meat, and eggs will increase their immunity and keep them safe against COVID-19 infection.

DISCUSSION

The findings of this study indicate that the household income level has been affected adversely in India due to the COVID-19 outbreak. The participants expressed concern about the sudden loss of jobs, drop in income, disruption in buying the food items due to the COVID-19 lockdown. The purchasing power of low- and middle-socioeconomic status was already low to buy expensive food items;^[18] furthermore, the adverse impact on the economy has added the number of people facing unemployment and poverty in India,^[19] which can additionally hurt the purchasing power of the households and hence can deteriorate the nutritional status of WRA.

Rising food prices have a greater impact on people in low- and middle-income countries since they spend a larger share of their income on food than people in high-income countries. There was a significant decrease in the frequency of consumption of vegetables, fruit, meat, poultry, and dairy products in developing countries such as China,^[20] Nepal,^[6] Bangladesh,^[21] Ethiopia, Nigeria, and Burkina Faso.^[22] There was also a reduction observed in daily consumption of fruits and vegetables in some of the developed countries such as UK,^[23] Belgium,^[24] and the USA.^[25] According to the systematic review, the adherence to a healthy diet was reduced, and the intake of locally available high-calorie food was increased in many countries.^[26,27]

According to the present study, the dietary consumption habit of people has altered due to the COVID-19 pandemic. Before the COVID-19 pandemic, the consumption of fruits, green vegetables, milk, and milk products in the targeted population was significant

among the majority of the population [Table 2]. However, after the COVID-19 outbreak, there has been a decline in the intake of these food items, which is definitely not enough to meet the nutritional requirement of WRA. Social distancing, stay-at-home rule, and lockdown undoubtedly reduce the accessibility to widely used/local nutritious food (such as milk, fruits, and green vegetables). In addition, the dry climate of Rajasthan is another factor that limits the availability of green vegetables and fruits in all seasons.^[28]

Fruits, green vegetables, and milk are good source of protein, vitamins, and minerals for all age groups and form an essential part of the diet in the majority of the targeted population. Vegetables and fruits are the rich sources of many nutrients, including potassium, dietary fiber, folate, vitamin A, and vitamin C.^[29] Eating a nutrient-rich diet (leafy vegetables, fruits, and milk) can provide us many health benefits, for instance, low risk of overweight/obesity, heart disease, high blood pressure, healthy immune system, and low risk of COVID-19 complications.^[30] As per the data of the present study, 34.6% of women did not have a normal BMI, out of which 4.4% were underweight, 26% were overweight, and 4.1% were obese. Observing the higher prevalence of overweight among WRA, it can be stated that the COVID-19 pandemic situation is responsible for increasing the double burden of malnutrition in WRA. Dietary intake patterns and lifestyle changes are not only increasing under- and over-nutrition in women but also affecting the optimal response of the immune system, and related comorbidities in COVID-19 patients.^[31,32] Furthermore, social distancing and stay-at-home orders during the COVID-19 pandemic caused alteration in the lifestyle of people, reduction in physical activities, and increase in anxiety which also led to an increase in the risk of malnutrition among women globally.^[33-35]

Overall, according to the present study, the diet intake of WRA has not been influenced hugely by the COVID-19 pandemic. However, in a middle-income country like India, where women's malnutrition rates are already high, a further reduction in the intake of nutrient-rich diet was making it more critical.^[36] These unintended consequences of the pandemic will not be confined to women only but will also propagate in the coming generation (their offspring). Malnutrition in mothers causes low birth weight in the newborn and poor nutritional status of the child in the future.^[2] As per GHI reports, low birth weight has led to an increase in child mortality in India.^[37] By understanding the derived effect of increasing malnutrition among WRA due to the COVID-19, the severity of this issue can be unified and estimated properly. A revision of the health-care system and social support system for women is a necessary step for improving maternal and child health, furthermore, for securing our accountability for the good health and well-being of our nation.

CONCLUSION

As per the findings of this study, it is clear that significant numbers of women are not consuming the minimum required diet which is a detrimental effect of the COVID-19 pandemic, which leads to lowering down of the nutritional status of women and increase in the double burden of malnutrition in India. These issues can be tackled with the help of frontline health workers by reaching the most vulnerable rural women suffering from some extent of malnutrition and providing them economic support, take-home rations, and nutritional awareness which can enable them to fulfill the optimal dietary requirements and protect themselves against COVID-19.

ETHICS STATEMENT

The letter of permission to conduct this study was obtained from IGNOU and TB Hospital, Nagaur, Rajasthan.

CONSENT

The rationale and objective of the present study was explained well to the study participants and the written consent was also received from and given to each participants before starting the interview. The confidentiality of participants was also secured.

AUTHOR CONTRIBUTION

Original drafting and data analysis was done by SS and data collection and editing was done by AS.

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