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Impact of COVID-19 on the Dietary Pattern of Indian Population: A Cross-sectional Study

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Abstract

Background: COVID-19 pandemic triggered fear, anxiety, and worries among people making it a phobia, named as *Coronaphobia*. This, in turn, changed the dietary pattern of people. **Objective:** The present study was carried out to investigate, whether there was a change in the dietary pattern of during pandemic. **Methodology:** An online survey was conducted using Google Form to assess the change in the dietary pattern of Indian population (*n = 130*) during the pandemic. Moreover, the present study examines the impact of socioeconomic profile of respondents to the extent of change in dietary pattern using a multiple regression equation. **Results:** The study finds that 76% of the participants, of which 69% were male changed their dietary pattern. Further, addition of immunity boosters along with the normal meal was prominent as the changed dietary pattern among a majority of respondents. Moreover, a majority of participants stopped consuming junk food to strengthen their immunities. In addition, the study found a significant positive effect of age ($P < 0.0001$) on the extent of change in dietary pattern among survey participants. **Conclusion:** The study concludes with the recommendation that people should consume immunity boosters and also be engaged with some physical activities to strengthen their immunities.

Key words: COVID-19, Dietary pattern, India, Immunity boosters, Physical activity

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Introduction

The emergence and world-wide spread of the corona virus disease 2019 (COVID-19, caused by the SARS-CoV-2 virus) has completely altered the global health system[1] making it a pandemic (declared by the World Health Organization in March, 2020). The non-availability of vaccine or antiviral drugs has doubled the threat making the situation highly troublesome.[2,3] Alike other pandemics, the COVID-19 pandemic also triggered fear, anxiety, and worries among people with multiple psychological and socioeconomic consequences.[4-6] The increased level of fear and anxiety has made this a phobia, named as *Coronaphobia* with three different components- physiological, cognitive, and behavioral, from which the physiological component brings changes in the appetite.[4]

In the context of the replication of viruses in the host body, it is evident that the replication rate is high when the immune system of the host is weak[7] and consumption of quality food rich with energy, protein, and micronutrients strengthens the immune system.[8,9] India is known for its poor performance in fighting against the problem of food insecurity due to which, it has the second highest number of under-nourished people In November 2020 (during mid of the 1st wave of COVID-19), India ranks the second most infected country in the world after USA with 9,291,068 confirmed cases. The increased infected cases might be due to poor diet quality. On the contrary, the death rate per one million population of India was much lower than other highly infected countries in the above-mentioned period.[10] Taking a cue from above statistics, it can be hypothesized that a definite change in the dietary pattern might have occurred (during the above-mentioned period) due to the physiological component of *Coronaphobia,* that not only helped in enhancing the immune system but also declined the death rate; as dietary ingredients are determinants in shaping the characteristics of immune responses in the host body.[9] Along with the above hypothesis, scant of the literature on examining the impact of COVID-19 on dietary pattern specifically in India provided the motivation to carry out the study with the objective of examining, whether there was a change in the dietary pattern among people in India during the 1st wave of COVID-19. The study also investigates the impact of socioeconomic profile of respondents on the extent of change in dietary pattern. The remainder of the paper is as follows. Section 2 explains the data sources and methodology used in the study, Section 3 explains the results and discussion, and Section 4 concludes.

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Data Sources and Methodology

Participants

An online survey questionnaire was designed through Google form and distributed in various social platforms such as Facebook and WhatsApp. To reach out to a large group of people, the link of the questionnaire was first sent to authors' relatives and friends to participate in the survey, and then, they were asked to share the link with their contacts. In this process, 130 respondents from five states of India (Odisha, Karnataka, Gujarat, Delhi, and Maharashtra) participated in the survey, which was started in March 2021 and ended in October 2021.

Based on[11] sample size calculator for multiple regressions with anticipated effect size of 0.15, desired probability level of

0.005 and desired statistical power of 0.8 for three independent variables (mentioned in eq^{n}1) were found to be 76. Hence, sample size of 130 respondents is adequate to achieve the satisfactory effect size.

Questionnaire

An online questionnaire was designed to assess the changes in the dietary pattern during COVID-19 pandemic in India. In the beginning of the questionnaire, participants were well informed about the objective of the study, confidentiality of collected data, and the approximate estimated time to complete the survey. The questionnaire is consisting of three sections with 15 questions. Section 1 of the questionnaire contains questions on socioeconomic characteristics including age, sex, educational qualification, occupation, and place of the participant. Section 2 of the questionnaire helps in assessing the knowledge of participants' on corona virus with the questions – type of disease COVID-19 is, availability of vaccine or medicine for COVID-19, how to fight against COVID-19, can immunity building help in fighting against COVID-19. Section 3 evaluates the changes in the dietary pattern. To assess this, participants were asked about the extent of COVID-19 had impacted their dietary pattern, what additional things they had added in their dietary habits, what food items they stopped consuming during pandemic, and what additional things they had adopted to enhance immunity apart from change in dietary pattern. The answers of the respondents to the questions of third section were with respect to their responses during the 1st wave of COVID-19.

To check the validity of the questionnaire, it was first sent to two nutrition experts for review and a week of time was given to them to submit their comments. Based on their comments or recommendations necessary modifications; in terms of language, rewording some questions, and addition of questions to examine the changes in participants' dietary pattern were incorporated.

Statistical Analysis

Apart from exploring the change in dietary pattern during COVID-19, the study also examines the effect of socioeconomic characteristics such as age and educational qualification on the extent of change in dietary pattern through a multiple regression analysis. The estimable regression equation is given below.

$$EIDP_i = \alpha + \beta_1 A_{i1} + \beta_2 Ed_{i2} + \beta_3 O_{i3} + \varepsilon_i \quad (1)$$

Where EIDP represents the extent of impact on dietary pattern, A, E, and O represent age, educational qualification and occupation of participants, respectively. A majority of the respondents were salaried employees. Therefore, a dummy variable was created for occupation, with 1 assigned for salaried employees and 0 otherwise. Details description of variables is presented in Table 1.

Results and Discussion

Socioeconomic Profile of Respondents

The socioeconomic profile of 130 respondents, who participated in the survey, is presented in Table 2. It is apparent from the table that, a majority of the respondents are male (70%), falls within the age group of 26–40 (65.3%), with educational qualification of postgraduation (43.1%) and are salaried employees (60.7%).

Changes in Dietary Pattern of Participants

Before assessing the change in the dietary pattern, the participants were asked whether building immunity can fight against COVID-19 in the absence of vaccine or drugs. In response to this question, 96% agreed that building immunity can help in fighting against COVID-19. Further, a prominent change in the dietary pattern was apparent from the responses of the participants. Based on the responses, the changes were categorized under two groups.

The first category includes the additional food items consumed along with normal meals, which have been further classified into consumption of more protein food, fiber food, and vitamin c rich food along with the normal meal. The second category includes the food items consumed in the form of immunity booster apart from normal meal. Drinking warm water, taking *Chawanprash,* and drinking *Kadha*[1] (herbal tea/decoction) are the immunity booster prescribed by Ministry of AYUSH, Government of India during the initial lockdown period. Therefore, the participants who had added these things along with their normal meal were categorized under immunity booster. A majority of participants (around 44%) added immunity boosters as a change in their dietary pattern during the 1st wave of COVID-19 and were belonging to the age group of 15–45. It was also found that majority of participants (more than 90%) who added immunity boosters were graduate. Moreover, 30 (around 23% of total participants) respondents did not change their dietary pattern. The detail on the changed dietary pattern of participants is presented in Table 3. Further, to bring a change in the dietary pattern, participants' relied on various sources such as doctor's advice, advices from family and friends, television, and newspapers. From the various sources, a majority of participants' (37.5%) changed their dietary pattern based on the recommendations of their family members.

It was also fond from the study that during the 1st wave of pandemic, participants not only consumed additional food items but also stopped consuming certain food items which directly or indirectly affect the immune system. It was found that a majority of the participants' (56%) stopped consuming junk food[2] followed

1 Kadha is made by adding Basil, Cinnamon, Black pepper, Dry Ginger and Raisin. Available at https://www.mohfw.gov.in/pdf/ImmunityBoostingAYUSHAdvisory.pdf (accessed on 26th July 2021).

2 The present study considers outside foods (samosa, chowmien, chat, mo:mo), pizza, burger, cold drinks, ice cream & chips as junk foods.

Table 1: Variables for regression

Dependent variable: Extent of impact on dietary pattern (in a five-point scale, 5=Highest, 1=Lowest)		
Independent variables	*Description*	*Expected sign*
Age	Continuous	Positive
Educational qualification	Matriculate=1, Intermediate=2, Graduate=3, Postgraduate=4, above post graduate=5	Positive
Occupation (dummy variable)	Salaried employee=1; 0=Otherwise	Positive

Table 2: Socioeconomic profile of respondents

Parameters	*Total (N=130)*
Age	
Below 18	5 (3.9)
18–25	31 (23.8)
26–40	85 (65.3)
41–60	9 (7)
>60	-
Sex	
Male	91 (70)
Female	39 (30)
Educational qualification	
Matriculate	5 (3.9)
Graduate	28 (21.5)
Postgraduate	56 (43.1)
Above postgraduation	41 (31.5)
Occupation	
Student	35 (27)
Business/self-employed	9 (7)
Professionals (CAs/Doctors/Lawyers)	7 (5.3)
Salaried employees	79 (60.7)

Source: Authors' calculation. Values in the parenthesis represent the percentage from the total. *Vales are rounded up to the next whole number

Table 3: Change in dietary pattern of participants

Changed food items	*Number (total)*
Immunity booster	57
Vegetables	14
Protein food	09
Fiber food	03
Millet	01
Vitamin C rich food	34
No change	30

Column totals are not additions across different categories, as one respondent can consume additional food in more than one way mentioned above

by non-veg products (10%). Restriction of junk food was observed in younger population (age < 30 years), whereas middle-aged participants (27 < age < 42) forsake non-veg products. Along with junk food, seven participants' stopped consuming non-veg and one stopped taking alcohol. Around 25% of the participants did not change anything. Surprisingly, younger population (16 < age < 45), majority of whom are salaried employees, did not make any restriction in their dietary habits during pandemic. Details are provided in Table 4.

Activities Other Than Dietary Pattern to Strengthen Immunity

Involvement in physical activities and yoga significantly affects the immune system.[12,13] It was found from the survey that 83% of the participants were involved in some kind of physical activities during the 1st wave of COVID-19 and the rest did not. The physical activities are further classified as general home exercise, yoga/pranayama, and walking. Around 34% ($n = 44$) of the participants were involved in yoga/pranayama followed by home exercises ($n = 40$) and walking ($n = 25$).

After investigating the change in the dietary pattern and physical activities, the present study examined the effect of socioeconomic profile (age, educational qualification, and occupation) on the dietary pattern using eq^{n}1. From the regression equation, a significant and positive effect of age (0.065, $P < 0.0001$) on dietary pattern was found, as shown in Table 5.

Table 4: Food items stopped consumed by participants

Food items	*Number (total)*
Junk food	73
Junk food and non-veg	07
Junk food and alcohol	01
Non-veg	14
Fats	01
Nothing	33

Source: Authors' calculation

Table 5: Impact of socioeconomic profile on extent of change in dietary pattern

Independent variables	*Coefficient*	*Robust standard error*
Age	0.074	0.007 (8.89)*
Educational qualification	0.097	0.077 (1.25)
Occupation	−0.22	0.14 (−1.59)
R^2	0.39	
RMSE	0.65	
F value	38.20	

Values in the parenthesis represent t values. *Significant at 5% level

Discussion

The present study was carried out to understand the impact of COVID-19 on dietary pattern of Indian population. Data were collected from 130 participants from five states of India using a pre-validated questionnaire. The key findings of the survey reports certain change in dietary pattern and physical activities among participants. First, a total 99 participants (76%) changed their dietary pattern; of which 69% were male. In terms of change in dietary pattern, a majority of participants included immunity booster in their diet along with their normal meal. Alike,[14] ginger, honey, and basil were the preferred choices for participants as immunity booster.

Consumption of green leafy vegetables, protein rich, fiber rich foods, and vitamin C were also recorded. In line with,[15] restriction of certain food items was found among younger population (age < 35 years). Junk food is generally consumed more by youth mass; and thus, junk food consumption was stopped by the majority of youth participants. Second, it was evident from the survey that a majority of participants were involved in physical activities apart from changing dietary pattern. Doing yoga/pranayama was the most preferred activity among the participants. Ten participants were found who neither changed their dietary pattern nor doing any physical activity. Third, the study found a significant positive effect for age and no significant effect for educational qualification on the extent of change in dietary pattern among survey participants. Moreover, the impact of age is found to be higher among participants above the age of 30. The outcome of the present study is believed to be an endeavor to enrich the existing literature; as to the best of our knowledge, this is the first study in examining the impact of socioeconomic profile on dietary pattern during the 1st wave of pandemic.

Although the present study provides generic insights on changed dietary habits among Indian population during COVID-19 pandemic, the outcomes are not free from limitations. First, the study relied on comparatively a small sample. Second, the study only captured the changes in the dietary pattern in terms of additional food items; but failed to provide information on quantity and frequency of consumption. Third, in the case of engagement in physical activity, the study fails to provide information on how

much time they spend in those activities to strengthen their immunities. Notwithstanding these limitations, the study provides solid outcome on how COVD-19 has altered the dietary pattern among Indian population.

Conclusion

The present study finds a definite change in the dietary habits in terms of consumption of immunity booster among majority of participants. Further, healthier food intake in the form green leafy vegetables, protein rich, fiber rich foods, and vitamin C was also recorded. Restriction in the consumption of junk food and non-veg were found among the participants. Apart from change in dietary habits, participants were engaged in physical activity (doing exercise and yoga/pranayama) to strengthen their immunity. In addition, the study finds a positive and significant effect of age on the extent of change in dietary pattern. The outcomes of the present study have potential implications in the development of recommendations for strengthening immunity during COVID-19 pandemic through the consumption of immunity boosters and doing physical activities.

Ethical Consent

No ethical approval was required. Only consent of participants was required and taken.

Conflicts of Interest

There is no conflicts of interest.

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