

# Changes in eating habits, physical activity, and its association with mental health status during COVID-19.

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**Abstract-** Context: The Novel Coronavirus (COVID-19) is spreading rapidly. The government efforts to break the chain have affected individual's physical and mental well-being. The lockdown led to restricted access to fresh fruits, vegetables and other essential items in India. Physical activity was also restricted in major parts of the country

Aims: The study aimed to see the effect of eating habits and physical activity changes on mental health status during this pandemic.

Settings and Design: A web-based cross-sectional survey

Methods and Material: A web-based cross-sectional survey was conducted using the snowball –sampling technique between 13 June-31<sup>st</sup> July, 2020 via sharing a link on social media platforms.. The score for mental health was calculated using the Healthcare Worker Exposure Response and Outcome- Daily experience index (HERO) scale.

Statistical analysis used: Multivariate logistic regression were used to examine the associations.

Results: A total of 1021 eligible responses were used for the final analysis. Males and females who reported more often eating snacks (OR- males-7.86, females 2.62), or eating unhealthy food (OR males- 3.88, females 2.50) or increased frequency of meals (OR males 2.60) or following sedentary life (OR males 3.19, females 2.57) were associated with poor mental health status. In contrast, males (OR 2.28) who reported eating fruits less often were associated with mental health status.

Conclusions: The COVID-19 pandemic has changed the eating habits and physical activity among the general population. The unhealthy eating factors and sedentary behaviours were associated with poor mental health. The study findings emphasis on urgent need in developing guidelines for healthy eating habits, physically active and mental health interventions during such pandemic outbreaks.

**Index Terms-** Mental Health, eating habits, Physical activity, COVID- 19, Pandemic, India

**Key Messages -** The COVID-19 pandemic has posed a significant threat to the overall health. The influence on both genders is different when viewed through the gender lens. Additionally, it

appears that psychological well-being is primarily affected among younger generation. Hence, a holistic approach to physical and mental health from social contextual, as well as policymakers is urgently required.

## I. INTRODUCTION

The eating behaviour constantly changes and is dynamically connected to the alterations in the physical as well as psychological environment of the individual. A study conducted by Torres SJ, et al. showed that only 20% of people do not change feeding behaviours during stressful periods, while rest had shown change in caloric intake when stressed. <sup>[1]</sup> Physical inactivity is one of the most commonly neglected risk factor in mental health problems <sup>[2]</sup>. In a study conducted by Peluso MA et al., hypotheses that exercise may cause self-efficiency and social interaction which has benefice effects on mental health <sup>[3]</sup>. Evidence has shown that changes in physical activity and eating habits may also affect the psychological well-being <sup>[4]</sup>. The unmatched situation like COVID-19 pandemic has brought about significant changes in the eating habits and physical activity of people around the globe.

In light of the above, an online survey was conducted to understand the changes in eating habits, physical activity and mental health during COVID-19.

## II. SUBJECTS AND METHODS:

A web-based cross-sectional survey was administered to obtain data using a snowball- a non-probability –sampling technique for recruiting the adult Indian population aged 18 years and above, during the COVID-19 pandemic. 'Research Electronic Data Capture, (RedCap) a secure web application for building and managing online surveys, and databases <sup>[5]</sup>. The survey link was shared on social media sites such as WhatsApp (57.1%), LinkedIn (9.6%), Facebook (5.3%) and, Instagram (1.6%). Healix website (2.4%) and email (3.3%) was also used to share the survey link. The link was active on the portals between 13<sup>th</sup> June to 31<sup>st</sup> July 2020. Online written consent was obtained from all the

participants before the initiation of the survey. A total 270 individuals were excluded from the study, out of them 141 surveys had missing values in the data, 3 reported other gender and remaining 126 mostly, duplicate email ids. .

The questionnaire included 32 questions with different sections such as demographic details, comorbidities, COVID-19 symptoms, mental health, eating habits, physical activity, and smoking and alcohol consumptions. The score for mental health was adapted from the Healthcare Worker Exposure Response and Outcome (HERO) – daily experience index scale was used to assess mental health status [6]. The score was categorized as ‘good mental health’ if the score was “zero to four” and ‘poor mental health’ if the score was “five to seven”. To capture the information on the eating habits and physical activity questions such as “I ate snacks since the last two months”, “I ate unhealthy ( fat-rich/ oil-rich/ sugar-rich/ salt rich) food since last two months”, “I ate fruits since the last two months”, “The frequency of meals (Number of meals) increased since the last two months”, “Portion size of the meals increased since the last two months”, “I ate vegetables since the last two months”, “I was sedentary since the last two months”, “I exercised since the last two months” were asked. The response was recorded as “More often”, “Less often” or “No change”.

The locations from where the participants responded the survey, were clubbed into six geographic zones i.e. West zone (Maharashtra, Goa, Gujarat, and Rajasthan), East Zone (Bihar, Orissa and West Bengal), North Zone (Haryana, Jammu & Kashmir, Punjab, Uttaranchal, Uttar Pradesh, Chandigarh, and Delhi), South Zone (Tamil Nadu, Telangana, Kerala, Andhra Pradesh, and Karnataka), North-East zone (Assam, Manipur and Arunachal Pradesh) and Central zone (Madhya Pradesh and Chhattisgarh). For analysis purposes, these six zones were further

categorized into three zones namely, West Zone, Central Zone and all other zones.

Descriptive statistics were calculated for all variables. A categorical variable was compared by the Chi-squared test ( $\chi^2$ -test) and Fisher's exact test. All statistical analyses were performed and a two-tailed P value < 0.05 was considered statistically significant. In the logistic regression model, association of eating habits or physical activity with mental health adjusted by confounders like age, education, zones. The data were analysed using the Statistical Package for the Social Sciences (SPSS) v25.0.

### III. RESULTS:

The territorial response to the survey spread over all Indian regions: 68.41% from the West zone, 16.8% from the Central zone, 7.6% from the North zone, 4.5% from the South zone, 1.9% from the East zone, and 0.48% from North-East zone. Females 45% and males 54.9% participated in the online survey.

Table 1 shows the logistic regression analysis of the association between socio-demographic factors and mental health status.

The results show that females in the age group of 18-25 years had 15 times higher odds of having poor mental health when compared to the females of 55 years and more. Similarly, females in the age group of 26-35 years (OR 8.31) and 36-45 years (OR 8.11) had eight times higher odds of poor mental health when compared to the females of 55 years and more. No such association were found in the males. As compared to west zone males and females, males in central zone (OR 2.46) and both males and females (OR males -2.47, females 2.02) from other combined zones had two times higher odds of poor mental health.

Socio-Demographic Factors		Mental Health status									
		Female					Male				
		No	Yes	AOR	95% C.I.		No	Yes	AOR	95% C.I.	
					Lower	Upper				Lower	Upper
Age	18-25	64	20	14.67*	1.87	115.19	37	9	2.11	0.71	6.26
	26-35	127	27	8.31*	1.09	63.44	160	14	0.77	0.29	2.01
	36-45	90	18	8.11*	1.04	63.28	166	21	1.10	0.44	2.74
	46-55	67	4	2.68	0.29	25.14	74	11	1.20	0.43	3.38
	55 years and more	40	1	Reference category			62	7	Reference category		
Education	Above graduate	258	50	1.40	0.75	2.59	262	30	0.77	0.43	1.37
	Below graduate	130	20	Reference category			237	31	Reference category		
Zone	Other combined zones	48	17	2.02*	1.04	3.92	70	14	2.47*	1.22	5.01
	Central Zone	61	7	0.81	.34	1.91	87	17	2.46*	1.27	4.79
	West Zone	278	46	Reference category			342	30	Reference category		

Note: '\*' indicated by statistically significant AOR values adjusted by age, education and zones

Table 2 shows the results of the logistic regression analyses of the association between eating habits, physical activity, and poor mental health adjusted by age, education, and

zones. In males who reported having snacks more often since last 2 months had 7.86 times higher odds and females had 2.73 times higher odds of having poor mental health when compared to those

who reported no change in the snack consumption since last two months. Similarly, males who reported having less often snacks since the last two months had 3.09 times higher odds and females had 2.31 times higher odds of having poor mental health than those who reported having no change. Males who ate unhealthy food since the last 2 months had 3.93 times odds and females had 2.72 times odds of having poor mental health than those who reported no change. Males who reported having fruits less often since last

two months had 2.26 times higher odds of having poor mental health than those who reported no change. Males who reported of more often-increased frequency of meals had 2.54 times higher odds of having poor mental health than those who reported no change. Being more often sedentary was reported by males had 3.33 times and females had 2.61 times higher odds of poor mental health than those who reported no change.

Table-2		Logistic regression analysis of association between eating habits and mental health status									
		Mental Health status									
		Female					Male				
		No	Yes	OR	95% C.I.		No	Yes	OR	95% C.I.	
Lower	Upper				Lower	Upper					
		Eating habits									
I ate snacks since last 2 months	More Often	129	30	2.73*	1.18	6.35	141	37	7.86*	2.92	21.14
	Less Often	146	31	2.31*	1.00	5.32	193	20	3.09*	1.12	8.55
	No change	106	8	Reference category			159	5	Reference category		
I ate unhealthy (fat rich/ oil rich/ sugar rich/ salt rich) food since last 2 months	More Often	65	23	2.72*	1.30	5.71	71	22	3.93*	1.76	8.78
	Less Often	186	28	1.03	0.53	2.00	214	24	1.37	0.70	2.70
	No change	134	17	Reference category			211	16	Reference category		
I ate fruits since last 2 months	More Often	185	21	0.74	0.36	1.52	190	29	1.92	0.89	4.12
	Less Often	96	33	1.95	0.99	3.87	138	21	2.26*	1.03	4.98
	No change	104	16	Reference category			167	12	Reference category		
Frequency of meals (Number of meals) increased since last 2 months	More Often	79	19	1.65	0.84	3.24	110	25	2.54*	1.25	5.17
	Less Often	91	17	0.99	0.52	1.91	140	15	1.29	0.62	2.67
	No change	214	34	Reference category			247	21	Reference category		
		Physical Activity									
I was sedentary since last 2 months	More Often	81	32	2.61*	1.35	5.03	80	23	3.30*	1.69	6.45
	Less Often	142	16	0.72	0.35	1.49	160	16	1.16	0.58	2.31
	No change	157	19	Reference category			254	23	Reference category		

*Note- Logistic regression analysis adjusted by age, education, zones; '\*' indicated by statistically significant OR values*

#### IV. DISCUSSION

The past (SARS) and the current (COVID-19) pandemics have imposed significant health and economic challenges to the world [7]. India being the most populous country was profoundly impacted due to the COVID-19 pandemic. On January 30, 2020 the first case of COVID-19, infection was reported from India. Within a span of five -six months, the numbers reached to 395,048 laboratory-confirmed cases and 12,948 deaths by end of June 2020<sup>[8]</sup>. The rise in the rate and spread of infection called for the undivided attention of the governmental and non-governmental organizations to formulate action plans to halt the infection rate. This led to the formulation of certain norms such as the use of a facial mask, hand sanitation; prevent social gatherings, home quarantine, and partial or complete lockdown in the Nation

##### **Demographics and mental health status**

From prehistoric cultures to more civilised nations, gender roles have been culturally dictated<sup>[9]</sup>. Although more women from all age groups as well as different socioeconomic classes work outside the home, this does not relieve them of their domestic responsibilities or change their social status appreciably. Literature has shown that age as well as gender are the critical determinant of mental health status. The pattern of psychological distress seen in females is different from those seen among males. Both the genders communicate, deal with relationships, express their thoughts, and react to stress in different psychologically and physiologically ways, according to theories<sup>[9]</sup>. Similar to the literature, in the current study, the data showed that females had higher odds of poor mental health when compared to males. In addition, the association is seen in younger females when compared to older female participants of the study.

##### **Eating habits and mental health during COVID-19 pandemic**

Habits such as unhealthy diet, physical inactivity, alcohol intake and smoking are not only major contributors to the global burden of disease<sup>[10]</sup>, but are also positively associated with adverse mental health outcomes<sup>[11]</sup>. The guidelines addressing the COVID-19 outbreak have highlighted the importance of maintaining a healthy nutritional status and being physically active<sup>[4]</sup>. In a meta-analysis done by Lai et al., showed that an increased intake of healthy diet (diet high in vegetables and fresh fruits, whole grains and fish) reduced the odds of mental health problem such as depression<sup>[12]</sup>. Knowing the fact that eating choice is impacted by mental health, addressing the mental health aspect during such pandemics is essential<sup>[13]</sup>. However, there is a gap in the literature for larger observational studies, which address the characteristics of behavior patterns such as dietary intake and physical activity during and after the outbreak of pandemic such as COVID-19<sup>[14]</sup>. A study conducted among the Chinese population after the outbreak recorded for an unhealthy lifestyle. The standard guidelines of five servings /day of fresh fruit and vegetable intake went as low as, less than five servings in a week. Reduced vegetable intake was reported by 30% and fruit intake was reported by 60% of the study participants<sup>[15]</sup>.

The studies done in the European countries reported a 40% increase in the consumption of comfort foods<sup>[16]</sup>. A similar study conducted in India looked at the overall effect of COVID-19 on lifestyle behavior and reported that unhealthy eating

behavior increased from 64.1% in pre-COVID-19 times to 81.6% during the COVID-19 pandemic. The study also reported a considerable rise in the intake of junk food and fried food<sup>[17]</sup>. In the current study, the more-often intake of snacks were reported by 33.5% of the respondents. Further, the more often intake of snacks (18.8% females and 20.7% males) were associated with poor mental health. The comfort food snacking most often is loaded with empty calories and low nutrient quality. Evidence shows that individuals under stressful situations tend to increase snacking behaviour as a coping mechanism. Supplementary to these findings, advocacy of various methods to avert stress may be advisable to promote healthy and sustainable eating habits<sup>[18]</sup>.

Scarmozzino F et.al. conducted a study in Northern Italy reported that sweet intake increased by 50% leading to rapid weight gain, which may be associated with poor mental health<sup>[19]</sup> Another study done in Mumbai, India reported that 50% of the survey respondents reported an increased number of meals consumed in the day. The study also reported that the portion size was large<sup>[20]</sup>. The eating habits underwent drastic changes because of pandemic led lockdown. It can be reasonably hypothesized that since during the lockdown all the meals were prepared and consumed at home and additionally the increased time spent at home may result in increased frequency of snacks and larger portion size of meals<sup>[20]</sup>. Similar findings were observed in the current study were, 23.0% of the respondents reported of the more-often increased frequency of meals. The more often increased frequency of meals (18.5% of males) were associated with poor mental health when compared to those who reported no change. Evidence has shown that during the lockdown although food intake increased, diet diversity and fresh fruits and vegetables, intake reduced rising concerns on the food quality and nutrient composition of the meals<sup>[21]</sup>. During the lockdown and unavailability of fresh fruits and vegetables, the vegetable intake reported was 11.4% in females and 13.9% in males. Additionally, a low fruit intake of 28.5% was reported among males and females in the current study. The low fruit intake was associated with poor mental health; this finding is consistent with previous studies<sup>[22]</sup>.

##### **Physical Activity and mental health during COVID-19**

Daily physical activity can be regarded as an essential component in maintaining the physical and mental health of the individuals. "Exercise make you feel well", is a common conjecture often reported for the psychological effects of physical activity such as walking or other structured exercises<sup>[3]</sup>.

Literature has shown a strong association between exercise and mental health. Clinical trials in the past have revealed that regular exercise can prove as a therapy for mental health issues such as depression and anxiety and the effect can be comparable to that of an anti-depressant<sup>[3]</sup>. A cross-sectional study done in the United Kingdom revealed that vigorous activity was positively associated with mental health even after adjusting for health , socioeconomic status and gender of the study population<sup>[23]</sup>. In the past during the SARS pandemic, a study conducted in Hong Kong showed that increased physical activity was positively associated with low levels of stress in the general population<sup>[24]</sup>. In a study done in India reported that 20% of the participants (21.2% females and 19.2% males) were physically inactive during the COVID-19 pandemic<sup>[25]</sup>. Similarly, in the current study, sedentary behavior was reported by 21.5% of the respondents. In

addition, poor mental health was associated (28.3% females and 22.3% males) with more often-sedentary behavior.

In the recent scientific literature, researchers have delineated to the effect of physical activity on mental health. A cohort study conducted by Dishmon et al., reported 20-33% lower odds of depression for a physically active group of individuals [26]. A recent cross-sectional analysis showed that physical inactivity could be strongly associated with depressive symptoms and metabolic syndrome [27]. A study conducted by Berk et al., concluded that the Lifestyle factors such as unhealthy eating, inactive lifestyle, smoking, and substance use contributed to an increased risk of a mental health problem such as depression, thus, encouraging healthy behavior has the potential to substantially reduce the burden of disease and improve overall health [28].

Evidence has shown that the psychological response to the virus outbreak may elevate the risk of dysfunctional eating behaviours like considering food as a reward and physiologically associating gratification as a response to the negative experience of self-isolation, mental health status and leading to increased body weight and obesity [29]. Thus, COVID-19 pandemic has surfaced the need of developing guidelines with scientific information and disseminating it to individuals and communities to maintain healthy eating habits and physical activity while in quarantine or restricted movements.

Determining a causal relationship between mental health and eating habits and physical activity might be a limitation due to the nature of the study. The study may not be a National representation of the data as the response were varied between the zones. Since the study was done via the use of social media, the sample could be only the reorientation of the population who use or have access to the social media sites and those who can read and write in the English language. Even though the results demonstrated that, the social demographic details of the study population can reprint the overall general population in India.

In conclusion, the poor mental health among the younger population from the current study may be a high alert for the appropriate action from the social, political and policy makers' point of view to address these issues among the younger population known as the future of the Nation. Further, if the poor eating habits are sustained in the period after the lockdown, they are likely to be responsible to accord multi-fold health issues for the mental and physical wellbeing of the population at large. The unhealthy eating habits clubbed with sedentary behaviour are commonly seen during the lockdown. We are currently at the crossroads with an end of one lockdown and a setting in of the other; therefore, changes in eating habits and physical activity are crucial to maintaining a healthy lifestyle. Further, the Nation needs to be ready to address the altered eating habits, physical inactivity leading to increased risk of Non-communicable disease including mental health problems following the pandemic. The trans-diagnostic approach can be applied to the healthy lifestyle, which would include the psychological as well as physical measures adapted to return to normal life and or adapt to the new normal post the pandemic. With the COVID-19 pandemic is still ongoing, our data can be confirmed and investigated in future larger population studies.

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