



Effect of lockdown on protein intake and sleep patterns in adults aged 40-60 years in Jain community

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Abstract: Sleep is an important part of life. A person spends one-third of his life sleeping. Having a quantity and sound sleep is essential for a person just like food and water. Sleep is important for a person's brain cells to function and communicate with other cells.

Objectives: To assess the protein intake and sleep pattern on adults aged 40-60 years in the Jain community in Mumbai city and to compare the effect of lockdown on protein intake and sleep pattern.

Methodology: 100 subjects were selected through the purposive convenience sampling method. The data was collected using a questionnaire which included a list of foods with high tryptophan content to assess the sleep pattern in the subjects on a theoretical basis.

Results: Data was analyzed, and results showed that there was a significant increase in consumption of cereal ($p=0.000$); pulses, dals, and legumes ($p=0.000$); nuts & oilseeds ($p=0.008$), and fruits ($p=0.014$) during the lockdown. Insomnia was high before lockdown but had even increased during the lockdown. A significant effect ($p=0.06$) was observed between the consumption of dals, pulses, and legumes and sleep patterns amongst the subjects an increase in sleep may be due to the consumption of dals, pulses, and legumes which are rich in tryptophan amino acid. Hence sleep pattern can be improved by a balanced diet which includes tryptophan-rich food for inducing sleep. Diet, meditation, and exercise awareness also can help for better sleep.

Keywords: Tryptophan, sleep pattern, lockdown, COVID-19, stress, protein intake

I. INTRODUCTION

Sleep is an important part of life. A person spends one third of his life sleeping. Having a quantity and sound sleep is essential for a person just like food and water. Sleep is important for a person's brain cells to function and communicate with other cells. Sleep is usually but not necessarily accompanied with postural lying down, behaviorally inactive, and closed eyes. An adult person needs seven to nine hours of good sleep daily to be alert during the day. It can also include other behaviors like sleepwalking, sleep talking, teeth grinding and other activities. (Carskadon et al., 2005) Energy expenditure (EE) is hypothesized to be lower during sleep versus wakefulness to reduce total daily energy needs. There are two types of sleep i.e., Rapid Eye Movement (REM) and Non-Rapid Eye Movement (NREM). A person undergoes all the stages of NREM and REM during a sound and quality sleep. It was observed that there is an increase in longer and deep REM periods which occurs towards morning (Basics, 2006). NREM and REM sleep patterns are related to brain waves and its neurologic activity.

Stages of NREM Sleep:

- Stage 1

When a person switches from wakefulness to sleep is NREM sleep stage 1. This stage lasts for a few minutes. The changes seen during this time is slowing of heartbeat, breathing, eye movements and the muscles relaxes with some infrequent twitches. During this stage, the brain waves also slow down compared to daytime wakefulness.

- Stage 2

Stage 2 is the span of entering light sleep before one enters deep sleep. The heartbeat and breathing slows down and muscles further relax. The body temperature reduces, and eye movements slow down. Brain wave activity falls but there is an abrupt rush of electrical activity. A person spends more time in this stage than any other sleep stage.

- Stage 3

Sleep at this stage makes a person refreshed in the morning. This stage lasts a longer time during the first half of the night. Heartbeat and breathing slows even more to its lowest during sleep. Muscles relax more and it's not easy to wake a person at this stage. Brain waves slow down more.

REM sleep occurs usually for about 90 minutes after a person goes to sleep. A newborn infant spends more time in REM sleep and it's time reduces as it reaches the age of maturity. Humans dream when they are in REM sleep (Peever et al., 2017).

Amino acids are the primary building blocks of protein. Two factors help determine the availability of tryptophan to the brain: (a) plasma tryptophan levels and (b) ratios between large neutral amino acids. Changes in these ratios can affect tryptophan availability. Because tryptophan serves as a precursor to serotonin and melatonin, it has a relationship in enhancing sleep in humans. A lack of tryptophan can result in less serotonin and may lead to sleep disturbances (Fernstrom, 2012). Tryptophan levels depend on dietary consumption, especially of protein, because the body is unable to synthesize tryptophan. Consequently, a high protein meal would contribute less tryptophan to the circulating blood in comparison with the other large neutral amino acids (LNAA), thus reducing brain serotonin levels and resulting in less sleep. (Lindseth and Murray, 2016) Proteins are made of amino acids. Amino acids like tryptophan, GABA, glutamine etc., are required to maintain good quality sleep. Due to low protein the metabolism of the body reduces will lead to increased risk of different diseases. Tryptophan is an essential amino acid which is metabolized via 5-hydroxytryptamine (serotonin) to melatonin by a series of four enzymes in the pineal body. Serotonin is known as a precursor to melatonin.

Sleep dysregulation disturbs the metabolism process by alteration in glucose and insulin metabolism, appetite, hypothalamic-pituitary-adrenal-axis activity, and gut-peptide concentration, etc. This metabolic alteration leads to impaired glucose tolerance and increased fat accumulation. The biological clock of circadian timing coordinates with cellular and physiological processes and synchronizes with the daily body's cycle, feeding patterns and regulates circadian. The body's peripheral clock in the gut regulates glucose absorption and metabolism, peripheral clock in muscles regulates adipose tissues and local insulin sensitivity in liver and in pancreas it further regulates insulin secretion. Disruption in the body's peripheral clock is associated with glucose intolerance, decreased insulin sensitivity, increased insulin resistance, etc. Thus, the phenomenon is an inducer of diabetes and obesity. Modifying the time of feeding alone can greatly affect body weight. Changes in the circadian clock are associated with temporal alterations in feeding behavior and increased weight gain.

II. ETHICAL CONSIDERATION

The research proposal on Effect of lockdown on protein intake and sleep patterns in adults aged 40-60 years in Jain community (from questionnaire and FFQ) was approved by the Institutional Ethics Committee (IEC) on 12th October 2020.

III. METHODOLOGY

Subjects were selected by purposive convenience sampling within Mumbai city. Sample sizes included in the study were 100 individuals from the Jain community of age 40–60-year-old. Adults have been reported to be more likely to present depression, anxiety and reduced sleep quality during Covid-19 lockdown (Gualano et al., 2020) was reported, henceforth the 40–60-year age group was selected. Online consents were taken from the participants before recruiting them as subjects.

The data was collected with the help of questionnaire and FFQ designed for this study. Background data, data related to any medical condition that persists and the medication taken were taken to understand the lifestyle of the subjects. Individuals, both men and women were included. Subjects who were less than 40-year-old and more than 60-year-old were excluded from the study. Also, subjects from other communities were not included in the study. Dietary assessment was done to know the eating pattern and if there were any changes before and during lockdown in diet. Data was collected with the help of questionnaire related to number of meals in a day, average time gap between meals, average portion size of cereals, pulses, milk, type of milk consumed, tea/ coffee consumption, if any protein supplements were taken.

Instructions were provided on the portion size being one portion of cereal and pulse to be 30 grams, one portion of milk to be 150 ml. Subjects were also informed which products came under cereals and pulses. Subjects had to estimate their diet intake according to the instructions provided. Food and Nutrition Technical Assistance (FANTA) project, works to improve the health and well-being of vulnerable individuals, families, and communities in developing countries by strengthening food security and nutrition policies, programs, and systems. FANTA works at both the country and global levels, supporting the design and implementation of programs in focus countries, and building on field experience to strengthen the evidence base, methods, and global standards for food security and nutrition programming. (Nutrition Program Design Assistant: A Tool for Program Planners (NPDA), 2015) From which the groups undertaken for the study were Cereals, Vitamin A rich vegetables, Dark green leafy vegetables, other vegetables, Vitamin A rich fruits, other fruits, Legumes, nuts and seeds, Milk and milk products, Beverages.

IV. RESULTS

Table 4.1 shows the t-test and significant values for comparison between different food groups consumption between before and during lockdown.

Table 4.1: P-values results for before and during lockdown for consumption of different food groups

Food groups		N	Mean \pm Standard Deviation	t- test	df	Sig. (2-tailed)
Cereals	Before Lockdown	100	21.26 \pm 6.01	24.034	99	0
	During lockdown	100	44.68 \pm 12.99			
Pulses	Before Lockdown	100	36.26 \pm 9.95	5.977	100	0
	During lockdown	100	29.9 \pm 14.11			
Nuts and oil seeds	Before Lockdown	100	48.38 \pm 25.79	9.216	101	0
	During lockdown	100	33.38 \pm 20.75			
Dairy products	Before Lockdown	100	20.24 \pm 7.43	0.437	102	0.663
	During lockdown	100	20.06 \pm 7.77			
Vegetables	Before Lockdown	100	18.72 \pm 8.48	0.852	103	0.396
	During lockdown	100	19.12 \pm 8.96			
Fruits	Before Lockdown	100	11.24 \pm 5.39	2.5	104	0.014
	During lockdown	100	10.34 \pm 5.57			

The results were quite favorable and most of the changes seen were significant. The results depict the increased ($p=0.000$) average total intake of cereals during the lockdown as compared to before the lockdown. Due to the lockdown, there was the unavailability of different cereals and millets in the market though rice and wheat were among those which were easily available everywhere. As the cafes and restaurants etc. were closed and people were at home, they then increased the intake of different cereals and millets. Being homebound, led to easily accessible to snacks. A decline in trend ($p=0.000$) for the overall consumption of total intake of pulse, dal, and legumes during the lockdown compared to before lockdown. The total consumption of milk and milk products was the same throughout the study ($p=0.663$). There was a significant decrease ($p=0.008$) in consumption of nuts and oil seeds during lockdown. A decrease in nuts and oilseeds during can be due to unavailability. The online orders were also restricted, and prices had surged too. There was a slight marginal increase ($p=0.396$) for consumption of vegetables during the lockdown in comparison to before lockdown. Due to lockdown, transportation was a problem, which led to decrease in availability of different vegetables. But limited vegetables were available. The total intake of fruits had decreased ($p=0.014$) as compared to during lockdown. Due to unavailability of fruits the consumption was reduced.

Table 4.2: Comparison of Insomnia

Do you have Insomnia?				
Insomnia	Before Lockdown		During Lockdown	
	Frequency	Percent	Frequency	Percent
Never	35	35	30	30
Sometimes	39	39	48	48
Always	26	26	22	22

Table 4.3: Regularity of sleep

Is your sleep regular?				
Regularity of sleep	Before Lockdown		During Lockdown	
	Frequency	Percent	Frequency	Percent
No	42	42	30	30
Yes	58	58	70	70
Total	100	100	100	100

Table 4.2 and 4.3 illustrates presence of insomnia and sleep pattern of respondents. Sleep deprivation was observed to be increased during lockdown. It was evident from Table 4.2 and Figure 4.1, that 39% samples were observed to have insomnia sometimes which increased to 48%. 35% samples did not have insomnia before lockdown, and it was reduced to 30% during lockdown. 26% of samples already had insomnia which reduced to 22%. Irregularity in sleep was observed from Table 4.3 and Figure 4.2 and it was noted to be increased during lockdown compared to before lockdown. 42% of subjects had irregular sleep before which increased to 70% during lockdown.

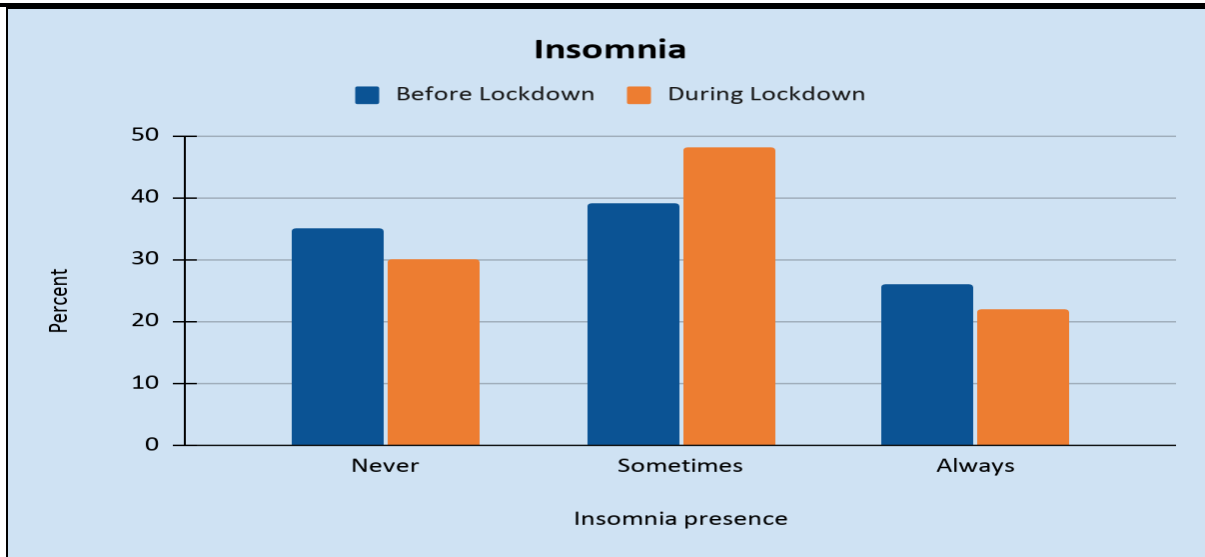


Figure 4.1: Distribution of Insomnia in subjects

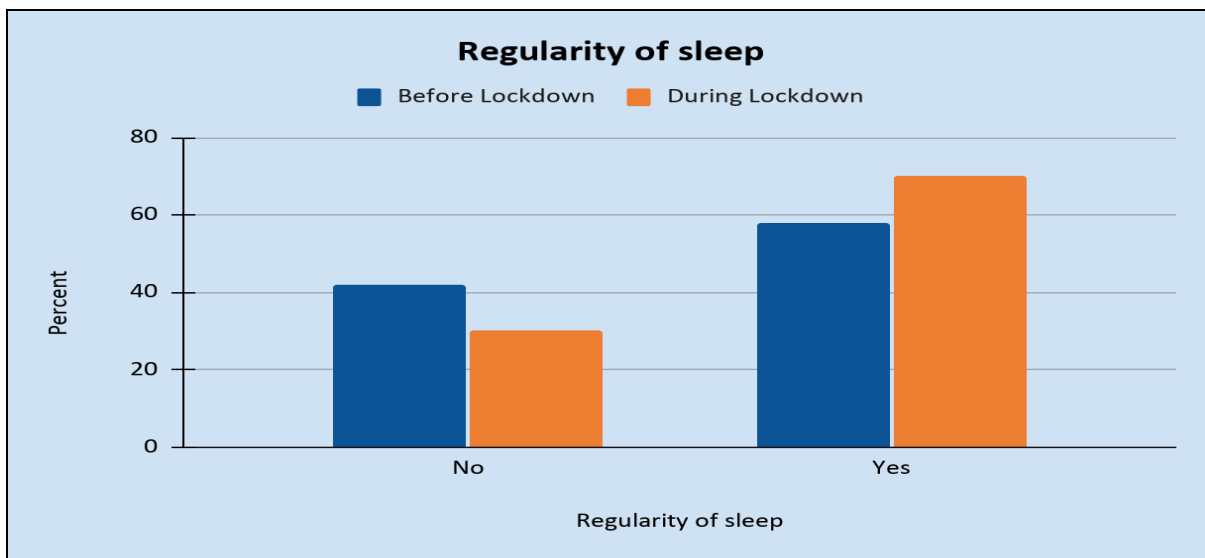


Figure 4.2: Comparison of regularity of sleep

Table 4.4: Correlation of sleep and different food groups

	Is your sleep regular?		Mean ± Standard Deviation	t- test	df	Sig. (2-tailed)
	No	Yes				
What is the portion size of cereals you consume daily?	No	42	3.17 ± 0.85	0.923	98	0.358
	Yes	58	2.98 ± 1.06			
What is the portion size of dals, pulses, or legumes you consume daily?	No	42	1.26 ± 0.70	1.9	98	0.06
	Yes	58	1.57 ± 0.86			
What is the portion size of milk you consume daily?	No	42	1.33 ± 0.90	0.226	98	0.821
	Yes	58	1.29 ± 0.85			
What is the quantity of nuts you take every day?	No	42	0.83 ± 0.82	1.598	98	0.113
	Yes	58	1.14 ± 1.01			
Do you take any protein supplement?	No	42	0.07 ± 0.26	1.364	98	0.176
	Yes	58	0.02 ± 0.13			

Of all the subjects in the study, maximum subjects had a regular sleep pattern. But different food groups had an impact on the sleep pattern. Table 4.4 represents the correlation between sleep and different foods. It was noted that daily intake of dals, pulses or legumes showed a slightly significant impact on sleep pattern (p= 0.06). But, other food groups, i.e., cereals (p= 0.358), milk (p= 0.821) and nuts (p= 0.113) did not show any significant effect on the sleep pattern. Even, protein supplement had an insignificant effect (p= 0.176) on sleep pattern.

V. DISCUSSION

It is a common idea that the number of meals in a day should be divided into three major meals- breakfast, lunch, and dinner. Often some people consume snacks in between lunch and dinner. But some consume a mid-morning snack between breakfast and lunch.

Due to the lockdown, the working class had shifted towards work from home which also plays a role in the increase in meals during the lockdown. It was also seen that the sleep pattern had changed as people were awake late at night which led to night-time eating also. As there was an increase in the number of meals, simultaneously there was a decrease in the gap noted between meals during the lockdown as compared to before lockdown.

As the stress had increased due to the pandemic in different ways, people of the 40–60-year age group tend to have more tea or coffee due to its stimulating effect. The workload had also increased so to compromise and stay fresh and awake, there was an increase in tea or coffee consumption even though the prices had surged. Due to unavailability the consumption of different food groups was seen to be affected. The prices had surged which led to inability for the respondents to buy certain foods.

Insomnia was seen to be increased during the lockdown. Social isolation, loss of employment, financial problems, illness, fear of getting infected with coronavirus, and the pressures of juggling office work and home chores all contributed to the trend. Stress and anxiety have also led to an increase in insomnia during the lockdown period. Due Covid-19 has caused significant distress around the globe. During the lockdown, there was a change in the lifestyle. People who did not have or were unable to get enough supplies of daily essentials were most affected by the lockdown. The new pattern of work from home, unavailability of services, social isolation, etc. had turned towards affecting mental health to all of this, there is a disrupted circadian rhythm which leads to an increase in insomnia. The fear of testing positive for Covid-19 within the family and managing everything had increased the anxiety.

VI. CONCLUSION

The focus of the study was to compare the protein intake and sleep pattern amongst the adults, in Mumbai, before and during the lockdown. Other than that, the meal patterns, anxiety, working hours, physical activity were also assessed. This was done as the factors are interrelated to each other and changing one can alter the other factors. It was seen that the protein, especially rich in tryptophan were not much consumed before the lockdown and further decreased during the lockdown. Due to pandemic the world has changed upside down. Everyone has adapted the new normal. Some respondents were having a good sleep but due to the current scenario, the sleep pattern is also disturbed. Anxiety had increased due to the pandemic. There is a need to change the diet pattern and have integrative therapies to be reinforced to have a healthy lifestyle which would help to have a better health and sleep. There is increased need for exercise routine also to maintain the hormonal balance in the body to have increase melatonin which also helps as a sleep inducer.

VII. REFERENCES

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