

Consumption Pattern of Pro- and Anti-Inflammatory Foods in Women before and during COVID-19

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Abstract

Since the ongoing COVID-19 pandemic is closely associated to chronic inflammation, people who consume more pro-inflammatory foods and less anti-inflammatory foods in their diets are more likely to experience the negative impact of COVID-19. The study has been designed to assess the 'Consumption pattern of pro and anti-inflammatory foods in women before and during COVID-19'. A total of hundred women were taken for the study by random sampling method using a well-structured questionnaire was framed to collect information regarding, health risk associated with consumption of pro-inflammatory foods, etc. Food frequency questionnaire was used to assess the consumption of pro- and anti-inflammatory foods before and during COVID-19. It was found that consumption of pro-inflammatory foods decreased during COVID-19, and anti-inflammatory foods increased during COVID-19. Despite the COVID-19 pandemic, women consumed nutritious food which improved immunity. Fatigue followed by breathing difficulty were the major health effects due to the consumption of pro-inflammatory foods among women. Thus, the study can be concluded that COVID-19 imposed lockdown had overall negative impact on consumption of pro-inflammatory foods among women on contrast to the consumption of anti-inflammatory foods.

Keywords: Anti-Inflammatory Foods, COVID-19, Pro-Inflammatory Foods

1. Introduction

Covid-19 pandemic resulted in chronic inflammation in people who consume more pro-inflammatory foods and less anti-inflammatory foods. As dietary habits are one of the most important modifiable risk factors associated with inflammation, it plays a significant role in controlling and reducing the risk of developing chronic inflammation.

The present study attempts to analyze the consumption pattern of Pro and anti-inflammatory foods and also to assess the consumption pattern and health aspects of such foods among women during Covid-19.

2. Methodology

The current study was a cross-sectional study that analysed the consumption of pro and anti-inflammatory foods in women before and during

COVID-19. The area selected for the study was Trivandrum district. The area was selected because of the availability of enough samples and convenience of the researcher. The study was conducted among 100 adult women. Random sampling was adopted for the study. They were informed about the purpose of study before data collection. The prepared questionnaire was used to collect and evaluate food consumption of Pro and anti-inflammatory foods before and during COVID-19. Possible health issues associated with the consumption of Pro-inflammatory

foods are also asked in the questionnaire. Online survey was done using Googleform questionnaire. After processing and coding, the data was tabulated using percentage. For statistical analysis, Paired *t*-test was used for the comparison of consumption of pro-inflammatory and anti-inflammatory foods before and during COVID-19.

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3. Results and Discussion

3.1 Consumption of Pro-Inflammatory Foods before and during Lock Down

Dietary-inflammatory index is calculated in grouped foods. A food which promotes inflammation is known as pro-inflammatory food¹. The consumption of pro-inflammatory foods in diet before and during COVID-19 is represented.

Comparing Figures 1 and 2 shows the consumption of pro-inflammatory foods before and during COVID-19. Three percent was the daily consumption of meat and meat products before COVID-19, which has been increased to 4% during COVID-19. Twenty two percent was the weekly consumption before COVID-19 which reduced to 19% during COVID-19. Twenty nine percent was the monthly consumption before COVID-19 which reduced to 24% during COVID-19. Twenty nine percent was the monthly consumption, which reduced to 24% during COVID-19.

Eight percent was the daily consumption of refined flour and products before COVID-19, which has been

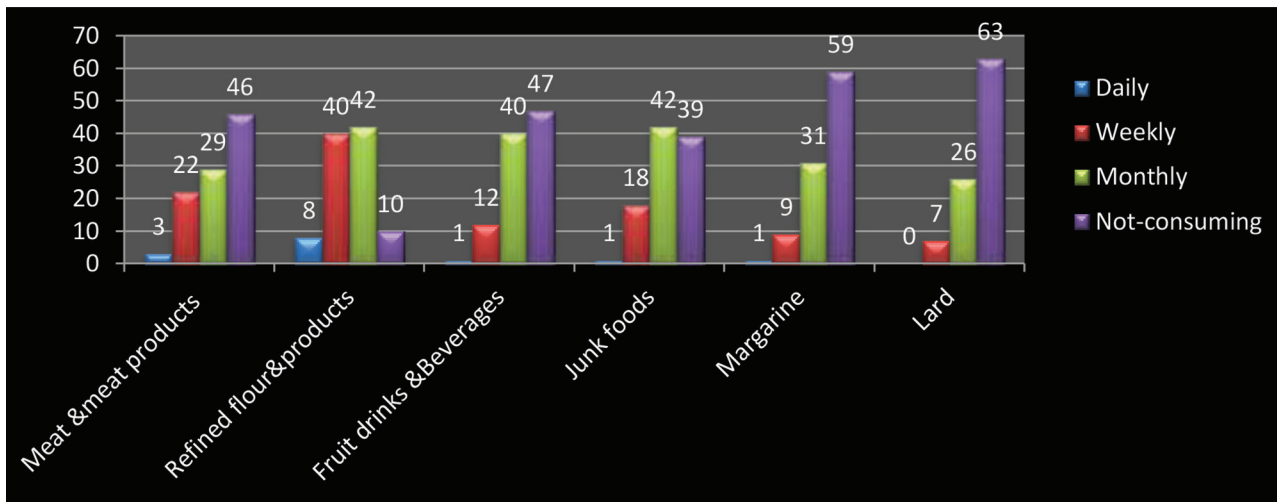


Figure 1. Consumption frequency of pro-inflammatory foods by respondents before COVID-19.

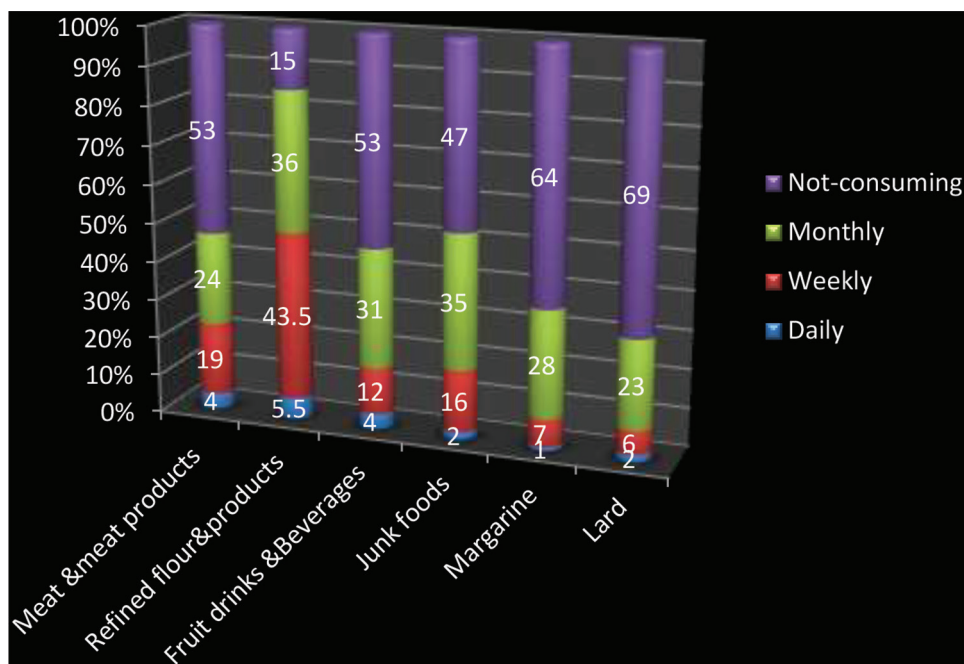


Figure 2. Consumption frequency of pro-inflammatory foods by respondents during COVID-19.

decreased to 5.5% during COVID-19. Forty percent was the weekly consumption before COVID-19 which increased to 43.5% during COVID-19. Forty two percent was the monthly consumption, which reduced to 36% during COVID-19 but rate of respondent who do not consuming refined flour and products increased during COVID-19 from 10% to 15%.

One percent was the daily consumption of fruit juices and beverages before COVID-19 which has been increased to 4% during COVID-19. Twelve percent was the weekly consumption before lockdown which remained unchanged during COVID-19. Thus the daily consumption of fruit drinks and beverages increased by 3% during COVID-19 but weekly consumption remains unchanged during COVID-19.

One per cent was the daily consumption of junk foods before COVID-19, which has been increased to 2% during COVID-19. Eighteen percent was the weekly consumption before lock down, which decreased to 16% during COVID-19. Forty-two per cent was the monthly consumption, which was reduced to 35% during COVID-19, but rate of respondent who does not consuming junk foods increased during COVID-19 from 39% to 47%. Hence daily consumption of junk foods increased by 1%, during COVID-19.

One percent was the daily consumption of margarine before COVID-19, which remained unchanged during COVID-19. Nine percent was the weekly consumption before lock down which decreased to 7% during COVID-19. Thirty-one per cent was the monthly consumption, which was reduced to 28% during COVID-19. Thus, the daily consumption of margarine remained unchanged before and during COVID-19 and weekly consumption of margarine reduced by 2% during COVID-19.

Daily consumption of lard before COVID-19 increased to 2% during COVID-19. Seven percent was the weekly consumption before lockdown, which decreased to 6% during COVID-19, but rate of respondent who does not consuming junk foods increased during COVID-19 from 63% to 69%. Thus, daily consumption of lard increased by 2% during COVID-19 and weekly consumption reduced by 1% during COVID-19.

Consumption of pro-inflammatory foods such meat and meat products, fruit drinks and beverages, junk foods, lard increased soon after during COVID-19. But refined flour and products decreased from their previous rate. The consumption of margarine remained unchanged by COVID-19. However, it was found that monthly

consumption of pro-inflammatory foods was high before COVID-19. COVID-19 had a negative impact on consumption of pro-inflammatory foods.

3.2 Consumption of Anti-Inflammatory Foods before and during COVID-19

Comparing Figures 3 and 4, consumption of whole cereals was 17% before COVID-19 on daily bases which remained unchanged during COVID-19, but weekly consumption was 52%, which was decreased 49% during COVID-19. Twenty seven percent was the monthly consumption before COVID-19 which was reduced to 26% by the COVID-19. Four percent of the respondents did not consume whole cereals before COVID-19 which increased to 8% during COVID-19.

Consumption of pulses and legumes was 24% before COVID-19 on daily bases, which was decreased by 21% during lock down; weekly consumption was 46% before COVID-19, which was also increased to 47% during COVID-19. Monthly consumption remained unchanged, 10% of the respondents do not consume before COVID-19, which was increased to 14% during COVID-19. Thus, the COVID-19 had significant impact on the consumption of pulses and legumes daily consumption decreased by 3%, and weekly consumption increased by 1.

Seventy-two per cent was the daily consumption of Tea and coffee, which was decreased by 62% during COVID-19. Eleven percent was the weekly consumption before COVID-19 which increased to 18% during COVID-19. Seven percent was the monthly consumption with remained unchanged before and during COVID-19. Ten percent of the respondents did not consume tea and coffee before COVID-19 which increased to 13% during COVID-19. Thus there was a significant impact on the consumption of Tea and coffee before and during COVID-19.

Sixty six percent was the daily consumption of species and herbs, which remained unchanged during COVID-19, 27% was the weekly consumption, which was reduced to 24% during COVID-19. Six percent was the monthly consumption rate, which remained unchanged by COVID-19 but 1% of the respondents did not consume species and herbs before COVID-19, which increased to 4% during COVID-19. Thus, the consumption of species remained unchanged on daily bases, but the percentage increase was found in respondents who did not consume species and herbs increased 1% to 4% during COVID-19.

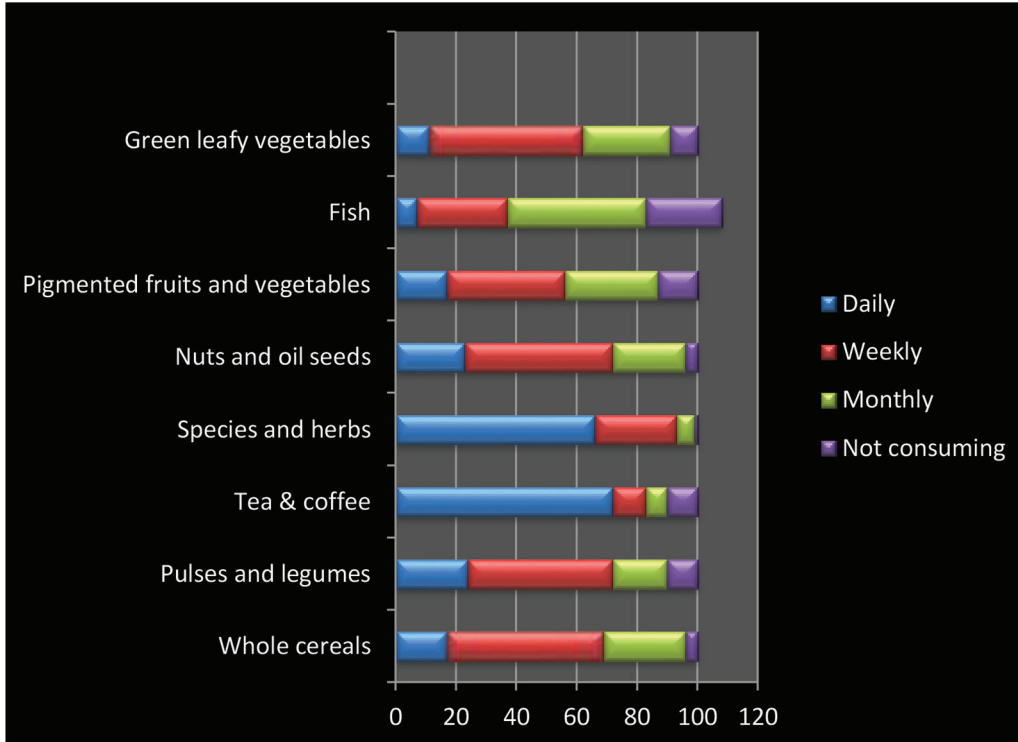


Figure 3. Consumption frequency of anti-inflammatory foods before COVID-19.

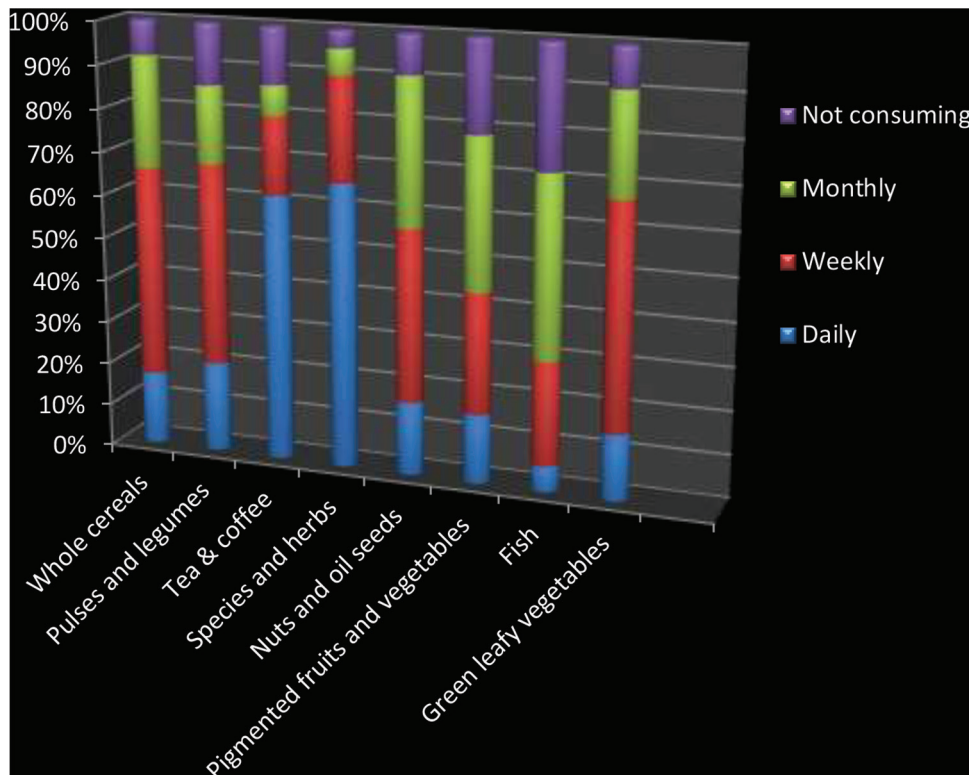


Figure 4. Consumption frequency of anti-inflammatory foods during COVID-19.

Twenty three percent was the daily consumption of nuts and oilseeds before COVID-19, which reduced to 17% during COVID-19, 49% was the weekly consumption which reduced to 40% during COVID-19, but monthly consumption was 24% which increased to 34% during COVID-19.

Consumption of pigmented fruits and vegetables was 17% before COVID-19, which reduced to 16% during COVID-19. Thirty nine percent was the weekly consumption which reduced to 28% during COVID-19, but monthly consumption was 31% which increased to 35% during COVID-19. Thirteen percent of the respondents did not consume pigmented fruits and vegetables before COVID-19 which increased to 21% during COVID-19. Thus the daily consumption rate declined by 1% and weekly consumption rate also declined by 11% during COVID-19.

Seven percent was the consumption of Fishes before COVID-19 on daily bases which reduced to 6% during COVID-19, 30% was the consumption before COVID-19, which also reduced to 24% during COVID-19. But 17% of the respondents did not consume fish before COVID-19 which increased to 28% during COVID-19.

Eleven percent was the daily consumption of Green leafy vegetables before COVID-19, which increased to 15% during COVID-19, 51% was the weekly consumption rate, which remained unchanged before and after COVID-19, but monthly consumption was 29% which reduced to 23% during COVID-19. Nine percent of respondents did not consume green leafy before COVID-19, which increased to 11% during COVID-19. Thus, there was a significant impact on the consumption of Green leafy vegetables before and after COVID-19, about 4% increase in the consumption of green leafy vegetables has been seen in daily basis.

Thus, there was a significant difference in the consumption of anti-inflammatory foods before and during COVID-19. During COVID-19, consumption of anti-inflammatory foods may be beneficial in both the prevention and management of COVID-19³.

3.3 Health problems due to the Consumption of Pro-Inflammatory Foods

According to dietary inflammatory index, foods are classified into pro-inflammatory foods and anti-inflammatory foods based on their activity in promoting

Table 1. Health effects of consumption of pro-inflammatory foods

Variables	Percentage (%)
Fatigue	77
Hypertension	12
High cholesterol	9
Cardiovascular diseases	5
Breathing difficulty	16
Thyroid	2
Bowel cancer	2
Pancreatic cancer	3
Respiratory tract cancer	1
Oral cancer	0
Diabetes	6
None	60

and preventing inflammation associated reactions. Pro-inflammatory foods promote inflammatory mediators and aggravate inflammation associated diseases such as fatigue, hypertension, high cholesterol, cardiovascular diseases, breathing difficulties, thyroid gland dysfunction, cancer, diabetes, etc².

From Table 1, majority of the respondents (77%) had fatigue, about 60% of the respondents did not have any health issues related to consumption of pro-inflammatory foods , but 16% of the total respondents had breathing difficulty, 12% of the total respondents had hypertension, about 9% of the respondents had elevated cholesterol levels in blood, about 6% of the respondents had diabetes, about 5% of the respondents had cardiovascular diseases, about 2% of the respondents had bowel and pancreatic cancer, about 1% of the respondents had respiratory tract cancer.

There is a significant association with consumption of pro-inflammatory foods and health especially inflammatory diseases. Data can be interpreted as majority of women suffer from fatigue, breathing difficulties, hypertension, high cholesterol levels, diabetes, cardiovascular diseases, cancers, respectively due to unhealthy consumption of pro-inflammatory foods and lifestyle.

Table 2. Paired t- test to test *the dietary choices among respondents before and during COVID-19*

Consumption pattern	Dietary Choices						t- value	p- value
	Before COVID-19			During COVID-19				
	Mean	Standard Deviation (SD)	Standard Error (SE)t	Mean	Standard Deviation (SD)	Standard Error (SE)		
Consumption of pro-inflammatory food before and during COVID-19	2.76	0.553	0.055	2.83	0.711	0.071	-1.044	0.299
Consumption of anti- inflammatory food before and during COVID-19	3.33	0.440	0.044	3.27	0.584	0.058	1.310	0.193

The above data suggested fatigue and breathing difficulty is the major health problem with the consumption of Pro-inflammatory foods among women.

3.4 Statistical Analysis

Paired t-test was used for the comparison of consumption of pro- inflammatory and anti-inflammatory foods before and during COVID-19 (Table 2).

Paired t-test to test *the dietary choices among respondents before and during COVID-19*.

Statistical analysis revealed that in the case of pro-inflammatory food consumption, p- value is 0.299 (>0.05), null hypothesis is accepted at 5% level of significance. Hence, there is no significant difference in the dietary choices before and during COVID-19.

In the case of anti-inflammatory food consumption, p-value is 0.193 (>0.05), null hypothesis is accepted at 5% level of significance. Hence, there is no significant difference in the dietary choices before and during COVID-19.

4. Conclusion

The study concluded that there was a significant change in the consumption of pro and anti-inflammatory foods in women by imposed lockdown. Consumption of pro-inflammatory foods such meat and meat products, fruit drinks and beverages, junk foods and lard increased during COVID-19. But refined flour and their product consumption decreased during COVID-19. The consumption of margarine remains unchanged by COVID-19. However, it was found that monthly

consumption of pro-inflammatory foods washigh before COVID-19. During COVID-19 there was a negative impact on consumption of pro-inflammatory foods. Consumption of anti-inflammatory foods before and during COVID-19 showed a sudden decline in the consumption of pulses and legumes, tea and coffee, nuts and oilseeds, pigmented fruits and vegetables, fishes. Consumption of whole cereals, spices and herbs remained unchanged. Meanwhile, consumption of only green leafy vegetables increased during COVID-19 on daily bases. In fact, except species and herbs, the category of non-consuming steadily increased during COVID-19. There was a significant impact on the consumption of pro-inflammatory foods among women. Fatigue (77%) followed by breathing difficulty (16%), hypertension (12%) are the major health effects due to the consumption of pro- inflammatory foods among women.

5. References

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