

Determinants of Dietary Food Prices in India: A Pre- and Post-COVID Comparative Analysis

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Abstract

In India and globally, dietary food consumption has significantly increased. Globally, there has been a shift towards healthier dietary choices, catalysed by both increased awareness and access to healthy foods. COVID has increased awareness of nutrition, which in turn has benefited society economically and socially. This paper aims to study the prices of dietary foods in India, comparing two distinct periods: pre-COVID and post-COVID. Using linear regression, the relationship between inflation and diet foods has been found in both timeframes. Additionally, using Google Consumer Search Volume Index as a consumer proxy, the effect of consumer interest has been mapped against dietary food prices in the respective time frames. This paper is in the form of a quantitative study, where a time-series analysis has been implemented for a comparison of pre and post-COVID periods. The pre-COVID findings show that prices of dietary foods were mainly associated with CPI (inflation), while consumer interest, tracked using Google Search Index, has had a limited impact on the variation of the price of dietary foods. This suggests there was low observable behavioural sensitivity with predictable demand for these foods in the pre-COVID period. The post-COVID findings suggest that the association between inflation and prices has become less consistent, and the strength of their association has decreased. The implications of this research in understanding changing price dynamics are important for policymakers and macroeconomists focusing on the post-pandemic timeframe.

Keywords: Dietary food, Consumer Price Index (CPI), Google Search Volume Index, Food price dynamics, COVID, India

Introduction

Over the past few decades, global dietary consumption patterns have undergone significant changes, catalysed by rising health awareness, urbanisation, access to nutritionally dense foods, and consumer preferences for specific dietary foods. These structural changes were further amplified during the COVID-19 pandemic, which heightened health consciousness in both developing and emerging economies (Raesi et al.). For the scope of this research, diet foods have been classified as meat and fish, milk and milk products, and eggs. Globally, the analysis of dietary shifts during the pandemic reflects spikes in the usage of ingredients associated with dietary food consumption. In the long run, global recipe data shows a 300% discovery and usage increase in items such as dry beans, chickpeas, and lentils during the pandemic periods, while in developing countries, sustainable and prolonged growth in consumption of meat calories

between 1963 and 2003 has showcased a rise by 119% (Eftimov et al.). During the shorter time period of COVID-19, favourable dietary changes were further displayed, including increased home cooking and fresh produce intake, as reported in over 11 global studies (Bennett et al.). Together, these trends suggest that dietary consumption changes are structural rather than sporadic, with adjustments in global food demand.

Such trends span both developed economies, such as Europe, and emerging economies, such as India and Brazil, showing global variance in dietary food consumption trends. In Italy, more than two-thirds of those surveyed reported an increase in consumption of junk foods, sweets and unhealthy leftovers (Raesi et al.). A similar trend was also seen in France, where more than 37,252 adults sampled reported a decrease in dietary diversity and fresh produce consumption during COVID-19 (Bennett et al.). However, there was a significant increase in the amount of home cooking across Italy, France and Spain. In emerging economies, especially focused on India, the pandemic had an opposite effect of having a surge in nutritious, immunity-boosting foods. In Telangana, India, when comparing 2019 and 2020, Chicken consumption rose by 37.27%, egg consumption rose by 31.56%, and milk consumption rose by 18.88%, all reflecting a positive increase in the diet foods after the interference of COVID-19 (Monroe-Lord et al.). Especially in the Indian diet, carbohydrate consumption is at 62%, showing evident domination of the food group, while the mean Dietary Diversity Score among Indian undergraduate students was 3.4, significantly below the "good" threshold of 5 or higher, highlighting the evident yet restricted intake before COVID-19 (Kumar et al.). Consumer Price Index (CPI), defined as the measure of the average change over time in the prices paid by urban consumers for dietary foods, acts as a macroeconomic measure of consumption. CPI is essential as diet foods tend to be both more expensive and more sensitive to price changes due to affordability. In Brazil, the relative price for healthy foods is 130.8% as compared to ultra-processed foods (UPF), indicating a massive affordability variance (Silva-Neto et al.).

Google Trends serves as a digital proxy being used to understand consumer interest through search volumes and platform engagement over a fixed time period. This is significant due to its high frequency and relevance, especially during the technological reliance during COVID-19. However, serving as a proxy, it does not reflect actual consumption metrics but rather measures consumer intent, not quantity. This paper attempts to understand the correlation between Consumer Price Index (CPI) trends and diet food prices, proxied using Google Trends for meat, fish, milk products, and eggs, when comparing pre-COVID and post-COVID periods. Structured sectionally as follows: outline of methodology and data sources, result presentation and analysis, concluding with key findings and abstraction for future research, with a way forward.

Methodology

Research design

This study uses a quantitative research design to analyse the price trends of diet foods in relation

to macroeconomic and behavioural indicators. A quantitative model approach is appropriate as the scope of the research aims to examine statistical relationships between variables tracking behaviour and consumption over a fixed time frame.

This study focuses on the responsiveness of food prices to changes in:

- Inflation is represented by the Consumer Price Index (CPI).
- Consumer interest and awareness, proxied using Google Search Volume Index.

To analyse the selected relationships, a linear regression model has been selected. Regression analysis allows for the examination of the relationship between variables of consumer interest and dietary food prices. This relationship is highlighted through the estimation of both the variance and statistical significance of the association between the selected independent variables and dietary food prices.

The analysis is conducted using monthly time-series data in the time frames of:

- pre-COVID period – January 2019 to December 2021
- post-COVID period – January 2022 to December 2024

To track whether COVID-19 has led to changes in consumer behaviour, prices and consumption.

Data sources

For the price and inflation metrics, monthly basis data was collected from the Reserve Bank of India (RBI) database on the Indian Economy (DBIE)

The RBI DBIE is a reliable, time-stamped data warehouse that provides macroeconomic data, widely used in both academic and professional research, of the Indian Economy. Additionally, it allows data retrieval in Excel and CSV formats, making it valid for data regression and analysis.

The data groups collected are as follows:

- Consumer Price Index (CPI) – representing inflation.
- Monthly prices of dietary foods:
 - Meat and fish
 - Milk and milk products
 - Eggs

The above categories of diet foods were chosen for the prevalence in global diets and nutritional importance, acting as strong determinants to track the association of inflation and consumer interest.

Data on consumer interest was sourced from Google Trends' Search Volume Database.

Using the Google Search Volume Index, values were collected from the selected time-frame category-wise and stored to measure consumer interest in changes in diet food prices.

For the Google Search Volume Index, data was collected using the keyword 'diet'. This displays the total number of Google users in India searching the term 'diet' in the search query in the selected time frame, which measures consumer interest in changes in diet food prices.

Google Trends showcases increasing significance, especially in the post-COVID timeframe, since digital reliance for information about food and nutrition has increased exponentially. Hence, this acts as a useful proxy to track consumer interest and information-seeking behaviour.

However, this paper acknowledges that Google Trends measures search interest through search volume rather than actual consumption patterns of an economy, and hence is strictly used as a proxy variable for information and research purposes.

Variable and Model Specification

The dependent variables in this research are the prices of the dietary foods analysed for the following categories:

- Meat and fish
- Milk and milk products
- Eggs

The independent variables in this research included in the regression model analysis are:

- Consumer Price Index (CPI)
- Google Search Volume Index

Regression Model

A separate linear regression has been executed for each dietary food category in both the pre-COVID and post-COVID time periods. This specification yields:

- Three regressions in the pre-COVID period
- Three regressions in the post-COVID period

This model allows for the study to isolate selected variables and allow a constant comparison between inflation and consumer interest with dietary food prices in the pre-COVID and post-COVID timeframes.

Data Analysis

All the data processing and statistical analysis were conducted using **Microsoft Excel**.

The undergone analysis involved:

- Organising and structuring the monthly data from RBI and Google Search Volume Index into a time-series format,
- Conducting Ordinary Least Squares (OLS) regression for each of the food categories, in order of Meat and fish, Milk and Milk products, and eggs, in the pre-COVID timeframe
- Next repeated process for the post-COVID timeframe.
- The results from the OLS regression were then separated time-frame-wise and structured for interpretation based on selected metrics.
- The interpretation of the regression results was based on:
 - The direction of the coefficients to track the association between the independent and dependent variables
 - P-values, with statistical significance placed at the 5% level ($p < 0.05$).

Hypotheses

Through consumer behaviour observed and economic theories addressed during the COVID-19 pandemic, the following hypotheses are validated:

pre-COVID Period

- **H₁:** Prices of dietary foods such as meats and milk products are strongly associated with inflation marked through CPI, with low influence of consumer info-seeking behaviour.

post-COVID Period

- **H₂:** Prices of dietary food such as meats and milk products are associated less significantly with inflation, with consumer preference seen through the Google Search Index, suggesting a stronger association than the pre-COVID period.

The pre-COVID and post-COVID hypotheses allow for comparison of prices before and after the COVID-19 pandemic in both timeframes.

Results and Discussion

Pre-COVID Regression analysis

Table 1: Regression Analysis of the Relationship between CPI, Google Search Volume Index, and Prices of Meat and Fish (pre-COVID Period)

	Coefficient (B)	P-value
Consumer Price Index (CPI)	0.329	0.010
Google Search Volume Index	0.211	0.005

Table 1 shows the regression analysis carried out with the consumer price index (CPI) as the independent variable, along with the Google search volume index as a proxy for consumer interest. The dependent variable measured is the prices of dietary food of meat and fish. The $p < 0.05$ for the consumer price index (CPI) shows that the p-value is significant. This shows that prices of meat and fish are statistically associated with inflation in the pre-COVID period. The Google search volume index finds a $p < 0.05$, showing that there is a significant relationship between the Google search volume index and prices of meat and fish. This suggests that prices of meat and fish are statistically associated with consumer interest in the given time period. Both the CPI and the Google search index exhibit a statistically significant but weak positive association with the prices of meat and fish in the pre-COVID period. This model suggests that inflation and information-seeking behaviours have a moderate influence on the prices of the meat and fish products in the pre-COVID period.

Table 2: Regression Analysis of the Relationship between CPI, Google Search Volume Index, and Prices of Milk Products (pre-COVID Period)

	Coefficient (B)	P-value
Consumer Price Index (CPI)	0.375	8.578×10^{-7} (≈ 0.000001)
Google Search Volume Index	-0.054	0.141

Table 2 shows the regression analysis carried out with the consumer price index (CPI) as the independent variable, along with the Google search volume index as a proxy for consumer interest. The dependent variable measured is the prices of dietary food, of milk and milk-based products in the pre-COVID period. The $p < 0.05$ for the consumer price index (CPI) shows that the p-value is significant. This shows that prices of milk and milk products are statistically

associated with inflation in the pre-COVID period. The CPI coefficient is positive, suggesting a positive association between inflation and milk prices. The Google search volume index finds a $p > 0.05$, showing that there is no significant relationship present between the Google search volume index and the prices of milk. The Google search volume index coefficient suggests that consumer interest is not associated with milk prices pre-COVID. There is no statistically significant association between consumer interest and milk prices. This model suggests that pre-COVID milk prices were linked to inflationary factors, with no significant association observed for consumer interest.

Table 3: *Regression Analysis of the Relationship between CPI, Google Search Volume Index, and Prices of Eggs (pre-COVID Period)*

	Coefficient (B)	P-value
Consumer Price Index (CPI)	0.483	0.031
Google Search Volume Index	0.217	0.092

Table 3 shows the regression analysis carried out with the consumer price index (CPI) as the independent variable, along with the Google search volume index as a proxy for consumer interest. The dependent variable measured is the prices of dietary food, of eggs, in the pre-COVID period. The $p < 0.05$ for the consumer price index (CPI) shows that the p-value is significant. This shows that prices of eggs are statistically associated with inflation in the pre-COVID period. The CPI coefficient is positive, suggesting a positive association between inflation and egg prices. The Google search volume index finds a $p > 0.05$, showing that there is no significant relationship present between the Google search volume index and the prices of eggs. This means consumer interest does not suggest an effect on the egg prices in the given time frame. This model suggests that pre-COVID egg prices had a statistically significant, weak positive association with inflationary factors, with no significant association observed for consumer interest.

Post-COVID Regression analysis

Table 4: *Regression Analysis of the Relationship between CPI, Google Search Volume Index, and Prices of Meat and Fish (post-COVID Period)*

	Coefficient (B)	P-value
Consumer Price Index	0.438	0.070

(CPI)		
Google Search Volume Index	0.119	0.141

Table 4 shows the regression analysis carried out with the consumer price index (CPI) as the independent variable, along with the Google search volume index as a proxy for consumer interest. The dependent variable measured is the prices of dietary food of meat and fish in the post-COVID time frame. The $p > 0.05$ for the consumer price index (CPI) shows that the p-value is not statistically significant. This shows that prices of meat and fish are not statistically associated with inflation in the post-COVID period. The Google search volume index finds a $p > 0.05$, showing that there is no significant relationship between the Google search volume index and prices of meat and fish. This suggests that prices of meat and fish are not statistically associated with consumer interest in the given time period. Both the CPI and the Google search index exhibit no association with the prices of meat and fish in the post-COVID period. This model suggests that inflation and information-seeking behaviours have no significant effect on the prices of the meat and fish products in the post-COVID period.

Table 5: Regression Analysis of the Relationship between CPI, Google Search Volume Index, and Prices of Milk and Milk Products (post-COVID Period)

	Coefficient (B)	P-value
Consumer Price Index (CPI)	-0.493	0.006
Google Search Volume Index	0.116	0.048

Table 5 shows the regression analysis carried out with the consumer price index (CPI) as the independent variable, along with the Google search volume index as a proxy for consumer interest. The dependent variable measured is the prices of dietary foods of milk and milk products in the post-COVID time frame. The $p < 0.05$ for the consumer price index (CPI) shows that the p-value is significant. This shows that prices of milk and milk products are statistically associated with inflation in the post-COVID period. The coefficient of CPI is negative; therefore, inflation is negatively associated with milk prices post-COVID, showing an inverse relationship. The Google search volume index finds a $p < 0.05$, showing that there is a significant relationship between the Google search volume index and prices of milk and milk products. The Google search index has a positive coefficient, showing consumer interest is positively associated with milk and its products' prices.

This model suggests that inflation and information-seeking behaviours have a weak-to-moderate influence on the prices of milk and milk products in the post-COVID period, though directions of associations differ across the two variables.

Table 6: *Regression Analysis of the Relationship between CPI, Google Search Volume Index, and Prices of Eggs(post-COVID Period)*

	Coefficient (B)	P-value
Consumer Price Index (CPI)	-0.484	0.121
Google Search Volume Index	-0.407	0.0003

Table 6 shows the regression analysis using the consumer price index (CPI) as the independent variable, with the Google search volume index as a proxy for consumer interest during the post-COVID period. The dependent variable measured is the prices of dietary food, of eggs, in the post-COVID period. The p-value for the consumer price index (CPI) is $P > 0.05$, indicating it is not statistically significant. This shows no statistically significant relationship between the prices of eggs and inflation.

The Google search volume index finds a $p < 0.05$, showing that there is a significant relationship present between the Google search volume index and the prices of eggs. This means consumer interest shows a statistical association with the egg prices in the given time frame. The Google coefficient is negative, showing that the association between consumer interest and egg prices are in an inverse and negative relationship.

This model suggests that egg prices are associated with consumer interest rather than inflation. There is a weak-to-moderate association with consumer interest, and no suggested association with inflation.

Interpretation of Results

Meat and fish had a substantial negative correlation with inflation before the pandemic, but there was little correlation with customer preference. Meat and fish acted more like semi-luxury or income-sensitive foods before the pandemic. Real purchasing power dropped as general inflation increased, people cut back on the intake of relatively expensive protein sources, and the impacts of cost-push inflation were overcome by the drop in demand. Consequently, lesser or weaker meat and fish prices were correlated with increased inflation. The insignificant link between GSVI and meat & fish in the pre-pandemic period implies that food consumption patterns were habitual and stable, internet search behaviour for food products was limited and not

price-informative. Active demand generation was not reflected in the Google search.

Overall, as seen through the regression analysis conducted in Tables 1, 2, and 3, the research finds that prices for dietary food were primarily associated with inflation, as denoted by the relationship between dietary foods and the Consumer Price Index (CPI) in the pre-COVID period. This is seen in Tables 1, 2 and 3 with a significant p-value < 0.05 . However, the regression analysis also suggests that consumer interest had a restricted overall role in determining prices for the mentioned diet foods.

This reflects stable price formations of the dietary foods in the pre-COVID period. There are stable demand and supply conditions with relatively lower volatility and structural shocks (Del Rio-Chanona et al.). Consumer search behaviour played a limited role in the prices of dietary foods because consumption habits were stable and had lower variance.

The post-COVID regression analysis findings suggest that the results differ from the pre-COVID results as hypothesised. Overall, as the findings show, the effect of inflation becomes less consistent across food categories. The observed weakening of the statistical association between inflation and prices in the post-COVID period may reflect structural disruptions. Consumer interest seen through the Google Search Index becomes more relevant for foods such as milk and eggs, specifically. This is suggested due to increased information-seeking behaviour and digital reliance, increasing consumer awareness. However, Google Trends reflects consumer attention and interest and not consumption and indicates greater behavioural sensitivity in prices (Stejskalová).

The models display that pre-COVID prices were inflation-driven, while post-COVID prices show greater behavioural sensitivity.

Conclusion:

This study involves the price dynamics of dietary foods in India. Through this study, the foods focused on were meat and fish, milk and milk products, and eggs. These foods' price dynamics were compared in a pre-COVID and post-COVID timeframe, where the paper investigated how the prices were associated with Inflation (CPI) and consumer interest (Google Search Volume Index). In the pre-COVID period, prices were mainly influenced by inflation rates, where CPI played a significant role across all 3 food categories. However, consumer interest, seen through the Google Search Volume Index, had a limited role in its impact on dietary food prices. This price formation reflected lower interest sensitivity and constant demand structures. In the post-COVID timeframe, inflation played a less significant role across the food categories, and a clear divergence between the food groups was noted. Milk and eggs rendered a stronger association with consumer interest, reflecting high behavioural sensitivity. However, meat and fish displayed no significant shift, limiting the significance of the impact of behavioural influence on their prices. These changes in structure are catalysed with increased digital reliance

for information on nutrition, as well as determinant changes of price formation (Xiong et al.). This research finds that pre-COVID was based on inflationary pricing, while the post-COVID period was based on mixed determinants, with the emergence of increased consumer interest in selected food categories and structural changes in pricing. Overall, understanding price mechanisms and changes is important for various stakeholders such as policymakers, inflation management and macroeconomists, as they act as behavioural and inflationary indicators. For future research, expansion of the scope size to other emerging economies, such as Brazil, as well as cross-country comparison and hypothesis formation, may be beneficial in understanding pricing mechanisms. Income level differentiation, as well as an increased timeframe, may allow for rendering if post-COVID changes were temporary or structural.

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