



A Study of the Role of Income, Consumption Patterns and Time in Shaping Food Expenditure in India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: we sought to determine the key factors affecting per capita monthly expenditure on food across Indian states over time.

Study Design: This is a quantitative, cross-sectional study that uses existing data from National Sample Survey (NSS), 61st, 66th and 68th rounds.

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Methodology: We compiled datasets on 10 independent variables believed to influence monthly per capita expenditure (MPCE) across 17 Indian states over three distinct time periods (2004-05, 2009-10, 2011-12). These variables include household size, dependency ratio, milk availability, Gross State Domestic Product (GSDP), literacy rate, a time dummy variable, poverty rate, and consumption patterns of cereals, pulses, and non-vegetarian food.

Results: The analysis of 68 observations identified key factors influencing household food consumption expenditure. Milk consumption showed a positive correlation with expenditure, yielding a coefficient of 1.106 ($p = 0.001$) as did literacy rate (coefficient = 10.018, $p = 0.045$), expenditure on non-food items (coefficient = 0.086, $p = 0.001$), and expenditure share on eggs and meat (coefficient = 29.011, $p = 0.001$). Time dummy variables indicated rising expenditures over time, with coefficients of 517.76 ($p = 0.001$) for 2009-10, 703.93 ($p = 0.001$) for 2011-12, and 2324.29 ($p = 0.001$) for 2022-23. Overall, the model accounted for 90.9% of the variance in food consumption expenditure.

Conclusion: Higher per capita milk availability leads to increased overall food spending, while the time factor indicates a trend of rising expenditures, likely linked to changing consumption patterns and incomes. Literacy rate also positively affects food expenditure choices. The analysis also shows that spending on protein-rich foods, such as eggs and meat, positively affects overall food expenditure.

Keywords: Food expenditure; socio economic factors; temporal factors, India.

1. INTRODUCTION

India's diverse population and rapid economic growth have led to meaningful changes in the consumption patterns of its citizens across different socioeconomic strata (Krishnan and Hatekar, 2017). These patterns have been shaped by various forces, including the rising affluence of the middle class, rapid urbanization, and the increasing integration of the Indian economy with global markets (Yoganandham and Varalakshmi, 2023). Numerous surveys have highlighted distinctions among various income groups in the country and how their food habits and preferences have evolved over time. Furthermore, the influence of globalization has introduced new food products and dietary trends, leading to a blending of traditional cuisines with international flavors.

Regardless of the apparent social divide, food remains an essential part of every household's budget. Statistics reveal that the lowest income group spends approximately 53.27% of its budget on food and beverages, while the highest income group allocates only 11.88%. Lower-income households exhibit higher elasticity in food expenditure, in line with Engel's law (Aryal and Aryal, 2023). The widening gap in consumption patterns between upper and lower classes indicates that as income increases, the proportion of expenditure on food decreases, with a shift towards non-food items (Gupta et al., 2022). Geographic and occupational factors also contribute to food expenditure inequality, as

poorer households spend more on cereals, while wealthier households invest in a more diverse array of food items (Borkotoky and Unisa, 2017).

Studies indicate that urban households tend to have higher real food expenditures compared to rural households; however, the share of food expenditure has decreased in urban areas due to rising nonfood expenditures (Varghese 2022). In contrast, rural areas have seen a decline in real food expenditures, particularly in staples like sugar and oil, while spending on fruits and vegetables has increased. Several studies corroborate the observation that individuals with higher incomes generally have healthier diets, consuming more fruits, vegetables, oils, and meats compared to those in lower income classes (Gupta and Mishra, 2014). The reason for this can be attributed to the fact that higher income levels often lead to better socioeconomic status, which in turn results in greater knowledge and awareness about health and nutritious foods.

Given the changes in expenditure, it becomes crucial to analyze how different socio-economic factors influence food consumption patterns. Higher-income households, for instance, may prioritize quality and variety, while lower-income groups might still focus on quantity and basic staples. Understanding food consumption patterns also helps in studying nutritional status and welfare of households.

The share of Indians who are classified as being in the lower class is smaller than it used to be, indicating a gradual improvement in economic

conditions. In 1990, 51% (Datt, 1997) of Indians lived below the poverty line, struggling to meet basic needs. By 2023, this share had fallen to 14.96% (Niti Aayog, 2023), reflecting significant progress in poverty alleviation efforts. However, despite this positive trend, it is concerning that, according to the Global Hunger Index, approximately 18.7% of the population in India was reported to be food insecure in 2021. This statistic highlights the ongoing challenges related to access to adequate nutrition. A household's socioeconomic status (SES) is a key factor influencing food insecurity in India, as it determines the resources available for food purchasing and preparation. Low SES, particularly in low-income households, results in the consumption of inadequate and nutrient-poor diets due to a lack of dietary diversity, which ultimately affects overall health and well-being.

Explaining consumer behavior, especially regarding food consumption, is complex and multifaceted. Traditional theories have emphasized income as the primary determinant of food choices; however, factors such as social groups, cultural norms, and demographic characteristics have been found to play significant roles in shaping these consumption patterns. These elements interact dynamically, influencing not only what people buy but also how they perceive food and nutrition. Previous studies have found that the consumption patterns of Indian consumers are undergoing a significant transformation, with a greater emphasis on high-value products such as fruits and vegetables, rather than traditional staples like cereals and pulses (Nandi and Nedumaran, 2022). This shift can be attributed to several interrelated factors, including increasing health awareness among consumers, which has led to a more conscious approach to diet, the influence of globalization that exposes individuals to diverse food options, and rising disposable incomes, particularly within the growing middle class, enabling greater access to these higher-value foods.

2. MATERIALS AND METHODS

The data used for the study was on food consumption and consumer expenditure collected by the National Sample Survey Organization (NSSO) of the Government of India. The analysis draws from the 61st, 66th, and 68th rounds of surveys, encompassing the years 2004-05, 2009-10, and 2011-12. The data includes per-capita consumption figures for both food and non-food commodities across sample households. Specifically, the NSS surveys

covered 79,297 rural households in the 61st round, 59,119 in the 66th, and 59,695 in the 68th round, along with 45,346, 41,736, and 41,967 urban households, respectively. For the study the data pertaining to 17 important states were selected during the three rounds thus making the total number of observations to 51.

2.1 A Consumption Model

Multiple linear regression analysis has been used study per capita monthly expenditure on food items. By incorporating multiple predictors, this method allows for a more comprehensive understanding of how each factor, such as household size, poverty rates or literacy rate, contributes to overall food spending. This regression analysis uses a mathematical model in the form of a straight-line equation that can define the relationship between variables according to the research objectives.

In this study, we analyze data across 17 states (Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan,

Tamil Nadu, Uttar Pradesh and West Bengal), over three time periods (2004-05 and 2009-10, 2011-12)

The dependent variable, Y , represents the per capita monthly expenditure on food items in Indian Rupees (₹) for the i^{th} state and the independent variables are X_1 (Household size for the i^{th} state in numbers), X_2 (per capita milk availability for the i^{th} state in grams per day)

X_3 (Literacy rate in % for the i^{th} state), X_4 (Expenditure on non-food items in ₹),

X_5 (per capita monthly consumption expenditure share on meat, fish and egg for the i^{th} state in ₹),

X_6 (dummy variable for time period. '1' for the 61st round and '0' for the 66th, 68th and 2022-23 round, '1' for the 66th round and '0' for the 61st, 68th and 2022-23 round, '1' for the 68th round and '0' for the 61st, 66th, 68th and 2022-23 round and '1' for the 2022-23 round and '0' for the 61st, 66th, 68th round, X_7 (relative per income), β_0 is the intercept, U_i is the stochastic disturbance term. Hence, the multiple linear regression model used is (Sendhil et al., 2020).

$Y = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + U_{it}$ for $i = 1$ to n states ($n=17$) and $t = 2004-05, 2009-10, 2011-12$ (three-point period).

where,

Y is per capita monthly expenditure of food items in ₹ for the i^{th} state

X_{1i} - household size for the i^{th} state in numbers

X_{2i} - per capita milk availability for the i^{th} state in grams per day

X_{3i} - Literacy rate in % for the i^{th} state

X_{4i} - Expenditure on non-food items in ₹

X_{5i} - per capita monthly consumption expenditure share on meat, fish and egg for the i^{th} state in ₹

X_{6i} - dummy variable for time period. '1' for the 61st round and '0' for the 66th, 68th and 2022-23 round, '1' for the 66th round and '0' for the 61st, 68th and 2022-23 round, '1' for the 68th round and '0' for the 61st, 66th, 68th and 2022-23 round and '1' for the 2022-23 round and '0' for the 61st, 66th, 68th round.

X_{7i} - relative per income in

β_0 is the intercept

U_i is the stochastic disturbance term

3. RESULTS AND DISCUSSION

The results indicate that selected variables significantly influence food consumption patterns across the Indian states during the analyzed period. Among the key variables, time period (dummy variable), milk availability, literacy rate, expenditure on non-food items and expenditure on eggs & meat show the strongest effects on food expenditure. India is the largest producer and consumer of milk in the world, which significantly impacts food consumption expenditure. The dairy sector contributes around 5.3% to India's agricultural GDP, with milk production rising from 146.3 million tones in 2014-15 to 198.4 million tonnes in 2019-20. Over 75% of households consume milk, making it a key part of nutrition and income for rural families (Kalimuthu *et al.*, 2021). An increase in milk availability leads to a rise in per capita food expenditure, with each additional unit of milk available increasing spending by ₹1.67. This highlights the importance of milk in household budgets, especially in rural areas where dairy farming is central to livelihoods. Moreover, milk remains a culturally significant and widely consumed product, which enhances its role in household expenditure decisions.

Food spending in India has changed a lot from 2004-05 to 2022-23, showing how economic growth and consumer habits have shifted over time. Back in 2004-05, households in India spent about 35.4% of their budget on food. This was actually lower than previous years, as people

were beginning to spend more on things like transportation and communication, which likely reflects a lifestyle change as people had more money and were prioritizing different things (Gandhimathi *et al.*, 2012). Each coefficient has an associated p-value far below 0.05, meaning the increases in MPCE for 2009-10, 2011-12, and 2022-23 are statistically significant when compared to the base year of 2004-05. The t-values (4.93, 6.20, and 13.31, respectively) are all high, reinforcing that these increases in food expenditure over time are not due to random chance but a genuine trend in consumer spending patterns. The coefficient values for each dummy variable represent the increase in MPCE for that specific year over 2004-05. On average, MPCE increased by 517.76 units in 2009-10, 703.93 units in 2011-12 and 2324.29 units in 2022-23. While the share of food expenditure on total household consumption expenditure has decrease it does not necessary mean that total food expenditure has dropped rather, it is growing at a slower rate than non-food expenditure. This phenomenon is evident in Engel's Law, which states that as household income rises, the proportion spent on food decreases while that spent on other goods and services rises.

According to the 2022-23 Household Consumption Expenditure Survey, The expenditure on eggs, fish, and meat in rural India has risen from 6.18% in 2011-12 to 9.01% in 2022-23, while the expenditure on eggs, fish, and meat in urban India has risen from 8.91% in 2011-12 to 10.54% in 2022-23.

The regression results indicate a significant relationship between spending on non-food items, high-value foods, and overall food expenditure, supporting broader trends in household consumption. Specifically, the coefficient for non-food items (0.0856) shows that as households increase spending on discretionary non-food items like clothing, transport, and entertainment, there is also a proportional rise in their monthly food expenditure. This suggests that households with higher disposable income do not reduce food budgets; instead, they expand overall spending, which includes food. The coefficient for eggs and meat expenditure (29.01) is notably high, indicating that for every additional unit spent on these high-value foods, the total food budget increases significantly.

With household consumption expenditure doubling over the past decade and the share of

non food items increasing, Specifically, the coefficient for non-food items (0.0856) shows that as households increase spending on discretionary non-food items like clothing, transport, and entertainment, there is also a proportional rise in their monthly food expenditure. This suggests that households with higher disposable income do not reduce food budgets; instead, they expand overall spending, which includes food. The coefficient for eggs and meat expenditure (29.01) is notably high, indicating that for every additional unit spent on these high-value foods, the total food budget increases significantly.

The dynamics of nutrient consumption indicate that rising food prices disproportionately impact the poor, leading to reduced calorie intake despite adequate food production (Nasurudeen et al., 2006). Chronic food insecurity persists due to insufficient purchasing power, closely tied to poverty levels. Poverty remains a crucial determinant of food expenditure, with a 1% increase in poverty leading to a ₹15.03 drop in food spending. This highlights the financial challenges that poorer households endure, ultimately restricting their access to adequate nutrition. Similarly, an increase in cereal consumption, traditionally a staple in Indian diets, is associated with a reduction in overall food expenditure. Due to the growing demand for high-value food items, there has been a considerable shift in nutritional preferences and economic growth. Expenditure on eggs and meat, on the other hand, positively

influences overall food spending. Households that spend more on eggs and meat also tend to spend more on food in general, with a 29.01 increase in food expenditure for each additional unit spent on these protein-rich items. This can also be noted in the 2022-23 household expenditure survey report which says that expenditure on eggs, fish, and meat in both rural and urban India has risen from 6.18% , 8.91% in 2011-12 to 9.01% 10.54% in 2022-23.

literacy rate has a direct impact on household spending on food. The coefficient for literacy rate (10.01771) indicates that for each one-unit increase in literacy, monthly per capita food expenditure increases by approximately 10.02 units. Higher literacy rates are associated with greater food spending, this is due to better access to information about nutrition and a more diverse diet which reinforcing the idea that education has a key role in shaping food consumption patterns.

The regression results indicate that household size and relative per capita income do not have a significant impact on MPCE for food. Despite the positive coefficient for relative per capita income, it is not statistically significant, suggesting that income disparities within the sample do not drive significant changes in food expenditure. Similarly, household size, though negatively related to food expenditure, shows no strong effect, further suggesting that these factors do not meaningfully influence the food spending patterns in the dataset.

Table 1. Determinants of food consumption expenditure in India

SI.No	Particulars	Coefficient	Standard error	T stat	P value
1	Intercept	-420.45	311.284	-1.3507	0.1820
2	Milk availability (gm/ day)	1.106***	0.209	5.298	1.888
3	Dummy variable for 2009-10	517.7559***	105.0914	4.927	7.32075E-06
4	Dummy variable for 2011-12	703.9335***	113.4681	6.204	6.2721E-08
5	Dummy variable for 2022-23	2324.29***	174.605	13.312	2.78695E-19
6	Literacy rate	10.018**	4.9001	2.04438	0.04547
7	Expenditure on non-food items	0.0857***	0.0218	3.9274	0.000231
8	Expenditure share on eggs & meat	29.01123***	7.95336	3.64767	0.000568
9	Household size	-6.3E-06	4.96E-06	-1.26515	0.21088
10	Relative per capita income	0.276	0.2637	1.0488	0.299

Note: ***, ** indicate the significance at 1, 5

4. CONCLUSION

In this paper, the impact of various socioeconomic factors on food expenditure has been investigated. It is clear that milk availability, the time period (represented by a dummy variable), and expenditures on eggs and meat have the most pronounced effects on food expenditure. Higher per capita milk availability significantly boosts food expenditure, as people with more access to milk are willing to spend more on food overall. This trend is particularly noteworthy in regions where milk is a dietary staple, reflecting both cultural preferences and nutritional needs. The dummy variable reflecting time shows the increase in spending across the years, which may be attributed to changing consumption patterns or perhaps rising incomes. Over time, households have shifted their spending habits towards more diverse and higher-quality food items, which are often more expensive. Poverty and food expenditure have a negative relationship because purchasing power can limit the ability of households to invest in a variety of food options. When financial constraints are in place, families often prioritize basic needs over diverse nutritional options. The Indian diet is majorly cereal-centric, and so increased cereal consumption correlates with lower spending due to its lower cost. Furthermore, it was estimated that the level of food expenditures is positively affected by expenditure on eggs and meat. In many households, these protein-rich foods are considered essential for a balanced diet and often take precedence in food budgets. Therefore, it is clear that spending on these protein-rich foods positively correlates with overall food expenditure. Consequently, it's imperative that food policies not only aim to increase availability and access to these nutritional staples but also consider the affordability of such foods. As the analysis indicates, rising food prices and poverty may lead consumers to opt for cheaper, low-quality food options, which could negatively affect their health and well-being. This shift toward less nutritious options can result in long-term health issues, underscoring the need for comprehensive food policies that address both access and quality.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image

generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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