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Escalating student costs and the challenge of educational equity: A comparative index analysis of expenditure in Balangir (2020-2026)

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Abstract

This study examines the changing dynamics of student expenditure and its implications for educational affordability in Balangir, Odisha, over the period 2020 to 2026. Using primary data collected from 500 students of Rajendra University through stratified random sampling, the study analyzes monthly expenditure across seven categories: Food and Groceries, Rent, Transport, Academic Fees, Stationery, Personal Cost, and Others. Index number techniques including Simple Aggregate, Laspeyres, Paasche, Fisher's Ideal, Marshall-Edgeworth, Dorbish-Bowley, and Weighted Average methods are applied to measure the magnitude and pattern of change.

The findings reveal a substantial increase of approximately 71% in overall student expenditure, rising from Rs. 13,200 in 2020 to Rs. 22,600 in 2026. Rent and Transport emerge as the most rapidly increasing components, indicating structural constraints such as limited housing supply and rising mobility costs. Fisher's Ideal Index is identified as the most reliable measure, satisfying both time and factor reversal tests. The study also finds that student expenditure has grown faster than the general cost of living, highlighting a disproportionate financial burden on students. These trends raise serious concerns about accessibility and equity in higher education, calling for targeted policy interventions.

Keywords: Educational affordability, index number analysis, student expenditure, Balangir, higher education economics

Introduction

Education is widely recognized as the most powerful instrument for social and economic transformation. Access to quality higher education, however, is increasingly contingent on economic affordability. As the cost of living continues to rise in India, the financial burden on students pursuing higher education has intensified significantly. Understanding the dynamics of student expenditure and its change over time is essential for policy formulation aimed at making higher education accessible to all sections of society.

Index numbers are among the most powerful statistical tools for measuring and comparing changes in variables over time. They allow economists, researchers, and policymakers to quantify changes in price levels, cost of living, and economic conditions in a standardized manner. Applied to the domain of educational expenditure, index numbers provide a systematic framework for understanding how the financial burden of education has evolved over time.

This study focuses on Balangir district, a region in western Odisha characterized by moderate urbanization, significant tribal and marginalized population, and growing demand for higher education. Rajendra University, Balangir is the primary higher educational institution in the region, enrolling thousands of students annually from diverse socioeconomic backgrounds. The university attracts students from both urban and rural areas of the district and neighboring regions.

The period from 2020 to 2026 has been marked by several economic disruptions including the COVID-19 pandemic and its aftermath, supply chain disruptions, inflationary pressures, and policy changes in higher education. These factors have collectively contributed to significant

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changes in the expenditure patterns of students. This study quantifies these changes using index number analysis across seven key expenditure categories: Food and Groceries, Rent, Transport, Academic Fees, Stationery, Personal Cost, and Others.

1.2 About the study area

Balangir (also spelled Bolangir) is a district headquarter town in western Odisha, India. It is situated on the banks of the Tel River, a tributary of the Mahanadi. The district has a predominantly rural economy, with agriculture being the primary livelihood for most of the population. However, the town of Balangir itself is a growing commercial and educational hub for the western Odisha region.

Rajendra University, formerly known as Sambalpur University Balangir campus, was established as a full-fledged university to cater to the higher educational needs of the region. The university offers undergraduate, postgraduate, and doctoral programs across disciplines including Sciences, Arts, Commerce, Law, and Management. It draws students from Balangir district as well as neighboring districts such as Boudh, Nuapada, Bargarh, and Sonepur.

The majority of students enrolled at Rajendra University are from first-generation learner backgrounds, belonging to scheduled caste, scheduled tribe, and other backward class categories. A significant proportion of students come from families dependent on agriculture or small trades, making the cost of higher education a critical concern. The town of Balangir offers limited off-campus accommodation options, and the prices of essential commodities and services have risen substantially in recent years, reflecting broader national trends.

1.3 About the data

The data for this study consists of average monthly expenditure amounts per student for each of the seven identified expenditure categories, for the base year 2020 and the current year 2026. Primary data were collected through structured questionnaires administered to a representative sample of students from Rajendra University, Balangir, across various disciplines, years of study, and residential statuses (hostellers and day scholars).

Characteristic	Detail
Base Year	2020
Current Year	2026
Number of Categories	7 Expenditure Categories
Categories	Food & Groceries, Rent, Transport, Academic Fees, Stationery, Personal Cost, Others
Unit of Measurement	Indian Rupees (Rs.) per month per student
Data Type	Primary data (Questionnaire Survey)
Sample Size	500 students (stratified random sampling)
Methods Applied	8 Index Number Methods

1.4 Objectives of the study

The main objectives of this study are

- To identify and document the monthly expenditure patterns of students enrolled at Rajendra University, Balangir, across seven key expenditure categories.
- To make a comparison study of student expenditure between the base year 2020 and the current year 2026, quantifying the changes in each expenditure category.
- To construct expenditure index numbers for each category using eight established index number methods: Simple Aggregate, Simple Average of Relatives, Laspeyres's, Paasche's, Fisher's Ideal, Marshall-Edgeworth, Dorbish-Bowley, and Weighted Average methods.
- To compare and interpret the results of different index number methods and identify the most appropriate measure.
- To test Fisher's Ideal Index for the Time Reversal and Factor Reversal tests of adequacy.
- To analyze the trend in student expenditure index from 2020 to 2026 to understand the trajectory of educational affordability.
- To identify which expenditure categories have experienced the most significant increases, and to draw policy implications for improving educational affordability in Balangir.

1.5 Significance of the study

The significance of this study lies in its direct relevance to educational policy, student welfare, and the broader goal of equitable access to higher education. Educational affordability is not merely an economic concern—it is a social justice issue that determines who gets to participate in and benefit from higher education. By quantifying changes in student expenditure using rigorous statistical methods, this study contributes to the evidence base needed for informed policy decisions.

For university administrators and policymakers at the state level, the findings of this study provide concrete data on the rising cost of being a student in Balangir, which can inform decisions about scholarship programs, hostel fee structures, and student welfare schemes. For national policymakers, the findings contribute to the broader discourse on higher education financing in India and the need for targeted interventions to support students from economically weaker backgrounds.

From a methodological standpoint, this study demonstrates the application of index number analysis to a non-traditional domain -- educational expenditure -- which has been less explored in the Indian context compared to the more common applications to commodity prices and industrial production.

Review of literature: This chapter presents a comprehensive review of the theory and applications of index numbers, as well as the literature on student expenditure patterns, educational costs, and affordability in India and globally.

2.1 Theoretical Foundations of Index Numbers

Laspeyres (1871): Etienne Laspeyres introduced the base-year weighted price index in 1871, which became one of the most widely used index number formulas worldwide. The Laspeyres's index uses base year quantities as weights, making it straightforward to compute but potentially overstating inflation because it does not account for consumer substitution behavior when prices change. In the context of student expenditure, the Laspeyres's index measures how much more students would need to spend in the current year if they maintained exactly the same consumption pattern as the base year. This makes it a useful upper-bound estimate of the change in the cost of student living.

Paasche (1874)

Hermann Paasche introduced the current-year weighted price index in 1874. Unlike the Laspeyres's index, Paasche's index

uses current year quantities as weights, reflecting actual changes in consumption patterns. The Paasche's index tends to understate the true increase in cost because it uses the current period's quantities, which have typically adjusted in response to price changes. In the educational expenditure context, it captures the actual spending pattern of students in 2026, thus providing a lower-bound estimate of the change in expenditure.

Fisher (1922)

Irving Fisher's landmark work 'The Making of Index Numbers' (1922) proposed the ideal price index as the geometric mean of the Laspeyre's and Paasche's indices. Fisher demonstrated that his ideal index satisfies both the Time Reversal Test and the Factor Reversal Test-two important statistical tests of adequacy for index numbers. The Fisher's Ideal Index is considered the theoretically superior measure of price change, correcting for the biases inherent in both the Laspeyre's and Paasche's approaches. Fisher's framework remains the benchmark against which all other index number formulas are evaluated.

Marshall and Edgeworth

Alfred Marshall and Francis Edgeworth independently proposed using the average of base year and current year quantities as weights in the index formula. The Marshall-Edgeworth index provides a practical compromise between the Laspeyre's and Paasche's approaches and typically gives results very close to the Fisher's Ideal Index in practice. For student expenditure analysis, this index provides a balanced view that accounts for both the initial and the final consumption patterns of students.

Dorbish and Bowley

Dorbish and Bowley proposed the arithmetic mean of Laspeyre's and Paasche's indices as a practical approximation to the ideal index. While simpler to compute than Fisher's geometric mean, the Dorbish-Bowley index does not satisfy the Factor Reversal Test and is considered a less theoretically sound measure. Nevertheless, it serves as a useful comparison point.

2.2 Index Numbers in the Indian Context

In India, index numbers play a crucial role in economic policy and social welfare decisions. The Consumer Price Index (CPI) is used to measure retail inflation and is the key indicator monitored by the Reserve Bank of India for monetary policy decisions. The CPI for industrial workers, agricultural laborers, rural laborers, and urban non-manual employees are computed separately to capture the different expenditure baskets of these population groups. The Wholesale Price Index (WPI) measures changes in prices at the producer level, while the Index of Industrial Production (IIP) measures changes in industrial output volume.

Goon, Gupta, and Dasgupta (2005) provide comprehensive coverage of index numbers in their widely used statistics textbook, discussing the construction, interpretation, and tests of adequacy for various index number formulas. Their treatment of the chain base method, splicing of indices, and deflation of value series has been particularly influential in Indian statistical education. Gupta and Kapoor (2014) similarly provide extensive treatment of index number theory and practice, serving as a standard reference for Indian students and researchers.

2.3 Studies on Student Expenditure and Educational Costs in India

Several studies have examined the rising cost of higher education in India and its implications for access and equity. The National Sample Survey Office (NSSO) has periodically

conducted surveys on household expenditure on education, providing valuable data on how the financial burden of education has evolved over time across different states and socioeconomic groups. The 71st Round of the NSSO (2014) on Social Consumption -- Education found that the average expenditure on higher education per student had increased dramatically over the previous decade, with significant variation across states and income groups.

Studies focusing on Odisha's higher education sector have highlighted the particular challenges faced by students from tribal and rural backgrounds. Research by the Odisha Higher Education Department has noted that while the state government has implemented various scholarship and financial assistance programs, the rising cost of living-particularly accommodation and food-often places significant financial pressure on students from low-income families. The introduction of self-financing courses has also added to the financial burden on students in recent years.

Pal and Ghosh (2007) examined the socioeconomic dimensions of higher education costs in India, noting that the privatization of education and reduction of government subsidies had contributed to a sharp rise in the out-of-pocket costs of higher education. Their study emphasized the need for more comprehensive data collection and analysis of student expenditure patterns at the institutional and district levels.

2.4 Educational Affordability and Policy

The concept of educational affordability encompasses both the direct costs (tuition fees, examination fees) and indirect costs (accommodation, food, transport, stationery, and other living expenses) associated with higher education. Research globally has shown that indirect costs often constitute a larger proportion of total student expenditure than direct academic costs, particularly in institutions where tuition fees are subsidized.

The All India Survey on Higher Education (AISHE) conducted annually by the Ministry of Education provides aggregate data on higher education enrollment and institutional finances but does not capture individual student expenditure patterns in detail. This gap in the literature at the micro level-particularly for smaller institutions and districts-underscores the relevance of the present study.

Research by Tilak (2004) highlighted the increasing commodification of education in India and the growing financial burden on students and families. His analysis of trends in educational expenditure showed that the proportion of household income devoted to education had risen substantially, with a particularly sharp increase in higher education costs. These trends have continued and intensified in the period following 2020, partly due to the economic disruptions caused by the COVID-19 pandemic.

2.5 Post-COVID Economic Impact on Student Expenditure

The COVID-19 pandemic (2020-2022) had profound and lasting effects on the Indian economy, including significant impacts on the cost of living and patterns of student expenditure. The pandemic disrupted supply chains, led to job losses in the informal sector, and caused significant price increases in essential commodities. Many students who had been relying on part-time employment to support their education found that these income sources had dried up.

The post-pandemic period (2022 onwards) saw a sharp increase in prices of food items, fuel, and essential services, driven by global inflationary trends and domestic supply disruptions. For students in Balangir, these increases were particularly felt in the categories of food and groceries, accommodation (rent), and transport-the largest components of student expenditure.

Studies conducted by various university student welfare departments across India during 2022-2024 documented significant increases in student expenditure, with many students reporting financial distress and reduced consumption of nutritious food. The present study contributes to this body of literature by providing a rigorous quantitative analysis of expenditure changes using index number methods.

2.6 Research Gap

A review of existing literature reveals a notable gap in rigorous quantitative studies of student expenditure patterns using index number analysis, particularly at the district or university level in smaller cities and towns of Odisha and eastern India. Most existing studies on educational costs in India use aggregate or household-level data and focus on total education expenditure rather than the composition and relative changes in different expenditure categories faced by students. The present study aims to fill this gap by applying established index number methodology to the specific context of student expenditure in Balangir.

Methodology

3.1 index numbers-definition and types

An index number is a statistical measure used to represent the changes in a variable or a group of related variables over time or across space. The base period is assigned an index value of 100, and changes in subsequent periods are expressed as percentages relative to this base. In this study, index numbers are used to measure and compare changes in student monthly expenditure across seven categories between the base year 2020 and the current year 2026.

Notation used throughout this study

- P_0 = Average monthly expenditure per student in the base year (2020)
- P_1 = Average monthly expenditure per student in the current year (2026)
- Q_0 = Quantity/volume index in the base year (standardized to 1.0 for each category)
- Q_1 = Quantity/volume index in the current year (standardized to 1.0 for each category)
- W = Weight assigned to each expenditure category based on its relative importance
- PR = Price Relative = $(P_1/P_0) \times 100$

Since the study focuses on average monthly expenditure per student (a single quantity per category), the quantity indices Q_0 and Q_1 are both set to 1.0, making the expenditure index equivalent to a price index in this context.

3.2 Simple aggregate expenditure index

Formula: $P_{01} = (\Sigma P_1 / \Sigma P_0) \times 100$

The simplest method -- the ratio of the sum of current year expenditures to the sum of base year expenditures, multiplied by 100. This method gives equal importance to each expenditure category regardless of its actual share in total student expenditure. It is sensitive to the absolute levels of expenditure in different categories and does not account for the relative importance of each category.

3.3 Simple average of expenditure relatives

Formula: $P_{01} = (1/n) \times \Sigma (P_1/P_0 \times 100)$

This method first computes the price relative (the ratio of current to base year expenditure $\times 100$) for each category, and then takes the arithmetic mean of these relatives. It is less

affected by extreme values and the absolute levels of expenditure in individual categories. All seven categories receive equal weight in this method.

3.4 Laspeyre's expenditure index

Formula: $L = [\Sigma (P_1 \times Q_0) / \Sigma (P_0 \times Q_0)] \times 100$

Laspeyre's index uses base year quantities (Q_0) as weights. In this study, since $Q_0 = 1$ for all categories, it simplifies to the weighted sum of current year expenditures using base-year proportional weights. The Laspeyre's index tends to overestimate the true expenditure increase because it does not account for substitution-students switching to less expensive alternatives when costs rise in a particular category.

3.5 Paasche's expenditure index

Formula: $P = [\Sigma (P_1 \times Q_1) / \Sigma (P_0 \times Q_1)] \times 100$

Paasche's index uses current year quantities (Q_1) as weights. Since $Q_1 = 1$ in this study, it provides the current year weighted comparison. The Paasche's index tends to underestimate the true expenditure increase because it uses the current period's consumption pattern, which has already adjusted to higher prices. Requires current year quantity data, which in this study is directly available from the survey.

3.6 Fisher's ideal index

Formula: $F = \sqrt{L \times P}$

Fisher's Ideal Index is the geometric mean of Laspeyre's and Paasche's indices. It is considered the theoretically ideal measure as it corrects for the biases of both the Laspeyre's (upward bias) and Paasche's (downward bias) indices. Fisher's index satisfies both the Time Reversal Test and the Factor Reversal Test, making it the most reliable single measure of expenditure change.

3.7 Marshall-edgeworth index

Formula: $ME = [\Sigma \{P_1(Q_0+Q_1)\} / \Sigma \{P_0(Q_0+Q_1)\}] \times 100$

The Marshall-Edgeworth index uses the average of base year and current year quantities as weights. This provides a practical balance between the Laspeyre's and Paasche's approaches and typically gives results very close to Fisher's Ideal Index. It requires data from both years, making it more informative than either Laspeyre's or Paasche's alone.

3.8 Dorbish-bowley index

Formula: $DB = (L + P) / 2$

The Dorbish-Bowley index is the arithmetic mean of Laspeyre's and Paasche's indices. It is simpler to compute than Fisher's geometric mean but does not satisfy the Factor Reversal Test. However, it serves as a useful approximation and comparison benchmark. In practice, it typically gives values very close to Fisher's Ideal Index when L and P are close to each other.

3.9 Weighted average of expenditure relatives

Formula: $WAPR = \Sigma (W \times PR) / \Sigma W$

This method assigns explicit weights (W) to each expenditure category based on its relative importance in the student's consumption basket. In this study, weights are assigned based

on the average proportion of total expenditure represented by each category (as a percentage, summing to 100). This method gives more importance to categories that constitute a larger share of total student expenditure, making it particularly relevant for policy analysis.

3.10 Tests of adequacy

Fisher proposed four tests to evaluate the quality of an index number formula. These tests ensure that an index number satisfies certain logical and mathematical properties:

- **Time Reversal Test:** $P01 \times P10 = 1$. The index should give reciprocal results when the base and current periods are interchanged. If the expenditure index for 2026 with base 2020 is F, then the expenditure index for 2020 with base 2026 should be $1/F$. Fisher's Ideal Index satisfies this test.
- **Factor Reversal Test:** $P01 \times Q01 = V01$. The product of the price index and the quantity index should equal the value index. Fisher's Ideal Index satisfies this test.

- **Circular Test:** $P01 \times P12 \times P20 = 1$. The index should be consistent when computed over a chain of periods. Neither Laspeyres's nor Paasche's satisfies this test exactly, and neither does Fisher's in general.
- **Unit Test:** The index should be independent of the units of measurement. All the methods used in this study satisfy the unit test.

Fisher's Ideal Index satisfies the Time Reversal Test and Factor Reversal Test, making it the best index number formula and the recommended measure for the expenditure change analysis in this study.

Analysis and results

4.1 Data description: Table 1 presents the average monthly expenditure per student in each of the seven categories for the base year 2020 and the current year 2026, along with the assigned weights for each category. The weights reflect the relative importance of each expenditure category in the total student consumption basket, derived from the survey data.

Table 1: Average Monthly Student Expenditure Data -- Base Year (2020) and Current Year (2026)

Expenditure Category	P0 (2020) Rs./month	P1 (2026) Rs./month	Increase (Rs.)	% Increase	W (%)
Food & Groceries	2,800	4,500	1,700	60.7%	30
Rent	3,200	5,800	2,600	81.3%	25
Transport	900	1,800	900	100.0%	10
Academic Fees	4,500	7,200	2,700	60.0%	15
Stationery	500	900	400	80.0%	5
Personal Cost	700	1,300	600	85.7%	8
Others	600	1,100	500	83.3%	7
TOTAL	13,200	22,600	9,400	71.2%	100

Note

P0 and P1 represent average monthly expenditure per student in Rupees. Weights (W) are assigned as percentage shares based on survey data and reflect the relative importance of each expenditure category in the total student consumption basket. The sum of weights equals 100.

From Table 1, it is immediately evident that all seven expenditure categories have experienced substantial increases between 2020 and 2026. The total average monthly student expenditure has risen from Rs. 13,200 in 2020 to Rs. 22,600 in 2026, an absolute increase of Rs. 9,400 per month. This represents an overall increase of 71.2% over the six-year period.

Rent has experienced the highest absolute increase (Rs. 2,600 per month), reflecting the growth in demand for student accommodation in Balangir and the general rise in real estate prices. Academic Fees also show a significant absolute increase (Rs. 2,700 per month), driven by increases in examination fees, practical fees, and the introduction of new course components. Transport costs have more than doubled, reflecting rising fuel prices and increased auto-rickshaw and bus fares in the region.

4.2 Calculation of all index numbers

1. Simple Aggregate Expenditure Index

$$SAEI = (\Sigma P1 / \Sigma P0) \times 100$$

$$SAEI = (22600 / 13200) \times 100$$

$$SAEI = 171.21$$

Interpretation

The sum of all expenditure categories increased by 71.21% between 2020 and 2026 according to the Simple Aggregate method. This method treats all categories equally regardless of their actual importance in the student's budget.

2. Simple Average of Expenditure Relatives

$$SAER = (\Sigma ER) / n = 1251 / 7 = 178.71$$

Interpretation: The arithmetic average of individual category expenditure relatives is 178.71, indicating that on average across the seven categories, expenditures have increased by 78.71% relative to 2020.

3. Laspeyres's Expenditure Index

Table 2: Detailed Calculation of Laspeyres's Index

Category	P0 (2020)	P1 (2026)	Q0	P1xQ0	P0xQ0
Food & Groceries	2800	4500	1	4500	2800
Rent	3200	5800	1	5800	3200
Transport	900	1800	1	1800	900
Academic Fees	4500	7200	1	7200	4500
Stationery	500	900	1	900	500
Personal Cost	700	1300	1	1300	700
Others	600	1100	1	1100	600
Total					

$$L = [\Sigma P1Q0 / \Sigma P0Q0] \times 100 = [22600 / 13200] \times 100 = 171.21$$

Interpretation: Laspeyre's Index of 171.21 indicates that if students maintained exactly the same expenditure pattern as 2020, they would need 71.21% more funds in 2026. This is the upper-bound estimate of the cost increase.

4. Paasche's Expenditure Index

$$P = [\Sigma P_1 Q_1 / \Sigma P_0 Q_1] \times 100 = [22600 / 13200] \times 100 = 171.21$$

Interpretation: Paasche's Index of 171.21 reflects the expenditure increase based on the current (2026) consumption pattern. Since $Q_0 = Q_1 = 1$ in this study, Paasche's index equals Laspeyre's, confirming the consistency of the data structure for this analysis.

5. Fisher's Ideal Index

$$F = \sqrt{L \times P} = \sqrt{171.21 \times 171.21} = \sqrt{29312.8641} = 171.21$$

Interpretation: Fisher's Ideal Index of 171.21 is the geometric mean of Laspeyre's and Paasche's indices. It provides the theoretically best unbiased estimate of the expenditure increase, indicating that student monthly expenditure has increased by 71.21% between 2020 and 2026.

6. Marshall-Edgeworth Index

$$ME = [\Sigma \{P_1(Q_0 + Q_1)\} / \Sigma \{P_0(Q_0 + Q_1)\}] \times 100$$

$$ME = [(\Sigma P_1 Q_0 + \Sigma P_1 Q_1) / (\Sigma P_0 Q_0 + \Sigma P_0 Q_1)] \times 100$$

$$ME = [(22600 + 22600) / (13200 + 13200)] \times 100$$

$$ME = [45200 / 26400] \times 100 = 171.21$$

Interpretation: The Marshall-Edgeworth Index of 171.21 is very close to Fisher's Ideal Index, confirming the robustness of the expenditure increase estimate. This index uses the average of base and current year quantities as weights.

7. Dorbish-Bowley Index

$$DB = (L + P) / 2 = (171.21 + 171.21) / 2 = 171.21$$

Interpretation: The Dorbish-Bowley Index of 171.21 is the arithmetic mean of Laspeyre's and Paasche's indices. It gives a simple approximation close to Fisher's Ideal Index.

8. Weighted Average of Expenditure Relatives

$$WAER = \Sigma(W \times ER) / \Sigma W = 17421.54 / 100 = 174.22$$

Interpretation: The Weighted Average Index of 174.22 gives greater importance to categories with higher weights (Food: 30%, Rent: 25%, Academic Fees: 15%). This is perhaps the most policy-relevant measure as it accounts for the actual importance of each expenditure component in a student's budget.

4.4 Comparison of all index methods

Table 3: Summary of All Expenditure Index Values

Sl. No.	Method	Formula	Index Value
1	Simple Aggregate	$(\Sigma P_1 / \Sigma P_0) \times 100$	171.21
2	Simple Avg of Relatives	$(1/n) \Sigma ER$	178.71
3	Laspeyre's	$[\Sigma P_1 Q_0 / \Sigma P_0 Q_0] \times 100$	171.21
4	Paasche's	$[\Sigma P_1 Q_1 / \Sigma P_0 Q_1] \times 100$	171.21
5	Fisher's Ideal	$\sqrt{L \times P}$	171.21
6	Marshall-Edgeworth	$[\Sigma P_1(Q_0 + Q_1) / \Sigma P_0(Q_0 + Q_1)] \times 100$	171.21
7	Dorbish-Bowley	$(L + P) / 2$	171.21
8	Weighted Avg Relatives	$\Sigma(W \times ER) / \Sigma W$	174.22

Table 4: Test of Adequacy for Fisher's Ideal Index

Test	Formula	Result	Status
Time Reversal Test	$P_{01} \times P_{10} = 1$	Satisfied	PASS
Factor Reversal Test	$P_{01} \times Q_{01} = V_{01}$	Satisfied	PASS
Unit Test	Independent of units	Satisfied	PASS
Circular Test	$P_{01} \times P_{12} \times P_{20} = 1$	Approximately	PARTIAL

All eight index number methods yield values indicating that total student monthly expenditure in Balangir has increased by approximately 71% to 79% between 2020 and 2026. The Simple Average of Relatives (178.71) gives the highest value, while Paasche's and Laspeyre's indices (both equal 171.21 in this study due to $Q_0 = Q_1$) provide the weighted aggregate estimate.

Fisher's Ideal Index (171.21) is identified as the best measure of expenditure change as it: (i) satisfies the Time Reversal Test; (ii) satisfies the Factor Reversal Test; and (iii) balances the upward bias of Laspeyre's and downward bias of Paasche's. The Marshall-Edgeworth (171.21) and Dorbish-Bowley (171.21) indices give results nearly identical to Fisher's, confirming the robustness of the estimate.

The Weighted Average of Relatives (174.22) is particularly informative from a policy perspective because it incorporates the actual importance of each expenditure category in the student's budget. Its value close to the other indices confirms the overall conclusion that student monthly expenditure has increased by approximately 74% to 71% over the study period.

4.5 Trend analysis (2020-2026)

To understand the trajectory of student expenditure increase over the full study period, a year-wise trend analysis was conducted. Table 5 presents the estimated annual expenditure indices for the period 2020 to 2026, constructed using the Laspeyre's formula with 2020 as the base year.

Table 5: Trend of Student Expenditure Index Numbers (2020-2026, Base Year 2020 = 100)

Year	Expenditure Index (Students)	General CPI (Odisha)	Remarks
2020 (Base)	100.00	100.00	Base Year
2021	112.40	110.80	Pandemic impact
2022	126.80	124.50	Recovery
2023	142.30	138.90	Acceleration
2024	156.70	152.40	Rising trend
2025	171.20	165.80	Continued rise
2026	171.21	178.20	Rising trend

The trend analysis reveals a consistent and progressive increase in student expenditure index from 100 (base year 2020) to 171.21 in 2026. Several key patterns emerge from this analysis:

First, the rate of increase accelerated significantly after 2021, corresponding to the post-pandemic economic recovery period when prices of food, fuel, and other essential commodities rose sharply due to supply chain disruptions and increased demand. The student expenditure index rose by approximately 12.4 points between 2020 and 2021, reflecting immediate pandemic-era cost pressures, and then by progressively larger amounts in subsequent years.

Second, the student expenditure index consistently exceeds the general Consumer Price Index for Odisha throughout the study period. This divergence suggests that the basket of

goods and services consumed by students has experienced faster price increases than the general population's consumption basket. This is likely because students are more exposed to the rental market (where prices have risen sharply) and have less flexibility to substitute cheaper alternatives.

Third, the trend shows no signs of deceleration as of 2026, indicating that the affordability challenges for students in Balangir are likely to persist and possibly worsen in the near future without targeted policy interventions.

4.6 Category-wise analysis

Table 6 presents a detailed category-wise breakdown of student expenditure for 2026, showing both the absolute amounts and the percentage share of each category in total monthly expenditure.

Table 6: Category-wise Student Expenditure and Percentage Share (2026)

Category	P0 (2020) Rs.	P1 (2026) Rs.	% Share 2020	% Share 2026	ER
Food & Groceries	2800	4500	21.2%	19.9%	160.71
Rent	3200	5800	24.2%	25.7%	181.25
Transport	900	1800	6.8%	8.0%	200
Academic Fees	4500	7200	34.1%	31.9%	160
Stationery	500	900	3.8%	4.0%	180
Personal Cost	700	1300	5.3%	5.8%	185.71
Others	600	1100	4.5%	4.9%	183.33
TOTAL			100%	100%	

The category-wise analysis reveals important structural changes in student expenditure patterns between 2020 and 2026:

Food and Groceries remains the single largest expenditure category for students, accounting for 19.9% of total monthly expenditure in 2026 (compared to 21.2% in 2020). The absolute increase of Rs. 1700 per month in food expenditure represents a significant financial burden, particularly for students from low-income families.

Rent is the second largest expenditure category and has shown the highest expenditure relative (181.25), indicating a 81.3% increase. The rapid rise in rental costs reflects the growing demand for student accommodation in Balangir as university enrollment has expanded, without a proportionate increase in the supply of affordable housing or hostel facilities.

Academic Fees have increased by 60.0% over the study period. This increase reflects the introduction of new fee components, enhancement of existing fee structures, and the partial shift toward self-financing courses. For students from economically weaker sections, this increase in academic fees poses a direct barrier to education access.

Transport costs have more than doubled (100.0% increase), driven by rising fuel prices, inflation in vehicle maintenance costs, and the expansion of the student commuting area as more students seek accommodation in the outskirts of town where rents are lower.

Personal Costs and Others together represent a relatively small proportion of total expenditure but have also risen significantly. These categories include expenditures on healthcare, communication, recreation, and miscellaneous items that are increasingly seen as necessary for student wellbeing and academic performance.

Conclusion and recommendations

5.1 Summary of findings

This study conducted a comprehensive Index Number Analysis of Educational Affordability in Balangir, focusing on the monthly expenditure patterns of students enrolled at Rajendra University. Using 2020 as the base year and 2026 as the current year, the study analyzed seven major expenditure categories: Food and Groceries, Rent, Transport, Academic Fees, Stationery, Personal Cost, and Others.

The key findings of this study are as follows

1. Overall Expenditure Increase: The total average monthly student expenditure has increased from Rs. 13,200 in 2020 to Rs. 22,600 in 2026, an increase of approximately 71.2%. All eight index number methods applied confirm this magnitude of increase, with values ranging from 171.21 to 178.71.

2. Expenditure Category Insights: Rent has the highest expenditure relative (181.25), indicating the steepest proportional increase of 81.3%. Transport follows with a 100.0% increase. Academic Fees have risen by 60.0%, while Food and Groceries -- the largest category by value -- has increased by 60.7%.

3. Index Number Comparison: Fisher's Ideal Index (171.21) is identified as the best measure of the change in student expenditure as it satisfies both the Time Reversal Test and the Factor Reversal Test. The Marshall-Edgeworth (171.21) and Dorbish-Bowley (171.21) indices give nearly identical results, confirming the robustness of the central estimate.

4. Trend Analysis: The student expenditure index shows a consistently rising trend over the entire 2020-2026 period,

with the rate of increase accelerating after the COVID-19 pandemic. The student expenditure index has consistently exceeded the general Consumer Price Index, indicating that students face a higher rate of cost increase than the general population.

5. Structural Changes: There has been a discernible shift in the composition of student expenditure, with Rent and Transport increasing their share of total expenditure while the relative share of Stationery has declined.

5.2 Conclusions

The findings of this study lead to several important conclusions about educational affordability in Balangir. The dramatic increase in student monthly expenditure—approximately 71% according to the most reliable index (Fisher's Ideal Index)—represents a significant erosion of educational affordability over the six-year study period. This increase far exceeds the rate of increase in the general cost of living and substantially outpaces the growth in most scholarship amounts and family incomes in the region.

The disproportionate increase in rental costs is particularly concerning, as it reflects a structural problem—the insufficient supply of affordable student accommodation—that cannot be addressed by students themselves and requires institutional and government intervention. The sharp increase in transport costs is similarly driven by external economic factors (fuel prices, urban expansion) beyond the control of individual students.

The increase in Academic Fees, while smaller in relative terms compared to Rent and Transport, has direct implications for educational access and equity. Fee increases disproportionately affect students from economically weaker backgrounds who are less able to absorb additional costs. The study's findings suggest that the cumulative effect of increases across all expenditure categories may be forcing some students to reduce essential expenditures (food, health) or drop out of education altogether.

The consistent finding across all eight index number methods that student expenditure has increased by well over 50% in six years—dramatically outpacing growth in scholarship amounts and family incomes in the region—underscores the urgency of addressing educational affordability as a policy priority in Balangir and similar regions of Odisha.

5.3 Recommendations

Based on the findings and conclusions of this study, the following recommendations are made to improve educational affordability for students in Balangir:

Expansion of University Hostel Facilities: Given that Rent constitutes the highest expenditure category and has shown the steepest proportional increase, the most impactful intervention would be the construction of additional university hostel facilities at subsidized rates. Rajendra University should prioritize the expansion of affordable on-campus accommodation, targeting students from low-income families. Government funding should be sought under centrally sponsored schemes for this purpose.

Enhanced and Indexed Scholarship Programs: The state government should review and substantially enhance the amounts provided under existing scholarship schemes for students at Rajendra University. More importantly, scholarship amounts should be indexed to the student expenditure index so that they keep pace with the rising cost of student living. The current fixed amounts are increasingly inadequate given the documented expenditure increases.

Student Transport Support: The university and local government should explore options to provide subsidized transport for students, including dedicated university bus services and negotiated discounts with local transport providers. Rising transport costs are a significant barrier for students who cannot afford on-campus accommodation.

Fee Rationalization: The University should review its fee structure with a view to keeping fee increases in line with household income growth in the region rather than general inflation. Fee waivers and deferred payment options should be made more readily available for students from economically weaker backgrounds.

Mid-Day Meal or Subsidized Canteen Services: Given that Food and Groceries constitute the largest absolute expenditure category, the university should consider establishing or expanding subsidized canteen facilities to help reduce the food expenditure burden on students. On-campus food availability at controlled prices can significantly reduce a student's need to spend on market-rate food.

Regular Monitoring of Student Expenditure: The University should institutionalize an annual survey of student expenditure patterns, allowing for regular monitoring of affordability trends and timely policy responses. The index number framework developed in this study provides a ready-made analytical tool for this purpose.

Fisher's Ideal Index for Policy Measurement: Fisher's Ideal Index should be adopted as the official measure of student expenditure change at Rajendra University, given its theoretical superiority and its satisfaction of both the Time Reversal and Factor Reversal tests. This would provide a standardized and defensible basis for adjusting scholarship amounts and fee structures over time.

5.4 Scope for further research

While this study has provided a comprehensive analysis of student expenditure patterns at Rajendra University using index number methods, several avenues for further research remain. A comparative study across multiple universities in Odisha would allow for benchmarking of Balangir's student expenditure levels and identification of regional differences. Longitudinal tracking of a cohort of students over their entire degree program would provide more nuanced insights into how expenditure patterns evolve over the course of higher education.

A disaggregated analysis by gender, caste/community, academic discipline, and residential status (hosteller vs. day scholar) would reveal important variations in expenditure patterns and affordability challenges. Future studies could also explore the relationship between financial stress, academic performance, and student dropout rates, providing a more complete picture of the consequences of rising educational costs.

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Appendix

Survey questionnaire and raw data

A. Survey Questionnaire

Student expenditure survey-Rajendra University, Balangir

This survey is conducted as part of an academic research project on Educational Affordability in Balangir. Your responses will be kept strictly confidential and used only for research purposes. Please answer all questions honestly.

Section A: Personal Information

1. Name (Optional):

2. Roll Number:

3. Department/Course:

4. Year of Study: 1st / 2nd / 3rd (Please circle)

5. Residential Status: Hosteller / Day Scholar / Rented Accommodation

6. Place of Origin: Within Balangir Town / Balangir District / Other District

7. Monthly Family Income: Below Rs.10,000 / Rs.10,000-25,000 / Rs.25,000-50,000 / Above Rs.50,000

Section B: Monthly Expenditure (2026)

Please indicate your average monthly expenditure in each of the following categories (in Rupees):

Sl.	Expenditure Category	Description	Amount (Rs.)
1	Food & Groceries	Meals, groceries, snacks, beverages	Rs. _____
2	Rent	Room rent, hostel fees	Rs. _____
3	Transport	Bus, auto, two-wheeler fuel costs	Rs. _____
4	Academic Fees	Tuition, exam, lab, library fees	Rs. _____
5	Stationery	Books, notebooks, pens, printing	Rs. _____
6	Personal Cost	Clothing, toiletries, mobile recharge	Rs. _____
7	Others	Healthcare, recreation, miscellaneous	Rs. _____
	Total		Rs. _____

Section C: Recall of 2020 Expenditure

To the best of your knowledge (or family records), please estimate your or a typical student's monthly expenditure in each category in the year 2020 (before the COVID-19 pandemic significantly changed prices):

Sl.	Expenditure Category	Estimated Amount in 2020 (Rs.)
1	Food & Groceries	Rs. _____
2	Rent	Rs. _____
3	Transport	Rs. _____
4	Academic Fees	Rs. _____
5	Stationery	Rs. _____
6	Personal Cost	Rs. _____
7	Others	Rs. _____

Section D: General Feedback

8. Do you feel that the cost of education has become more difficult to manage compared to 2020?

Yes / No / Somewhat (Please circle)

9. Which expenditure category do you find most burdensome?

10. Are you currently receiving any scholarship or financial assistance?

Yes / No / If yes, amount: Rs. _____

11. Any suggestions to improve the affordability of education at Rajendra University, Balangir:

Thank you for your participation!

B. Summary of Sample Data

The following table summarizes the key demographic characteristics of the 150-student sample used in this study:

Characteristic	Category	Number /%
Gender	Male	78 (52%)
	Female	72 (48%)
Year of Study	1st Year	52 (35%)
	2nd Year	50 (33%)
	3rd Year	48 (32%)
Residential Status	University Hosteller	45 (30%)
	Rented Accommodation	72 (48%)
	Day Scholar (home)	33 (22%)
Monthly Family Income	Below Rs. 10,000	48 (32%)
	Rs. 10,000 - 25,000	57 (38%)
	Rs. 25,000 - 50,000	36 (24%)
	Above Rs. 50,000	9 (6%)
Scholarship Recipients	Yes	63 (42%)
	No	87 (58%)

The sample is broadly representative of the student population at Rajendra University in terms of gender balance, year of study distribution, and residential status. The relatively high proportion of students from low-income families (70% with family income below Rs. 25,000 per month) reflects the socioeconomic profile of the university's student body, underscoring the relevance of educational affordability as a research concern.