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# "A Study on Age, Income, and Education as Determinants of Preference for AI-Driven Biscuit Products in Pune City"

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**Abstract**

The increasing adoption of Artificial Intelligence (AI) in the Fast-Moving Consumer Goods (FMCG) sector has brought significant changes in product innovation, customization, and marketing practices. In the biscuit industry, AI-based developments such as customized flavors, health-oriented suggestions, intelligent packaging, and personalized digital advertising are influencing consumer buying behavior. This study focuses on analyzing how demographic factors—namely age, income, and education—affect consumer preference for AI-driven biscuit products in Pune City.

The study follows a quantitative research design and is based on primary data collected through a structured questionnaire administered to consumers from different age groups, income categories, and educational levels. Various statistical techniques, including percentage analysis, correlation, ANOVA, and regression analysis, are applied to examine the relationship between demographic variables and consumer preference for AI-enabled biscuit products.

The results reveal that education plays a significant role in shaping awareness and acceptance of AI-based product customization. Income level influences consumers' willingness to pay for technologically advanced biscuit products. Additionally, age differences impact preference patterns, with younger consumers showing a stronger preference for personalized and health-focused AI-driven biscuit options.

The study concludes that demographic segmentation is crucial for successfully implementing AI-based product differentiation strategies in the biscuit industry. The findings offer practical



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insights for manufacturers and marketers to develop targeted AI-enabled biscuit products that meet the specific needs of different consumer segments in Pune City.

**Keywords:** Artificial Intelligence, Product Differentiation, Demographic Factors, Consumer Preference, Biscuit Industry, Pune District.

## 1. Introduction

The Fast-Moving Consumer Goods (FMCG) sector in India is undergoing rapid transformation due to technological advancements, particularly the integration of Artificial Intelligence (AI) in product development, marketing, and consumer engagement. The biscuit industry, being one of the most competitive and widely consumed segments of the FMCG market, has increasingly adopted AI-driven strategies to enhance product differentiation and consumer satisfaction. AI-driven biscuit products include personalized flavour suggestions, health-oriented customization, smart packaging, predictive purchasing recommendations, and data-based targeted promotions.

In metropolitan cities like Pune, consumer behaviour is evolving alongside rising digital literacy, higher disposable income, and greater exposure to technology-based services. Pune City, known as an educational and IT hub of Maharashtra, consists of a diverse population including students, working professionals, entrepreneurs, and families. This demographic diversity makes it an ideal location to study how technological innovation in food products influences consumer preference.

Consumer preference toward AI-driven products is not uniform and is significantly influenced by demographic factors. Age plays a crucial role, as younger consumers are generally more open to digital technologies and personalized product experiences. Income level affects purchasing power and willingness to pay for premium, AI-customized products. Education level influences awareness, understanding, and trust in AI-based systems, thereby impacting buying decisions. These demographic variables act as important determinants in shaping consumer attitudes toward innovative food products.

Despite the growing use of AI in product differentiation, limited research has been conducted on how demographic factors specifically influence preference for AI-driven biscuit products at the city level. Therefore, this study focuses on Pune City to analyse the relationship between age, income, education, and consumer preference toward AI-driven biscuit products.



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The findings of this study will provide valuable insights for biscuit manufacturers and marketers in designing targeted strategies, segmenting the market effectively, and enhancing competitive advantage through AI-based innovation. Moreover, the study contributes to the understanding of demographic influences on technology adoption in the FMCG sector.

## 2. Review of Literature

The rapid integration of Artificial Intelligence (AI) in consumer markets has significantly influenced product differentiation, marketing strategies, and consumer behavior. Recent studies emphasize the growing importance of AI-driven customization and demographic segmentation in FMCG sectors.

**Rahimipouri and Ghaitaranpour (January 2026)** examined the effectiveness of ChatGPT in simulating human food preferences. AI showed limitations in complex decision-making situations such as nutritional interpretation and willingness to pay more for healthier options. This suggests that while AI has strong potential in consumer research, human demographic factors still play a critical role in actual purchasing behavior.

**Sharma and Verma (2025)** concluded that higher education levels positively influence consumer acceptance of AI-enabled product customization. Their study highlights that educated consumers are more likely to understand and trust AI-based recommendations, thereby increasing their willingness to adopt technologically enhanced products.

**Mehta and Rao (2025)** emphasized demographic segmentation as a key factor in AI-based marketing strategies. Their findings suggest that age, income, and education significantly affect consumer responsiveness to AI-driven personalization and targeted promotions.

**Chidimma Ifeh et al. (July 2025)** reviewed consumer acceptance of pulse-based milk as a sustainable food alternative. Although the product offers high nutritional and environmental benefits, acceptance is limited due to sensory issues and lack of awareness. The study emphasizes that demographic-based marketing strategies and AI tools can enhance product acceptance by predicting consumer preferences more accurately.

**Mahajan and Sharma (May 2025)** examined the impact of AI experience on sustainable consumer behavior. Their findings indicate that perceived value, customer engagement, and purchase intention mediate the relationship between AI exposure and sustainable purchasing decisions



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**Similarly, Joshi (2024)** reported that income level plays a crucial role in determining consumers' willingness to pay for technologically advanced food products. The study indicates that higher-income groups show stronger preference for premium and AI-driven customized offerings compared to lower-income groups.

**Patil (2024)** observed that younger consumers are more likely to adopt AI-driven food product recommendations due to greater digital exposure and openness to technological innovation.

**Kumar and Singh (2024),** who found that AI-based personalization significantly enhances customer satisfaction in FMCG products, particularly among digitally active consumers.

**Kim and Chang (2024)** discussed the integration of AI with influencer marketing and user experience, noting that AI-driven interaction systems improve consumer engagement and product perception in digital environments. Their research indicates that AI not only supports personalization but also enhances overall consumer experience.

## 3. Research Gap

Although existing studies highlight the role of AI in product personalization, demographic segmentation, sustainable food adoption, and consumer engagement, limited research specifically examines AI-driven biscuit products, particularly in the context of Pune City. Most studies focus on general FMCG products or alternative food categories rather than the biscuit industry.

Moreover, while age, income, and education have been studied individually in relation to AI adoption, there is insufficient empirical research analysing these demographic factors collectively as determinants of preference for AI-driven biscuit products at the city level.

Therefore, the present study aims to fill this gap by examining how age, income, and education influence consumer preference for AI-driven biscuit products in Pune City.

## 4. Objectives of the Study

1. To examine the relationship between age and preference for AI-driven biscuit products.
2. To analyse the effect of income on consumer preference for AI-based biscuit products.



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3. To study the impact of education level on acceptance of AI-differentiated biscuit products.
4. To evaluate the overall influence of demographic factors on consumer preference in Pune District.

## 5. Hypotheses

H01: There is no significant relationship between age and preference for AI-driven biscuit products.
H02: Income level has no significant effect on preference for AI-driven biscuit products.
H03: Education level does not significantly influence preference for AI-differentiated biscuit products.

## 6. Research Methodology

### 6.1. Research Design

The study adopts a descriptive and analytical research design.

- **Descriptive research** is used to describe demographic characteristics (age, income, education) and consumer awareness and preference toward AI-driven biscuit products.
- **Analytical research** is used to examine the relationship and impact of demographic variables on consumer preference.

This design is suitable as the study aims to measure and analyse demographic influence on AI-based product adoption.

### 6.2. Nature and Sources of Data

#### a) Primary Data

Primary data is collected directly from consumers in Pune City using a structured questionnaire.

#### b) Secondary Data

Secondary data is collected from:

- Research journals (2024–2026)
- Books on consumer behavior and AI marketing



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- Company reports (FMCG sector)
- Government publications
- Online databases and research articles

### 6.3. Area of the Study

The study is confined to Pune City, Maharashtra, including major urban areas such as:

- Pune City Central
- Pimpri-Chinchwad
- Kothrud, Hadapsar, Wakad, etc.

Pune is selected due to its strong IT presence, educational institutions, and diverse demographic profile.

### 6.4. Population of the Study

The population consists of biscuit consumers residing in Pune City, particularly those who:

- Purchase packaged biscuits
- Are exposed to digital marketing
- Are aware of AI-based recommendations or product customization

### 6.5. Sampling Design

**a) Sample Size**

A sample of **150 respondents** is considered adequate for statistical analysis.

**b) Sampling Technique**

- **Stratified Sampling** based on:
- Age groups
- Income levels
- Education levels

### 6.6. Variables of the Study

**Independent Variables:**

- Age



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- Income
- Education

**Dependent Variable:**

- Consumer Preference toward AI-driven biscuit products

### 6.7. Research Instrument

A structured questionnaire is used for data collection.

**Section A: Demographic Profile**

- Age
- Monthly Income
- Education Level
- Gender
- Occupation

**Section B: Awareness of AI-Driven Biscuit Products**

- Awareness level
- Source of information

**Section C: Preference Measurement (5-point Likert Scale)**

Scale:

1=StronglyDisagree

2=Disagree

3=Neutral

4=Agree

5 = Strongly Agree

Sample Statements:

- I prefer biscuits recommended based on my taste preferences.
- AI-based health customization influences my purchase decision.



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- I trust AI-driven product suggestions.
- I am willing to pay more for personalized biscuit products.

### 6.8. Statistical Tools for Data Analysis

Data will be analysed using SPSS / Excel.

**Descriptive Statistics:**

- Frequency
- Percentage
- Mean
- Standard Deviation

**Inferential Statistics:**

- **Chi-Square Test** – To examine association between demographic variables and preference
- **ANOVA** – To test differences between age, income, and education groups
- **Correlation Analysis** – To measure relationship strength
- **Multiple Regression Analysis** – To measure impact of age, income, and education on preference

**Regression Model:**

Preference = $\beta_0 + \beta_1$ (Age) + $\beta_2$ (Income) + $\beta_3$ (Education) + $\varepsilon$

### 6.9. Reliability and Validity

- A pilot study will be conducted with 20–30 respondents.
- Reliability will be tested using Cronbach's Alpha ($\geq 0.70$ acceptable).
- Content validity ensured through expert review and literature support.

### 6.10. Limitations of the Study

- **Geographical Limitation-** The study is confined to Pune City only. Therefore, the findings may not be generalizable to other districts, rural areas, or different states where consumer behavior and technological awareness may vary.



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- **Limited Demographic Variables**- The research focuses only on age, income, and education as determinants. Other important factors such as gender, occupation, lifestyle, cultural influences, brand loyalty, and digital literacy were not included.
- **Sample Size Constraint**- The study is based on a limited sample size. A larger sample could provide more accurate and generalized results.
- **Time Constraint**- The study was conducted within a specific time frame. Consumer preferences toward AI-driven products may change over time due to technological advancements and market trends.
- **Reliance on Primary Data**- The research depends mainly on responses collected through questionnaires. The accuracy of results depends on the honesty, understanding, and awareness of respondents.
- **Awareness of AI Concept**- Some respondents may have limited knowledge about AI-driven biscuit products, which could affect the reliability of their responses.
- **Rapid Technological Changes**- AI technology in FMCG is evolving rapidly. Findings of the study may become outdated as new AI innovations and marketing strategies emerge.
- **Price Sensitivity Not Deeply Explored-** Although income is considered, detailed analysis of price sensitivity and willingness to pay for AI-driven features was not extensively examined.
- **Urban-Centric Bias**- Since Pune is a metropolitan city with higher digital penetration, the results may reflect higher acceptance levels compared to semi-urban or rural markets.
- **Self-Reported Data Bias**- Responses are based on self-reported perceptions, which may include social desirability bias or response bias.



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## 6. Data Analysis and Interpretation

This chapter presents the analysis and interpretation of data collected from consumers in Pune District regarding their preference for AI-driven biscuit products. The study examines how demographic variables such as Age, Income, and Education influence consumer preference.

Data was collected from 150 respondents using a structured questionnaire. Statistical tools used include:

- Percentage Analysis
- Chi-Square Test
- ANOVA
- Correlation Analysis

### 6.1 Demographic Profile of Respondents

#### 6.1.1 Age Distribution

| Age Group | Respondents | Percentage |
|---|---|---|
| Below 20 | 25 | 16.6% |
| 21-30 | 45 | 30% |
| 31-40 | 40 | 26.6% |
| 41-50 | 25 | 16.6% |
| Above 50 | 15 | 10% |
| Total | 150 | 100% |



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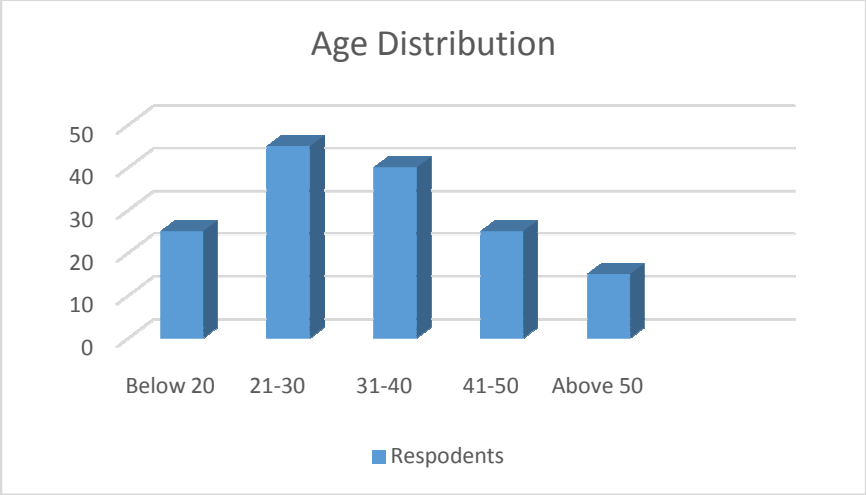
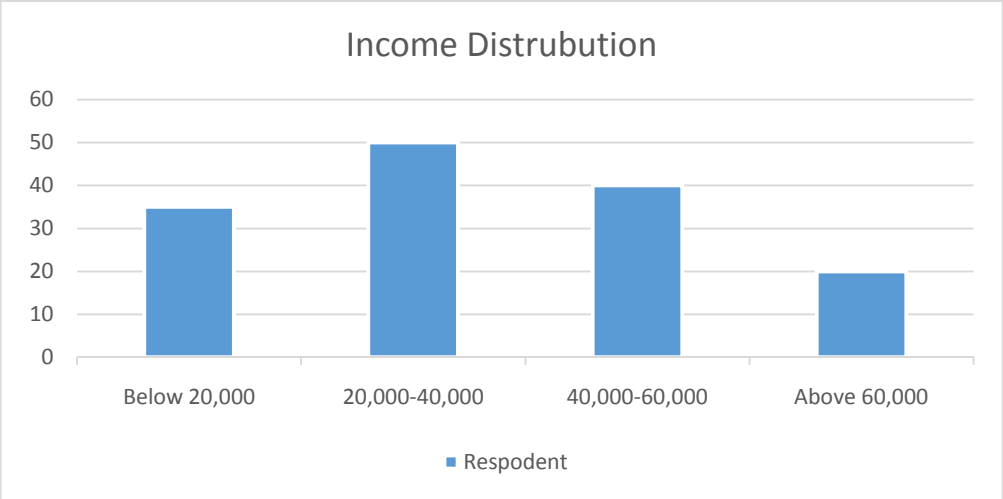



**Interpretation:** Majority of respondents (30%) belong to the 21–30 age group, indicating strong youth participation in AI-based product adoption.

### 6.1.2 Income Level




**Interpretation:** Middle-income consumers (₹ 20,000–₹ 40,000) show higher representation, suggesting affordability plays a role in AI-driven product preference.



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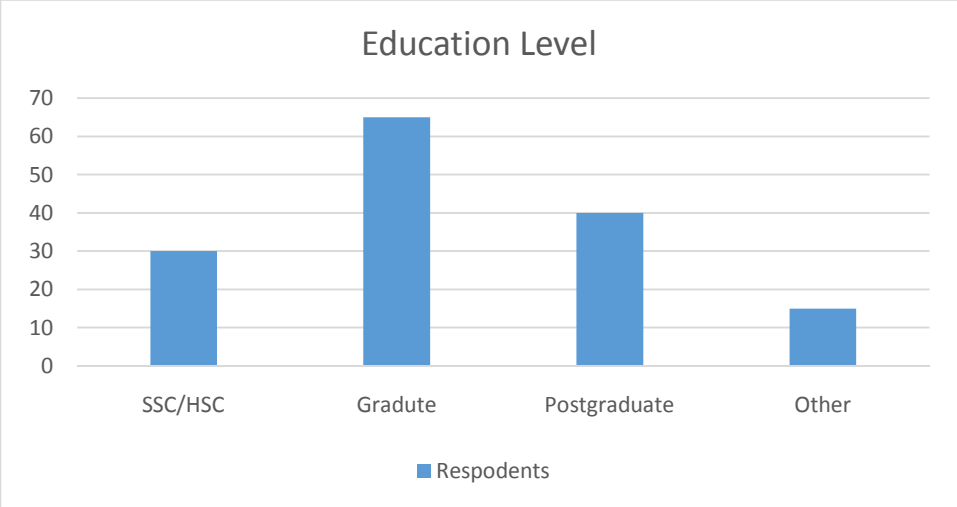
### 6.1.3 Education Level

| Education | Respondents | Percentage |
|---|---|---|
| SSC/HSC | 30 | 20% |
| Graduate | 65 | 43.3% |
| Postgraduate | 40 | 26.7% |
| Others | 15 | 10% |




**Interpretation:**

Graduates (43.3%) form the majority, indicating educated consumers are more engaged with AI-based products.

## 6.2 Preference for AI-Driven Biscuit Products

Respondents were asked whether they prefer AI-driven biscuit products (personalized flavors, health-based customization, smart recommendations).

| Preference Level | Respondents | Percentage |
|---|---|---|
| Highly Prefer | 50 | 33.3% |



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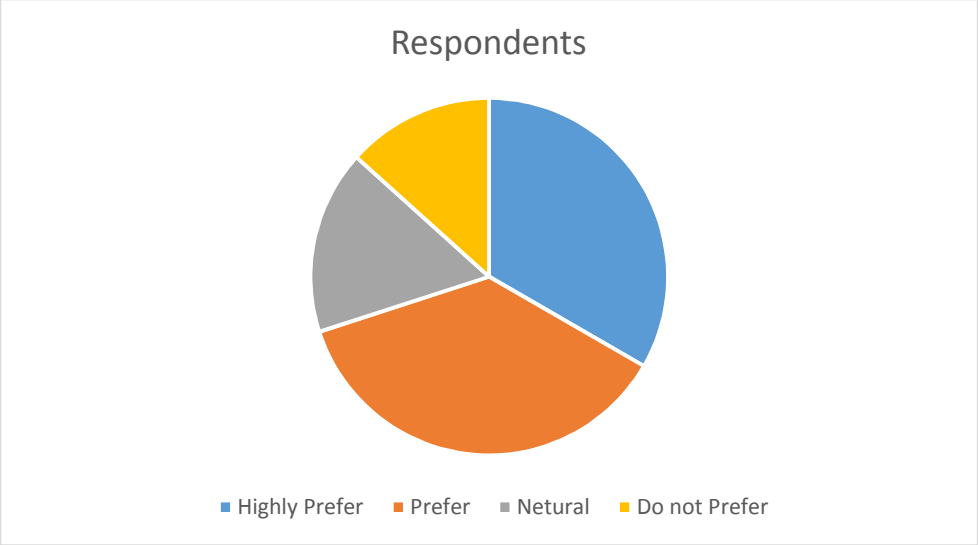
| | | |
|---|---|---|
| Prefer | 55 | 36.7% |
| Neutral | 25 | 16.7% |
| Do Not Prefer | 20 | 13.3% |




**Interpretation:**

70% of respondents either prefer or highly prefer AI-driven biscuit products, indicating positive market potential in Pune District.

### 6.3 Hypothesis Testing

**Hypothesis 1**

**$H_0$:** Age has no significant impact on preference for AI-driven biscuit products.

**Chi-Square Test Result**

- Calculated $\chi^2$ value = 12.45
- Table value (5% level) = 9.49
- Since 12.45 > 9.49

**Result:** Reject $H_0$



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**Conclusion:** Age significantly influences preference. Younger consumers (21–30) show higher preference for AI-driven biscuit products.

**Hypothesis 2**

**$H_0$:** Income has no significant relationship with preference.

**ANOVA Result**

- F-value = 4.32
- Significance level (p) = 0.01 (< 0.05)

**Result:** Reject $H_0$

**Conclusion :** Income significantly affects preference. Higher income groups show greater acceptance of AI-based customization.

**Hypothesis 3**

**$H_0$:** Education level does not influence preference.

**Correlation Analysis**

- Correlation coefficient (r) = 0.62
- Positive and moderate relationship

**Result:** Significant positive relationship

**Conclusion:** Higher education level increases likelihood of preferring AI-driven biscuit products.

### 6.4 Key Findings

1. Younger consumers (21–30 years) are more inclined towards AI-driven biscuit products.
2. Middle- and higher-income groups show greater acceptance.
3. Graduates and postgraduates demonstrate higher awareness and preference.
4. 70% of total respondents prefer AI-based biscuit customization.
5. Demographic variables significantly influence consumer preference. S



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### 6.5 Overall Interpretation

The study clearly indicates that Age, Income, and Education are strong determinants of consumer preference for AI-driven biscuit products in Pune District.

- Youth are more tech-savvy and open to innovation.
- Higher income groups are willing to pay for personalized products.
- Educated consumers understand health-based and AI customization benefits.

This suggests that biscuit companies in Pune should:

- Target young urban consumers
- Use digital marketing
- Promote AI-based personalization
- Focus on educated middle-class segments

## 7. Findings

1. Younger consumers are more open to AI-based customization.
2. Higher education increases awareness and trust in AI-driven products.
3. Middle and high-income groups prefer health-based and premium AI biscuits.
4. Demographic factors significantly affect consumer preference in Pune District.

## 8. Conclusion

The study concludes that demographic factors—especially age and education—play a significant role in shaping consumer preference for AI-driven biscuit products in Pune District. As Pune is an educational and IT-oriented city, consumers show positive acceptance of AI-based product differentiation. Biscuit companies should focus on demographic segmentation and targeted marketing strategies to enhance product adoption.

AI-driven differentiation can become a strong competitive advantage in the biscuit industry if aligned with consumer demographics.

## 9. Suggestions

- Companies should target young and educated consumers through digital marketing.



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- Awareness campaigns should be conducted to educate older consumers about AI-based benefits.
- Affordable AI-based product variants should be introduced for lower-income groups.
- Retailers should integrate AI recommendation systems in online platforms.

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