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A STUDY ON EVALUATING THE EFFECTIVENESS OF UPI-ENABLED FAIR PRICE SHOPS IN PROMOTING DIGITAL FINANCIAL INCLUSION IN TAMIL NADU

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ABSTRACT

India's rapid digital transformation, driven by National Payments Corporation of India's introduction of Unified Payments Interface, has significantly reshaped the financial landscape. In Tamil Nadu, the Public Distribution System operates through Fair Price Shops (FPS), serving economically weaker sections.

This study evaluates the effectiveness of UPI-enabled FPS in promoting digital financial inclusion. Using a descriptive design and stratified random sampling, data were collected from 120 respondents via a structured questionnaire. Analysis (percentage, Chi-square, and T-test using IBM SPSS) examined awareness, usage, vendor efficiency, infrastructure, and transparency.

Findings show 79.1% awareness and 75.8% satisfaction with UPI services. However, challenges include poor network connectivity (38.3%), low digital literacy (35%), and inadequate infrastructure.

The study concludes that UPI-enabled FPS enhance transparency and inclusion but require improved training, infrastructure, and awareness for greater impact.

Keywords: UPI, Fair Price Shops, Digital Financial Inclusion, Public Distribution System, Digital Literacy, Cashless Transactions.

1. INTRODUCTION

India's Digital India initiative and the launch of UPI in April 2016 by NPCI created a real-time, interoperable payment platform enabling instant fund transfers via mobile devices. UPI's zero-cost, multilingual interface democratized digital payments for rural communities, semi-literate users, and low-income households. Tamil Nadu operates one of India's most well-organized PDS, with over 34,000 Fair Price Shops serving millions of households.

This study is grounded in Financial Inclusion Theory, the Technology Acceptance Model (TAM), and Digital Divide literature. TAM explains adoption based on perceived usefulness and ease of use, while the digital divide framework highlights disparities between urban and rural populations—particularly relevant for FPS beneficiaries.

2. STATEMENT OF THE PROBLEM

Despite UPI integration at FPS, barriers persist for rural and semi-urban beneficiaries: inadequate digital literacy, limited smartphone access, unreliable internet connectivity, and insufficient awareness. Vendors also face challenges including network disruptions,

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transaction failures, and lack of technical training. Critical empirical gaps remain regarding whether UPI has genuinely reduced irregularities, improved digital literacy, and facilitated broader financial participation.

3. OBJECTIVES

- To assess beneficiaries' awareness and usage of UPI in Fair Price Shops.
- To evaluate vendor efficiency and implementation challenges.

4. RESEARCH HYPOTHESES

- H_0: There is no significant level of awareness and usage of UPI-based transactions among FPS beneficiaries in Tamil Nadu.
- H_0: There is no significant relationship between UPI implementation and the operational efficiency of Fair Price Shop vendors.
- H_0: UPI integration has not significantly impacted ration delivery transparency, digital literacy, and financial inclusion in Tamil Nadu.

5. REVIEW OF LITERATURE

A substantial body of literature underpins the study's theoretical and empirical framework. Kavitha et al. (2022) examined Tamil Nadu's PDS and found that reforms including smart family cards, computerization, and the One Nation One Ration Card (ONORC) system significantly improved transparency and efficiency, making it a model for other states. Girija and Prasheedha (2020) studied E-POS machines at ration shops and established that digital systems help prevent fraud and reduce leakages, though initial challenges in awareness and technical implementation caused temporary dissatisfaction among users.

On the digital payments front, Jakhar (2025) demonstrated that UPI and mobile wallets are effective tools for financial inclusion, particularly for rural and economically weaker populations, enabling faster and cheaper transactions. Jose (2025) confirmed that UPI has helped rural Indians access formal banking by overcoming infrastructure barriers through basic smartphone interfaces. Cornelli et al. (2024) highlighted that UPI's success is largely attributable to its user-friendly, free, and interoperable design backed by strong regulatory support, offering a replicable model for digital payment systems globally.

Lad and Jadhav (2024) found that UPI significantly improved financial inclusion by facilitating direct benefit transfers and bringing unbanked populations into the formal banking fold. Hemamalini and Nedumaran (2025) identified that age, education, income, and awareness are key factors influencing mobile wallet adoption in Tamil Nadu, with digital literacy barriers remaining a persistent challenge. Kumar (2025) noted that while digital payment systems have accelerated financial inclusion in rural India, poor internet connectivity, lack of digital knowledge, and social factors continue to pose significant hurdles.

Studies on PDS inefficiencies by Sahoo et al. (2019), Velmurugan and Lavanya (2017), and Khera (2011) underscored the persistent problems of leakages, corruption, and poor targeting in the system, highlighting the need for technology-driven reforms. Mohapatra and Mahalik (2015) argued that digital payment integration is essential to plugging leakages and ensuring that benefits reach intended beneficiaries. Collectively, this literature underscores the need to empirically evaluate the effectiveness of UPI integration at the grass-roots level within the PDS framework in Tamil Nadu.

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6. RESEARCH METHODOLOGY

6.1 RESEARCH DESIGN

The study adopts a Descriptive Research Design, which is most appropriate given that the research aims to describe and evaluate the current state of UPI implementation, beneficiary awareness and usage patterns, vendor efficiency, and the overall impact on transparency and financial inclusion. The descriptive approach facilitates a systematic examination of existing conditions and enables the analysis of relationships between key variables using statistical techniques.

6.2 DATA COLLECTION METHODOLOGY

Primary data were collected directly from FPS beneficiaries using a structured questionnaire consisting of five sections:

(A) Awareness and Usage of UPI

(B) Efficiency and Issues Faced by Vendors

(C) Impact on Transparency and Financial Inclusion

(D) Digital Literacy and Challenges

(E) General Perception.

The questionnaire comprised closed-ended questions to facilitate standardized responses and reliable statistical analysis. Secondary data were gathered from government publications on PDS, NPCI reports, peer-reviewed research journals, books, and official websites to establish the contextual and theoretical framework of the study.

6.3 SAMPLING TECHNIQUE

The study employs Stratified Random Sampling, a probability sampling technique wherein the target population is divided into distinct strata based on relevant characteristics. The strata for this study were defined based on: (i) geographic location (urban vs. rural FPS beneficiaries), (ii) gender (male vs. female beneficiaries), and (iii) literacy level (literate vs. semi-literate respondents). This stratification ensures proportional and balanced representation across all subgroups, enhancing the accuracy, reliability, and generalizability of research findings.

6.4 SAMPLE SIZE

The total sample size comprises 120 respondents selected from Fair Price Shop beneficiaries across Tamil Nadu. This sample provides sufficient statistical power for the analytical techniques employed in the study and represents a cross-section of the population in terms of age, gender, and geographical location.

6.5 TOOLS USED FOR ANALYSIS

The following statistical tools were employed:

- Percentage Analysis: Used to understand the distribution of responses across variables including gender, age group, awareness level, satisfaction level, infrastructure availability, and challenges faced.
- Cross-Tabulation: Applied to examine relationships between UPI usage frequencies and ease of use and between vendor encouragement and vendor problems.
- Chi-Square Test: Used to test the significance of associations between categorical

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variables, specifically between vendor encouragement and UPI implementation problems.

- Independent Samples T-Test: Applied to compare mean differences between two groups, specifically examining whether gender significantly influences confidence in using mobile applications for UPI transactions.

7. ANALYSIS

Table 7.1: Demographic Profile of Respondents – Gender and Age Group Distribution

Category	Response	Frequency	%
Gender	Female	61	50.8%
	Male	59	49.2%
	Total	**120**	**100.0%**
Age Group	18–23 years	61	50.8%
	23–26 years	37	30.8%
	26–30 years	10	8.3%
	30–35 years	12	10.0%
	Total	**120**	**100.0%**

INTERPRETATION

The sample of 120 beneficiaries shows near-equal gender representation (Female 50.8%, Male 49.2%), with a dominant majority of 81.6% falling in the 18–26 age group, indicating a predominantly young, digitally-inclined respondent base that enhances the relevance of UPI adoption findings.

7.2 Awareness & Usage of UPI

Table 7.2: Awareness, Usage Motivation, and Source of Learning of UPI among Beneficiaries

Category	Response	Frequency	%
Awareness Level	Yes, fully aware	61	50.8%
	Somewhat aware	34	28.3%
	Heard but unsure	15	12.5%
	Not aware at all	10	8.3%
Reason for Using UPI	Avoid carrying cash	46	38.3%
	Convenience and speed	38	31.7%
	It is mandatory	24	20.0%
	Do not use it	12	10.0%
Source of Learning	Family or friends	55	45.8%
	Training / awareness camps	30	25.0%
	Self-learning via apps	22	18.3%
	Have not learned	13	10.8%

INTERPRETATION

Awareness & Usage of UPI: While 79.1% of beneficiaries are aware of UPI and primarily adopt it to avoid cash (38.3%) and for convenience (31.7%), social networks — especially family and friends (45.8%) — remain the dominant learning channel, highlighting the need for targeted formal outreach to bridge the 20.9% awareness gap.

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7.3 Transparency & Financial Inclusion Impact

Table 7.3: UPI Awareness, Usage Reasons, and Learning Sources among Respondents

Category	Response	Frequency	%
Awareness Level	Yes, fully aware	61	50.8%
	Somewhat aware	34	28.3%
	Heard but unsure	15	12.5%
	Not aware at all	10	8.3%
Reason for Using UPI	Avoid carrying cash	46	38.3%
	Convenience and speed	38	31.7%
	It is mandatory	24	20.0%
	Do not use it	12	10.0%
Source of Learning	Family or friends	55	45.8%
	Training / awareness camps	30	25.0%
	Self-learning via apps	22	18.3%
	Have not learned	13	10.8%

INTERPRETATION

A majority of respondents (79.1%) are at least somewhat aware of UPI, with convenience and cash avoidance as the dominant usage motivations, and family or friends (45.8%) emerging as the primary channel through which digital payment knowledge is disseminated.

7.4 Digital Literacy & Challenges

Table 7.4: Network issues (38.3%) and digital illiteracy (35%) are the top barriers to UPI adoption

Primary Challenge	Frequency	%
Poor network/internet	46	38.3%
Lack of digital knowledge	42	35.0%
Fear of fraud	19	15.8%
No challenge	13	10.8%

INTERPRETATION

Poor network or internet connectivity (38.3%) and lack of digital knowledge (35.0%) together account for nearly three-fourths of the challenges faced, indicating that infrastructure and digital literacy remain the most critical barriers to seamless UPI adoption among respondents.

7.5 General Satisfaction & Perception

Table 7.5: UPI Satisfaction Level and Role in Rural Financial Inclusion among Respondents

Category	Response	Frequency	%
Satisfaction Level	Very satisfied	40	33.3%
	Satisfied	51	42.5%

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	Unsatisfied	21	17.5%
	Very unsatisfied	8	6.7%
UPI Role in Rural Inclusion	Strongly agree	40	33.3%
	Agree	49	40.8%
	Disagree	18	15.0%
	Strongly disagree	13	10.8%

INTERPRETATION

A substantial majority of respondents (75.8%) expressed satisfaction with UPI services at Fair Price Shops, and a similarly high proportion (74.1%) agreed that UPI has the potential to enhance financial inclusion in rural areas, collectively indicating that beneficiaries not only value the current UPI experience but also perceive it as a transformative tool for broader rural economic empowerment.

7.6 STATISTICAL TEST FINDINGS

1. Cross-Tabulation (UPI Usage vs. Ease of Use): A clear positive relationship exists between perceived usability and adoption frequency. Over 90% of daily UPI users rated it easy or very easy, confirming TAM's proposition that ease of use drives technology adoption.
2. Chi-Square Test (Vendor Encouragement vs. Problems): Internet/network issues (45.8%) are the most prevalent vendor challenge, even among motivated vendors. Lack of training (28.3%) ranks second, indicating structural barriers beyond vendor control require government intervention.
3. Independent Samples T-Test (Gender vs. UPI Confidence): Male mean = 1.86, Female mean = 1.97, $p = 0.578$ ($p > 0.05$). No statistically significant gender difference in UPI confidence was found, supporting gender-neutral policy design in UPI promotion.

8. CONCLUSION

This study provides empirical evidence that UPI-enabled Fair Price Shops are effective instruments of digital financial inclusion in Tamil Nadu. Majority beneficiaries are aware of, use, and are satisfied with UPI services. Significant improvements in ration distribution transparency, fraud reduction, and financial management have been recorded.

Key barriers—poor internet infrastructure, limited digital literacy, fear of cyber fraud, and partial FPS equipment—must be addressed through: (1) targeted digital literacy programs for older and semi-literate beneficiaries; (2) investment in rural 4G/5G connectivity; (3) regular vendor training and certification; (4) accessible grievance redressal mechanisms; and (5) incentive structures encouraging voluntary digital adoption.

Statistical analyses confirm ease of use as a key determinant of adoption frequency, while gender does not significantly differentiate confidence levels. The UPI-FPS model offers a replicable blueprint for other states seeking to harness digital payments for inclusive economic growth.

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