



CONSUMER PREFERENCE FOR ELECTRIC VEHICLES VS. PETROL VEHICLES IN THE CONTEXT OF E20 FUEL: A STUDY IN VIJAYAWADA

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ABSTRACT :

Introduction The Indian car market is entering a transition period and electric vehicles are increasingly making their presence felt in addition to the 2014 introduction of Ethanol Blended Petrol in the Indian market. E20 petrol refers to petrol blended with ethanol up to 20%, which consumers need to consider in respect to their vehicle type, mileage, operating costs and efficiency in order to make wise choices. In this context, an attempt is made to study preference for petrol vehicles or electric vehicles (EV) in Vijayawada city of Andhra Pradesh and the possible role of awareness on vehicle type, perceived concerns on fuel, purchase price, running costs, convenience of charging, maintenance and environmental sustainability. **Research Design and methodology** This research work intends to adopt a descriptive and analytical research design. With regard to primary data, structured questionnaire could be used to seek a variety of consumer opinions regarding the perception of vehicle purchase cost and running costs of electric vehicles, compared to traditional petrol vehicles. It is envisioned to obtain a sample of consumers of different ages, educational background and income groups, with and without vehicles of diverse ownership backgrounds. Secondary data will be used from research literature and official reports. As of this writing, primary data collection has yet to commence so no actual figures or analysis is available. **Findings** This research could be used to inform consumer and policy-maker decisions about future vehicle choices.

Key Words: Electric vehicles, petrol vehicles, E20 fuel, consumer preference, vehicle purchase intention, ethanol blending, Vijayawada.

Problem Statement

Consumers comparing EVs and petrol vehicles are likely to consider a range of different trade-offs from a practical and cost perspective. There is extensive existing refuelling infrastructure for petrol and that all drivers would be familiar with, whilst some drivers of petrol vehicles could see lower energy costs and maintenance on certain types of usage in the future. EVs require either a suitable charging point and tend to have a premium purchase price in the majority of vehicle segments. Alongside wider introduction of E20 petrol vehicles, recent messaging on vehicle speed, costs and E20 has received media coverage which may impact on consumers' perception of vehicle efficiency, and thus could influence purchase considerations for vehicle types, including EVs. It will be important to assess whether energy efficiency – or concerns about E20 – impacts on consumer choice for EVs in Vijayawada, and how that compares to purchase considerations such as cost of purchase and running costs, or ease of access to charging points.

1. Introduction

Mobility is a major part of our lives, such as work, travel for education, business and family reasons. Petrol (gas) powered bikes and cars continue to be the most common solution in India, as these vehicles have an extensive service network, refuelling infrastructure and are easily available. But, concerns around air quality, energy independence, fuel prices and climate change are raising the profile of alternative propulsion.

Electric vehicles contain an electric motor powered by a battery of electrical energy. Advantages of EVs may include zero tailpipe emissions when in use, quiet operation and, potentially, lower total energy expenditure and routine maintenance costs. Such factors as purchase price, range, recharging time, home or public recharging access, battery warranty and resale value are important for individual consumers and vary by vehicle and location.

Between two-wheelers, cars and commercial vehicles, and between consumers who travel to make many long journeys and those who make few such journeys.

E20 is a blend of fuel that contains about 20% by volume of ethanol. The Government of India has incentivised blending ethanol to reduce reliance on import of fossil fuels and to further energy and environmental goals. This transition and vehicle compatibility issues were outlined in the 2021 Ethanol Blending Roadmap by NITI Aayog and the Ministry of Petroleum and Natural Gas.

With the concerns surrounding the E20 introduced in the fuel mix, public knowledge and perceptions can be an interesting basis for a study. Consumers may have E20 in mind as an alternative to petrol or feel that petrol vehicle use is more convenient, more comfortable and cheaper to buy. This study is conducted at Vijayawada and investigates E20 awareness and other factors affecting vehicle preference. The study does not assume that E20 related concerns mean a lean towards EVs, and instead aims to test the hypothesis if such a relationship exists for the respondents' group.

2. Literature Review

2.1 NITI Aayog and Ministry of Petroleum and Natural Gas (2021)

The report Roadmap for Ethanol Blending in India: 2020-2025 explains the policy rationale and implementation issues around ethanol blending. It explains the interaction of engines and fuel, tuning of vehicles and fuel efficiency considerations and the demands of vehicle manufacturers. This is important to the current work as consumers have to have easy access to information on E20's compatibility with their vehicles, not vague, uninformed statements.

2.2 Egbue and Long (2012)

Egbue and Long considered consumer attitudes and perceptions that can act as barriers to a mass adoption of electric vehicles. Consumer preferences are dominated not only by environmental factors but also by vehicle price, range, charging infrastructure, battery-related issues and the level of the technological familiarity. These factors are applicable to the contrast between the EV preference and petrol-vehicle preference in Vijayawada.

2.3 Rezvani, Jansson and Bodin (2015)

Rezvani and team's literature review of consumer research on electric vehicle adoption found various psychological, contextual and product factors that affected purchase intention. Their review affirmed the notion that adoption of EVs is an aggregation of consumer reasons, perceived benefits and costs, subjective norms, economic factors and pragmatic constraints. This study extends such a discourse into a local setting, with awareness of E20 as an extra factor.

2.4 NITI Aayog (2022)

NITI Aayog work on electric-mobility value chain and clean-energy use in EV notes the significance of vehicle economics, charging footprint, model options and policy enablers in scaling up electric vehicles. It points out consumers tend to compare total cost of ownership and practicality of the model instead of car price. These factors are reflected in the variables proposed for this study.

2.5 NITI Aayog (2025)

The report Unlocking a \$200 Billion Opportunity: Electric Vehicles in India, looks at the future growth of the Indian EV market and what is required to make the market more widely accepted. It provides a context of recent policy and industry to situate understanding of EV uptake. For the present research, it is relevant because consumer preference can not be divorced from affordability, charging infrastructure, product availability and the development of the EV ecosystem more generally.

2.6 Review Summary

The published research shows that vehicle choice is multi-faceted. Factors that could influence EV uptake may include: price, running costs, charging infrastructure, range, servicing costs, environmental concern, and trust in innovation. E20 related research literature separately identifies factors such as: compatibility and information provision. This current research examines these factors jointly by investigating if the awareness and opinion of E20 are related to EV / petrol preference in Vijayawada.

3. Research Gap

The literature available on EV adoption and ethanol blending is only chronicled as relevant but more often than not separate issues. A comparative local study can be done to include knowledge of E20 in the same context as the practical and financial issues in purchasing decisions. The research gaps identified which can be filled by this study are:

- Minimal synergy in understanding of E20 and choice of EV: one needs to see whether individuals' awareness of E20 is reflected in their stated preference of EVs or petrol.
- Local consumer perspective: Consumer data at the national level might not be directly applicable to the behaviour of consumers in Vijayawada including the fact that their travel behaviour, budgets, charging infrastructure demand, charging infrastructure perception.
- Perceived matching compared to actual compatibility: consumers may understand E20 differently, so we have to separate what they see in their mind vs. the instructions from the manufacturer.
- Grading of decision factors: E20-related attitudes have to be considered together with purchase price, cost of running, mileage, and costs of

maintenance and charging, and lack of environmental concerns.

- Even if people state that they prefer EVs, this doesn't necessarily mean that they will actually buy one.

By means of a structured questionnaire of Vijayawada's consumers, the study aims to fill these voids. Its findings are limited to the sample and the technique used for the study and may not be universally applicable to all purchasers of car.

4. Objectives of the Study

The study aims to:

The purpose of the study: Comparison of the behavior of the consumer when choosing electric vehicles and petrol vehicles in Vijayawada in view of E20 fuel.

- To determine whether respondents are aware of and understand E20 petrol.
- To test if E20 awareness and EV20 concerns were related to EV purchase intention.
- To demonstrate the significance of the purchase price, running cost, fuel consumption, maintenance and ease of use.
- To determine perceived barriers to EVs adoption, such as cost of initial purchase, charging time and availability, driving range.
- To test whether consumer attributes such as age, income, occupation, and current vehicle ownership influence preferences for the type of vehicle.
- - To give recommendations on the enhancement of consumer information and advice for better car purchase decision making.

5. Research Methodology

The present study is planned as a Descriptive and Analytical survey of the consumers of Vijayawada. The research will describe awareness and preferences and, where possible, will analyze associations between E20 awareness and vehicle preference.

5.1 Research Design

Cross-sectional questionnaire based design will be used. Responses will be obtained during a certain period of time as opposed to following individuals over time. Descriptive analysis will be used to describe consumer demographics and preferences, whereas an appropriate test of association will be used to compare categorical variables.

5.2 Study Area and Population

The geographical area for the target population would be Vijayawada Andhra Pradesh. The target population would include Adult consumers who own a vehicle or are thinking of buying two wheeler car. The questionnaire needs to specify the vehicle it is asking about and hence the response of two wheeler segment, four wheeler segment are not comparable.

5.3 Variables

Independent or explanatory variables in the utilities may include: awareness of E20; the expected impact of E20 on the usage of petrol vehicle; purchase budget; expected running cost; environmental concern; and availability of charging points for the EV. The main dependent or stated choice for vehicle type may include EV or petrol vehicle. Background variables such as age; income; occupation; current ownership of vehicle; and the annual distance travelled.

5.4 Sampling Technique and Sample Size

Sampling might be conducted through convenient sampling, due to lack of time and accessibility, with effort to include different age ranges, job types, household incomes and driving history. The intended sample size of 100-150 usable responses may be suitable for a university project, depending on feasibility and supervisor advice. The number of responses obtained will be the figure stated, once the data has been collected, not the intended number.

5.5 Data Collection

Primary data will be gathered through a questionnaire which will be closed/structured and could have diverse types of questions like; multiple choice questions (MCQ), the short questions covering the demographics of the respondents and statements using 5 point likert scale from strongly disagree to

strongly agree. Secondary data will be gathered through the literature review from publications of government and peer review journals on ethanol blending.

5.6 Data Processing and Analysis

- Frequency & percentage analysis to describe respondent characteristics, knowledge of E20 and preferred vehicles.
- Average scores for on-style items where applicable to provide a summary of perceptions.
- Cross-tabulation to compare E20 preferences by groups of awareness.
- A chi-square test of independence can be employed to test the association between two variables if the sample size and expected values are adequate.
- Results should include the number of participants from the original sample, number who responded, any relevant limitations, and if a test has been performed, the significance of the result.

5.7 Hypotheses Proposed

There is no relation in the proportion of consumers who are aware of the usage of E20 as a fuel and are willing to prefer either an electric vehicle or a petrol vehicle in Vijayawada.

There is no statistically significant relationship between awareness of E20 fuel and are consumers likely to show the preference for electric vehicle than petrol vehicle in Vijayawada.

6. Conceptual Background

6.1 Consumer Preference

Consumer preference is the relative favourability a consumer or the target market shows to a specified product or service when comparing it to alternative products or services. Consumer preference depends upon many variables including the consumer's purchasing power, consumption preferences, risk, attitude and habits.

6.2 Awareness and Perception E20

E20 covers if consumers understand the meaning of a 'blend', realise compatibility is different in different vehicles and are aware of how to check official recommendations. Perceived concerns may still affect attitude if consumers lack in-depth technical knowledge. The study will thus need to assess awareness and perception separately, whilst using official vehicle guidance as the best indicator of compatibility.

6.3 Economic and practical considerations

Cost of ownership including the purchase price, cost of financing, projected energy or fuel costs, maintenance, resale value and the expected period of ownership. Practical considerations include mileage, charging or refuelling options, ease of charging time, availability of servicing and suitability for long distance travel. The priority of these considerations varies from consumer to consumer.

6.4 Environmental and Technology Attitudes

For some consumers, lower local tailpipe emissions and a lower dependence on petrol may be a big advantage. For other consumers, they may require less persuasion than other features, such as familiarity of technology and greater experience leading to increased perceptions of dependability and reliability. These factors will interact with income, information and social sources and own travel needs and should be measured rather than assumed.

7. Conceptual Framework

The dependent (outcome) variable in the model is consumer decision to buy an EV or petrol-powered vehicle. The primary explanatory variables of interest are E20 awareness and perceived E20 related issues. Other decision drivers are also incorporated into the model to put the E20 perceptions into context.

Proposed framework:

- E20 awareness and perceived E20-related concerns
- Economic factors: purchase price, financing, running cost and maintenance

- Pragmatic considerations: charging points, driving range, ease of refuelling and local expertise.
- Attitude attitudes: environmental concern, confidence in technology, and perceived reliability

It is hypothesized that these factors are related to the outcome: stated preference and purchase intention towards either an electric vehicle or a petrol vehicle. Characteristics of the respondent, including age, income, occupation, daily travel distance, and a current vehicle, may help to describe variation among groups. The framework suggests relationships to be tested; it does not assume that E20 awareness causes EV purchase.

8. Highlights & Insights

The primary survey data have not been included in this draft. What is shown in this section is the strategy of analysis rather than creatively fabricated results, percentages, or statistical tests. This section will be revised once data collection has been completed.

8.1 Respondent Profile and Vehicle Preference

The study should state the number of valid responses and the distribution of respondents by age, income, occupation, current vehicle and vehicle type category considered. The number who preferred EVs, petrol cars or who were undecided should then be listed with frequencies and percentages.

8.2 E20 Awareness and Perceived Impact

These should help to identify those who understand E20 and those who do not and summarise their perception of which vehicles would be compatible with E20. Do not treat perceived effects as proven technical results. Interpretation of these responses should be checked against official sources and guidance from vehicle manufacturers.

8.3 Decision Elements Comparison

The questionnaire needs to determine the ranking of factors such as purchase price, running cost, maintenance, fuel economy, availability of charge points, range, environmental considerations and convenience. This outcome can then be used to show which factors were ranked as most important by respondents without forcing the ranking to be the same for all vehicle types.

8.4 Testing for and Interpreting Associations

Prepare a cross-tabulation of knowledge E20 and proclaimed vehicle. If assumptions are met for a chi-square test of independence, then the test should be carried out to examine whether the two variables are statistically associated or not. The completed paper should give the observed frequency, the test statistic, degrees of freedom and p-value for the test where appropriate, and emphasise the difference between association and causation.

9. Practical and Theoretical Aspects

The findings could potentially provide a helpful guide for consumers, vehicle dealers, policymakers and researchers about the relative importance of E20 awareness compared to the other factors influencing consumers' choice of EVs or petrol vehicles. The below implications are tentative until the survey data is released.

9.1 Practical Implication

Providing consumers with transparent, easily understandable information on E20 and vehicle compatibility could allay concerns and could support fact-based decision making. Consumers should refer to the instructions supplied with their vehicle, rather than assuming all petrol vehicles are affected by E20 in the same way.

Implications for a vehicle dealer and manufacturer The results may point to the areas where communications could be made more explicit such as, fuel types, running costs, EV range, charging needs, warranty and servicing. Implications for local authorities and charging-service providers Evidence on charging concerns may help highlight barriers to EV consideration in Vijayawada.

9.2 Theoretical Implications

This research introduces fuel-policy awareness to a consumer-choice model that considers economic, pragmatic, environmental, and attitudinal variables. It might provide evidence on whether E20 awareness influences stated EV preference even after controlling for other explained decision criteria. This study is a local, cross-sectional survey; it cannot, on its own, delineate causality nor generalize to all of Andhra Pradesh consumers.

10. Further Studies

Potential follow-up research might include broader sampling of Vijayawada and nearby metropolitan and semi-urban areas, can further distinguish

between two-wheeler and car buyers, and can compare recent buyers and prospective buyers. Longitudinal studies could investigate how responses may change over time with increasing vehicle supply and refuelling infrastructure and awareness. Comparative studies could also explore the overlap of stated preferences with buying decisions and compare total cost of ownership based on easy-to-verify assumptions. In-depth interviews with dealers, mechanics, refuelling operators and buyers might shed light on the emergence of certain perceptions.

11. Conclusion

Consumer choice for electric versus petrol vehicles will be influenced by a range of financial, practical, technical and attitudinal considerations. The availability of E20 petrol is a practical consideration that is well-timed for a detailed investigation of consumer awareness and attitudes, but vehicle compatibility and performance should be considered in accordance with manufacturers' information. This proposed research will only be undertaken in Vijayawada, and the aim is to determine if awareness of E20 is associated with driving vehicle choice away from EVs towards petrol, in addition to retail cost, operational cost, charging convenience and positive environmental attitudes. The research design and conceptual framework outlined below will support collection and analysis

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