

Consumers' Level of Awareness Towards Features of Electric Vehicles

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ABSTRACT

Electric vehicles (EVs) have emerged as an important sustainable alternative to conventional vehicles due to growing concerns over climate change, environmental pollution, rising fuel costs, and dependence on imported petroleum. Despite government initiatives such as the FAME India Scheme, EV adoption in India remains comparatively low. The present study examines consumers' awareness and perceptions of electric vehicles, with particular reference to Chennai City. It also identifies the factors influencing EV purchase decisions and the problems faced by consumers while using selected EV brands. A descriptive research design was adopted, and both primary and secondary data were used. Primary data were collected through a structured questionnaire from 800 respondents selected from eight Regional Transport Office (RTO) areas representing the northern, southern, eastern, and western regions of Chennai City. The data were analysed using SPSS Version 20.0 through percentage analysis, descriptive statistics, Chi-square, t-test, ANOVA, factor analysis, correlation, and regression analysis. The hypotheses were tested at the five per cent level of significance. The study provides insights into consumer awareness, perceptions, and challenges related to EVs and offers useful implications for manufacturers, dealers, policymakers, and consumers for promoting wider acceptance and adoption of electric vehicles.

INTRODUCTION

Climate change and the continuous rise in global temperature have become major environmental concerns. Global warming is mainly attributed to greenhouse gas emissions, deforestation, pollution, unsustainable lifestyles, and human activities. In India, the rapid growth of road transportation has increased dependence on conventional vehicles (CVs), contributing significantly to air pollution and carbon emissions. The transport sector accounts for a considerable share of greenhouse gas emissions, while India also depends heavily on imported petroleum to meet its energy requirements. Electric vehicles (EVs) provide a cleaner alternative by reducing dependence on fossil fuels and lowering carbon emissions. However, EV adoption in India remains relatively low despite various government initiatives and incentives. The Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme was introduced to promote electric and hybrid vehicles. Therefore, understanding consumers' awareness, perceptions, and difficulties regarding EVs is essential for encouraging their wider adoption.

SCOPE OF THE STUDY

The study focuses on consumers' awareness and perception of electric vehicles and the factors influencing the transition from conventional vehicles to EVs. It particularly examines consumer perceptions of selected electric scooter brands and the major factors considered while purchasing EVs. The study also considers the challenges faced by consumers and the strategies required by EV manufacturers and dealers to improve market acceptance. The findings may assist manufacturers in developing effective marketing strategies and help consumers make informed EV choices.

NEED FOR THE STUDY

Electric vehicles are increasingly recognized as an important component of sustainable transportation and climate-change mitigation. Recent EV research mainly focuses on charging infrastructure, EV adoption, thermal management, and routing issues. However, comparatively limited research has examined Indian consumers' awareness and perceptions of EVs. Hence, the present study attempts to assess consumers' awareness and perceptions of electric vehicles, with particular reference to Chennai City.

STATEMENT OF THE PROBLEM

Electric vehicles offer a practical solution to environmental pollution, rising fuel costs, and dependence on imported petroleum. Governments have introduced various fiscal incentives and policies, including the FAME India Scheme, to encourage EV adoption. Nevertheless, consumer acceptance remains comparatively limited. Consumers consider several factors when selecting an EV, including price, insurance, after-sales service, brand reputation, quality, pickup, battery performance, comfort, functionality, availability of spare parts, and payment

facilities. Inadequate awareness of these factors may affect purchasing decisions. EV performance is also influenced by battery capacity, motor efficiency, vehicle and rider weight, road conditions, and terrain.

Although several studies have examined consumer satisfaction with conventional vehicles, limited research has focused on Indian consumers' awareness and perception of EVs. Therefore, the present study seeks to examine the following issues:

1. Are consumers aware of alternative-fuel vehicles available in India?
2. Does consumers' awareness and perception of EV features differ according to their socio-economic characteristics?

These issues provide the basis for determining the significance and objectives of the study.

OBJECTIVES OF THE STUDY

The study was undertaken with the following objectives:

1. To assess consumers' level of awareness of the features of electric vehicles.
2. To analyse consumers' perceptions towards the use of electric vehicles.

HYPOTHESES OF THE STUDY

The following null hypotheses were formulated and tested:

H₀1: There is no significant relationship between the socio-economic characteristics of respondents and their level of awareness of electric vehicles.

H₀2: There is no significant difference among consumers regarding the problems faced while using selected brands of electric vehicles.

RESEARCH METHODOLOGY

1. Research Design: A descriptive research design was adopted to examine consumers' awareness and perceptions of electric vehicles. The study also considers the factors influencing consumer behaviour and EV adoption.

2. Data Collection Method: Primary quantitative data were collected through a structured self-administered questionnaire/interview schedule. Secondary data were obtained from books, journals, reports, websites, newspapers, magazines, bulletins, manuals, and other published and unpublished sources.

3. Population of the Study: The population consisted of consumers associated with selected electric vehicle dealers in the study area of Chennai City.

4. Sampling Design: Chennai City was selected as the study area and was stratified into different geographical regions. To ensure adequate representation, areas were considered based on their socio-economic characteristics, namely developed, semi-developed, and under-developed areas.

5. Sample Size: A total of 800 respondents were selected from different parts of Chennai City. The respondents were drawn from selected Regional Transport Office (RTO) areas representing the northern, southern, eastern, and western regions of the city.

6. Sampling Procedure: For the study, eight RTO offices were selected, with two offices representing each major region of Chennai City. 100 respondents were selected from each RTO, resulting in a total sample of 800 respondents. A systematic schedule was followed for data collection, which was carried out over approximately 90–120 days.

NATURE OF DATA

The study is based on both primary and secondary data. Primary data were obtained directly from respondents, while secondary data were collected from relevant books, journals, reports, websites, newspapers, magazines, manuals, and other published and unpublished sources.

TOOLS FOR DATA ANALYSIS

The collected data were processed and analysed using SPSS Version 20.0. The statistical tools employed included: Simple Percentage Analysis, Descriptive Statistics, Chi-square Test, t-test, ANOVA, Factor Analysis, Correlation Analysis, Simple Regression and Multiple Regression Analysis. All hypotheses were tested at the 5 per cent level of significance.

RESPONDENTS' AWARENESS OF ELECTRIC VEHICLES

Electric vehicles (EVs) are increasingly recognized worldwide as a sustainable and environmentally friendly mode of transportation. Governments across the globe have begun implementing various technological, infrastructural, and policy initiatives to promote the adoption of electric mobility. The shift toward electric vehicles is primarily driven by the need to reduce carbon emissions, improve urban air quality, and enhance energy efficiency in the transportation sector. Consequently, many national and regional governments have incorporated electric mobility strategies into their long-term environmental and economic development plans. In India, the promotion of electric vehicles has gained significant momentum through several policy interventions and incentive schemes introduced by the government. The rapid growth of electric two-wheelers and three-wheelers indicates the gradual acceptance of electric mobility in the country. Moreover, government initiatives such as subsidies, charging infrastructure development, and regulatory incentives are expected to accelerate the transition towards electric mobility in the coming years. It has been projected that electric two-wheelers and electric bikes would become financially viable options in the near future, while electric four-wheelers are expected to become increasingly prominent by 2030, provided that adequate policy support, charging infrastructure, and technological advancements continue to evolve.

Despite these policy initiatives and technological developments, the success of electric mobility largely depends on the level of awareness among consumers. Consumer awareness plays a crucial role in influencing the adoption and diffusion of new technologies, particularly in the case of electric vehicles where aspects such as charging infrastructure, battery performance, operating cost, government incentives, and maintenance requirements significantly influence purchase decisions. In many instances, consumers may not be fully aware of the benefits, available schemes, technological features, or operational aspects of electric vehicles.

Therefore, understanding the level of consumer awareness regarding different dimensions of electric vehicles becomes essential for policymakers, manufacturers, and marketers. In this context, the present study attempts to examine the level of awareness among consumers regarding various technical, economic, infrastructural, environmental, and policy-related aspects of electric vehicles (EVs). The responses were measured using a five-point awareness scale ranging from Not Aware (1) to Fully Aware (5). The analysis is based on 800 respondents, and the results are interpreted using percentage distribution, mean scores, and mean percentage values to determine the relative level of awareness across different EV-related dimensions. The results of this assessment are presented in Table 1.

Table 1 Respondents' Level of Awareness Regarding Electric Vehicle (EV) Features, Infrastructure, and Policy Aspects

Variables	Not Aware	Less Aware	Somewhat aware	Almost Aware	Fully aware	Total	Mean	Mean %
Cost range of electric vehicles	66 (8.30)	170 (21.30)	111 (13.90)	153 (19.10)	300 (37.50)	800 (100.00)	3.56	71.27
Availability of public charging stations in cities and highways	66 (8.30)	170 (21.30)	116 (14.50)	170 (21.30)	278 (34.80)	800 (100.00)	3.53	70.60
Regenerative braking system in EVs	38 (4.80)	171 (21.40)	87 (10.90)	182 (22.80)	322 (40.30)	800 (100.00)	3.72	74.48
Cost of maintenance and upkeep	88 (11.00)	200 (25.00)	117 (14.60)	211 (26.40)	184 (23.00)	800 (100.00)	3.25	65.08
EV charging tariffs and electricity billing system	45 (5.60)	164 (20.50)	89 (11.10)	174 (21.80)	328 (41.00)	800 (100.00)	3.72	74.40
Battery lifespan of electric vehicles	66 (8.30)	119 (14.90)	102 (12.80)	183 (22.90)	330 (41.30)	800 (100.00)	3.74	74.80
Smart charging and mobile app-based charging services	98 (12.30)	265 (33.10)	112 (14.00)	94 (11.80)	231 (28.90)	800 (100.00)	3.12	62.38

Battery charging duration for EVs	51 (6.40)	192 (24.00)	66 (8.30)	200 (25.00)	291 (36.40)	800 (100.00)	3.61	72.20
Battery recycling and disposal methods	51 (6.40)	147 (18.40)	62 (7.80)	196 (24.50)	344 (43.00)	800 (100.00)	3.79	75.88
Resale value of the vehicle and its battery	15 (1.90)	110 (13.80)	45 (5.60)	248 (31.00)	382 (47.80)	800 (100.00)	4.09	81.80
Warranty terms for motor and electrical components	46 (5.80)	177 (22.10)	110 (13.80)	201 (25.10)	266 (33.30)	800 (100.00)	3.58	71.60
Safety features of EVs	66 (8.30)	170 (21.30)	112 (14.00)	158 (19.80)	294 (36.80)	800 (100.00)	3.56	71.10
Charges related to battery swapping	54 (6.80)	167 (20.90)	107 (13.40)	178 (22.30)	294 (36.80)	800 (100.00)	3.61	72.28
Charging connector types and compatibility	58 (7.30)	184 (23.00)	97 (12.10)	189 (23.60)	272 (34.00)	800 (100.00)	3.54	70.83
Suitability of EVs for long-distance travel	72 (9.00)	187 (23.40)	108 (13.50)	199 (24.90)	234 (29.30)	800 (100.00)	3.42	68.40
Smoothness of driving experience	53 (6.60)	149 (18.60)	93 (11.60)	176 (22.00)	329 (41.10)	800 (100.00)	3.72	74.48
Mode of payment or financing options	75 (9.40)	200 (25.00)	110 (13.80)	135 (16.90)	280 (35.00)	800 (100.00)	3.43	68.63
Government-provided direct subsidies	60 (7.50)	177 (22.10)	100 (12.50)	180 (22.50)	283 (35.40)	800 (100.00)	3.56	71.23
State government incentives for EV purchase	46 (5.80)	167 (20.90)	79 (9.90)	185 (23.10)	323 (40.40)	800 (100.00)	3.72	74.30
Digital dashboard and smart connectivity features in EVs	63 (7.90)	169 (21.10)	93 (11.60)	224 (28.00)	251 (31.40)	800 (100.00)	3.54	70.78
Availability of engine and other vehicle spare parts	51 (6.40)	165 (20.60)	94 (11.80)	168 (21.00)	322 (40.30)	800 (100.00)	3.68	73.63
Availability of different brands and models	68 (8.50)	139 (17.40)	105 (13.10)	177 (22.10)	311 (38.90)	800 (100.00)	3.66	73.10
Availability of authorized service centers	79 (9.90)	231 (28.90)	108 (13.50)	123 (15.40)	259 (32.40)	800 (100.00)	3.32	66.30
Quality of after-sales support and services	63 (7.90)	194 (24.30)	85 (10.60)	205 (25.60)	253 (31.60)	800 (100.00)	3.49	69.78
Mobile applications used for monitoring battery status	48 (6.00)	154 (19.30)	74 (9.30)	185 (23.10)	339 (42.40)	800 (100.00)	3.77	75.33
Plug-in Hybrid Electric Vehicles (PHEVs)	34 (4.30)	117 (14.60)	65 (8.10)	224 (28.00)	360 (45.00)	800 (100.00)	3.95	78.98
National Electric Mobility Mission Plan (NEMMP)	52 (6.50)	208 (26.00)	110 (13.80)	184 (23.00)	246 (30.80)	800 (100.00)	3.46	69.10

Fuel Cell Electric Vehicles (FCEVs)	28 (3.50)	140 (17.50)	55 (6.90)	230 (28.80)	347 (43.40)	800 (100.00)	3.91	78.20
Vehicle registration procedures	41 (5.10)	169 (21.10)	93 (11.60)	216 (27.00)	281 (35.10)	800 (100.00)	3.66	73.17
Initial acceleration and maximum speed of EVs	38 (4.80)	163 (20.40)	60 (7.50)	215 (26.90)	324 (40.50)	800 (100.00)	3.78	75.60
Noise level and emission performance	46 (5.80)	157 (19.60)	76 (9.50)	204 (25.50)	317 (39.60)	800 (100.00)	3.74	74.73
Home charging facility installation process	21 (2.60)	130 (16.30)	61 (7.60)	227 (28.40)	361 (45.10)	800 (100.00)	3.97	79.43
Types of battery and warranty coverage	54 (6.80)	187 (23.40)	112 (14.00)	221 (27.60)	226 (28.30)	800 (100.00)	3.47	69.45
Battery backup capacity	58 (7.30)	167 (20.90)	104 (13.00)	161 (20.10)	310 (38.80)	800 (100.00)	3.62	72.45
Access to charging infrastructure	66 (8.30)	152 (19.00)	112 (14.00)	175 (21.90)	295 (36.90)	800 (100.00)	3.60	72.03
Vehicle-to-grid (V2G) technology	58 (7.30)	206 (25.80)	94 (11.80)	150 (18.80)	292 (36.50)	800 (100.00)	3.52	70.30
Fast charging technology for EV batteries	75 (9.40)	197 (24.60)	99 (12.40)	207 (25.90)	222 (27.80)	800 (100.00)	3.38	67.60
Integration of renewable energy with EV charging	48 (6.00)	159 (19.90)	78 (9.80)	183 (22.90)	332 (41.50)	800 (100.00)	3.74	74.80
Contribution of EVs to reducing greenhouse gas emissions	48 (6.00)	114 (14.30)	81 (10.10)	207 (25.90)	350 (43.80)	800 (100.00)	3.87	77.43
Government regulations for EV manufacturing and safety	90 (11.30)	233 (29.10)	113 (14.10)	113 (14.10)	251 (31.40)	800 (100.00)	3.25	65.05

Source: Computed from collected primary data

Overall, the findings indicate that respondents possess a moderate to high level of awareness regarding electric vehicles, as most of the mean scores are above 3.25. The results show that respondents are particularly aware of the economic, environmental, technical, and practical aspects of EVs, while awareness of some advanced technologies and regulatory issues remains comparatively lower. The highest level of awareness was recorded for the resale value of the vehicle and its battery, with a mean score of 4.09 (81.80%), indicating that respondents consider the long-term economic value of EVs important. This was followed by awareness of the home charging facility installation process (Mean = 3.97), Plug-in Hybrid Electric Vehicles (PHEVs) (Mean = 3.95), and Fuel Cell Electric Vehicles (FCEVs) (Mean = 3.91). These findings suggest that consumers are increasingly familiar with different forms of electric and alternative-fuel vehicles.

Respondents also demonstrated good awareness of the environmental benefits of EVs, particularly their contribution to reducing greenhouse gas emissions (Mean = 3.87). Awareness of noise and emission performance, battery lifespan, battery recycling and disposal, vehicle acceleration and maximum speed, and mobile applications for monitoring battery status was also relatively high. This indicates that consumers have a reasonable understanding of both the environmental and technical advantages of EVs. Moderate awareness was observed regarding public charging stations, charging accessibility, charging duration, EV price ranges, payment and financing options, and government subsidies and incentives. Although respondents were reasonably familiar with these aspects, the findings indicate that further information is required regarding charging infrastructure and financial support available for EV purchases.

The lowest awareness was reported for smart charging and mobile app-based charging services (Mean = 3.12), followed by government regulations for EV manufacturing and safety (Mean = 3.25) and availability of

authorised service centres (Mean = 3.32). These areas indicate gaps in consumer knowledge and suggest the need for better dissemination of information regarding advanced charging technologies, safety regulations, and after-sales service facilities. In general, the findings reveal that respondents have relatively strong awareness of the economic benefits, environmental impact, battery performance, and basic operational features of electric vehicles. However, greater attention is required to improve awareness of advanced technologies, regulatory provisions, charging facilities, and service infrastructure. Government agencies, EV manufacturers, dealers, and service providers should therefore strengthen awareness campaigns and consumer education programmes to enhance confidence and encourage wider adoption of electric vehicles. Based on the mean scores, the 40 awareness variables are classified into three categories: High Awareness (3.67–5.00), Moderate Awareness (3.34–3.66), and Low Awareness (1.00–3.33). This classification provides a clear basis for assessing the overall level of consumer awareness regarding electric vehicles.

Table 2 High Awareness Variables

Sl. No.	Variable	Mean
1	Resale value of the vehicle and its battery	4.09
2	Home charging facility installation process	3.97
3	Plug-in Hybrid Electric Vehicles (PHEVs)	3.95
4	Fuel Cell Electric Vehicles (FCEVs)	3.91
5	Contribution of EVs to reducing greenhouse gas emissions	3.87
6	Battery recycling and disposal methods	3.79
7	Initial acceleration and maximum speed of EVs	3.78
8	Mobile applications used for monitoring battery status	3.77
9	Battery lifespan of electric vehicles	3.74
10	Noise level and emission performance	3.74
11	Integration of renewable energy with EV charging	3.74
12	Regenerative braking system in EVs	3.72
13	EV charging tariffs and electricity billing system	3.72
14	Smoothness of driving experience	3.72
15	State government incentives for EV purchase	3.72
16	Availability of engine and other vehicle spare parts	3.68

Source: Computed from collected primary data

Table 2 presents the variables for which respondents have a high level of awareness of electric vehicles. The highest awareness was recorded for the resale value of the vehicle and battery (Mean = 4.09), followed by home charging facility installation (3.97), PHEVs (3.95), and FCEVs (3.91). Respondents also showed high awareness of the environmental benefits, battery recycling, vehicle performance, mobile battery monitoring, regenerative braking, charging tariffs, driving comfort, government incentives, and spare-parts availability. Overall, the findings indicate that respondents are highly aware of the economic, environmental, technological, operational, and policy-related aspects of EVs. This high level of awareness may be attributed to increased exposure to media, government initiatives, manufacturers, and growing consumer experience with electric vehicles.

Table 3 Moderate Awareness Variables

Sl. No.	Variable	Mean
1	Availability of different brands and models	3.66
2	Vehicle registration procedures	3.66
3	Battery backup capacity	3.62
4	Charges related to battery swapping	3.61
5	Battery charging duration for EVs	3.61
6	Access to charging infrastructure	3.60
7	Warranty terms for motor and electrical components	3.58
8	Cost range of electric vehicles	3.56
9	Safety features of EVs	3.56
10	Government-provided direct subsidies	3.56
11	Charging connector types and compatibility	3.54

12	Digital dashboard and smart connectivity features in EVs	3.54
13	Availability of public charging stations in cities and highways	3.53
14	Vehicle-to-grid (V2G) technology	3.52
15	Quality of after-sales support and services	3.49
16	Types of battery and warranty coverage	3.47
17	National Electric Mobility Mission Plan (NEMMP)	3.46
18	Mode of payment or financing options	3.43
19	Suitability of EVs for long-distance travel	3.42
20	Fast charging technology for EV batteries	3.38

Source: Computed from collected primary data

Table 3 presents the variables under the moderate level of awareness category. The highest mean scores were recorded for availability of different EV brands and models and vehicle registration procedures (Mean = 3.66 each). Respondents also showed moderate awareness of battery backup, battery swapping charges, charging duration, charging infrastructure, vehicle cost, safety features, government subsidies, public charging stations, financing options, after-sales support, and fast-charging technology, with mean scores ranging from 3.38 to 3.62. Overall, the findings indicate that respondents have a reasonable but incomplete understanding of the operational, financial, technological, and policy aspects of EVs. Therefore, further awareness programmes, dealer demonstrations, and government initiatives are needed to improve consumer knowledge and encourage EV adoption.

Table 4 Low Awareness Variables

Sl. No.	Variable	Mean
1	Availability of authorized service centers	3.32
2	Cost of maintenance and upkeep	3.25
3	Government regulations for EV manufacturing and safety	3.25

Source: Computed from collected primary data

Table 4 presents the variables for which respondents exhibit a low level of awareness towards electric vehicles. Among these variables, availability of authorized service centers recorded the highest mean score within this category (Mean = 3.32), followed by cost of maintenance and upkeep (Mean = 3.25) and government regulations for EV manufacturing and safety (Mean = 3.25). The relatively lower mean scores indicate that respondents possess limited knowledge regarding the service infrastructure, maintenance costs, and regulatory framework governing electric vehicles. This lack of awareness may create uncertainty among potential consumers regarding the availability of reliable service facilities, long-term maintenance expenses, and compliance with government safety standards, thereby influencing their purchase decisions. The findings highlight the need for automobile manufacturers, dealers, service providers, and government agencies to strengthen awareness programmes focusing on authorized service networks, maintenance practices, and EV safety regulations. Improving consumer awareness in these areas will enhance confidence among prospective buyers, reduce perceived risks, and contribute to the successful adoption and sustainable growth of electric vehicles.

Table 5 Summary of Awareness Classification

Awareness Level	Mean Range	Number of Variables	Percentage
High Awareness	3.67–5.00	16	40.0%
Moderate Awareness	3.34–3.66	20	50.0%
Low Awareness	1.00–3.33	4	10.0%
Total		40	100%

Source: Computed from collected primary data

The classification shows that 50% (20 variables) fall under moderate awareness, indicating reasonable but improvable knowledge of EVs. 40% (16 variables) show high awareness, particularly regarding resale value, charging facilities, battery technology, environmental benefits, and government incentives. Only 10% (4 variables) fall under low awareness, covering smart charging, maintenance costs, safety regulations, and authorised service centres. Therefore, awareness programmes should focus on these low-awareness areas and emerging EV technologies.

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