



A STUDY ON ANALYSING THE PERCEPTIONS OF CUSTOMERS TOWARDS ELECTRIC VEHICLES IN INDIA

Dr Charu Bisaria*

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Abstract-

The transportation sector is one of the biggest contributors to greenhouse gas emissions, and as a result, there has been a growing interest in the use of electric vehicles (EVs) as a means of reducing carbon emissions. EVs are vehicles that use electric motors powered by batteries instead of internal combustion engines. Electric vehicles (EVs) have the potential to transform the Indian transportation system by reducing emissions, decreasing dependence on imported fuel, and improving air quality. However, despite the government's push towards EV adoption, the penetration rate remains low due to several challenges. The paper will review the existing literature on EVs, analyze data on EV adoption, and provide an empirical analysis of the perception of customers towards EVs and the factors that influence their decision to purchase or not purchase an EV. The aim of this research paper is also to discuss the prospects and challenges of electric vehicles.

Keywords: electric vehicles, automobiles, transportation, carbon emissions, prospects, challenges

*Assistant Professor, Amity Business School, Amity University Uttar Pradesh, Lucknow Campus, Lucknow

***Corresponding Author:** Dr Charu Bisaria

*Assistant Professor, Amity Business School, Amity University Uttar Pradesh, Lucknow Campus, Lucknow

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INTRODUCTION

The shift towards sustainable transportation has led to an increase in the popularity of electric vehicles (EVs). However, despite the many benefits of EVs, their adoption rate has been slower than anticipated. Electric vehicles (EVs) are gaining popularity in India due to their potential to reduce greenhouse gas emissions, dependence on fossil fuels, and overall environmental impact. The prospects electric vehicles in India are quite promising, given the current state of the industry.

India is the third-largest emitter of greenhouse gases in the world. The transportation sector is a significant contributor to India's carbon footprint, accounting for 14% of greenhouse gas emissions. The government has set an ambitious target of achieving 30% EV penetration by 2030. However, the current penetration rate of EVs in India is less than 1%. Electric vehicles (EVs) have emerged as a promising alternative to traditional internal combustion engine (ICE) vehicles in recent years. The growth of the EV market has been driven by a variety of factors, including environmental concerns, regulatory policies, and advances in battery technology. While the adoption of EVs is still in its early stages, the market is poised for significant growth in the coming years.

History of Electric Vehicles:

The history of EVs dates back to the 19th century, with the invention of the first electric car in 1837. While early EVs were limited in range and performance, technological advancements in battery technology and electric motors have made them a more viable alternative to ICE vehicles in recent years. In the early 2000s, the Toyota Prius and Tesla Roadster were among the first commercially successful EVs, paving the way for the current generation of EVs.

Current State of the EV Market:

The EV market has grown significantly in recent years, with global sales increasing from 450,000 in 2015 to reaching 145 million by 2030 according to a report by the International Energy Agency (IEA) published in 2021 under its Sustainable Development Scenario. Despite this growth, EVs still account for a small percentage of total vehicle sales, with market share ranging from 2% to 4% in most countries. China is currently the largest EV market, accounting for nearly 50% of global EV sales in 2020, followed by Europe and the United States.

The electric vehicle (EV) market in India was still in its nascent stages, but there were positive

developments indicating a potential for growth in the near future. The Indian government has been promoting EVs through various initiatives such as the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME) scheme, which provides subsidies for electric vehicles, and the National Electric Mobility Mission Plan (NEMMP) which aims to have 30% of all vehicles on the road to be electric by 2030. However, the market share of EVs in India is still very low, with only around 1% of the total vehicles sold in India being electric. The major reasons for this slow adoption are the high cost of EVs, lack of charging infrastructure, and range anxiety among customers. The EV market in India is still in its early stages and needs further government support and investments to develop charging infrastructure, improve the technology, and bring down the cost of EVs to make them affordable for the masses.

Literature Review

The literature on EVs has grown significantly in recent years, reflecting the growing interest in this technology. Many studies have examined the factors that influence the adoption of EVs, such as the availability of charging infrastructure, the cost of the vehicles, and government policies. One study by Zhou et al. (2021) found that government incentives were a significant driver of EV adoption in China. Another study by Lu et al. (2020) found that the availability of charging infrastructure was a key factor in EV adoption in the United States. Other studies have focused on the environmental benefits of EVs. A study by Hawkins et al. (2020) found that EVs produce fewer emissions than gasoline-powered vehicles over their lifetime. Another study by Jia et al. (2019) found that EVs had a positive impact on air quality in urban areas. Several studies have been conducted to explore the perception of customers towards EVs. One such study conducted by Krishnan et al. (2020) found that customers perceive EVs as more environmentally friendly, technologically advanced, and safer than gasoline-powered vehicles. Another study conducted by Zhang et al. (2020) found that customers' perceived benefits of EVs, such as lower fuel costs, reduced emissions, and improved driving experience, positively influenced their intention to purchase an EV. On the other hand, studies have also identified several barriers that hinder the adoption of EVs among customers. These barriers include high upfront costs, limited driving range, lack of charging infrastructure, and the perception of EVs as less powerful and less convenient than gasoline-powered vehicles (Heo et al., 2020; Zhu et al., 2021).

Objectives

1. To explore the general public's perceptions of electric vehicles, including their attitudes, beliefs, and concerns about these vehicles.
2. To investigate the factors that influence people's decision-making process when considering purchasing an electric vehicle.
3. To identify the barriers to adoption of electric vehicles and the potential strategies for overcoming them.
4. To compare perceptions of electric vehicles across different demographic groups: such as age, gender, income, and education level

Hypothesis

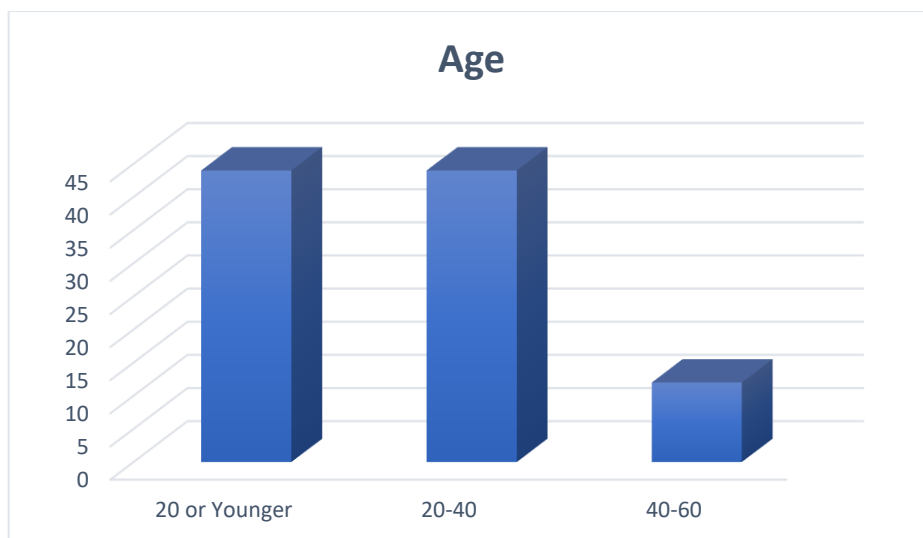
H1: Customers who have positive perceptions of the benefits of electric vehicles, such as environmental friendliness, cost savings, and performance, are more likely to have a favourable attitude towards EVs.

H2: Customers who are concerned about range anxiety and the availability of charging infrastructure are less likely to have a favourable attitude towards EVs.

H3: Demographic factors such as age and gender are significant predictors of the perception of customers towards EVs.

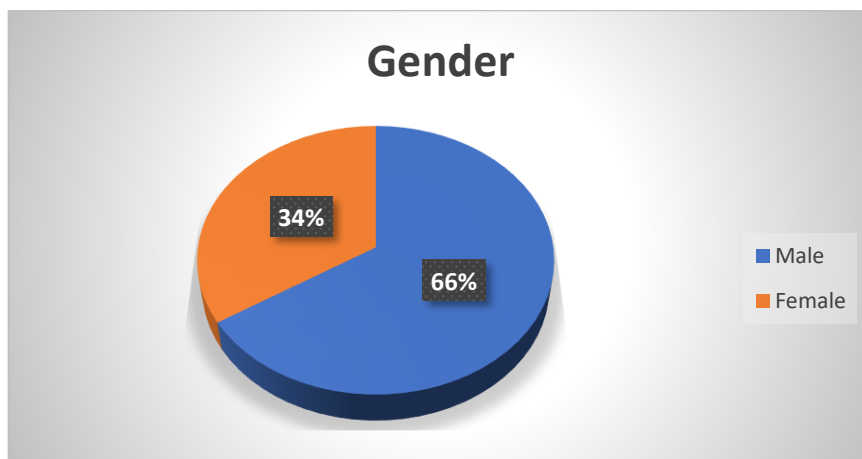
Research Methodology

This study is mainly descriptive in nature which focuses on awareness, demographics, perception of EVs and factors that influence the purchase decision of electric vehicles. The sampling unit taken is respondents of different age groups, gender, and locations. The sample size taken for study is 100 and sampling technique used is convenience sampling. Data collection instrument was structured questionnaire method which was collected through google forms

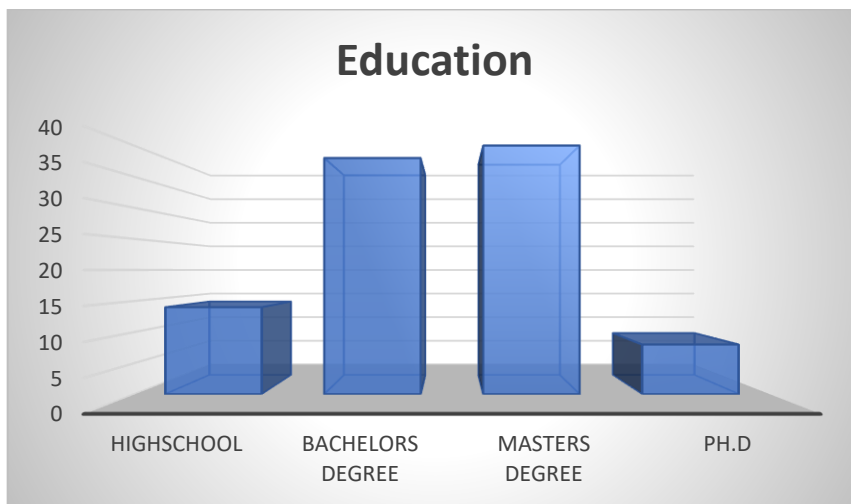


The demographic characteristics show that 44% of the respondents were in the age group of 20 or

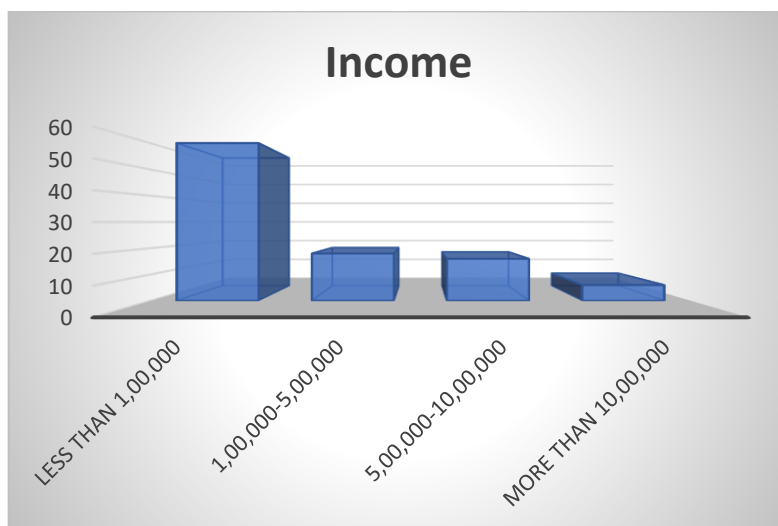
younger, 44% & were in the age group of 20-40 and rest 12% were in the age group of 40-60



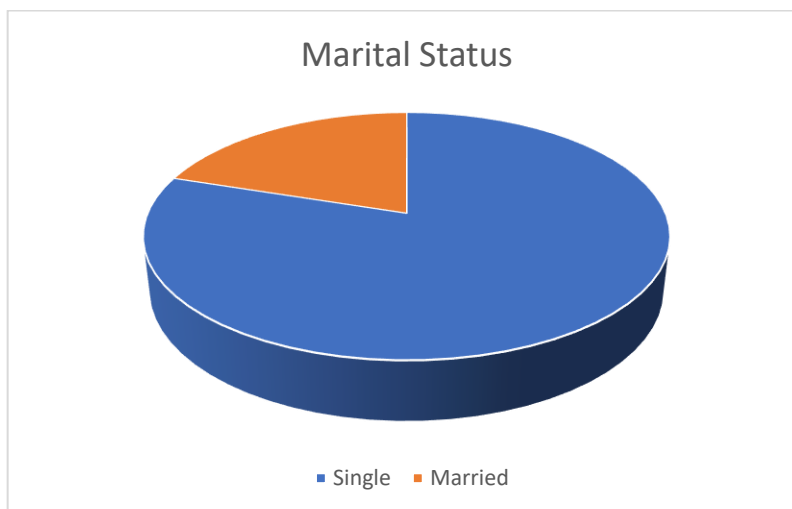
The demographic data shows that 66% of the respondents were male and rest 34% were females



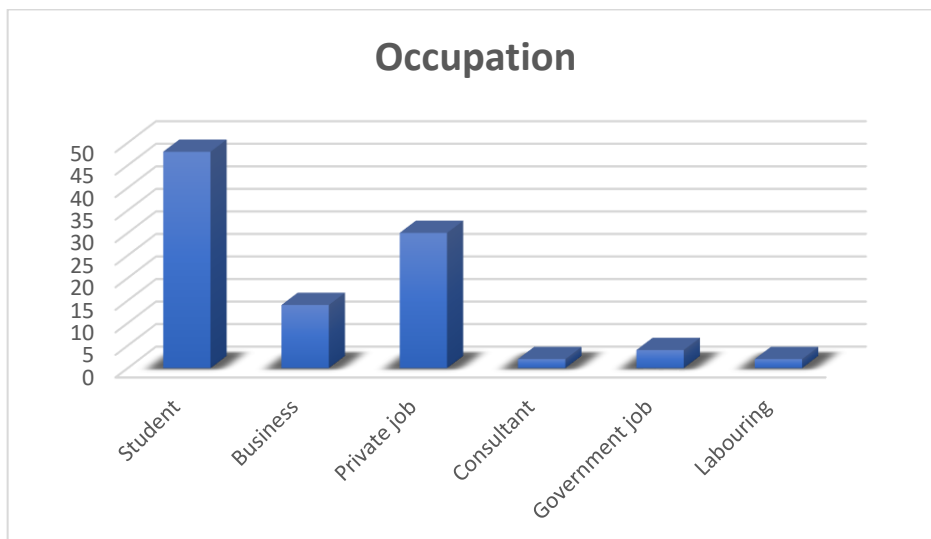
This survey shows that 38% respondents had Bachelors degree, 40% respondents had Master’s degree who were having interest in electric vehicle



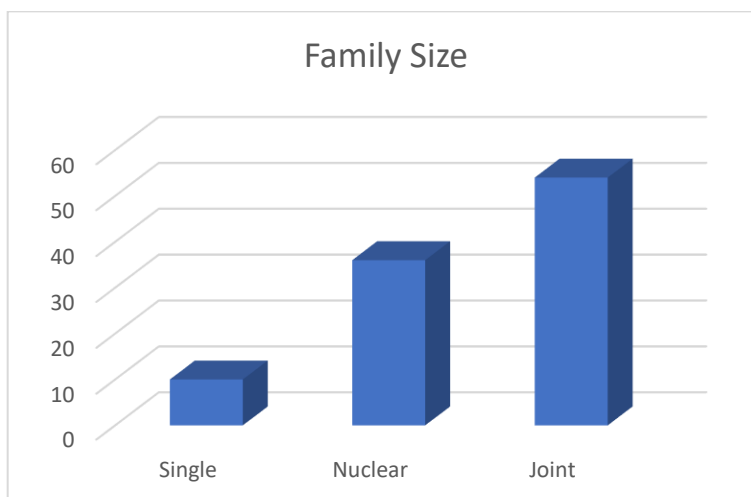
Maximum respondents surveyed had a monthly income of less than Rs 1,00,000



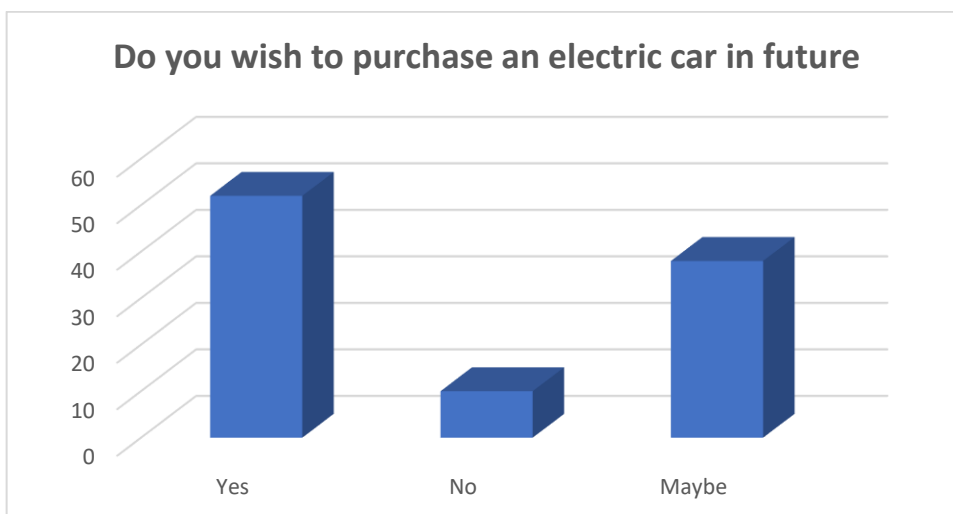
80% of the respondents were single and 20% married



Maximum respondents who were interested in electric vehicles were students and having private jobs

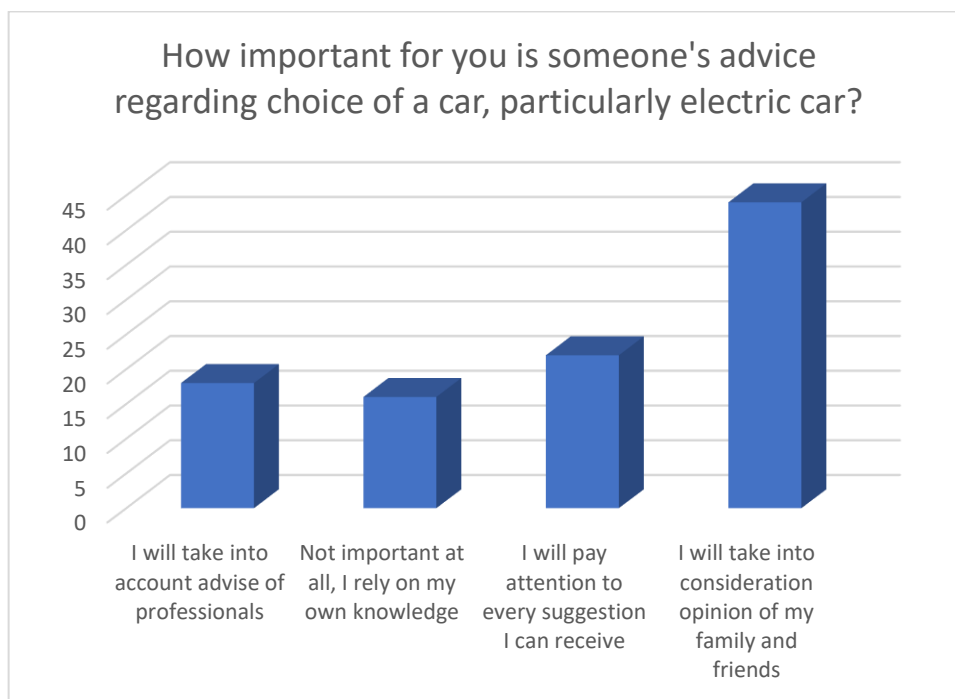


Maximum respondents were living in joint families



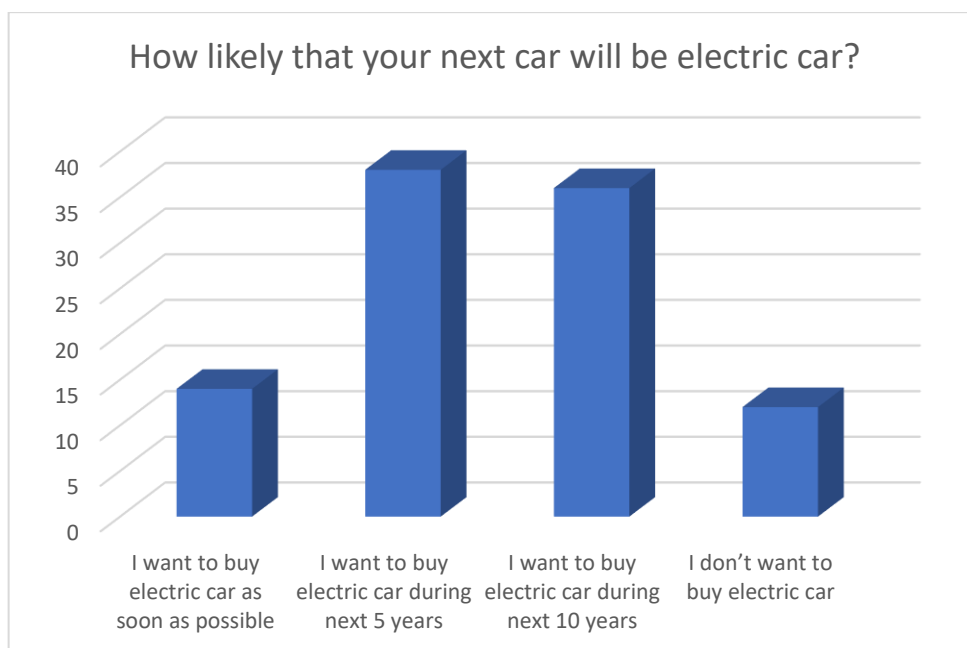
52% of the respondents wish to purchase electric vehicle in future, 10% don't want to purchase

electric vehicle whereas 38% of the respondents were not clear about the future decisions



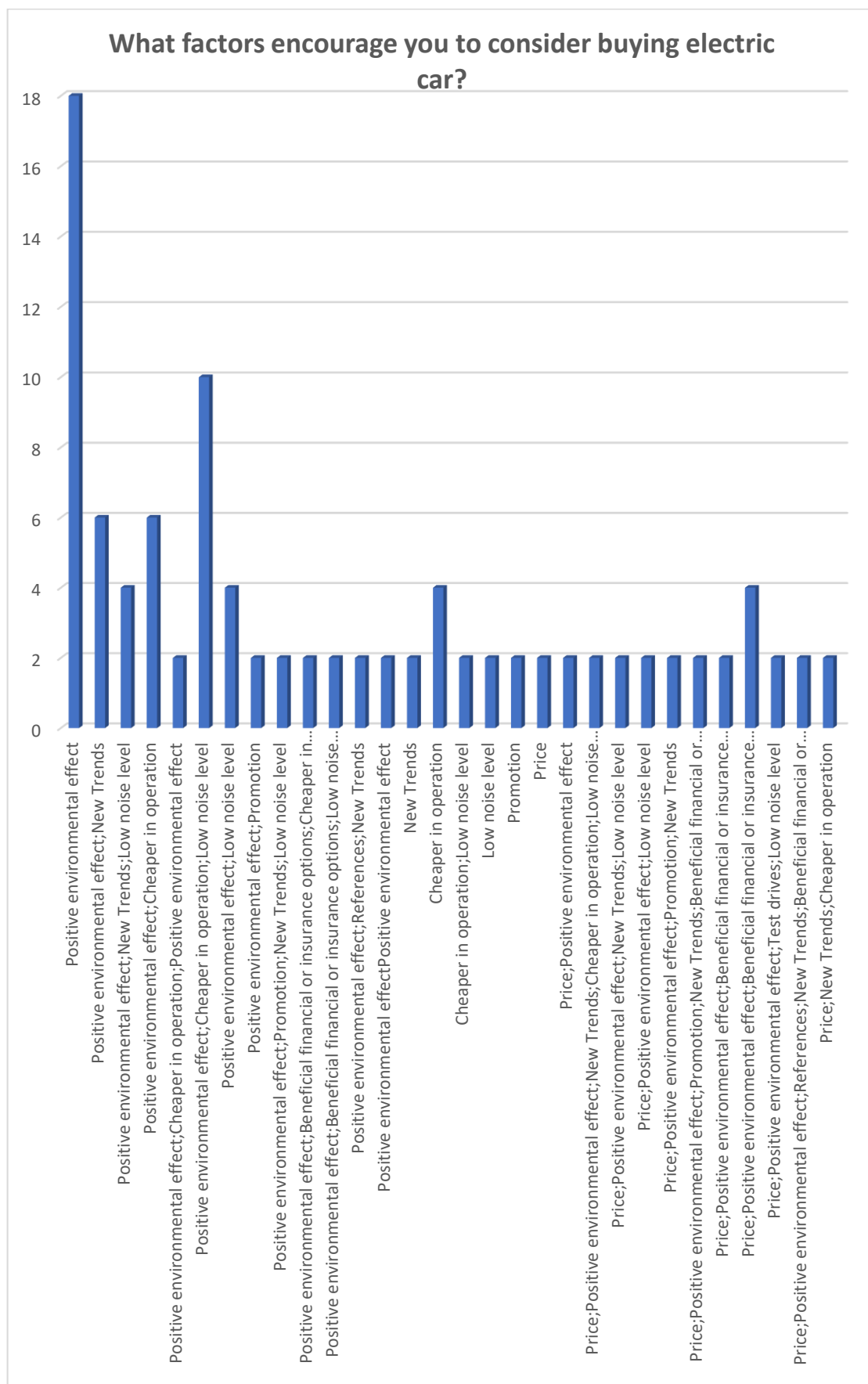
When respondents were asked about the importance of someone's advice when they purchase a electric vehicle, opinion of family and friends was at the top with 44% followed by the

suggestions received by them(22%). 18% respondents consider that advise of professions is important to them and only 16% wish to rely on their own knowledge.



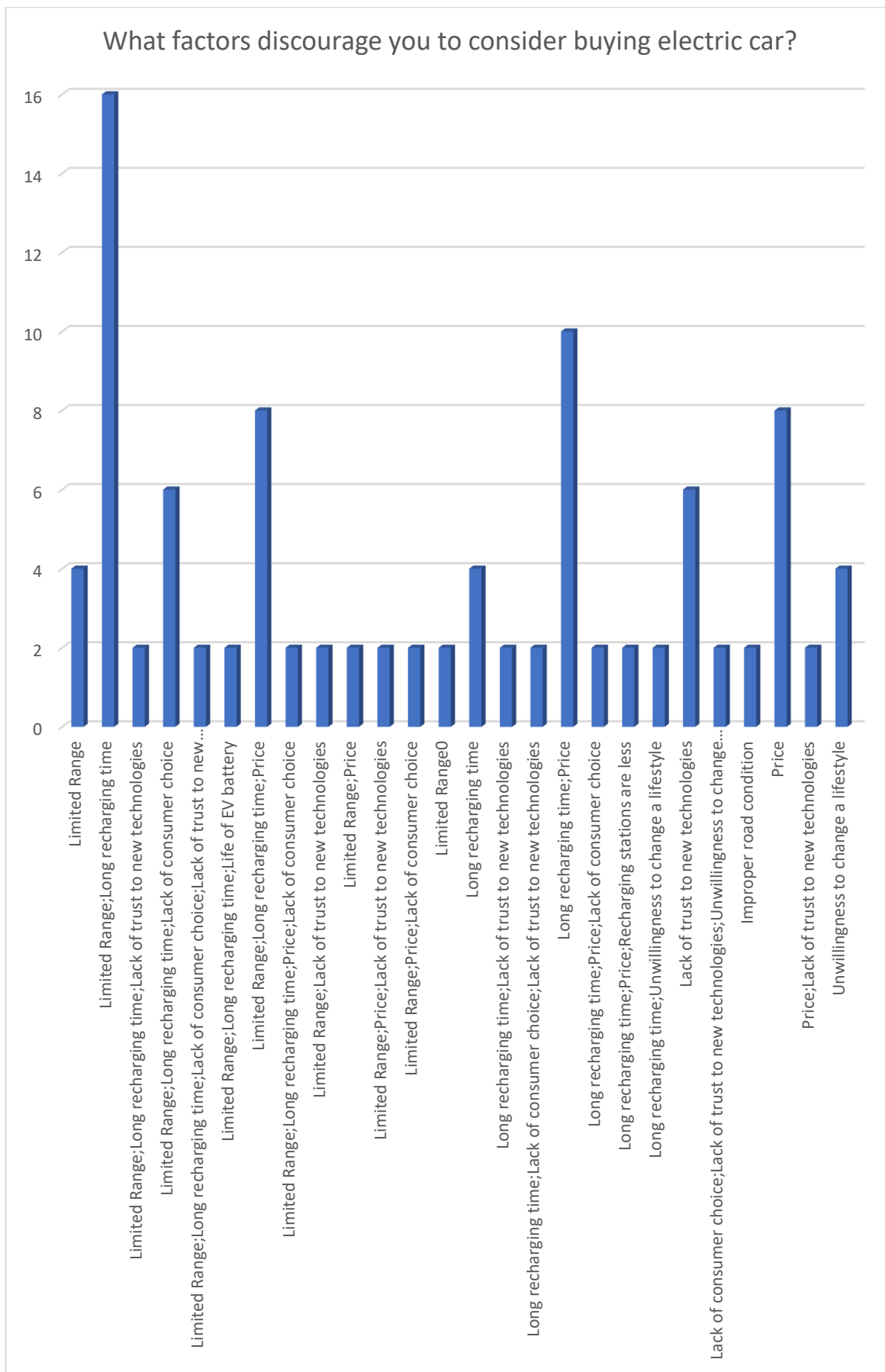
When the respondents were asked about the likeliness that their next car will be electric car then the response was very positive. 14% people want to

purchase electric car as soon as possible, 38% within 5 years , 36% within 10 years. Only 12 % respondents don't want to buy electric car in future



Among the factors that encourage the respondents to purchase electric vehicle the most important are positive environmental effect, cheap in operation,

low noise level followed by beneficial financial or insurance options, test drives, promotion , price, references and new trends etc.



Important factors that discourage the respondents to consider buying electric car are limited range, long charging time, price, lack of trust to new technologies followed by unwillingness to change a lifestyle, improper road condition, life of EV battery, lack of consumer choice etc

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technologies followed by unwillingness to change a lifestyle, improper road condition, life of EV battery, lack of consumer choice etc

SN	Hypothesis	Value	Degree of freedom	Decision
1	There is no significant relationship between Age and the feeling that electric cars can improve the environment	3.581 ^a	2	Accepted
2	There is no significant relationship between Age and the opinion that Electric cars can protect from global warming	4.949 ^a	2	Accepted
3	There is no significant relationship between Age and the view that Electric cars can replace regular cars in terms of satisfying consumer needs	6.684 ^a	4	Accepted
4	There is no significant relationship between Age and the opinion that Electric cars can save a lot of money to the owner	12.129 ^a	6	Accepted
5	There is no significant relationship between Age and the perception that Electric cars are very expensive	5.145 ^a	4	Accepted
6	There is no significant relationship between Age and the view that Maintenance infrastructure is well developed	7.315 ^a	6	Accepted
7	There is no significant relationship between Age and the view that Buying electric car will show my value and beliefs	4.212 ^a	6	Accepted
8	There is no significant relationship between Age and the opinion that owning an electric car have an influence on your image?	10.790 ^a	4	Rejected
9	There is no significant relationship between Age and the importance of someone's advice regarding choice of a electric car	17.199	6	Rejected
10	There is no significant relationship between Age and the likeliness that your next car will be electric car?	21.660 ^a	6	Rejected

Chi-square test was used to find the association of age with various opinion of respondents towards electric vehicles and it was found that no significant relationship exist between age and the environmental concerns, protection from global warming, replace regular cars, save a lot of money

to the owner, expensive, maintenance infrastructure is not developed, belief. Age has significant relationship with owing a electric can influence on self image, importance of someone's advise regarding choice of electric cars and the likeliness that the next car will be a electric car

SN	Hypothesis	Value	Degrees of Freedom	Decision
1	There is no significant relationship between Gender and the feeling that electric cars can improve the environment	2.311	3	Accepted
2	There is no significant relationship between Gender and the opinion that Electric cars can protect from global warming	1.826 ^a	1	Accepted
3	There is no significant relationship between Gender and the view that Electric cars can replace regular cars in terms of satisfying consumer needs	9.058 ^a	1	Rejected
4	There is no significant relationship between Gender and the opinion that Electric cars can save a lot of money to the owner	1.416 ^a	2	Accepted
5	There is no significant relationship between Gender and the perception that Electric cars are very expensive	3.719	3	Accepted
6	There is no significant relationship between Gender and the view that Maintenance infrastructure is well developed	3.701 ^a	2	Accepted
7	There is no significant relationship between Gender and the view that Buying electric car will show my beliefs and what I stand for	1.047 ^a	3	Accepted
8	There is no significant relationship between Gender and the opinion that owning an electric car have an influence on your image?	3.916	3	Accepted
9	There is no significant relationship between Gender and the importance of someone's advice regarding choice of a electric car	2.260 ^a	4	Accepted
10	There is no significant relationship between Gender and the likeliness that your next car will be electric car?	9.872 ^a	3	Rejected

In order to test the association of gender with various opinions towards electric vehicles it was seen that only view that the electric cars can replace regular cars in terms of satisfying consumer needs and the likeliness that your next car will be electric car has significant relationship with gender.

Findings

The findings show that electric vehicles are whole heartedly accepted by respondents below 40 years of age. The reason being that these people are ready to accept innovation in vehicles. They have huge concern for environment and for global warming and thus they are ready to welcome electric vehicles.

Findings also showed that maximum people who were interested in electric vehicles were either graduates or postgraduates. Thus, it can be interpreted that literate people can easily be convinced to accept electric vehicle as compared to respondents with low academic degrees. Maximum respondents surveyed had a monthly income of less than Rs 1,00,000 which shows that operating cost of electric vehicles is the major concern for shifting from petrol/diesel options.

Maximum respondents were single and were living in joint families. Maximum respondents who were interested in electric vehicles were students or having private jobs. Around 52% of the respondents surveyed wish to purchase electric vehicle in future, 10% don't want to purchase electric vehicle whereas 38% of the respondents were not clear about the future decisions. Thus shows that through proper promotion, pricing these customers can be convinced to purchase electric vehicles.

Opinion of family and friends was at the topmost importance while purchasing electric vehicle with followed by the suggestions received by them. Few respondents also consider advise of professions and few wish to rely on their own knowledge. Factors that encourage the respondents to purchase electric vehicle are positive environmental effect, cheap in operation, low noise level followed by beneficial financial or insurance options, test drives, promotion, price, references and new trends etc.

Important factors that discourage the respondents to consider buying electric car are limited range, long charging time, price, lack of trust to new technologies followed by unwillingness to change a lifestyle, improper road condition, life of EV battery, lack of consumer choice etc. When the

respondents were asked about the likeliness that their next car will be electric car then the response was very positive. Few people want to purchase electric car as soon as possible, others within 5 years or 10 years. Only very few respondents don't want to buy electric car in future. The reason for this may be that electric vehicles are new to market and few limitations are also there so that want to wait and watch for bugs to be removed and purchase the electric vehicle thereafter.

Chi-square test applied to age with various perceptions about electric vehicles showed that owning a electric car can have influence on self image, importance of someone's advise regarding choice of electric cars and the likeliness that the next car will be a electric car has significant relationship with age whereas in order to test the association of gender with various opinions towards electric vehicles it was seen that only view that the electric cars can replace regular cars in terms of satisfying consumer needs and the likeliness that your next car will be electric car has significant relationship with gender.

Prospects of Electric Vehicles:

1. Environmental benefits: EVs are considered environmentally friendly as they produce zero emissions at the tailpipe. They are powered by electricity, which can be generated from renewable energy sources such as solar, wind, or hydropower, thus reducing greenhouse gas emissions.
2. Reduced operating costs: Electric vehicles have lower operating costs than traditional gasoline-powered vehicles. The cost of electricity is significantly lower than gasoline, and electric vehicles require less maintenance.
3. Improved performance: Electric motors provide instant torque, which gives electric vehicles better acceleration and performance than traditional gasoline-powered vehicles.
4. Government incentives: Governments around the world offer incentives such as tax credits, rebates, and grants to encourage the purchase of electric vehicles. These incentives help reduce the initial purchase price of electric vehicles and make them more affordable for consumers.
5. Increased charging infrastructure: The development of charging infrastructure is essential for the widespread adoption of electric vehicles. Governments and private companies are investing in the development of charging infrastructure, making it easier for electric vehicle owners to charge their vehicles.

Challenges of Electric Vehicles:

1. Range anxiety: Electric vehicles have a limited range compared to traditional gasoline-powered vehicles. The range of electric vehicles is improving, but it is still a concern for some consumers.
2. High upfront costs: Electric vehicles are more expensive than traditional gasoline-powered vehicles. The cost of batteries, which is the most expensive component of electric vehicles, is expected to decline, making electric vehicles more affordable.
3. Charging time: Electric vehicles take longer to charge than it takes to refuel a traditional gasoline-powered vehicle. The development of fast charging technology is reducing charging times, but it is still a challenge for some consumers.
4. Battery technology: Battery technology is improving, but there are still challenges in terms of battery life, durability, and safety. Improvements in battery technology are essential for the widespread adoption of electric vehicles.
5. Grid infrastructure: The widespread adoption of electric vehicles could strain the electricity grid. The development of smart grid technology is essential for managing the increased demand for electricity

CONCLUSION

In conclusion we can say that respondents are interested in electric vehicles as it has got many advantages. There are few limitations in sale of electric vehicles like less number of charging stations, price, limited range etc. In order to remove these limitations Government should give more rebate or subsidy in the initial stages as the price of electric vehicles is more. Incentives should be given to business people to open more charging points. More work should be motivated in technology area to increase the range of electric vehicles. As pollution is one of the major concerns so electric vehicle should be promoted and must substitute petrol/diesel vehicles in the coming years. In conclusion, the EV market in India is still in its early stages and needs further government support and investments to develop charging infrastructure, improve the technology, and bring down the cost of EVs to make them affordable for the masses.

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