2023

" CONSUMER BEHAVIOUR TOWARDS BUYING ELECTRIC VEHICLES "

BANARAS HINDU UNIVERSITY

" CONSUMER BEHVIOUR TOWARDS BUYING ELECTRIC VEHICLE "

PROJECT REPORT

In Partial fulfillment of the requirement for the award of Bachelor's Degree (hons.) in

STATISTICS

Under the supervision of :-   Submitted by :-

Prof. Sanjay Kumar Singh   **Gagan Kumar Mishra**

Department of statistics   B.Sc. (hons.)-Statistic

Institute of Science   Enrollment no. :- 428591

Banaras Hindu University   Exam Roll no. :- 20220STA019

Certificate

The project report titled

" <u>CONSUMER BEHAVIOUR TOWARDS</u>

<u>BUYING ELECTRIC VEHICLE</u> "

Submitted by **GAGAN KUMAR MISHRA** (Exam roll no.-20220STA019) for the partial fulfillment of the B.Sc. (hons.) in statistics for the session 2022-2023, has been originally completed by him under my supervision. I recommend this project report for the evaluation.

Prof. Sanjay Kumar Singh

Department of Statistics

Institute of Science

Banaras Hindu University
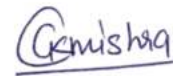
Date: 06|05|23   **Varanasi 221005**

Acknowledgement

Firstly, I praise and thank almighty god who showers his plentiful blessings upon me, who guide, shield and strengthen me all the time.

I have a great pleasure in expressing my deep sense of gratitude and ineptness to **Prof. Sanjay Kumar Singh (Department of Statistics), Banaras Hindu University**, my supervisor of the continuously guidance and giving invaluable suggestion at all stages during course of this work. In his natural parental style, he has provided constant support and encouragement in successful completion of this work in its present form.

Again, I want to say my sincere thanks to my supervisor and Head of Department, Department of Statistics, Institute of Science, Banaras Hindu University (BHU) for providing facilities existing in the department during project work.

At last, I am very thankful to my parents for providing me their valuable time and financial help for completing this project work.

Gagan Kumar Mishra

B.Sc. (hons.) 3rd year

Institute of Science

Date: 06|05|23   **Banaras Hindu University**

<u>Abstract</u>

With the current depletion of fossil fuels and its price hike, there is a need for another energy resource to run the vehicle. The automobile sector is considering Electric Vehicles as a solution to the industry and environment in India. However, the current market penetration of EV is relatively low in spite of governments implementing Electric vehicle policies. Through this project, awareness level about Electric vehicles and factors influencing consumers to consider purchasing Electric vehicles will be studied and consumer response for the same will be analyzed. The research will be based on primary data. The data will be collected through a detailed questionnaire. Since the youth are the future of the nation, therefore their opinion matters and hence the target for the data collection would be youth of the age group 18-30 who are students.

CONTENTS

Chapter 1 : Introduction

1.1   Rationale of the Study :-

Although the rapid progress of the global economy and technology has advance human civilization, it has also caused tremendous damage to the global ecological environment. Therefore, humans are thinking seriously about the environment and its sustainable development. One of the solutions to these environmental problems is new energy vehicles.

From an energy perspective, more abundant energy sources for vehicles will improve the reliability and balance of energy consumption. Coupled with the intelligent development of electric vehicles, traffic status and road usage will be significantly improved. The IEA (2017a) has indicated that, based on vehicle fuel cycle calculations, electric passenger vehicles in Europe in 2015 emitted 50%less carbon dioxide than gasoline vehicles and 40% less carbon dioxide than diesel vehicles. When emissions related to vehicle manufacturing are considered, carbon dioxide emissions are reduced.

However, Ellingsen et al, clearly stated that, considering the full life cycle of vehicles (manufacture, usage, and scrap),Under the current European electricity production structure, pure electric vehicles can reduce greenhouse gas emissions by about 30% compared to internal combustion engine vehicles. For countries with carbon-intensive power production structures (such as India), with the full life cycle of vehicles considered, the reduction may even be greater. With the dual pressure of resource reduction and environmental changes, electric vehicles will become the mainstream development trend of the future automotive industry. Therefore, it is a critical issue to develop low-carbon, energy-saving, and intelligent electric vehicles to reduce environmental impact. This paper studies consumers' opinions of electric vehicles in an uncertain environment, and analyzes the factors influencing consumers' acceptance of electric vehicles, in order to improve the penetration of electric vehicles into the market and to provide reference suggestions for future researchers.

1.2 Introduction to the Industry :-

Of all the oil consumed in the World, 20 percent is used for transportation. Further, passenger vehicles use 70 percent of transportation oil. By 2050,there may be as manyas 1.5 billion carson the road, compared to 750 million in 2010.This type of demand represents both a challenge and an opportunity to capitalize on new vehicle technologies, and in the process, reap substantial economic development benefits. In a world where oil is a limited resource, an alternate source of transportation fuel –electricity –is not only a smart investment, but as some would say, it is an inevitable one. Further, the switch to electric vehicles will generate demand for existing jobs and create new jobs as well. As study after study confirms, job growth in electric vehicle industries will outweigh any reduction of jobs in traditional fuel industries, resulting in net job growth. Electric vehicles create additional economic development opportunities by improving quality of life, reducing energy spending, and decreasing reliance on foreign oil.

Now let's take a step back to know where this electric vehicle comes from, Electric vehicles technology came into existence in 1837 in Scotland by Robert Anderson. He made the first electric crude vehicle which works on both electric motor and crude engine. After that many scientist performed different research and invented different electric vehicle. Each vehicle would have more improvement compared to previous electric vehicle. Scientist made improvements in battery technology, electric motor which improved efficiency and speed of vehicle day by day. Abstract Electric mobility revolution is considered as biggest revolution for automobile industrial sector. This revolution came into existence due to depletion of crude oil, fossil fuels, natural gas etc. To overcome this crisis many technologies have been developed by different nations in our world. In India electric vehicles was introduced in the year 2011 by Mahindra electric mobility Ltd. And Revai electric company car i.e. Revai electric car. The global automotive industry is undergoing a paradigm shift at present in trying to switch to alternative/less energy intensive options. India, too, is investing in this electric mobility shift. The burden of oil imports, rising pollution, and as well as international commitments to combat global climate change are among key factors motivating India's recent policies to speed up the transition to e-mobility.

The Indian automotive industry is the fifth largest in the world and is slated to be the third largest by 2030. Catering to a vast domestic market, reliance on the conventional modes of fuel intensive mobility will not be sustainable. In an effort to address this, federal policymakers are developing a mobility option that is

"Shared, Connected, and Electric" and have projected an ambitious target of achieving 100 percent electrification by 2030.By making the shift towards electric vehicles (EVs), India stands to benefit on many fronts: it has a relative abundance of renewable energy resources and availability of skilled manpower in the technology and manufacturing sectors.

According to an independent study by CEEW Centre for Energy Finance (CEEW-CEF), the EV market in India will be a US$206 billion opportunity by 2030 if India maintains steady progress to meet its ambitious 2030 target. This would require a cumulative investment of over US$180 billion in vehicle production and charging infrastructure. Another report by India Energy Storage Alliance (IESA) projects that the Indian EV market will grow at a CAGR of 36 percent till 2026. The EV battery market is also projected to grow at a CAGR of 30 percent during the same period.

The FAME India Scheme is an incentive scheme for promotion of electric and hybrid vehicles. It aims to promote electric mobility and gives financial incentives for enhancing EV production and the creation of electric transportation infrastructure. In 2015 the Ministry of Heavy Industries and Public Enterprises launched FAME to incentivize the production and promotion of eco-friendly vehicles including EV and hybrid vehicles. The scheme is proposed for establishing charging infrastructure) . The National Electric Mobility Mission Plan (NEMMP) 2020, a National Mission document providing the vision and therefore the roadmap for the faster adoption of EVs and its manufacturing. This plan has been designed to boost national fuel security, to supply affordable and environmentally friendly transportation, and to enable the Indian automotive industry to attain global manufacturing leadership.

1.3   Introduction to the Companies :-

Regardless of the country's ambitious targets, India's EV space is at a nascent stage. It is less than 1% of the total vehicle sales however has the potential to grow to more than 5% in a few years. At present there are more than 5 lac electric two-wheelers and few thousand electric cars on Indian roads. The industry volumes have been fluctuating, mostly depending on the incentives offered by the government. However, looking at it differently – India offers the world's largest untapped market, especially in the two-wheeler segment. 100 percent foreign direct investment is allowed in this sector under the automatic route.

Responding to this opportunity, leading players like OLA Electric Mobility Pvt, Ather Energy, and Mahindra Electrics are rapidly growing their market presence.

Moreover, certain states like Karnataka and Tamil Nadu are rolling out innovative and timely investor-friendly policies besides building necessary infrastructure. Recently, the American electric vehicle and clean energy company Tesla Inc. marked its entry into India by incorporating its subsidiary, Tesla India Motors and Energy Pvt Ltd, in Bangalore.

In February 2021, Ather Energy, India's first intelligence EV manufacturer moved its US$86.5 million factory from Bangalore (Karnataka) to Hosur (Tamil Nadu). Ather Energy's factory is said to have an annual production capacity of 0.11 million two-wheelers.

This week, Ola Electric, the subsidiary of the unicorn Indian ride-hailing start-up, also announced that it would be setting up the world's largest electric scooter plant in Hosur (which is a two and a half-hour drive from Bangalore over the next 12 weeks, at a cost of US$330 million, and aiming to produce 2 million units a year. By 2022, Ola Electric wants to scale up production to pump out 10 million vehicles annually or 15 percent of the world's e-scooters.

There have also been positive developments in the expansion of charging infrastructure across the country – states like Andhra Pradesh, Uttar Pradesh, Bihar, and Telangana are setting impressive targets for the deployment of public charging infrastructure to increase uptake of electric vehicles in the country.

Recently, Sterling and Wilson Pvt. Ltd (SWPL), India's leading engineering, procurement, and Construction Company announced its entry into the electric mobility segment in India. It has signed a 50-50 joint venture with Enel X, to be incorporated on April 1, 2021, to launch and create innovative charging infrastructure in India.

1.4 Justification of the Study :-

The shift towards EVs in India is imperative in the near future, though not imminent. Several cities are victims of unplanned urbanization and high pollution. They suffer unqualified degradation, with vehicular emission as the primary source. The Government of India has announced that all cars need to be electric by 2030. Society of Indian Automobile Manufacturer (SIAM, 2017) followed this with their white paper stating that EVs would make up 40 per cent of new car sales by 2030 and 100 per cent by 2047. This milestone date coincides with 100 years of the country's independence

As we can see in the introduction , there seems to be an overflowing amount of Data and changes coming towards the consumer regarding the Automobile industry and electric vehicles. From a consumer's point of view, when they make purchase decisions, they face more alternatives due to information exchange, and the aspects that they value during purchase are also varied. Although the popularity of electric vehicles is increasing, the market ratio of electric vehicles is still very low. Consequently, the key to this study is to investigate how to make consumers better accept electric vehicles, and explore the conditions which influence consumers' acceptance of electric vehicles. Therefore, this study aims to investigate the factors influencing consumers' purchase of electric vehicles in order to provide a reference for the design and development of electric vehicles and offer suggestions for companies regarding future consumer purchases of electric vehicles.

Chapter 2: Review of Literature

2.1 International Review-

(CFA, 2015& 2016) Second annual electric vehicle survey by Consumer Federation of America shows consumer interest in the technology is growing. Electric vehicle sales are outpacing hybrid vehicle sales in their respective years of market introduction. Survey by Consumer Federation of America also shows how knowledge affects consumer interest in EVs. Clear and significant correlation between EV knowledge and positive attitudes towards the technology. Positive attitudes and a willingness to purchase them are also correlated. For consumers that were more knowledgeable, there was a significant correlation between understanding and purchase desire.

(Gyimesi & Viswanathan, 2011) Interviews with executives from auto companies and survey of consumers to understand their attitudes towards EVs. 45% of the drivers they surveyed have little to no understanding of EVs. Consumers with better understanding are generally more willing to pay a premium for the technology. Nevertheless, even well informed consumers are sometimes unaware of the lifetime fuel savings that EVs offer.

(Lingzhi Jin, 2017) The early market growth for electric vehicles continues, but a number of barriers prevent their widespread uptake. These barriers include the additional cost of the new technology, relative inconvenience of technology considering range and charge times, and consumer understanding about the availability and viability of the technology. This last point, typically referred to as "consumer awareness," is crucial.

(Kahn, 2007) Found that people who show concern towards the environment are more inclined to adopt EVs, supporting these findings were **(Pierre, Jemelin, and Louvet, 2011)**. People who are inclined to environmental protection and energy conservation exhibit higher intention for adoption. Pro-environmental consumers are the probable EV adopters.

(Larson et al, 2014) A survey of consumer attitudes was carried out and results were analysed. Individuals with greater familiarity and experience with EVs are more likely to value the vehicles higher and consider them in future purchases.

(Breakwell, 1993) Consumer's car evaluation considers performance attributes like efficiency and comfort. Additionally, it evaluates factors, such as the symbolism of IM and social status. Individuals compare themselves with others to increase their self-

recognition and IM. People attribute high symbolic value to their vehicle as indicated by **(Helveston et al,2015)** in their investigations.

(Egbue & Long, 2012) Survey that samples technology enthusiasts to determine attitudes toward EVs. Consumer attitudes and uncertainty regarding EV battery technology and sustainability of fuel sources may be a barrier to widespread adoption; this uncertainty may stem from lack of understanding and familiarity.

2.2 National Review-

(Jeetender Sharma, 2020) The market and consumer sentiments toward electric vehicles are principally positive. The consumer mindset is evolving, which will ultimately lead to healthy growth for the electric vehicles. It is being said that EVs will become mainstream in less than a decade and can be taken as a sign of markets being aggressively ready for a product launch and marketing by automobile companies.

(Pritam K. Gujarathi, 2018) Indian Scenario is different because the current market share of EV/PHEV is around 0.1%. Presently almost all vehicles consider fossil fuel-based transportation. These pollute the atmosphere by the emission of greenhouse gases & causes global warming. The gap between domestic petroleum production and consumption is widening. India imports around 70% of oil required per annum. Hence there's an urgent need to investigate factors and challenges for sustainable and cleaner alternatives.

(Janardan Prasad Kesari, 2019) Developing an aggressive strategy for the adoption of EVs in India and ensuring a well-executed implementation is a challenge but vital for government. The geography and diversity of India will present problems that require thoughtful solutions. Public procurement is expected to be an important driver of growth of EVs, with the purchase of four-wheeled vehicles for government offices, three-wheeled vehicles and buses for public transport. Investments by fleet operators such as Ola and Uber, and operators of food distribution services, are also expected to boost the initial growth of two and four-wheeled electric vehicles. However, the private EVs may take 5-6 years to gain popularity and acceptance.

(Mr. A. Rakesh Kumar, 2019) Global pollution is on the rise and each effort made, is to cut back the CO2 emissions and save the earth. One such effort is the introduction of EVs. The transport sector is one in all the largest emitter of CO2 and hence it's important to reduce it. The government has come up with ambitious plans of introducing EVs to the Indian market and confine pace with the event of EVs globally. The National Electric Mobility Mission Plan 2020 has included an in-depth report on the EVs. India encompasses a huge challenge in shifting the transportation sector from

ICE engines to EVs. This needs lots of planning along with R&D. Charging infrastructure must be adequately build to deal with range anxiety.

(Pretty Bhalla, 2018) Choice of cars depends upon environmental concern, cost, comfort, trust, technology, social acceptance, infrastructure availability. These arguments have been tested for both conventional cars and EVs. They assume that these factors have direct influence on individual choice of vehicle. They found that EV manufacturers and Government have to invest more in social acceptance of the vehicle by creating more infrastructural facilities, putting more thrust on technology to create trust. The analysis depicts that the population is well aware of the environmental benefits. The responsibility lies on the shoulders of the Government and manufacturers to investing in the manufacturing of vehicles.

(Mohamed M, 2018) The replacement of ICE with electric engines will reduce pollution to a great extent and be profitable to consumers. Many countries have implemented this technology and are contributing to the improvement of the environment. The researcher saw the opportunities and challenges faced in India over implementing EVs. Opportunities like Government Initiatives, Batteries, Industries, and Environment have been considered. With these challenges like cost of EVs, efficiency of EVs in India and demand for EVs were taken into consideration. The implementation of EVs in India aims primarily to scale back greenhouse emissions and cut oil expenses. The govt. should make the foremost out of the opportunities available and find suitable ways to tackle the challenges.

Chapter 3: Research Methodology

3.1 Statement of the problem :

The topic of the project is 'a study on the consumer behavior towards buying electric vehicles: with special reference to youngsters. The study's goal is to examine the current state of electric car potential, as well as customer attitudes and preferences regarding electric vehicles, particularly among young people. The research would also aid in concentrating on the numerous elements that may have influenced the use of electric vehicle.

The significance of study is to analyse customer's attitudes toward electric vehicles as well as projected demand in the future. As a result, statistical study of people's desire for electric vehicles would be possible. The research would also aid in deducing the experiences and perspectives of various electric vehicle customers.

3.2 Objective of the study :

- To know the awareness level of of Electric vehicle among consumers.
- To examine the factors affecting the decision to purchase electric vehicle.

3.3 Area of the survey :

According to the aim of the survey the area for sample collection would be broader,
But I have restricted the area to the students of age 18-30 of Banaras Hindu University.

3.4 Sampling techniques :

A group of units or elements which have well defined characterstics under study, called population. The population may be finite or infinite , a finite population in which unit of population is finite and an infinite population is one in which member of population is infinite. A sample is a finite subset of statistical individuals in a population and a number of individuals/units in a sample is called a sample size. On the basis of sample, we can estimate about the population parameter in which we are interested. The sample was selected by using random sampling as sampling technique & Sample size collected for survey is 151.

3.5 Data collection :

The data has been collected through random sampling, from the sample respondents through the schedule with the help of the questionnaire which was distributed online.

3.6 Data analysis and reporting :

Data analysis involves summarizing the Raw data and interpreting their meaning which provides clear answer to questions in which we are interested. For this purpose, I have used software named as **MS-EXCEL** & **MS- WORD**. Then I analysis and interpret the data using statistical tools (bar chart, histogram and pie chart) available in **MS EXCEL** and also uses **Chi-square test**.
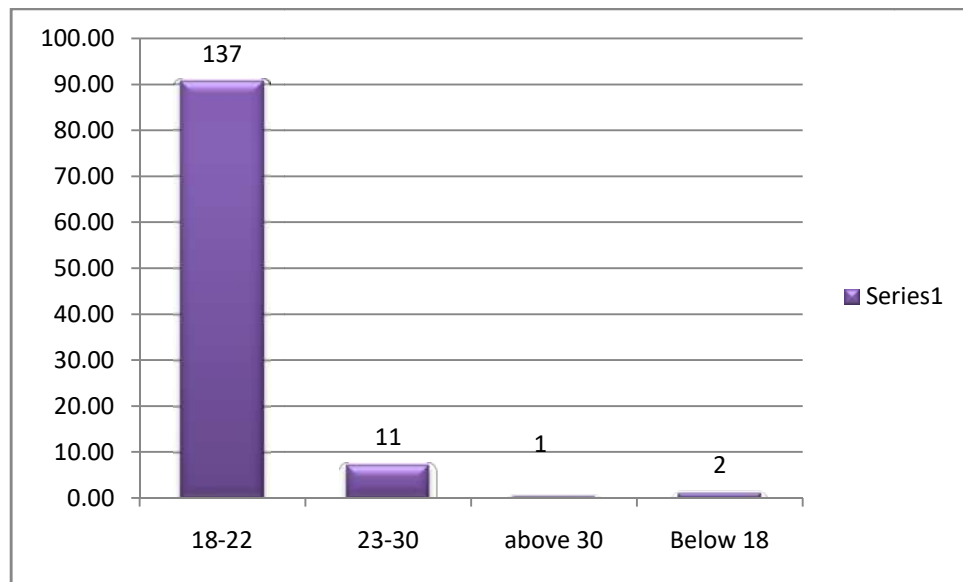
Chapter 4

Tabulation

&

Graph Interpretation

Age wise respondents

Table-4.1

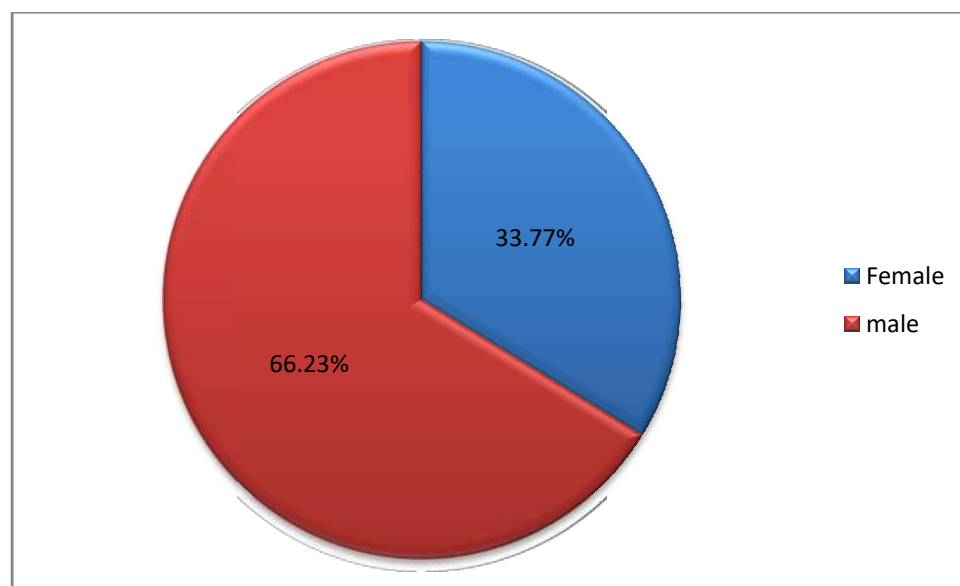| AGE	FREQUENCY	PERCENTAGE
Below 18	2	1.32%
18-22	137	90.73%
23-30	11	7.28%
Above 30	1	0.66%
Total	151	100%

Figure-4.1

Interpretation :-

- The primary data is collected from 151 respondents.
- **1.32%** of the respondents are of age group **below 18.**
- **90.73%** of the respondents are of age group **18-22.**
- **7.28%** of the respondents are of age group **23-30**.
- **0.66%** of the respondents are of age group **above 30.**

Gender wise respondents

Table-4.2

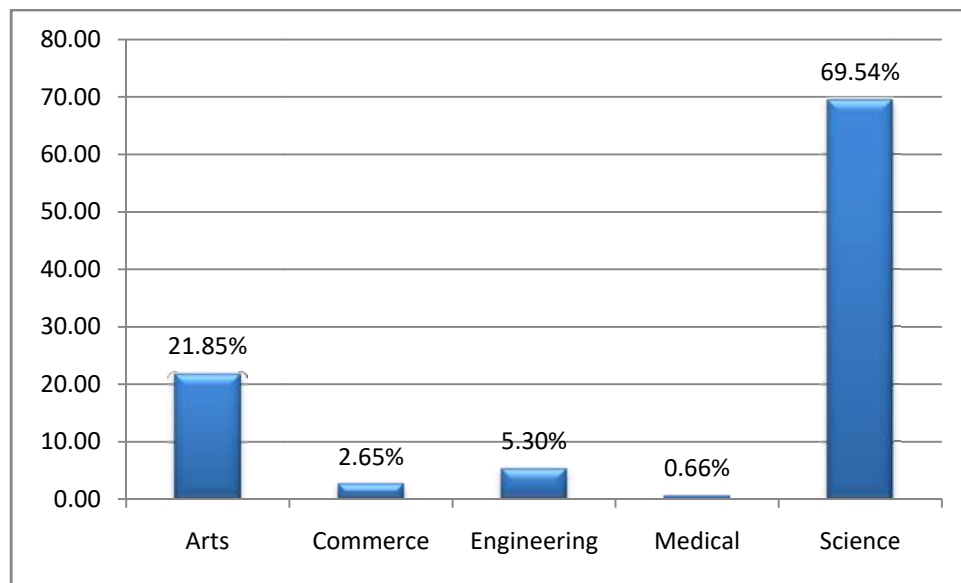| GENDER	FREQUENCY	PERCENTAGE
Male	100	66.23%
Female	51	33.77%
Total	151	100%

Figure-4.2

Interpretation :-

- The primary data is collected from 151 respondents.
- **33.77%** of the respondents are **female.**
- **66.23%** of the respondents are **male.**

Faculty wise respondents

Table-4.3

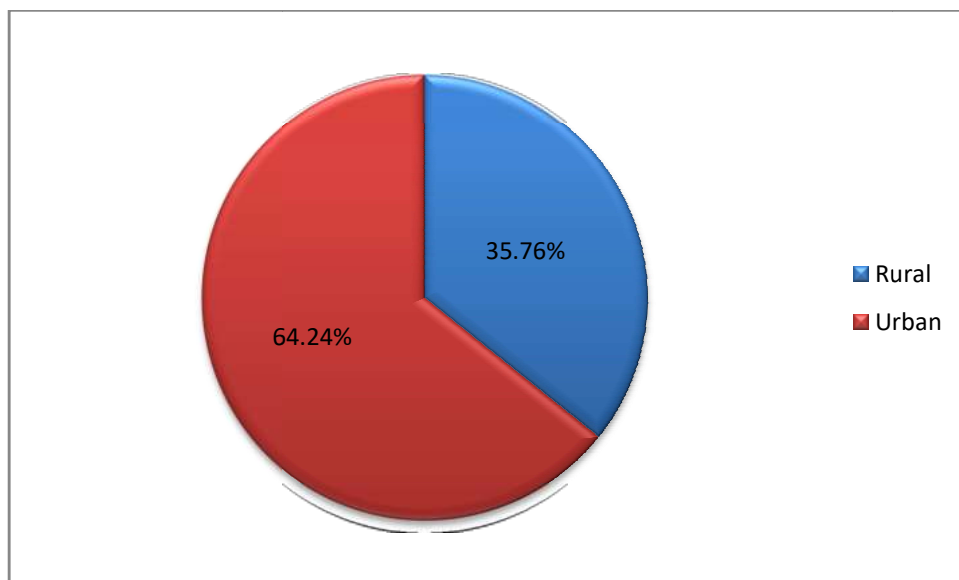| FACULTY	FREQUENCY	PERCENTAGE
Science	105	69.54%
Arts	33	21.85%
Commerce	4	2.65%
Engineering	8	5.30%
Medical	1	0.66%
Total	151	100%

Figure-4.3

Interpretation :-

- The primary data is collected from 151 respondents.
- **69.54%** of the respondents are from **Science faculty**.
- **21.85%** of the respondents are from **Arts faculty.**
- **2.65%** of the respondents are from **Commerce faculty**.
- **5.30%** of the respondents are from **Engineering .**
- **0.66%** of the respondents are from **medical Science**.

Family's Residential Locality

Table-4.4

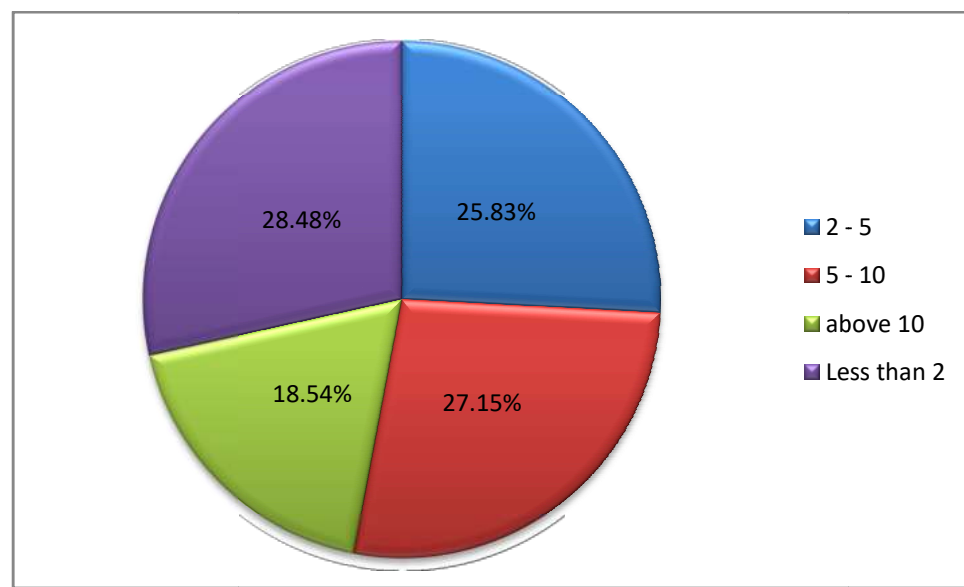| RESIDENT	FREQUENCY	PERCENTAGE
Urban	54	64.24%
Rural	97	35.76%
Total	151	100%

Figure-4.4

Interpretation :-

- The primary data is collected from 151 respondents.
- **35.76%** of the respondents are from **Rural locality.**
- **64.24%** of the respondents are from **Urban locality**.

Family's yearly income(in lakh)

Table-4.5

INCOME GROUP	FREQUENCY	PERCENTAGE
Less than 2	43	28.48%
2-5	39	25.83%
5-10	41	27.15%
Above 10	28	18.54%
Total	151	100%

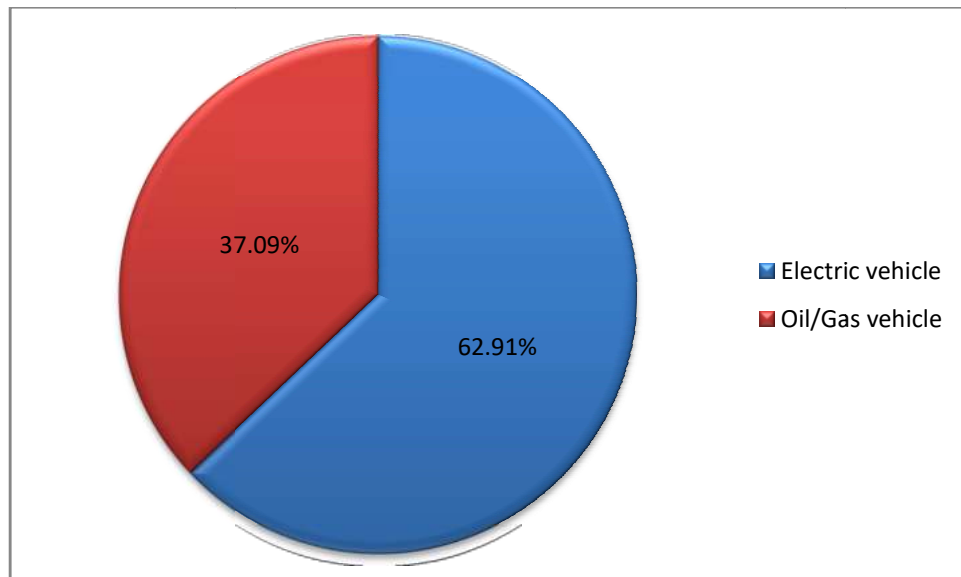## Figure-4.5

Interpretation :-

- The primary data is collected from 151 respondents.
- **28.48%** of the respondents belongs to **Less than 2 lakhs** Group.
- **25.83%** of the respondents belongs to **2-5 lakh** group.
- **27.15%** of the respondents belongs to **5-10 lakh**goup.
- **18.54%** of the respondents belongs to **above 10 lakh** group.

Vehicle type preference

Table-4.6

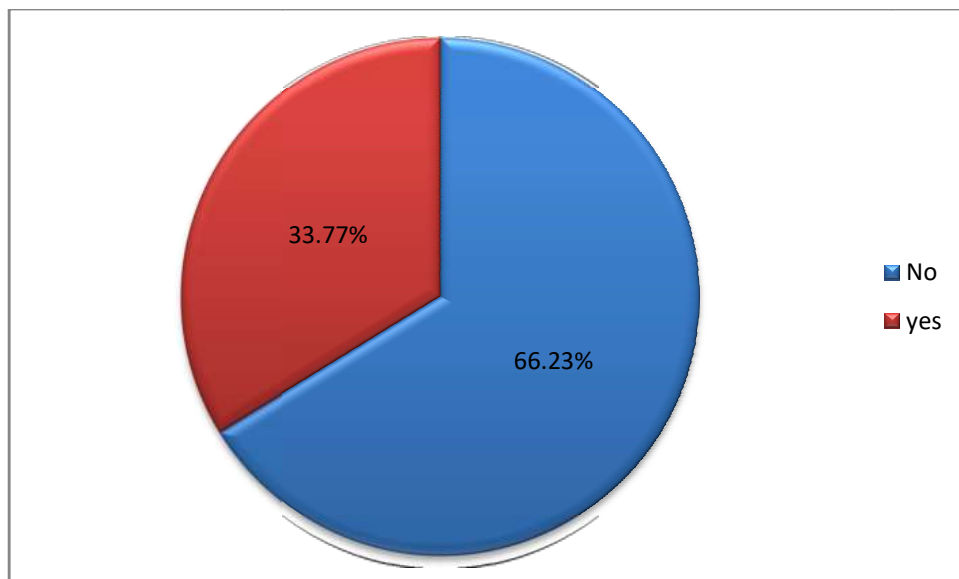| PREFERENCE	FREQUENCY	PERCENTAGE
Electric vehicle	95	62.91%
Oil/gas vehicle	56	37.09%
Total	151	100%

Figure-4.6

Interpretation :-

- The primary data is collected from 151 respondents.
- **37.09%** of the respondents prefer **oil/gas vehicle.**
- **62.91%** of the respondents prefer **electric vehicle.**

Do the respondents own Electric vehicle or have they ever used it?

Table-4.7

STATUS	FREQUENCY	PERCENTAGE
Yes	51	33.77%
No	100	66.23%
Total	151	100%

Figure-4.7

Interpretation :-

- The primary data is collected from 151 respondents.
- **33.77%** of the respondents **either they own electric vehicle or used** it.
- **66.23%** of the respondents **neither they own electric vehicle nor the used** it.
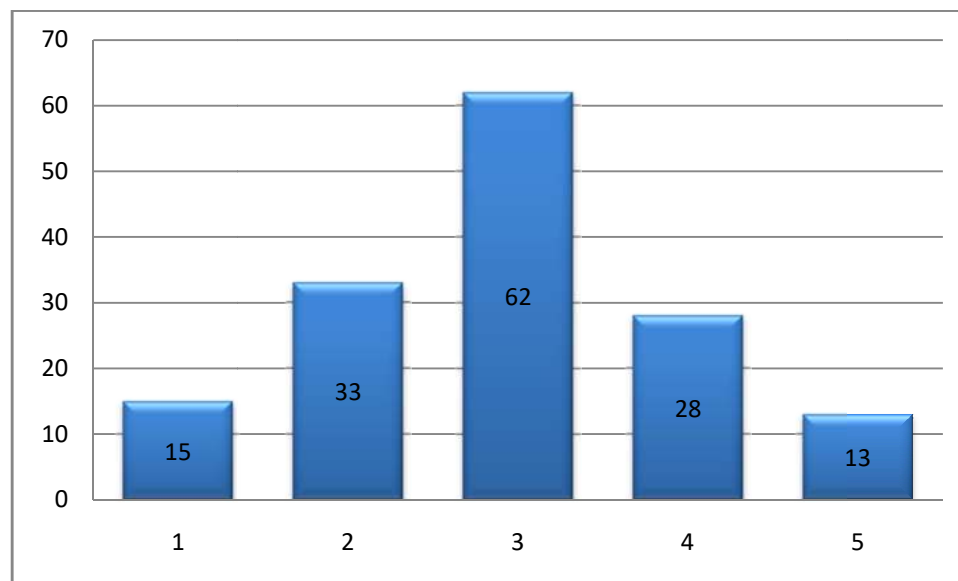
Respondents rating of knowledge about Electric vehicle

Table-4.8

RATING	FREQUENCY	PERCENTAGE
1	15	10%
2	33	22%
3	62	41%
4	28	18%
5	13	9%
Total	151	100%

Average rating=$\dfrac{1*15+2*33+3*62+4*28+5*13}{151}=\dfrac{444}{151}$

$=2.94$

Figure-4.8

Interpretation :-

- From the table we can see 10% rated 1, 22% rated 2, 41% rated 3, 18% rated 4 and 9% rated 5 their knowledge about EV's.
- The average rating of the respondents is 2.94.

Electric cars can protect from global warming

Table-4.9

PARTICULARS	FREQUENCY	PERCENTAGE
Strongly agree	59	39.07%
Agree	81	53.64%
I don't know	6	3.97%
Disagree	4	2.65%
Strongly disagree	1	0.66%
Total	151	100%

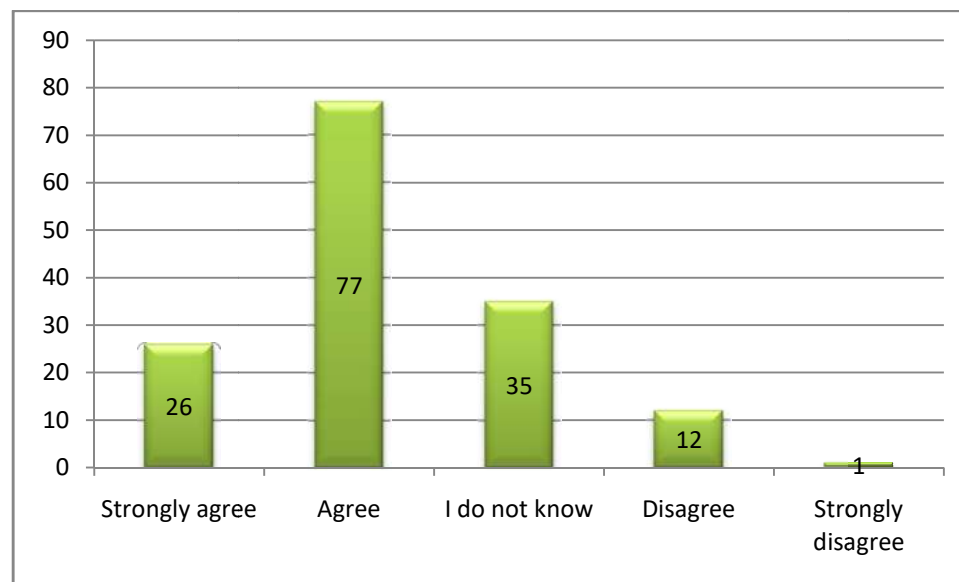**Figure-4.9**
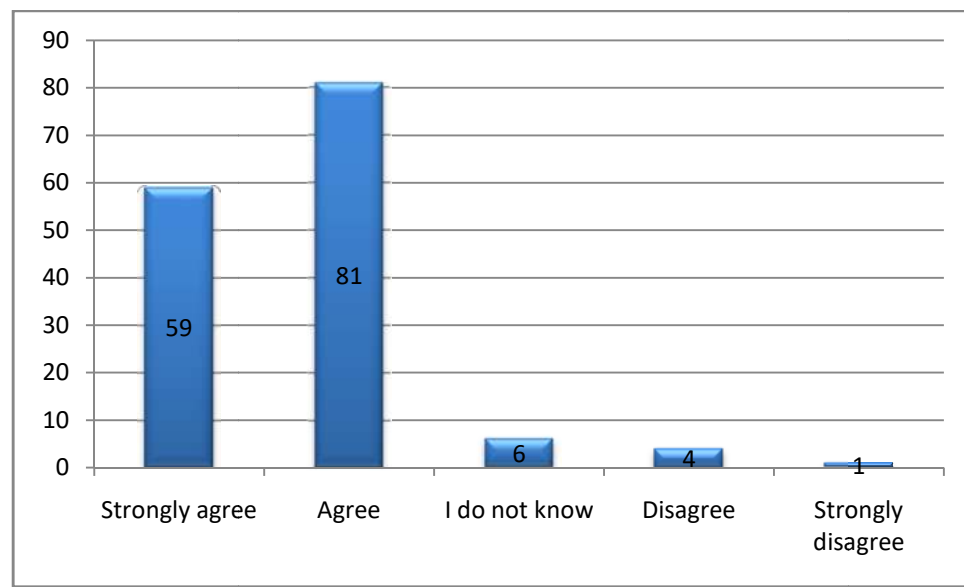
Interpretation :-

- 39.07% of the respondents strongly Agree
- 53.64% of the respondents agree
- 3.97% of the respondents don't know
- 2.65% of the respondents disagree
- 0.66% of the respondents strongly disagree
  That EV's can protect from global warming.

Electric vehicle can replace regular cars in terms of satisfying consumer needs

Table-4.10

PARTICULARS	FREQUENCY	PERCENTAGE
Strongly agree	26	17.22%
Agree	77	50.99%
I don't know	35	23.18%
Disagree	12	7.95%
Strongly disagree	1	0.66%
Total	151	100%

Figure-4.10

Interpretation :-

- 17.22% of the respondents strongly Agree

- 50.99% of the respondents agree

- 23.18% of the respondents don't know

- 7.95% of the respondents disagree
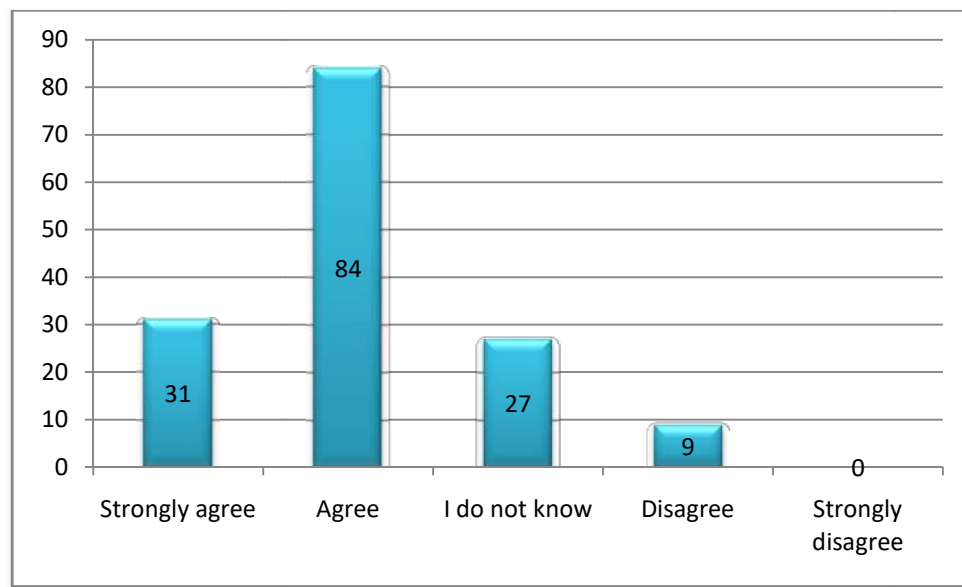
- 0.66% of the respondents strongly disagree

That EV's can replace regular cars in terms of satisfying consumer needs.

Electric vehicle can save a lot of money to the owner

Table-4.11

PARTICULARS	FREQUENCY	PERCENTAGE
Strongly agree	31	20.53%
Agree	84	55.63%
I don't know	27	17.88%
Disagree	9	5.96%
Strongly disagree	0	0%
Total	151	100%

Figure-4.11

Interpretation :-

- 20.53% of the respondents strongly Agree
- 55.63% of the respondents agree
- 17.88% of the respondents don't know
- 5.96% of the respondents disagree
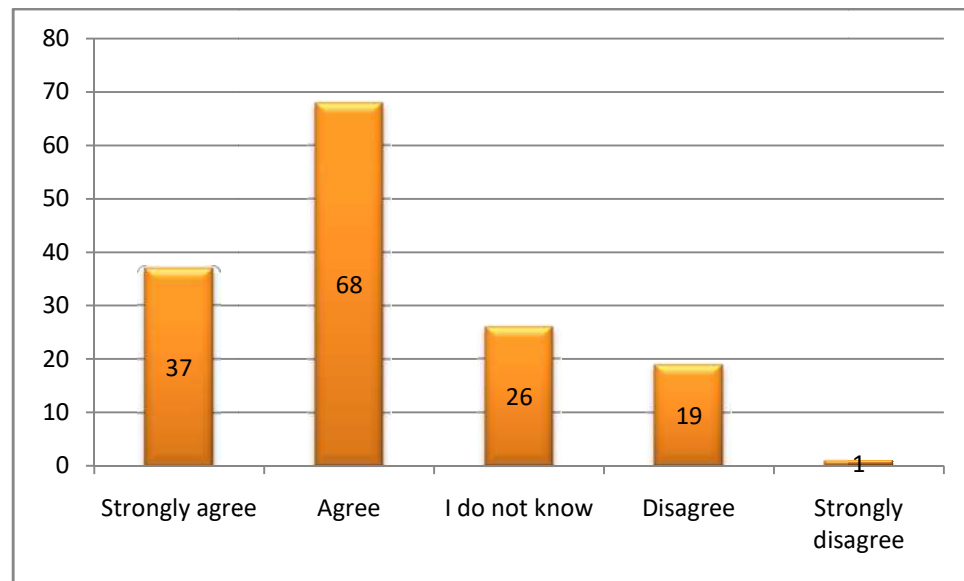- 0% of the respondents strongly disagree

That EV's can save a lot of money to the owner.

Electric vehicles are very expensive

Table-4.12

PARTICULARS	FREQUENCY	PERCENTAGE
Strongly agree	37	24.50%
Agree	68	45.03%
I don't know	26	17.22%
Disagree	19	12.58%
Strongly disagree	1	0.66%
Total	151	100%

Figure-4.12

Interpretations :-

- 24.50% of the respondents strongly Agree

- 45.03% of the respondents agree

- 17.22% of the respondents don't know

- 12.58% of the respondents disagree

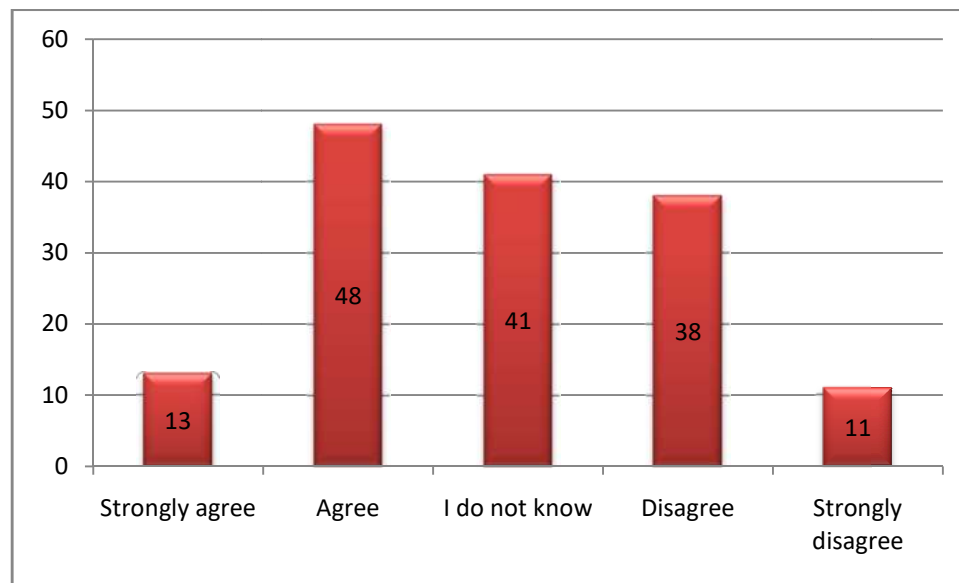- 0.66% of the respondents strongly disagree
That EV's are very expensive.

Maintenance Infrastructure is well developed

Table-4.13

PARTICULARS	FREQUENCY	PERCENTAGE
Strongly agree	13	8.61%
Agree	48	31.79%
I don't know	41	27.15%
Disagree	38	25.17%
Strongly disagree	11	7.28%
Total	151	100%

Figure-4.13

Interpretations :-

- 8.61% of the respondents strongly Agree

- 31.79% of the respondents agree

- 27.15% of the respondents don't know

- 25.17% of the respondents disagree

- 7.28% of the respondents strongly disagree

That maintenance infrastructure is well developed.

Factors that encourages consumer to consider Electric vehicle

Table-4.14

FACTORS	FREQUENCY	PERCENTAGE
Price	40	26.7%
Positive environmental effect	134	89.3%
New trends	54	36%
Beneficial insurance option	42	28%
Low noise level	98	65.3%
Promotion	6	6%
References	10	6.7%
Petrol price hikes	106	70.7%

Figure-4.14
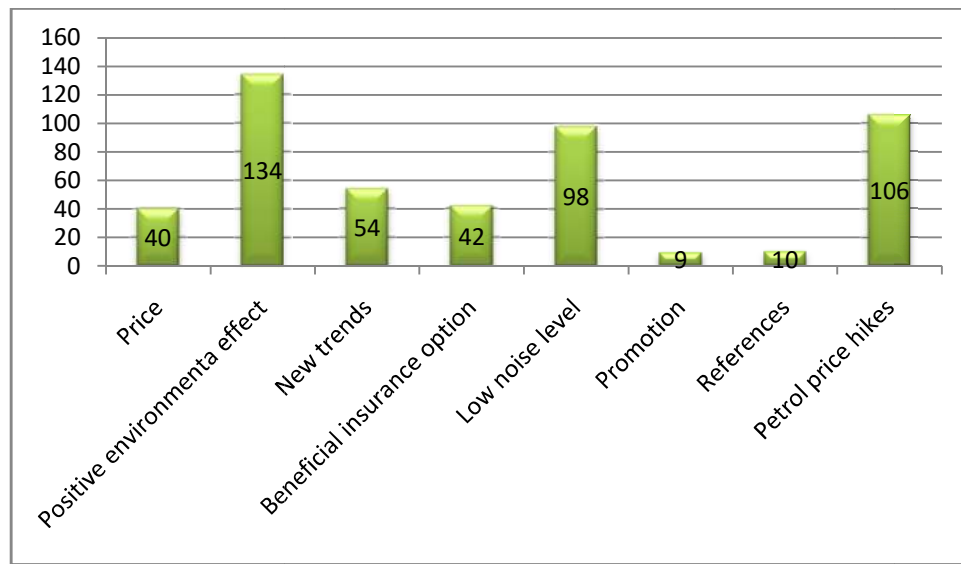
Interpretations :

In order to get factors that encourages to consider EV's respondents have been given liberty to select the factors so -

- 89.3%, 70.7% and 65.3% respondents selected positive environmental effect, petrol price hikes and Low noise level resp. in regards to EV's.
- 36%, 28%, 26.7%, 6.7%,and 6% selected New trends, Beneficial insurance option, Price, References and promotion respectively.

Factors that discourages consumer to consider Electric vehicle

Table-4.15

FACTORS	FREQUENCY	PERCENTAGE
Long recharging time	80	53.3%
Lack of charging station	109	72.7%
Price	63	42%
Lack of consumer choice	33	22%
Lack of trust to new technologies	54	36%
Price of electricity	40	26.7%
Mileage	59	39.3%
Lack of skilled workforce	40	26.7%

Figure-4.15
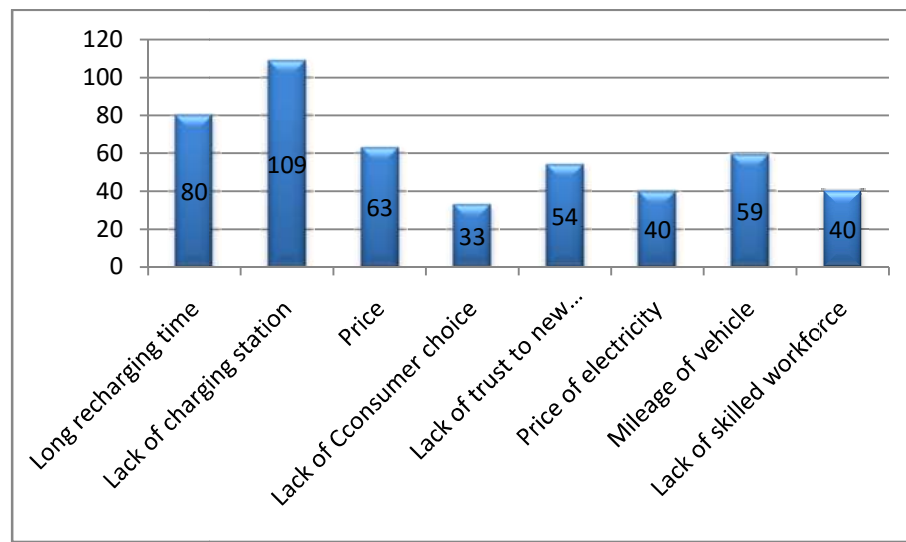
Interpretation :-

In order to get factors that discourages to consider EV's respondents have been given liberty to select the factors so-

- 72.7%, 53.3%and 42% selected Lack of charging stations, Long recharging time and price respectively in regards to EV's.
- 39.3%, 36%, 26.7%, 26.7% and 22% selected Mileage, Lack of trust to new technologies, Price of electricity, Lack of skilled workforce and Lack of consumer choice respectively in regards to EV's.
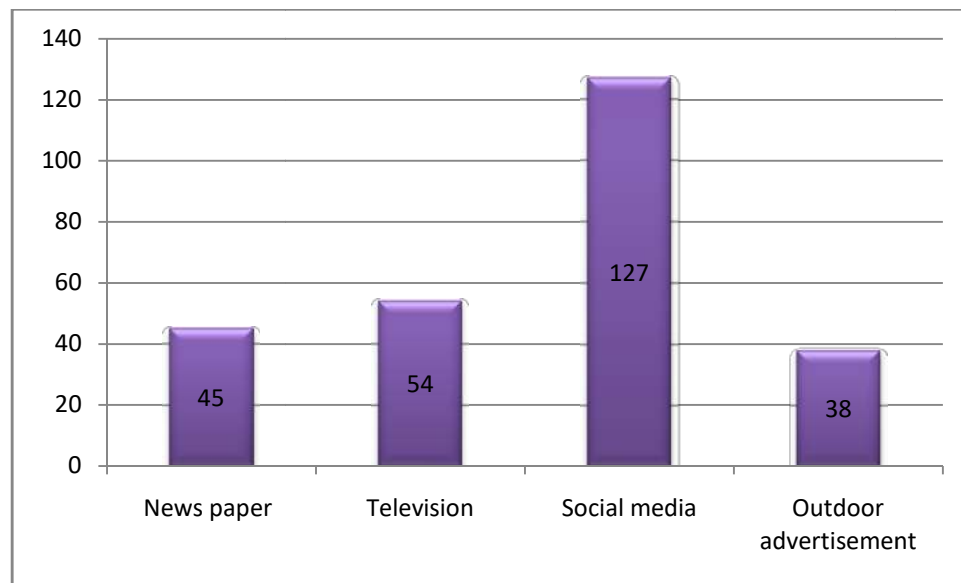
Sources of knowledge about of electric vehicle

Table-4.16

SOURCES	FREQUENCY	PERCENTAGE
Newspaper	45	30%
Television	54	36%
Social media	127	84.67%
Outdoor advertisement	38	25.33%

Figure-4.16

Interpretations :- To know from what sources respondents gets most of their knowledge about Electric vehicles in this section they have been given options to select all that apply so-

- 84.67% of the respondents gets most of knowledge from social media.
- 36% of the respondents gets most of knowledge from Television.
- 30% of the respondents gets most of knowledge from Newspaper.
- 25.33% of the respondents gets most of knowledge from Outdoor advertisements.

Potential scope of Electric car in near future

Table-4.17

PARTICULARS	FREQUENCY	PERCENTAGE
I want to buy Electric car as soon as possible	18	11.92%
I want electric car during next 5 years	59	39.07%
I want electric car during next 10 years	55	36.42%
I don't want to buy Electric car	19	12.58%
Total	151	100%

Figure-4.17
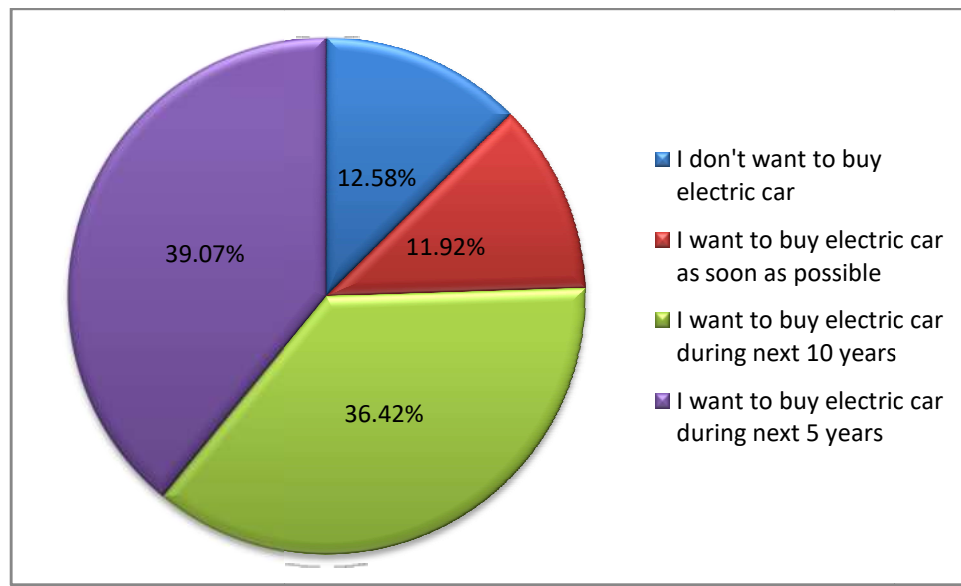
Interpretations :- To know how likely the consumer is to buy electric car in near future some options of time range were given so :-

- 11.92% of the respondents are to buy electric car as soon as possible.
- 39.07% of the respondents are to buy electric car in next 5 years.
- 36.42% of the respondents are to buy electric car in next 10 years.
- 12.58% of the respondents don't want to buy electric car.

Chapter 5

Data analysis

&

Interpretation

Concept of Chi-square

Test :-

Chi-square test is applied to find out whether the two variables in a bivariate contingency table under the study are dependent or independent. Our two hypotheses; null hypothesis H_0 and alternate hypothesis H_1.

H_0: The two attributes are independent
H_1: The two attributes are dependent

Computation is done using the formula:

$$\chi^2_{(cal.)} = \sum_i \sum_j \frac{(Oij - Eij)^2}{Eij} \sim \chi^2_{(r-1)(s-1)}$$

Where r and s are the no. of rows and number of columns of the contingency table and i=1, 2......r and j=1, 2........ s.

O_{ij} = Observed frequency of $(i, j)^{th}$ cell.
E_{ij} = Expected frequency of $(i, j)^{th}$ cell.

Where N_{io} and N_{oj} are marginal totals and N is the total number of observations.

The test statistic follows, under H_0 a chi-square distribution with (r-1) (s- 1) degrees of freedom. The null hypothesis can be tested either at 5% or 1% level of significance.

If $\chi^2_{(cal.)} < \chi^2_{(tab)}$ then **H_0 may be accepted** which shows that the **two variables are independent of each other** otherwise we may be reject the H_0 which shows that the two variables are not independent i.e., dependent of each other.

Also, when the observed frequency is less than five, pooling is done to apply the test.

Test-1

H_0 : There is no association between Gender and preference of type of vehicle.

H_1 : There is an association between Gender and preference of type of vehicle.

OBSERVED		PREFERNCE OF VEHICLE		
		ELECTRIC	OIL/GAS	TOTAL
GENDER	MALE	61	39	100
	FEMALE	34	17	51
	TOTAL	95	56	151

EXPECTED		PREFERNCE OF VEHICLE		
		ELECTRIC	OIL/GAS	TOTAL
GENDER	MALE	62.91391	37.086093	100
	FEMALE	32.08609	18.913907	51
	TOTAL	95	56	151

χ^2 - VALUE	
CALCULATED	0.464826
α	0.05
D.O.F	1
TABULATED	3.841459

Interpretations :-

- The result clearly indicates that the calculated value of χ^2 is 0.464826, which is smaller than the tabulated value of χ^2 is 3.841459 with degree of freedom 1 at 5% level of significance.

- Thus we can say that the sample information doesn't provide enough evidence to reject the null hypothesis, and hence there is no significant association between gender and type of vehicle they prefer.

Test-2

H_0 : There is no association between Family's annual income and preference of type of vehicle.

H_1 : There is an association between Family's annual income and preference of type of vehicle.

OBSERVED		PREFERENCE OF VEHICLE		
		ELECTRIC	OIL/GAS	TOTAL
FAMILY'S YEARLY INCOME	LESS THAN 2	25	18	43
	2-5	25	14	39
	5-10	31	10	41
	ABOVE 10	14	14	28
	TOTAL	95	56	151

EXPECTED		PREFERENCE OF VEHICLE		
		ELECTRIC	OIL/GAS	TOTAL
FAMILY'S YEARLY INCOME	LESS THAN 2	27.05298	15.94072	43
	2-5	24.53642	14.46358	39
	5-10	25.79470	15.20530	41
	ABOVE 10	17.61589	10.38411	28
	TOTAL	95	56	151

χ^2 – VALUE	
CALCULATED	5.27739
α	0.05
D.O.F	3
TABULATED	7.814728

Interpretations :-

- The result clearly indicates that the calculated value of χ^2 is 5.27739, which is smaller than the tabulated value of χ^2 is 7.814728 with degree of freedom 3 at 5% level of significance.

- Thus we can say that the sample information doesn't provide enough evidence to reject the null hypothesis, and hence there is no significant association between Family's annual income and type of vehicle they prefer.

Test-3

H_0 : There is no association between Family's residential locality and preference of type of vehicle.

H_1 : There is an association between Family's residential locality and preference of type of vehicle.

OBSERVED		PREFERNCE OF VEHICLE		
		ELECTRIC	OIL/GAS	TOTAL
FAMILY'S RESIDENTIAL LOCALITY	RURAL	35	19	54
	URBAN	60	37	97
	TOTAL	95	56	151

EXPECTED		PREFERNCE OF VEHICLE		
		ELECTRIC	OIL/GAS	TOTAL
FAMILY'S RESIDENTIAL LOCALITY	RURAL	33.97351	20.02649	54
	URBAN	61.02649	35.97351	97
	TOTAL	95	56	151

χ^2 - VALUE	
CALCULATED	0.130186
α	0.05
D.O.F	1
TABULATED	3.841459

Interpretations :-

- The result clearly indicates that the calculated value of χ^2 is 0.130186, which is smaller than the tabulated value of χ^2 is 3.841459 with degree of freedom 1 at 5% level of significance.

- Thus we can say that the sample information doesn't provide enough evidence to reject the null hypothesis, and hence there is no significant association between Family's residential locality and type of vehicle they prefer.

Chapter-6

Findings, Limitation & Conclusion

Findings :-

- Most of the respondents preferred Electric vehicle over oil/gas vehicle.
- On a scale of 1-5 the average rating of knowledge about electric vehicles among the respondents was found to be 2.94≈3.
- Most of the respondents agreed to the fact that Electric vehicle are Environmental friendly and Electric vehicles can replace regular cars in terms of satisfying consumer needs.
- Majority respondents had the opinion that Electric vehicles can save a lot of money of the owner but the initial cost of Electric vehicle are a bit too high.
- About maintenance infrastructure of Electric vehicles, there were mixed opinions - 31.79% agreed, 27.15% don't know and 25.17% disagreed that it is well developed.
- Majority of the respondents considered Positive environmental effect, Low noise level and petrol price hikes as factors that encourages them to consider Electric vehicle.
- Majority of the respondents considered Lack of charging stations, Long recharging time , Price and Mileage as factors that discourages them to consider Electric vehicle.
- There is a potential scope of Electric vehicle in next 10 years.
- There is no significant association between Gender and type of vehicle they prefer.
- It was expected that there will exist some association between family's annual income and their preference but sample information doesn't provide enough evidence to show existence of such association. Therefore on the basis of result Family's annual income and type of vehicle they prefer are independent.
- There is no significant association between Family's residential locality and type of vehicle they prefer.

Limitation:-

- Research is never ending process; every research is having limitation, this research is also having some limitation.
- Study is limited to 151 respondents of which are youth. So, findings and suggestions given based on the study cannot be extrapolated to the entire population.
- In the data collected male and female had not shared equal representation.
- The most of the respondents had not used the Electric vehicle, so they might not be much aware about EV's and therefore the primary data collected may be biased.

Conclusion :-

In India, there may be a need for energy transition in automobiles because of the depletion of fossil fuels assets and the consistent rise in gas fees. The government has taken steps to reduce pollution stages with the aid of promoting electric automobiles and providing buying subsidies .

The authorities has relaxed FDI regulations in order to promote output.

EVs are being introduced in India by a number of new brands. Governments and manufacturers should work together to construct the infrastructure and create positive climate for electric motors.

The respondents are aware of global climate conditions and are ready to change but their cost is an important factor while considering the purchase of EV. If sufficient infrastructure is available, respondents are inclined to simply accept EV's as future buying option.

The initial cost of buying, Lack of charging station, Long recharging time and mileage are all major factors that limit consumer confidence.

References

- Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand and Sons publications.
- Gupta, S.C. and Kapoor, V.K.: Fundamentals of applied statistics, Sultan chand and sons publications.
- Consumer Federation of America (CFA) (2016). New Data Shows Consumer Interests in Electric Vehicles is Growing. Retrieved from https://consumerfed.org/press_release/new-data-1-1-million-federal-student-loan-defaults-2016/
- Pretty Bhalla,I.S.(2018).A Study of Consumer Perception and Purchase Intention of Electric Vehicles, European Journal of Scientific Research,362- 368.
- Janardan Prasad Kesari,Y.S.(2019). Opportunities and Scope for Electric Vehicles in India. IJME Journal,8.
- Mohamed, M., Tamil Arasan, G., & Sivakumar, G. (2018). Study on electric vehicles in India opportunities and challenges. International Journal of Scientific Research in Environmental Science and Toxicology.
- Kahn, M. E. (2007). Do greens drive Hummers or hybrids? Environmental ideology as a determinant of consumer choice. Journal of Environmental Economics and Management.
- Jin, Lingjhi., Delgado, O., Gadepalli, R., & Minjares, R. (2020). © 2020 INTERNATIONAL 17 COUNCIL ON CLEAN TRANSPORTATION. Jankel, A., Morton, R., & Leach, R. (1984). Creative computer graphics. Cambridge University Press.
- The Evolution of the Automobile Industry in India, SYMBO. Retrieved from:•https://www.symboinsurance.com/blogs/car-insurance/evolutionautomobileindustry-india/
- Transportpolicy.netRetrieved from:https://www.symboinsurance.com/blogs/car-insurance/evolution-automobile-industry-india/

Questionaire

1. Email

_____

2. What is your age ? *

   Mark only one oval.

   - ⬭ Below 18
   - ⬭ 18-22
   - ⬭ 23-30
   - ⬭ above 30

3. What is your gender ? *

   Mark only one oval.

   - ⬭ male
   - ⬭ Female
   - ⬭ Prefer not to say

4. Faculty *

   Mark only one oval.

   - ⬭ Medical
   - ⬭ Engineering
   - ⬭ Science
   - ⬭ Arts
   - ⬭ Commerce

5. Family's residential locality *

Mark only one oval.

◯ Urban

◯ Rural

6. What is your yearly family income(in lakh) ? *

Mark only one oval.

◯ Less than 2

◯ 2 - 5

◯ 5 - 10

◯ above 10

7. How would you rate your knowledge about Electric vehicle ? *

Mark only one oval.

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

8. Do you own an Electric vehicle or have you ever used it ? *

Mark only one oval.

◯ Yes

◯ No

9. What do you prefer ? *

   Mark only one oval.

   ( ) Electric vehicle

   ( ) Oil/Gas vehicle

10. What do you think about following statements ? *

    Mark only one oval per row.

	Strongly agree	Agree	I do not know	Disagree	Strongly disagree
Electric cars can protect from global warming	( )	( )	( )	( )	( )
Electric cars can replace regular cars in terms of satisfying consumer needs	( )	( )	( )	( )	( )
Electric cars can save a lot of money to the owner	( )	( )	( )	( )	( )
Electric cars are very expensive	( )	( )	( )	( )	( )
Maintenance Infrastructure is well developed	( )	( )	( )	( )	( )

11. What factor encourage you to consider electric vehicles? *

   Check all that apply.

   - [ ] Price
   - [ ] Positive environmental effect
   - [ ] New trends
   - [ ] Beneficial financial or insurance option
   - [ ] Low noise level
   - [ ] Promotion
   - [ ] References
   - [ ] Petrol price hikes

12. What factor discourage you to consider electric vehicles? *

   Check all that apply.

   - [ ] Long recharging time
   - [ ] Lack of charging infrastructure
   - [ ] Price
   - [ ] Lack of consumer choice
   - [ ] Lack of trust to new technologies
   - [ ] Price of electricity
   - [ ] Mileage of vehicle
   - [ ] Lack of skilled workforce

13. From what sources did you get the most of your knowledge about electric vehicles? *

   Check all that apply.

   - [ ] Newspapers
   - [ ] Television
   - [ ] Social media
   - [ ] Outdoor advertisements

14. How likely that your next car will be electric car? *

   Mark only one oval.

   - ( ) I want to buy electric car as soon as possible
   - ( ) I want to buy electric car during next 5 years
   - ( ) I want to buy electric car during next 10 years
   - ( ) I don't want to buy electric car