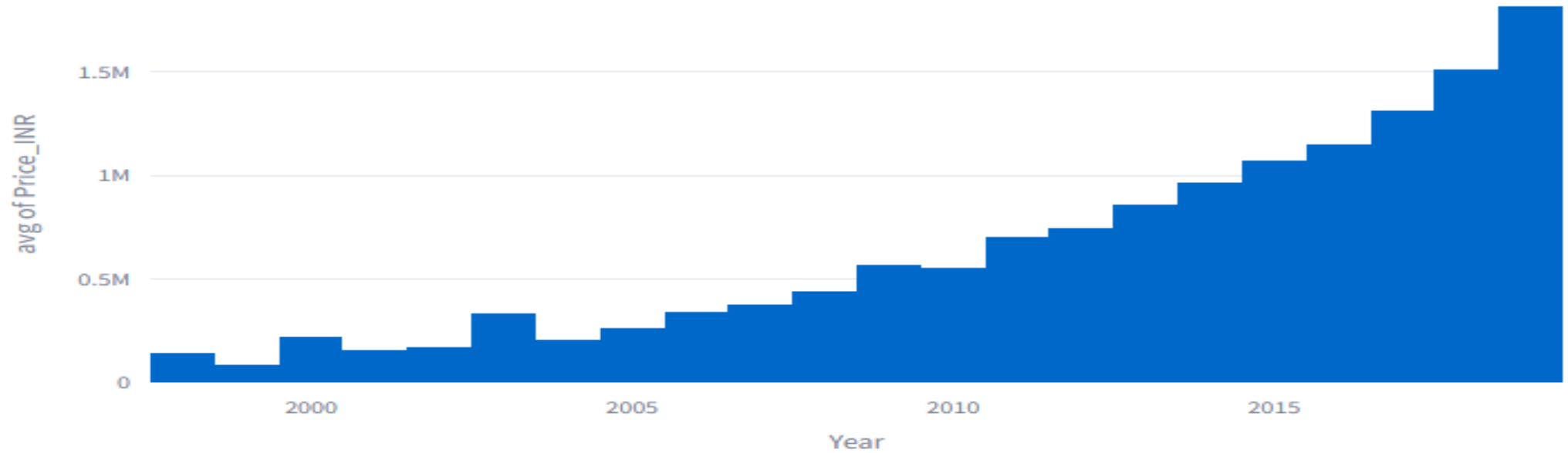# USED CARS DATA ANALYSIS

📍 Context

There is a huge demand for used cars in the Indian Market today. As sales of new cars have slowed down in the recent past, the pre-owned car market has continued to grow over the past years and is larger than the new car market now. Cars4U is a budding tech start-up that aims to find footholes in this market. In 2018-19, while new car sales were recorded at 3.6 million units, around 4 million second-hand cars were bought and sold. There is a slowdown in new car sales and that could mean that the demand is shifting towards the pre-owned market. In fact, some car sellers replace their old cars with pre-owned cars instead of buying new ones. Unlike new cars

📌 Columns Description

1. **S.No.** : Serial Number
2. **Name** : Name of the car which includes Brand name and Model name
3. **Location** : The location in which the car is being sold
4. **Year** : Manufacturing year of the car
5. **Kilometers_Driven** : Total kilometers driven
6. **Fuel_Type** : Type of fuel used
7. **Transmission** : Type of transmission
8. **Owner** : Type of ownership
9. **Mileage** : Standard mileage
10. **Engine** : Engine displacement
11. **Power** : Maximum power
12. **Seats** : Number of seats
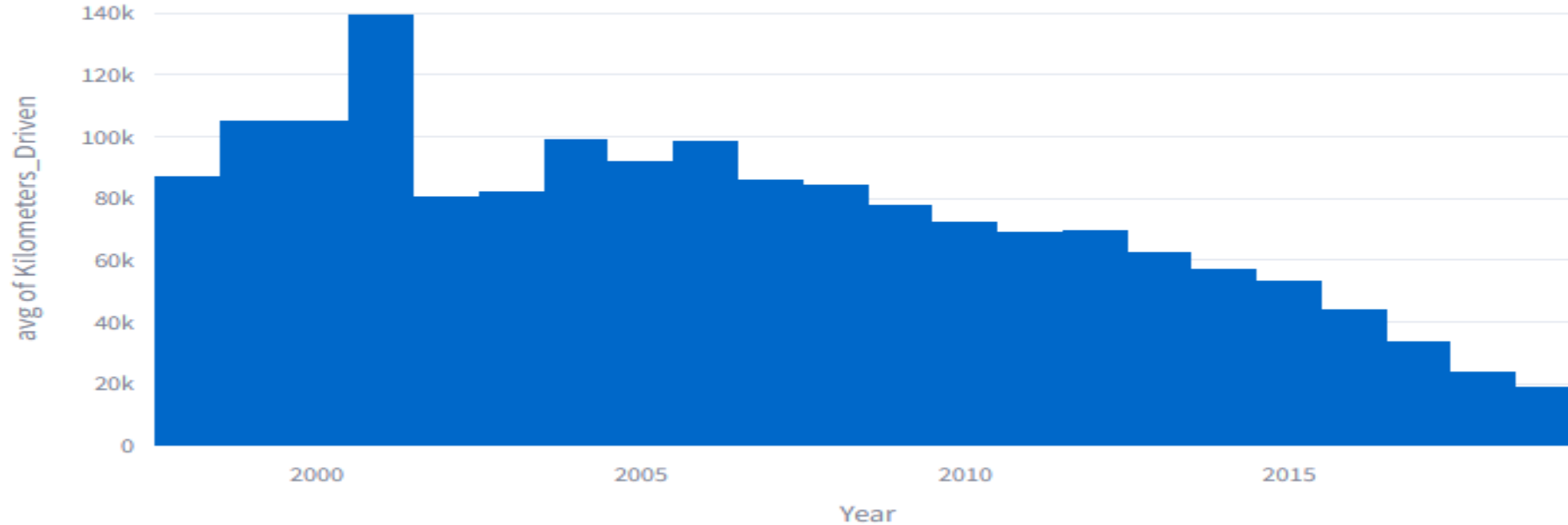13. **Price** : Used car price in INR

Used car prices increase based on year of manufacture, with a noticeable increase after 2010.

In recent years (after 2015), prices have increased significantly, which may be due to:
Increased demand for used cars as new car sales slow.
New car costs are rising, making buying used a more attractive option.
Used car prices increase based on year of manufacture, with a noticeable increase after 2010.
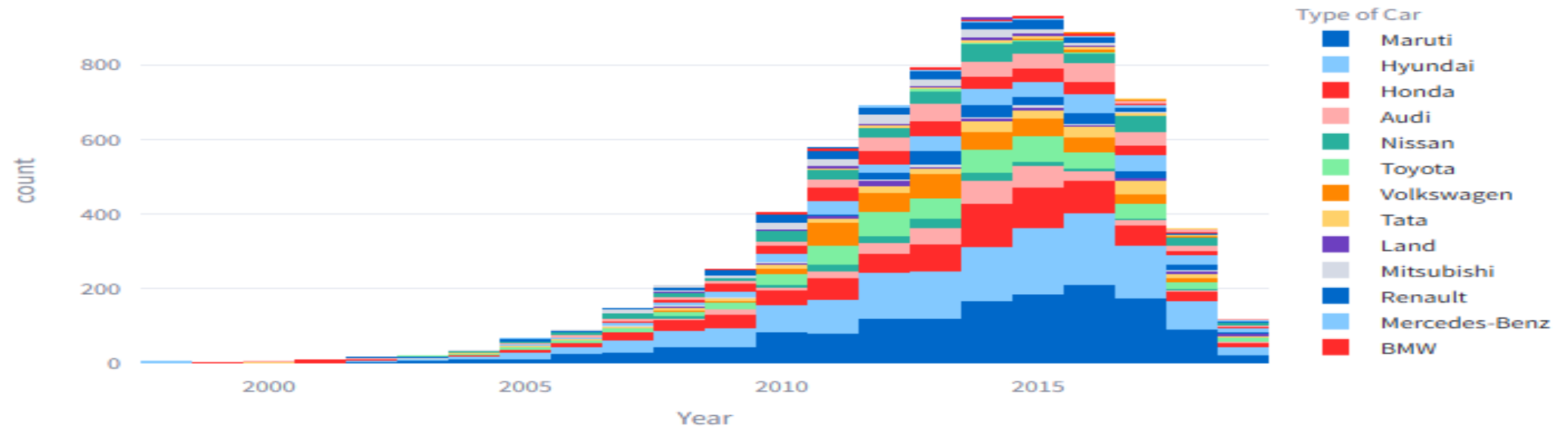
Year vs Kilometers Driven

Older cars (pre-2005) have higher average mileage, indicating they were used for longer periods before being resold.
After 2010, the average mileage gradually decreases, which means that newer cars are sold with little mileage

Consumer behavior has changed, as there may be a tendency to change the vehicle within a shorter period.

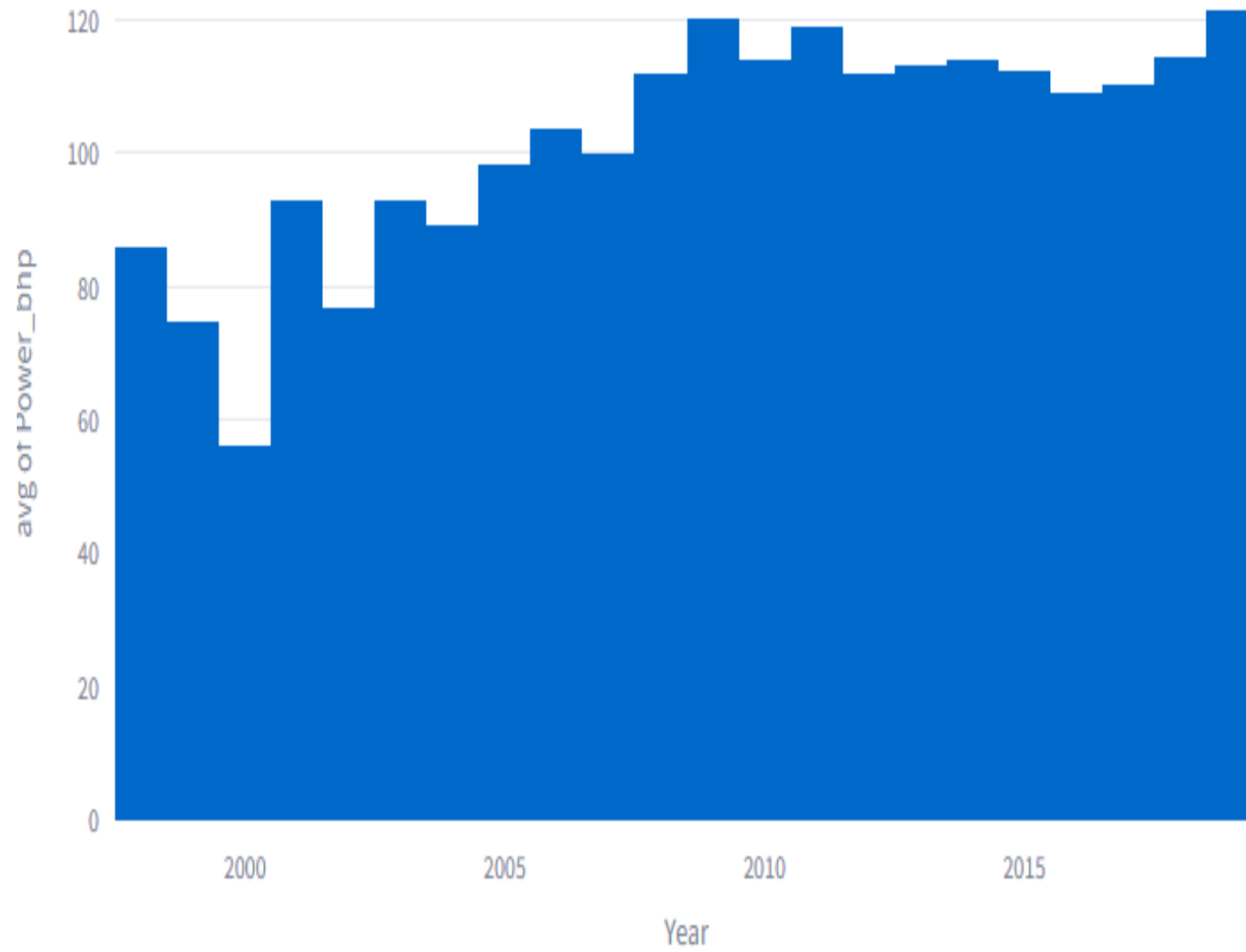# Which years have the largest number of cars?

The peak in the number of cars was between 2010 and 2015, which means that the majority of used cars on the market currently were manufactured during this period.

The number of cars clearly declines after 2015, which may indicate that newer cars have not yet entered the used car market in a significant way.

Maruti has the largest share of used cars compared to other brands, which reflects its popularity in the Indian market.

Hyundai and Honda come in second and third place in terms of the number of used cars.

1. Gradual increase in average engine power (bhp) over the years.

2. Newer cars tend to be more powerful than older cars.

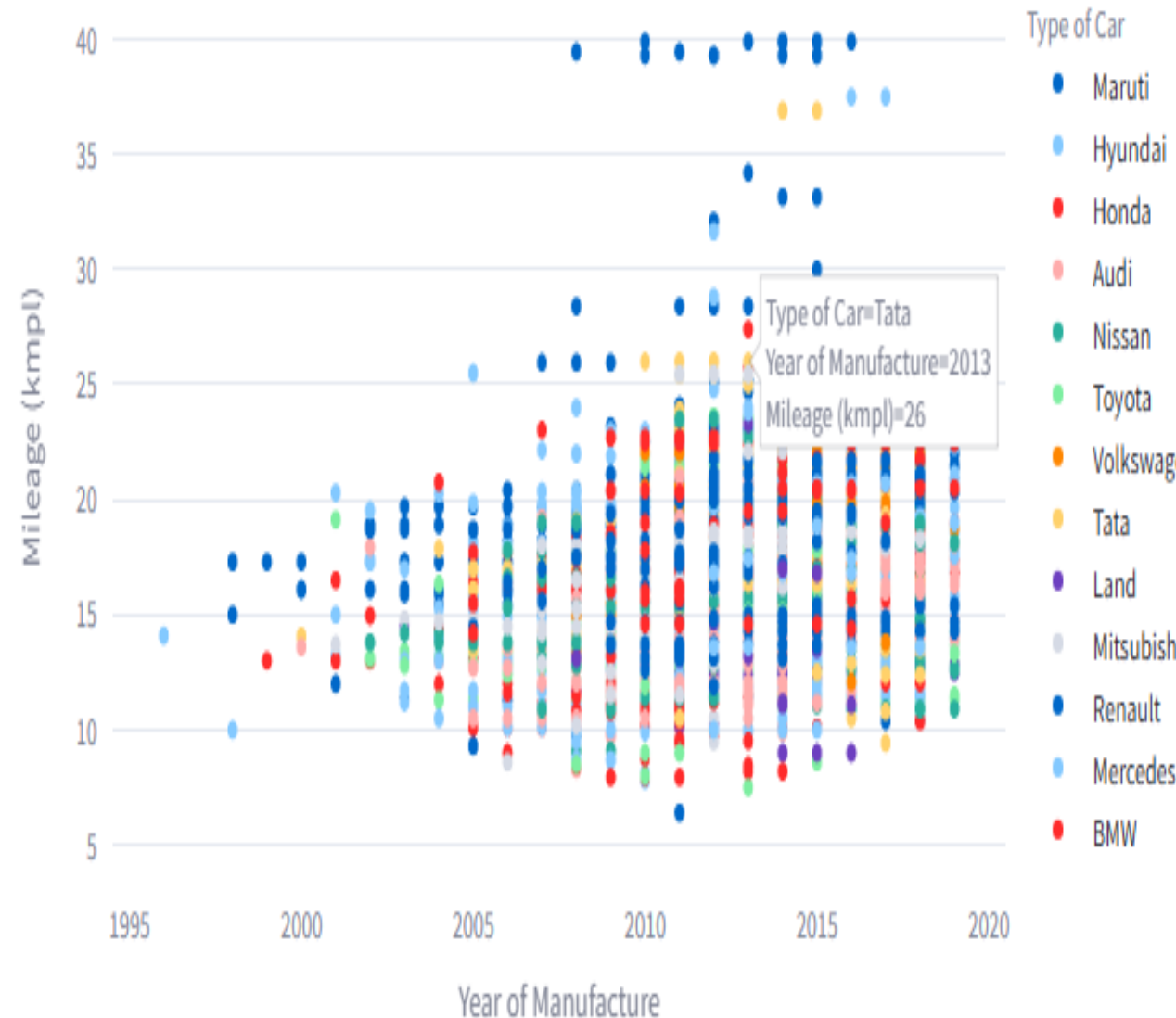3. The development of engine technology has gradually increased the power of cars over the years.

Year vs Mileage (kmpl)
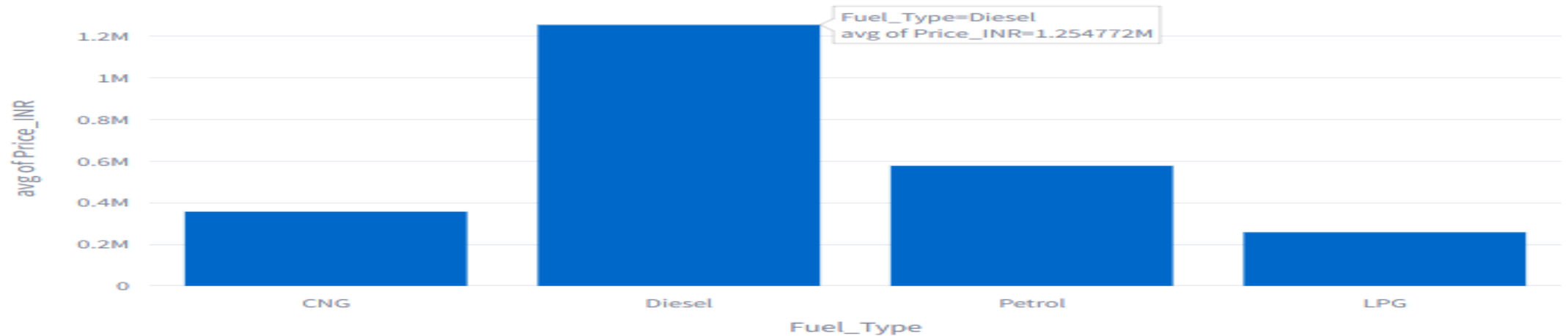
Fuel efficiency improves over time:

Newer cars tend to have higher fuel efficiency (kmpl) than older models.

Before 2005, most cars had an efficiency range between 10-20 kmpl, while after 2010 some cars reached 35-40 kmpl.

Some luxury cars (like BMW and Mercedes-Benz) still offer low fuel efficiency compared to budget brands like Maruti and Honda.

Type of Car
- Maruti
- Hyundai
- Honda
- Audi
- Nissan
- Toyota
- Volkswag
- Tata
- Land
- Mitsubish
- Renault
- Mercedes
- BMW

Type of Car=Tata
Year of Manufacture=2013
Mileage (kmpl)=26

Price by Fuel Type

•**Diesel-powered cars are the most expensive.**
  •The average price of diesel-powered cars is significantly higher compared to other fuel types, exceeding **1.2 million Indian Rupees**.
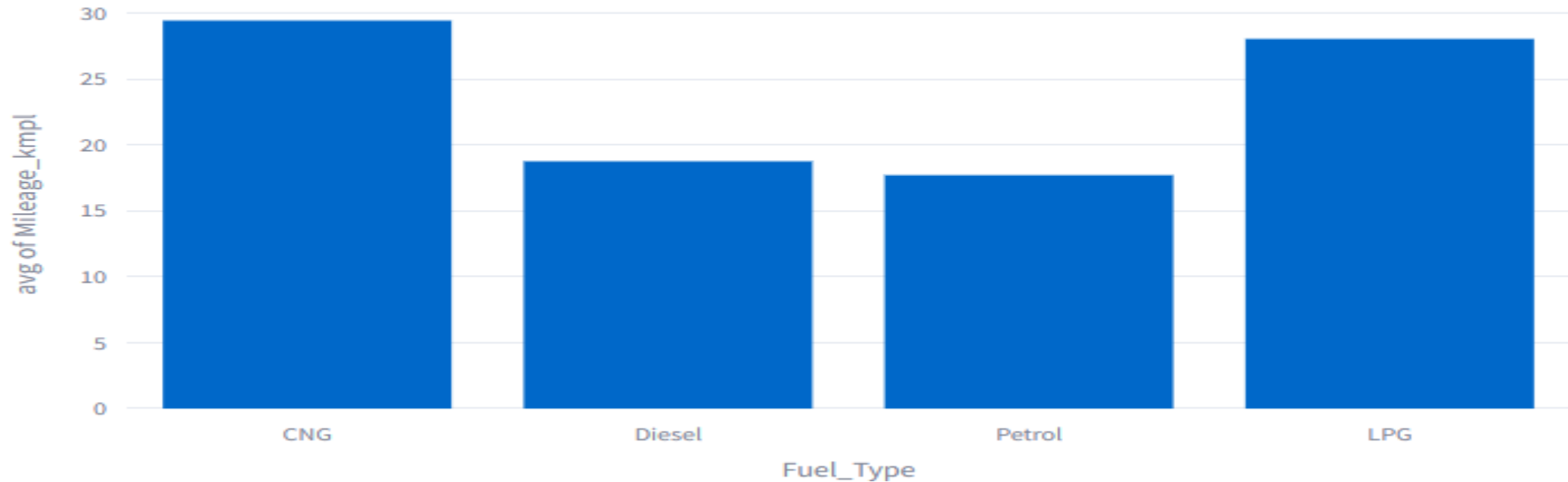 •This may be due to the fuel efficiency of diesel, making it a preferred choice for long-distance usage.
•**Petrol-powered cars come in second place.**
  •Petrol cars are priced lower than diesel but higher than **CNG and LPG**, indicating that they remain a popular choice in the market.
•**CNG and LPG cars are the cheapest.**
  •CNG and LPG cars have the lowest average price, which may be due to their limited availability or being considered less powerful compared to diesel and petrol vehicles.

  •CNG and LPG vehicles may require more maintenance due to their impact on the engine, making them less capable of commanding high prices.

Mileage by Fuel Type

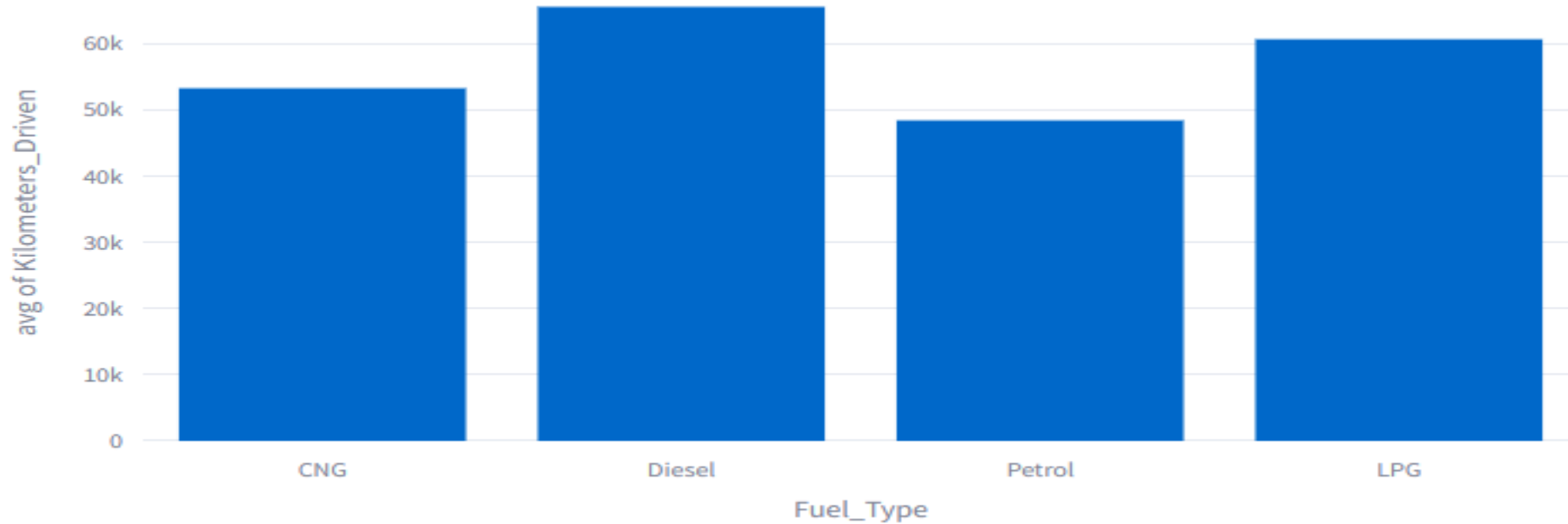CNG and LPG cars have the highest mileage.

CNG cars offer the best mileage, averaging close to 30 km per liter (or kg).
LPG cars follow closely, also providing high fuel efficiency.
Diesel and Petrol cars have lower mileage.

Diesel and Petrol cars have a significantly lower mileage compared to CNG and LPG, averaging around 18-19 km per liter.
Despite their lower mileage, Diesel cars are often chosen for their torque and long-distance efficiency.
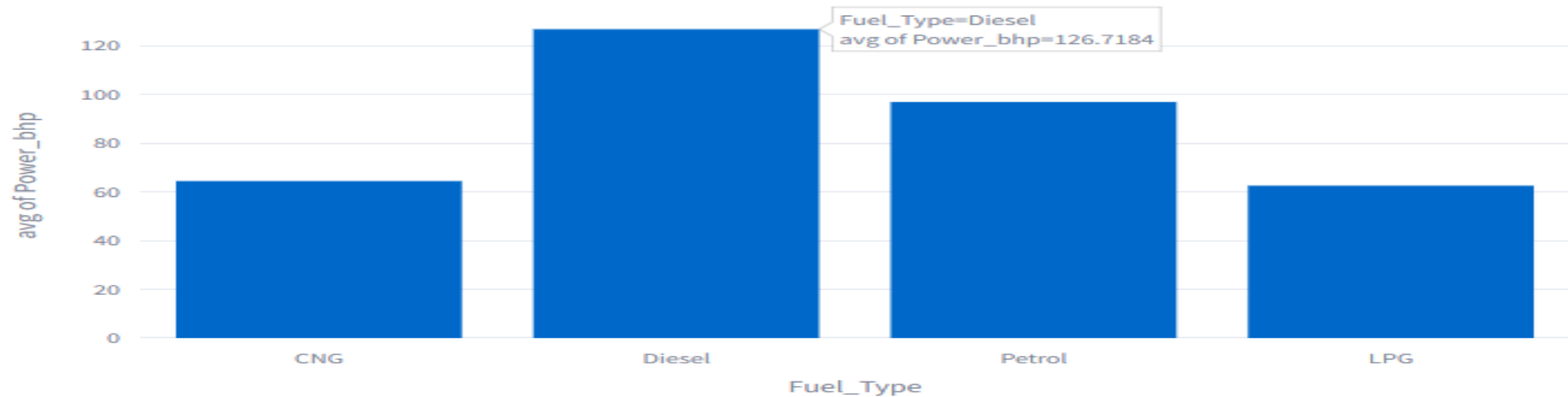
1. Diesel cars cover the longest distance
   - The average distance traveled by diesel cars is the highest, which aligns with the fact that diesel vehicles are typically used for long trips and transportation due to their fuel efficiency and strong torque.

2. LPG and CNG cars are also used for long distances
   - Interestingly, LPG and CNG cars have a high average distance traveled, close to that of diesel cars.
   - This may be because these vehicles are primarily used for commercial transportation or as taxis, leading to higher mileage.

Average php by Fuel Type

Fuel_Type=Diesel
avg of Power_bhp=126.7184

Diesel cars have the highest horsepower (bhp)
Diesel cars have the highest average horsepower, which justifies their use for long trips and heavy transportation, as they require high torque.
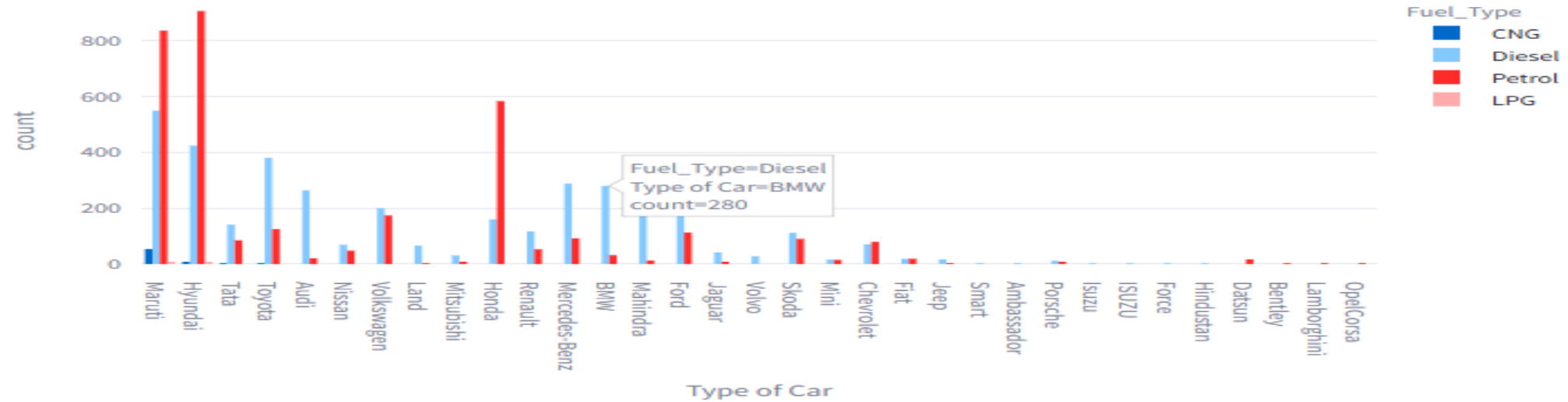**Petrol cars come in second place**
Petrol-powered cars have slightly lower horsepower than diesel, making them a popular choice for regular driving and good performance.
CNG and LPG have the lowest horsepower
CNG and LPG cars have the lowest average horsepower, which may explain their lower prices compared to diesel and petrol. They are mostly used for economical commuting rather than high performance.

Type of Car with Fuel Type

Petrol Cars Are the Most Widespread

Most cars in the market run on petrol (red color), especially brands like **Maruti, Hyundai, Honda, and Toyota**.

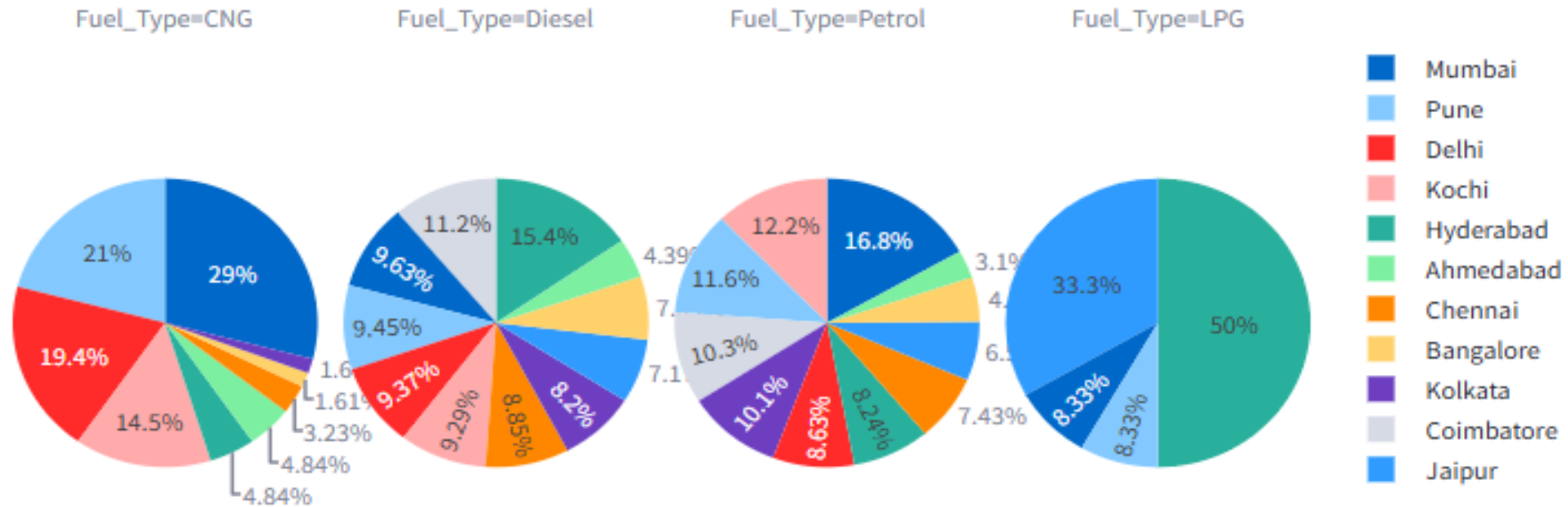**Diesel Is the Second Most Popular Choice**

Many cars run on diesel (light blue color), particularly luxury brands such as **BMW, Mercedes-Benz, and Audi**, where users prefer strong torque and fuel efficiency.
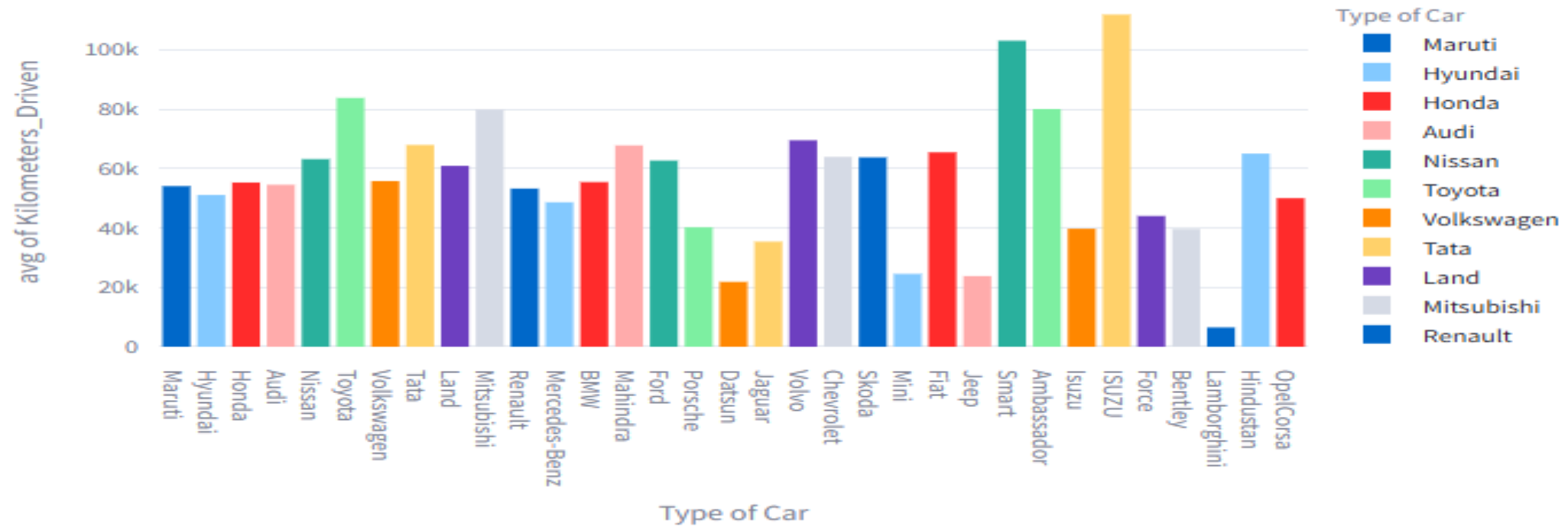
Limited Presence of CNG and LPG

Very few cars run on **CNG and LPG** (dark blue and pink colors), mostly concentrated in popular brands like **Maruti, Hyundai, and Toyota**, indicating their economic use.

Luxury Cars Prefer Diesel and Petrol

Brands like **BMW, Mercedes-Benz, Jaguar, and Volvo** primarily rely on petrol and diesel, reflecting the need for high performance and speed.

Mumbai and Delhi prefer CNG,
Hyderabad and Ahmedabad favor diesel, likely for commercial use.
Petrol is common across multiple cities with no single dominant preference.
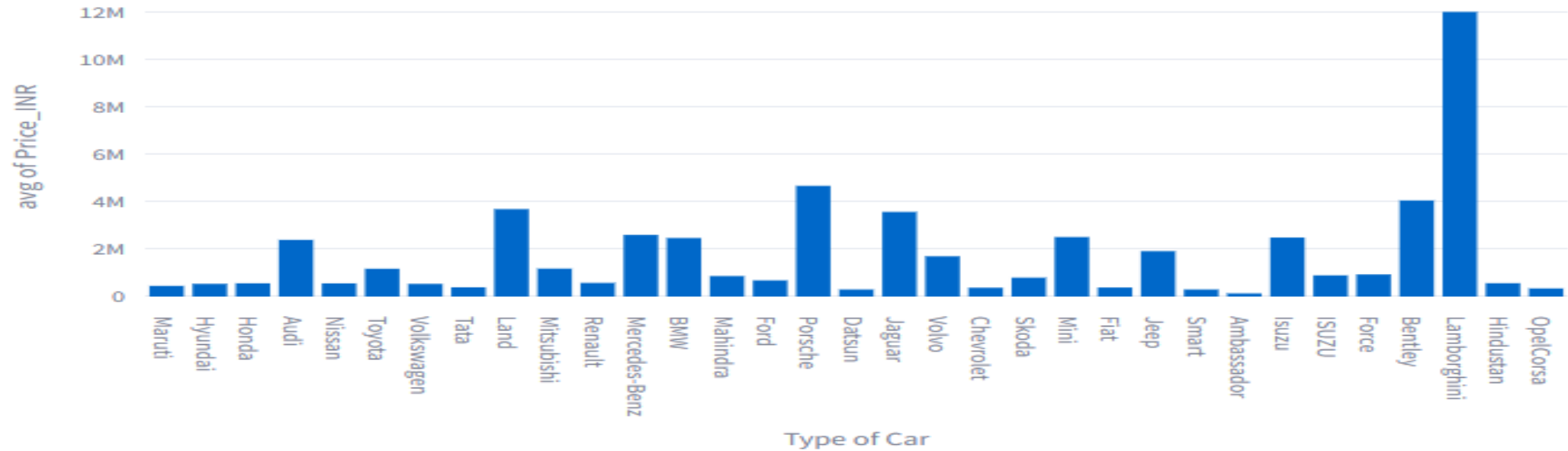Chennai leads in LPG usage

Commercial vehicles (such as Force, Ambassador, and ISUZU) are used for long distances, so they have the highest average kilometers driven.
Economical cars (such as Maruti, Hyundai, and Honda) have a moderate average, reflecting their use in cities.
Luxury cars (such as Lamborghini and Porsche) have the lowest kilometers driven, as they are used for special occasions rather than daily use.
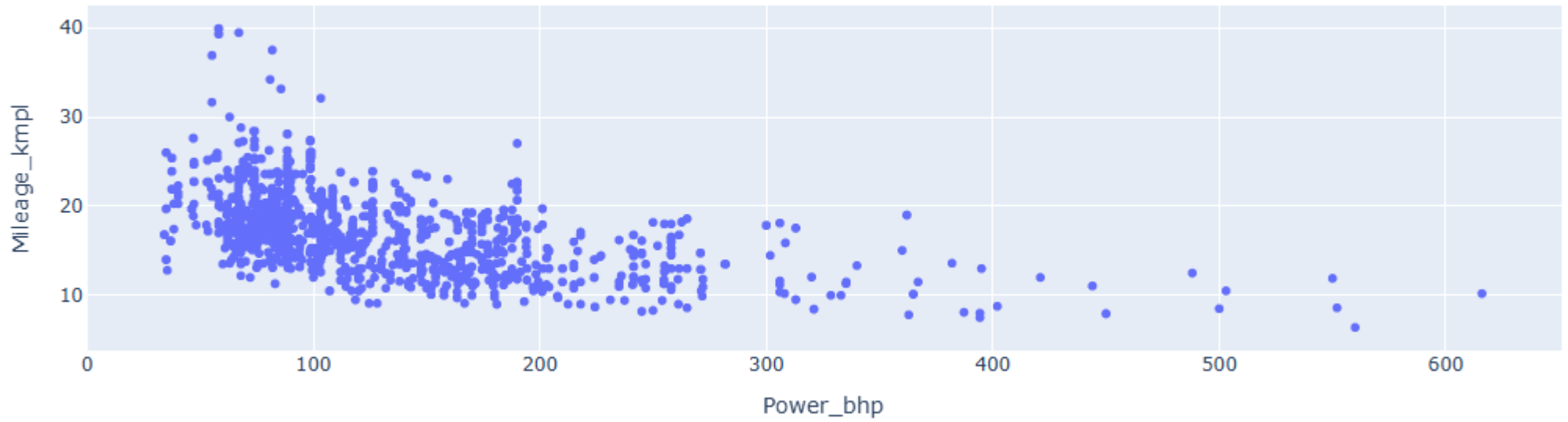
Price by Type of Car

*The chart shows that Lamborghini is the most expensive, with an average price exceeding 12 million INR, reflecting its status as a highly luxurious brand.

*Luxury cars like Porsche, Jaguar, BMW, and Mercedes-Benz follow, with average prices ranging between 2 million and 5 million INR.
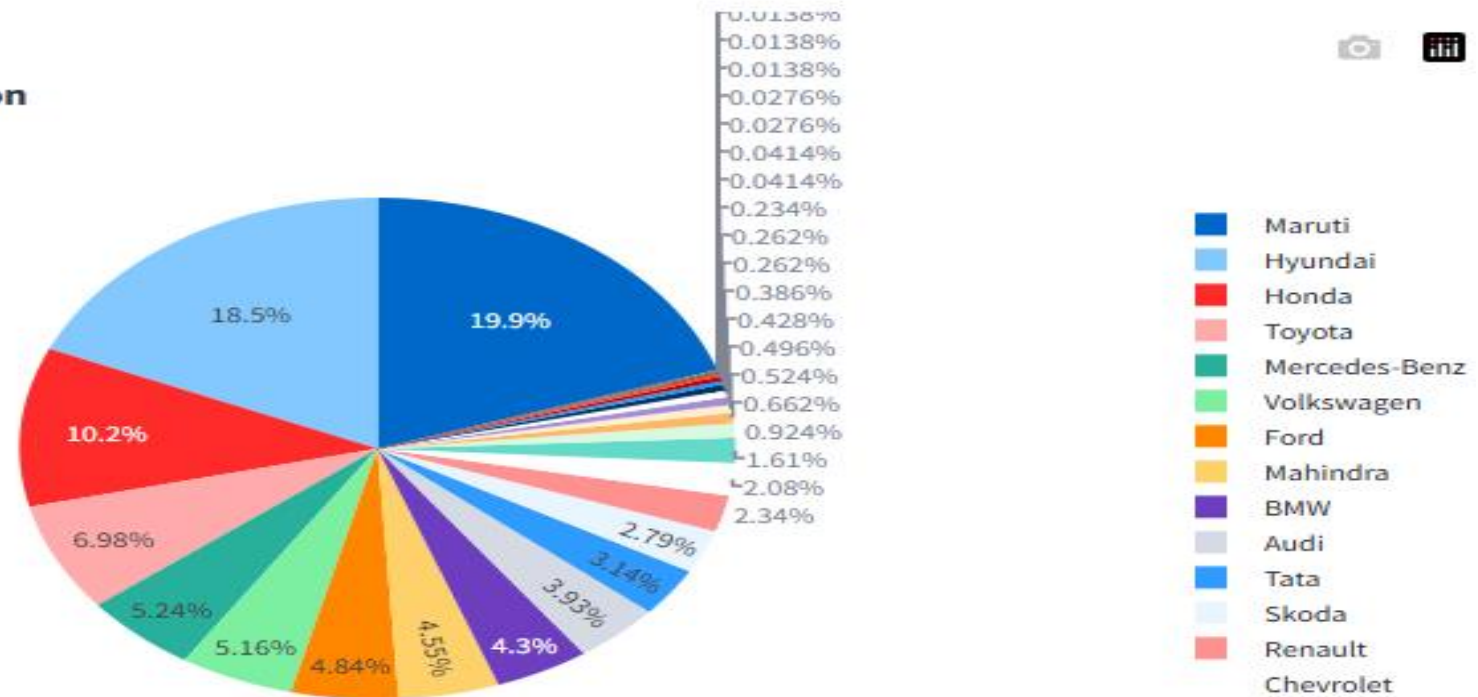
*Economy cars like Maruti, Hyundai, and Honda have the lowest average prices, making them affordable for the average consumer.

*Some brands like Ford, Volkswagen, and Toyota fall in the mid-range price category, indicating a balance between performance and cost.

The relationship between horsepower (Power_bhp) and fuel efficiency (Mileage_kmpl) seems inverse

Car type Distribution

Legend:
- Maruti
- Hyundai
- Honda
- Toyota
- Mercedes-Benz
- Volkswagen
- Ford
- Mahindra
- BMW
- Audi
- Tata
- Skoda
- Renault
- Chevrolet

Pie chart values: 19.9%, 18.5%, 10.2%, 6.98%, 5.24%, 5.16%, 4.84%, 4.55%, 4.3%, 3.93%, 3.14%, 2.79%, 2.34%, 2.08%, 1.61%, 0.924%, 0.662%, 0.524%, 0.496%, 0.428%, 0.386%, 0.262%, 0.262%, 0.234%, 0.0414%, 0.0414%, 0.0276%, 0.0276%, 0.0138%, 0.0138%, 0.0138%, 0.0138%
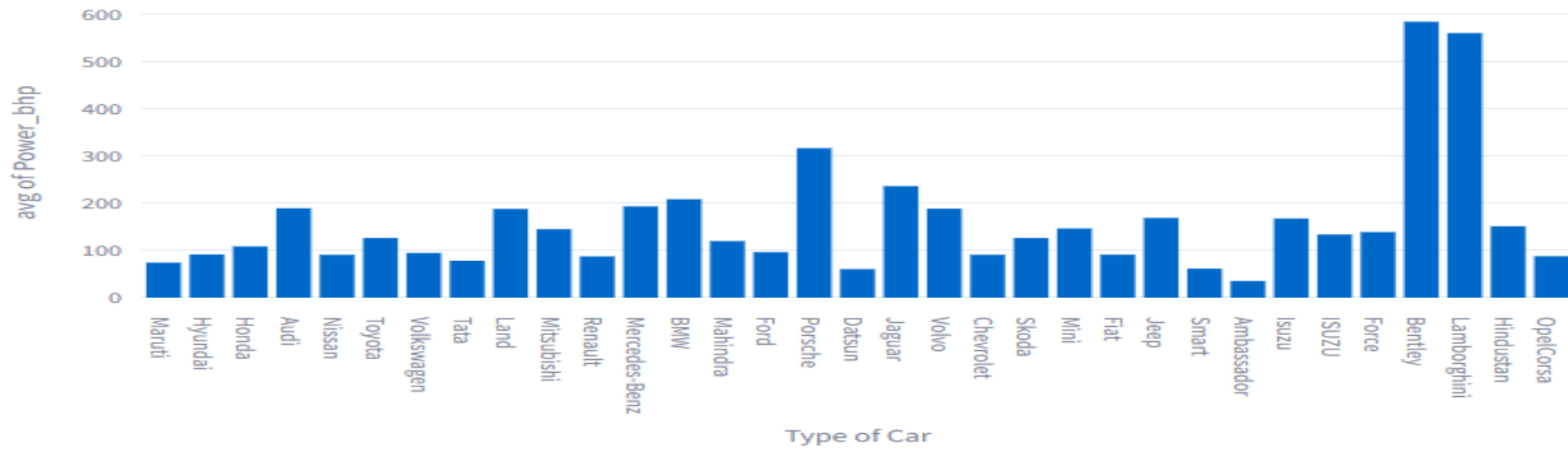
Maruti is the most common car brand in the dataset, making up 19.9% of the total.

Hyundai follows closely with 18.5%, showing its strong market presence.

Honda (10.2%) and Toyota (6.98%) are also among the top brands, indicating their popularity.

Luxury brands like Mercedes-Benz and BMW have smaller shares, reflecting their niche market.

Brands like Chevrolet, Renault, and Skoda have lower percentages, suggesting less availability in the dataset.
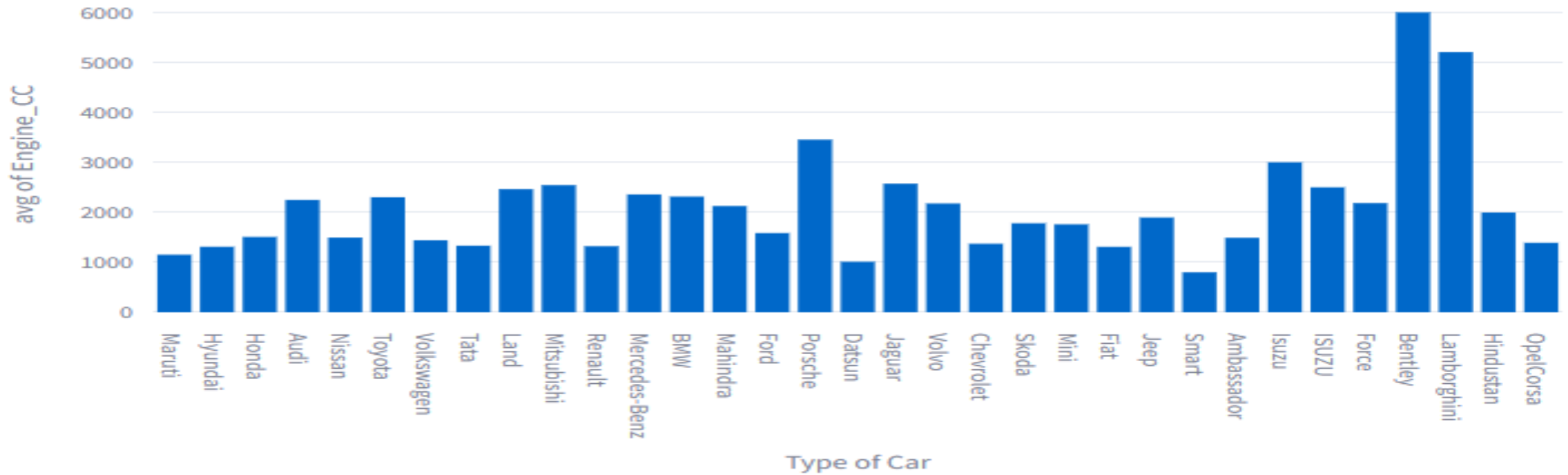
Lamborghini and Bentley have the highest average horsepower, exceeding 600 bhp, reflecting their high-performance capabilities.

Porsche, Jaguar, and Ford also have high horsepower, indicating a focus on sporty performance.

Mercedes-Benz, BMW, and Audi have moderate horsepower, balancing performance and comfort.

Maruti, Hyundai, and Honda have the lowest average horsepower, reflecting their focus on daily economic use.
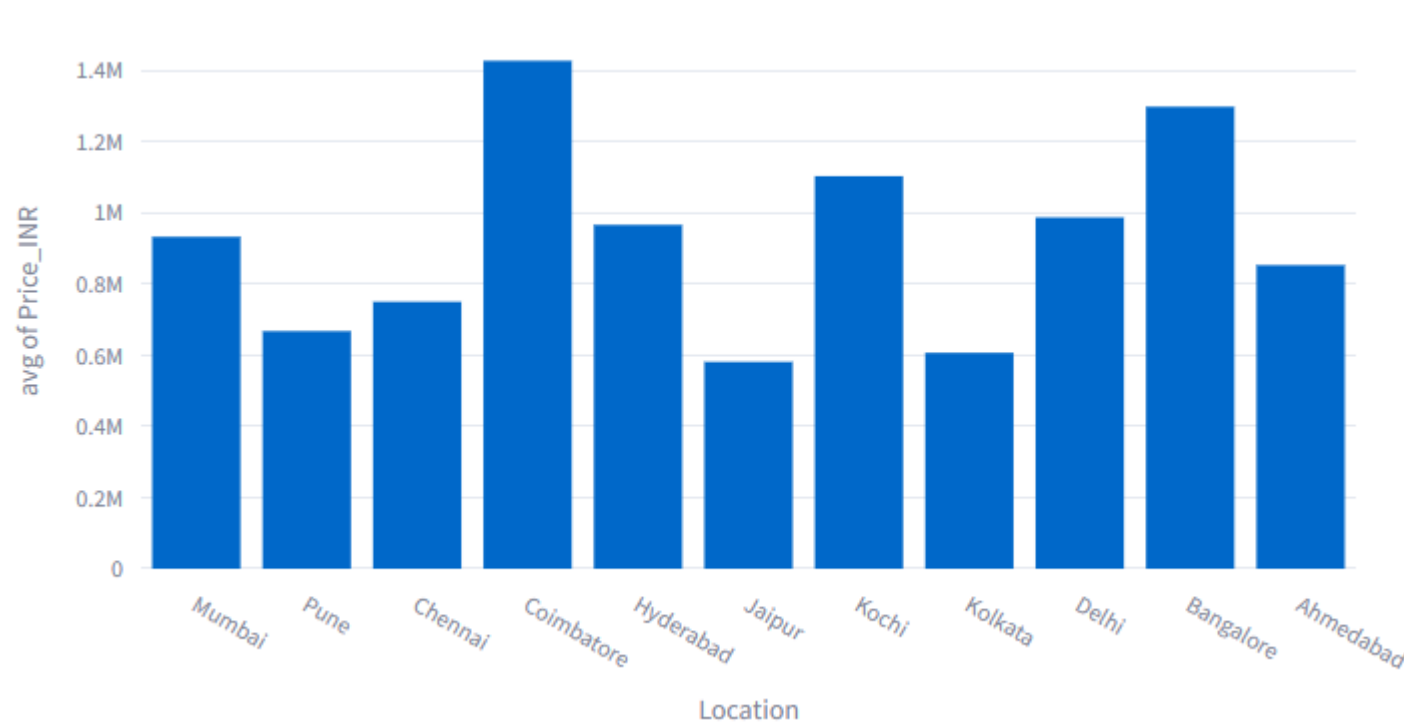
Lamborghini and Bentley have the largest average engine sizes, exceeding **5000 CC**, highlighting their high-performance and luxury status.

Force ,Isuzu also have a large engine size, making it suitable for heavy-duty or commercial use.
Porsche, Jaguar, and Mercedes-Benz have moderately high engine capacities, typically over **3000 CC**, reflecting a balance of power and luxury.
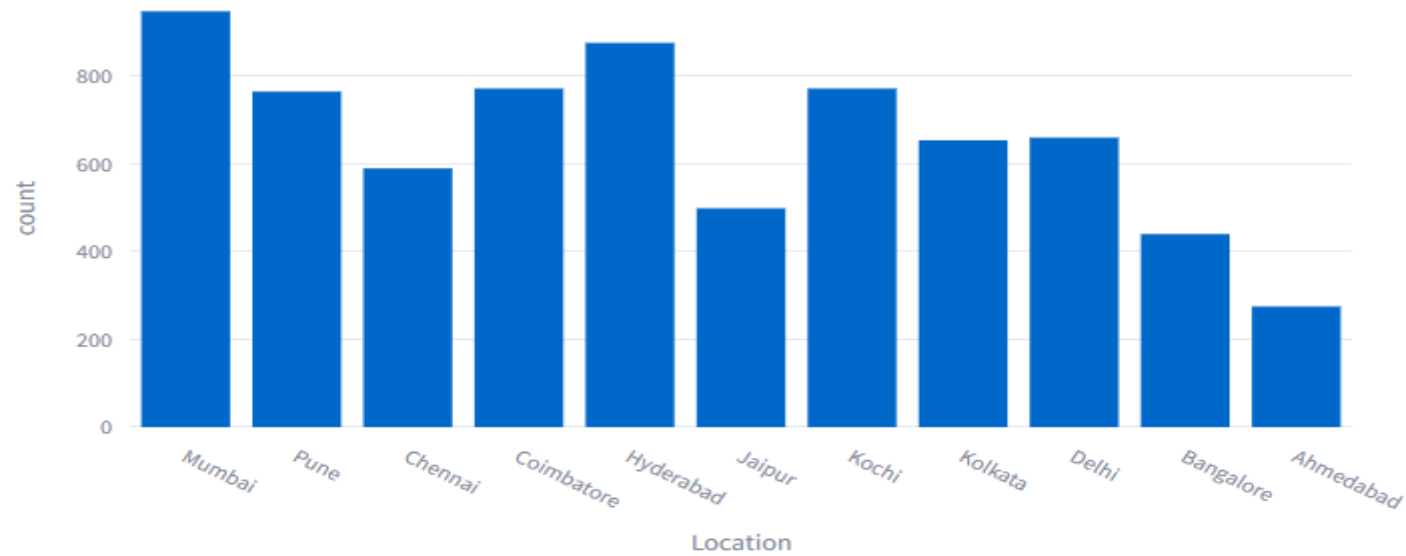
Maruti, Hyundai, and Honda have the smallest engines, usually under **1500 CC**, prioritizing fuel efficiency and city driving.

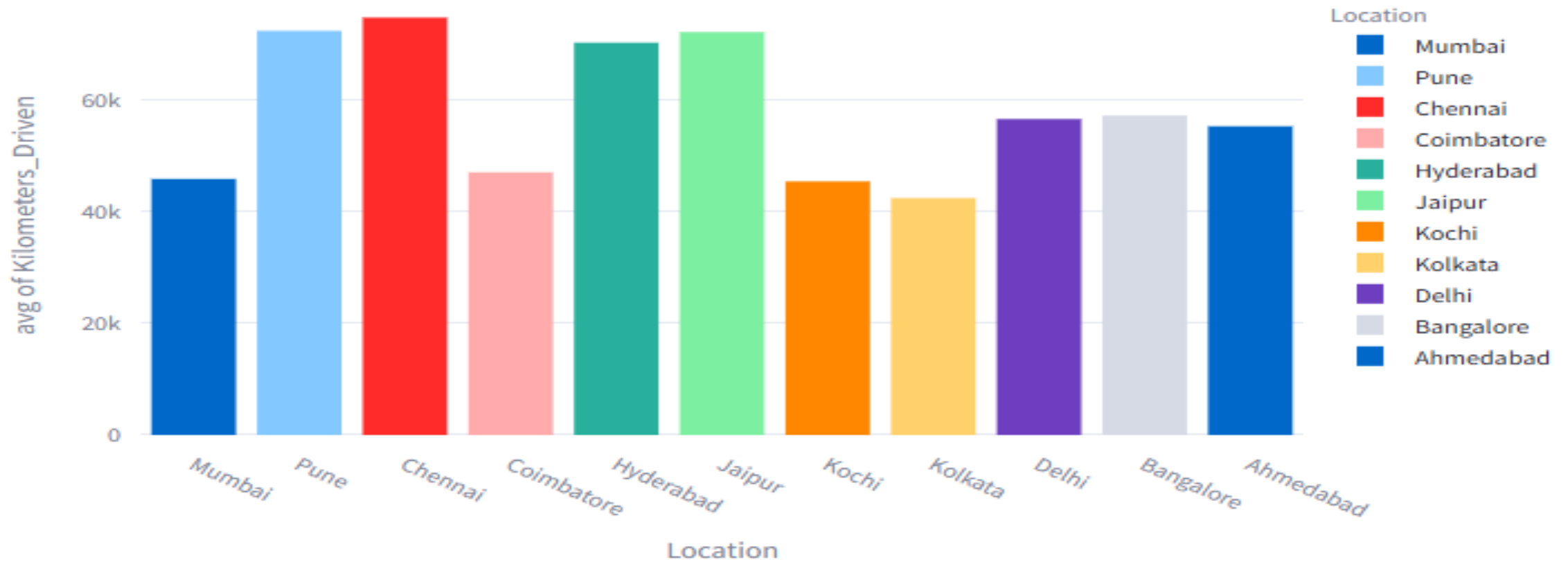| Location	Category	Value
Ahmedabad	Economy	119
	Mid-range	81
	Luxury	54
	Ultra-Luxury	21
Bangalore	Economy	139
	Mid-range	131
	Ultra-Luxury	97
	Luxury	73
Chennai	Economy	327
	Mid-range	157
	Luxury	61
	Ultra-Luxury	45
Coimbatore	Mid-range	311
	Ultra-Luxury	180
	Economy	155
	Luxury	126
Delhi	Economy	288
	Mid-range	175
	Luxury	116
	Ultra-Luxury	81
Hyderabad	Economy	354
	Mid-range	296
	Luxury	118
	Ultra-Luxury	108
Jaipur	Economy	290
	Mid-range	148
	Luxury	41
	Ultra-Luxury	20
Kochi	Mid-range	339
	Economy	214
	Ultra-Luxury	110
	Luxury	109
Kolkata	Economy	414
	Mid-range	164
	Luxury	51
	Ultra-Luxury	25
Mumbai	Economy	378
	Mid-range	325
	Luxury	150
	Ultra-Luxury	95
Pune	Economy	434
	Mid-range	205
	Luxury	88
	Ultra-Luxury	38

Coimbatore has the highest average price for used cars, exceeding **1.4 million INR**, indicating high demand or the prevalence of luxury cars.

Bangalore ranks second, with an average price close to **1.3 million INR**.

If you are buying a used car, it is best to look in cities with larger numbers as they have more options and good prices.
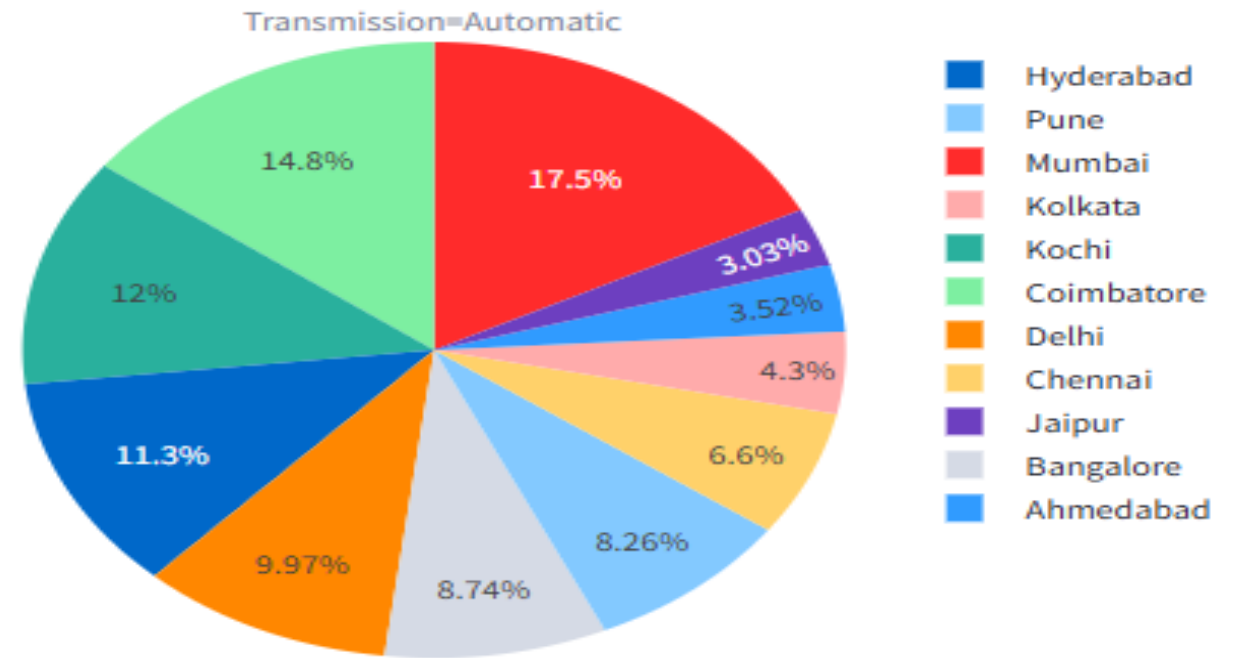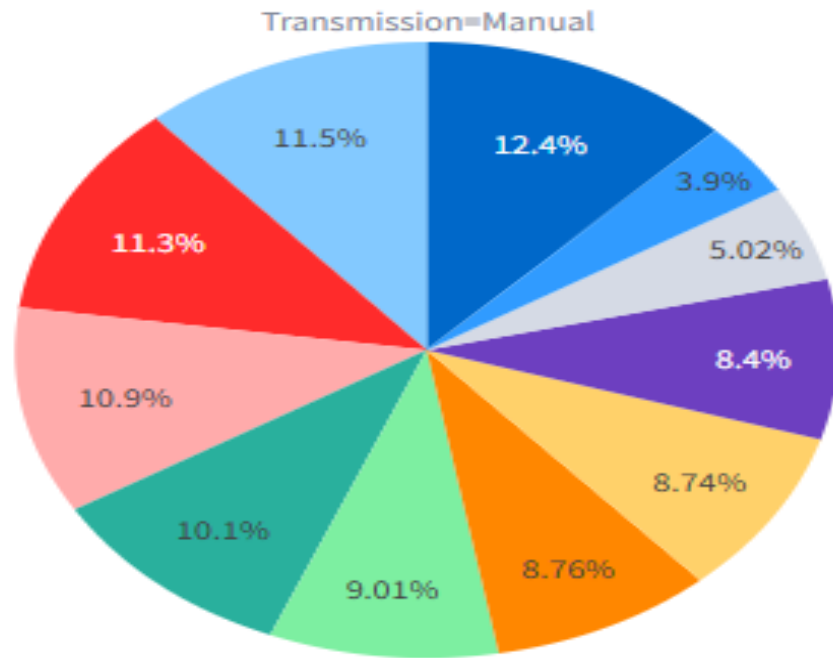
Areas with high numbers (such as Mumbai) may have high competition which may result in lower prices.
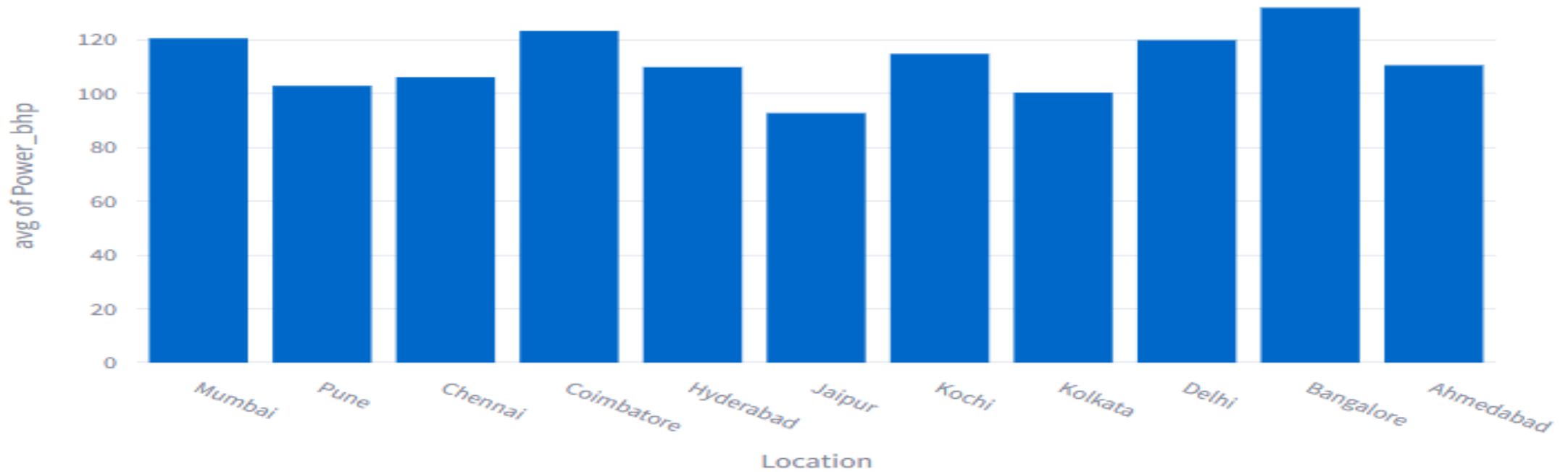
Cities with high average mileage (e.g. Chennai, Hyderabad, Jaipur) may have more worn cars, which may mean a greater need for maintenance.

Cities with lower average kilometers (e.g. Kochi, Kolkata) may have cars in better condition.

If you are looking for a car in good condition, it may be better to look in cities with shorter distances.

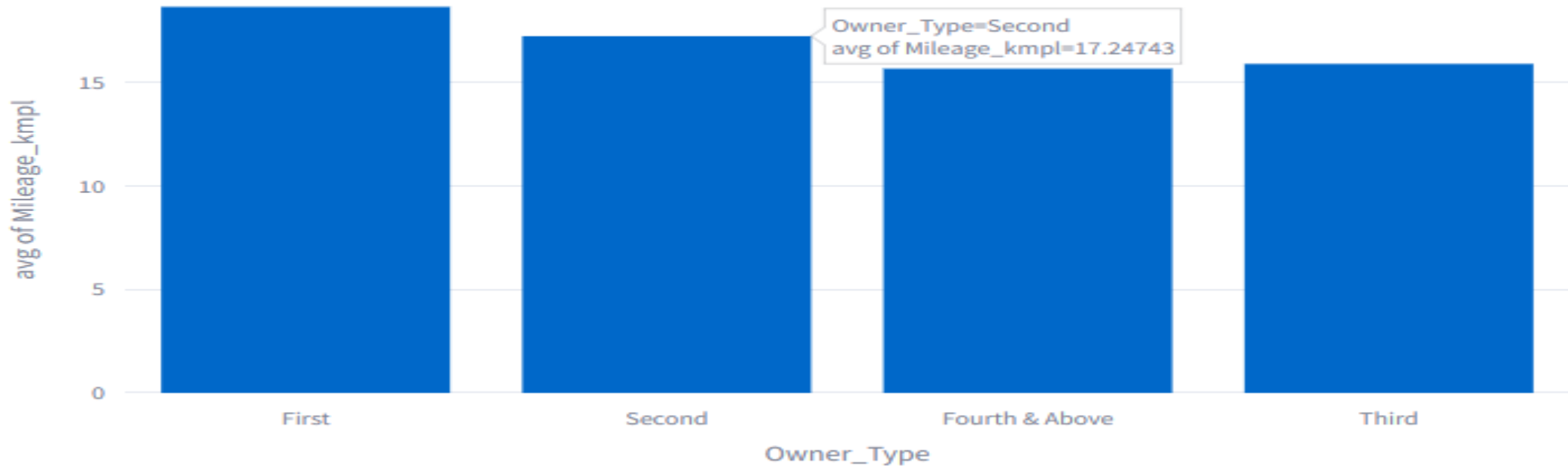Which country has more automatic or manual cars?

Highest average engine power:

Coimbatore and Bangalore have the highest average engine power, exceeding 120 bhp.
This may indicate a preference for high-performance cars in these regions.

Lowest average engine power:

Jaipur has the lowest average engine power, at less than 100 bhp.
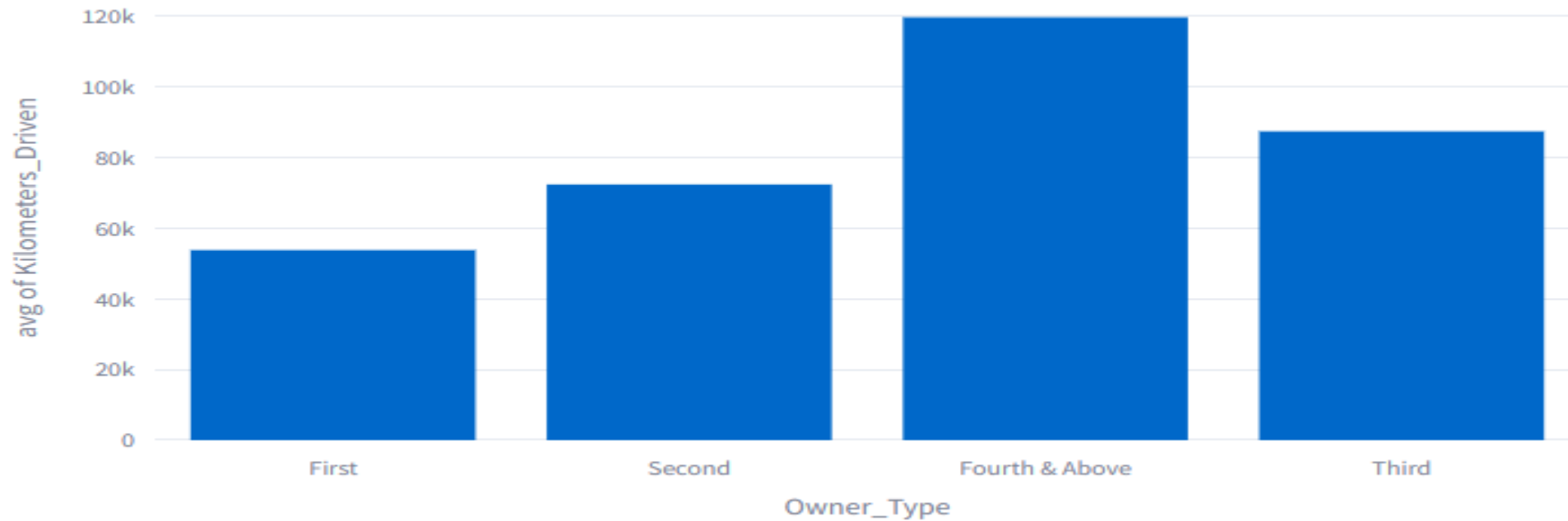This may indicate the spread of economical or small cars there

Cars purchased from the first owner have the highest average fuel economy (kmpl).

This suggests that cars used for the first time are often in better condition and achieve higher fuel efficiency.

As the number of owners increases, the average fuel consumption gradually decreases.

Cars that have gone through the third or fourth owner or more show a noticeable decline in fuel efficiency.
This may be due to normal wear and tear, lack of maintenance, or changing driving style from one owner to another.
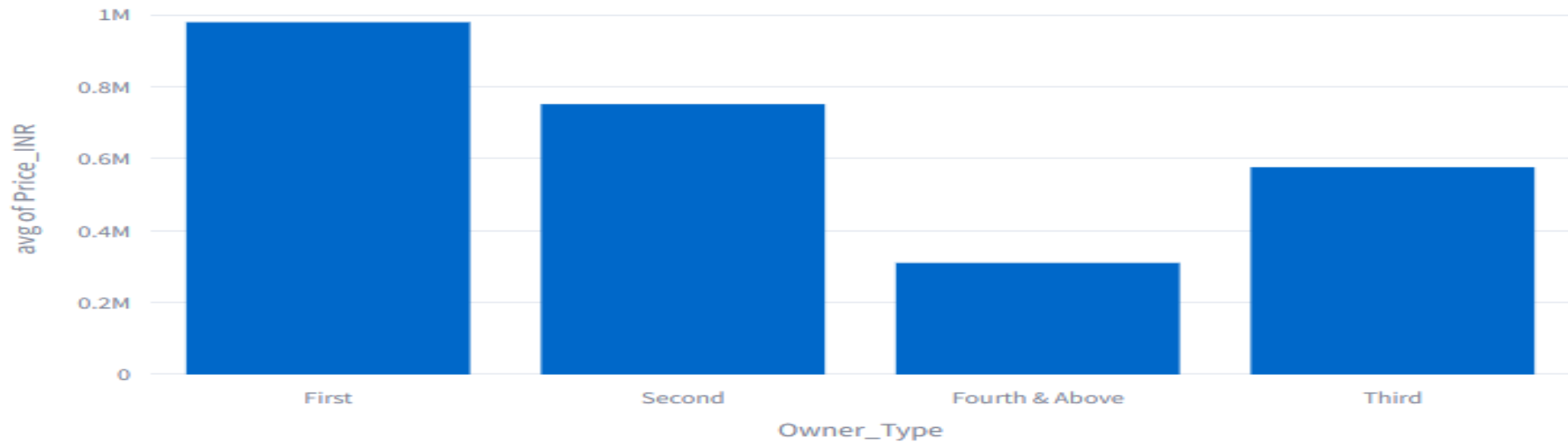
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First-owner cars have the highest average price This makes sense because they are usually in better condition and have lower wear and tear, increasing their resale value.

Second-owner cars see a price drop but still maintain a relatively high value.
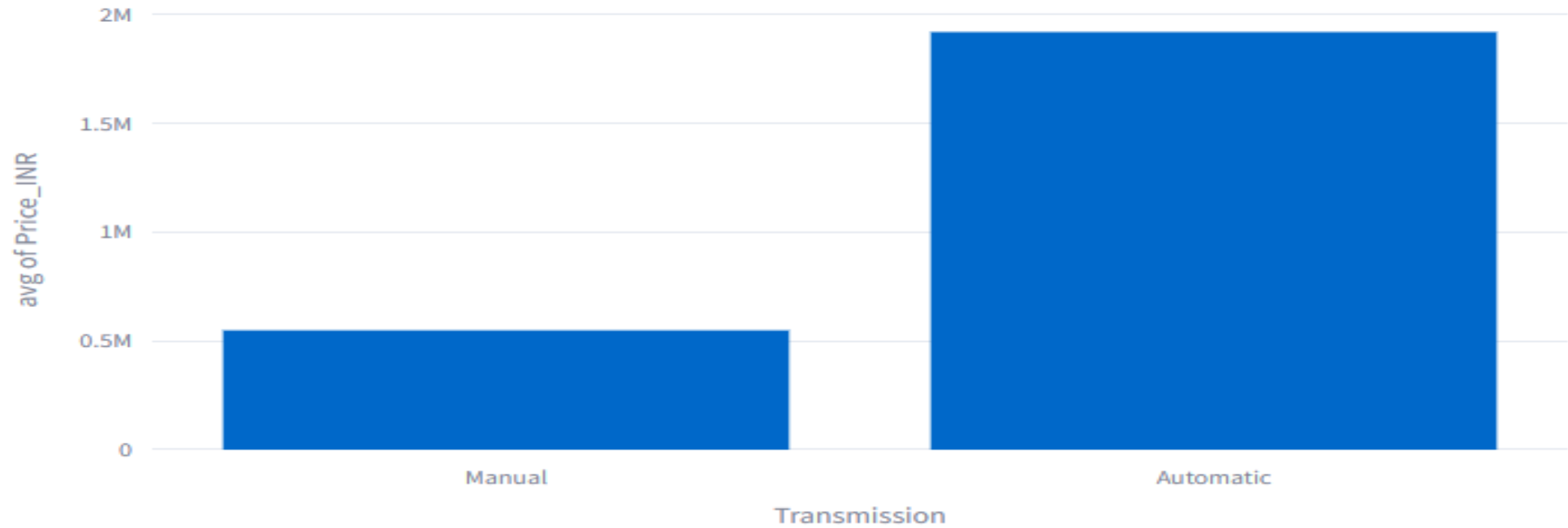•These cars are still in demand as they are often in good condition.

Third-owner cars experience a more significant price decline.
•At this point, the impact of usage and aging starts to become more noticeable, reducing their market value.

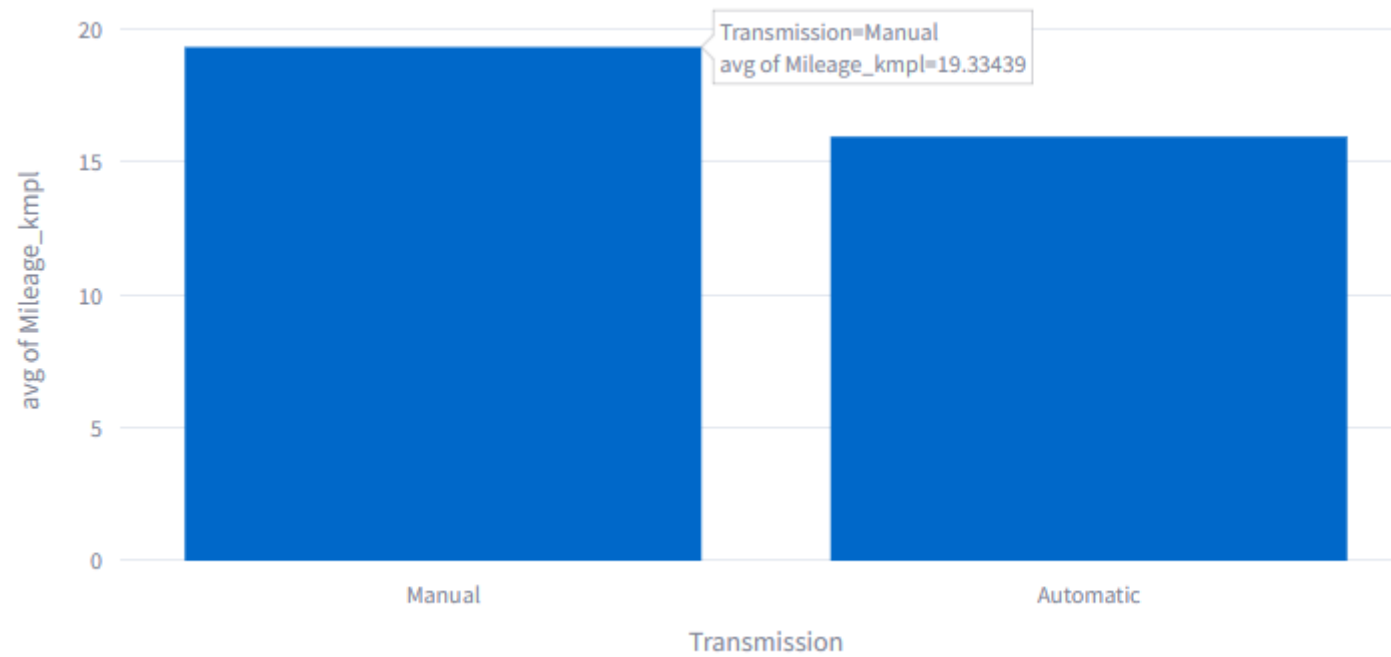4 **Cars with four or more previous owners have the lowest average price.**
•These vehicles are often older and have higher mileage, leading to a steep drop in value.
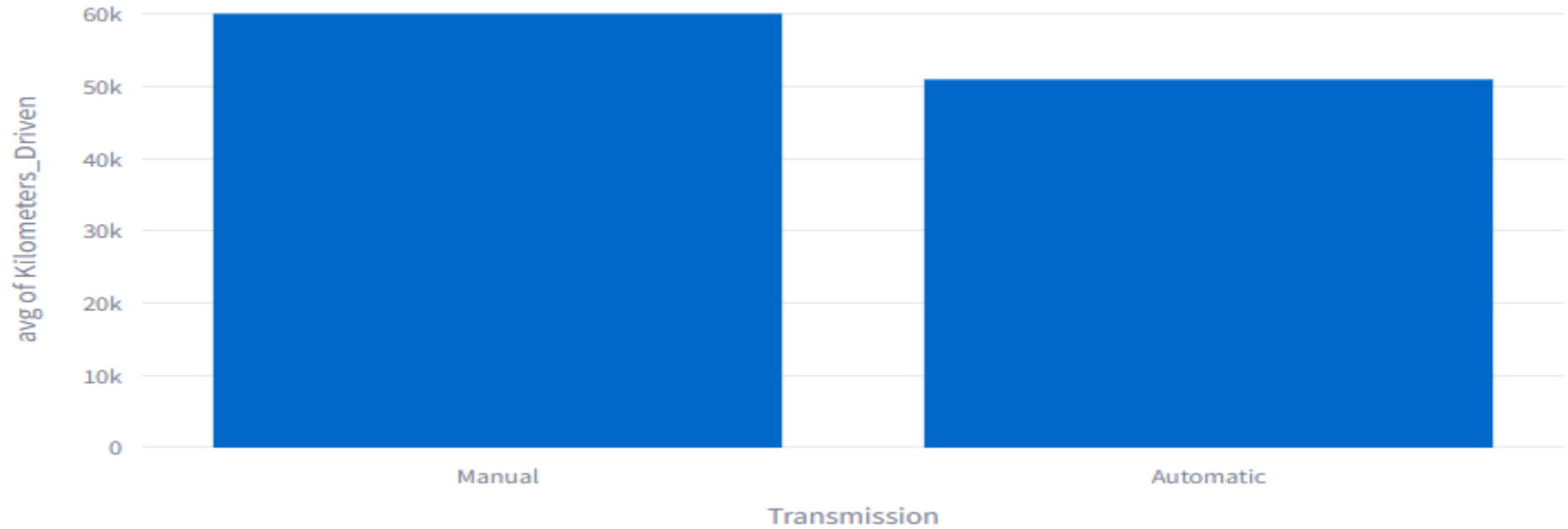
Price by Transmission

Automatic cars have a significantly higher average price than manual cars

They come with advanced technology and higher manufacturing costs.
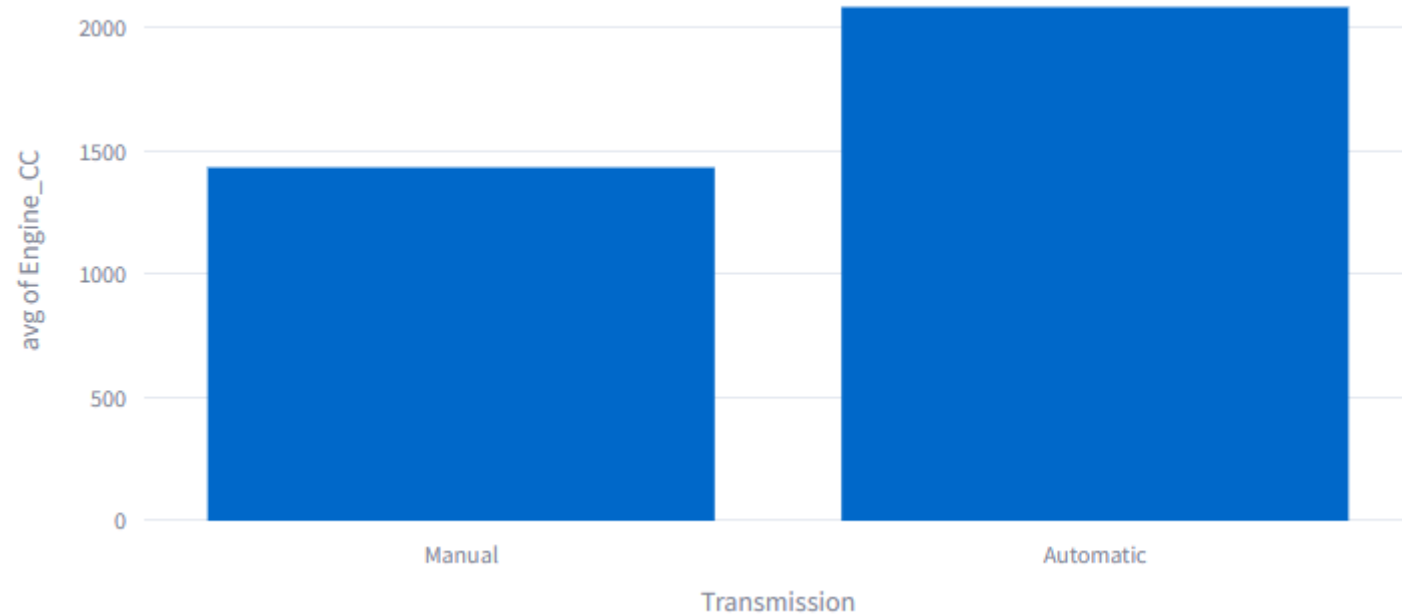
Manual cars have higher mileage (kmpl) compared to automatic cars
Manual transmissions allow drivers to **control gear shifts** more efficiently.

Manual cars are more durable and less expensive to maintain, making them a better choice for long-term use.

In some markets, automatic cars are considered luxury and therefore not used as much.
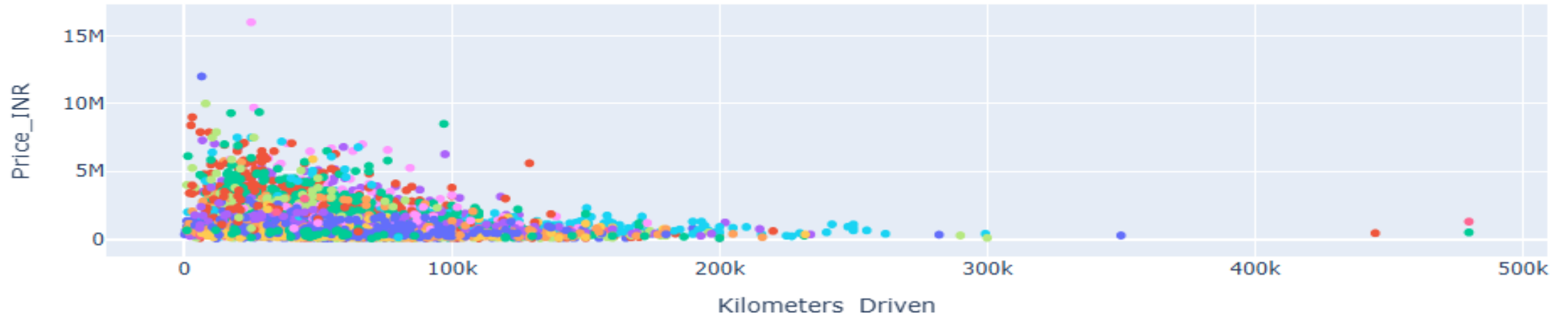
Engines in automatic cars are larger than manual cars

If you're looking for a fuel-efficient car, manual cars may be a better option, as smaller engines mean lower fuel consumption.

If you are looking for a car with strong performance, automatic cars offer more engine power, making them a better choice for long roads and comfortable driving.

price vs kilometers driven

This scatterplot shows the relationship between the number of kilometers traveled and the price of the car (in Indian Rupees). Here are some important notes from the analysis:

Inverse relationship: In general, the more kilometers a car has traveled, the lower its price. This makes sense because cars that have been used over long distances experience greater depreciation, which reduces their market value.
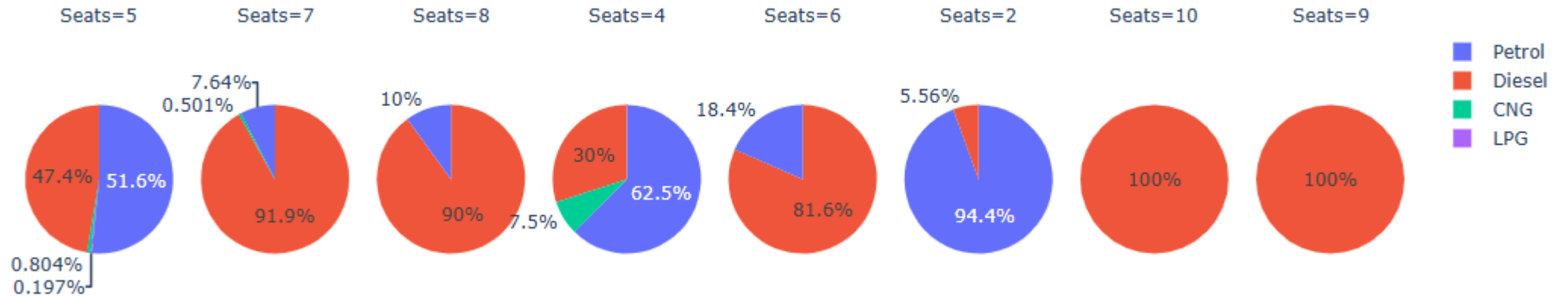
Distribution of Price Rate

Comparing the average resale age between economy and luxury cars

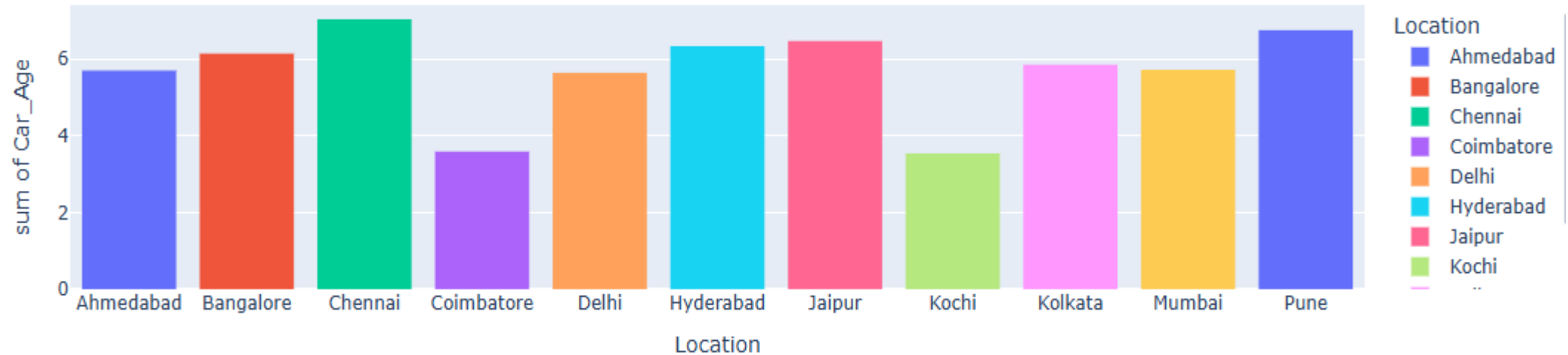The more luxurious the car, the more likely it is to sell early.

Economy cars stay with their owners for a longer period compared to other categories.

Seats=5 Seats=7 Seats=8 Seats=4 Seats=6 Seats=2 Seats=10 Seats=9

Petrol
Diesel
CNG
LPG

Large cars (7 seats or more) mainly rely on the following two types of fuel:
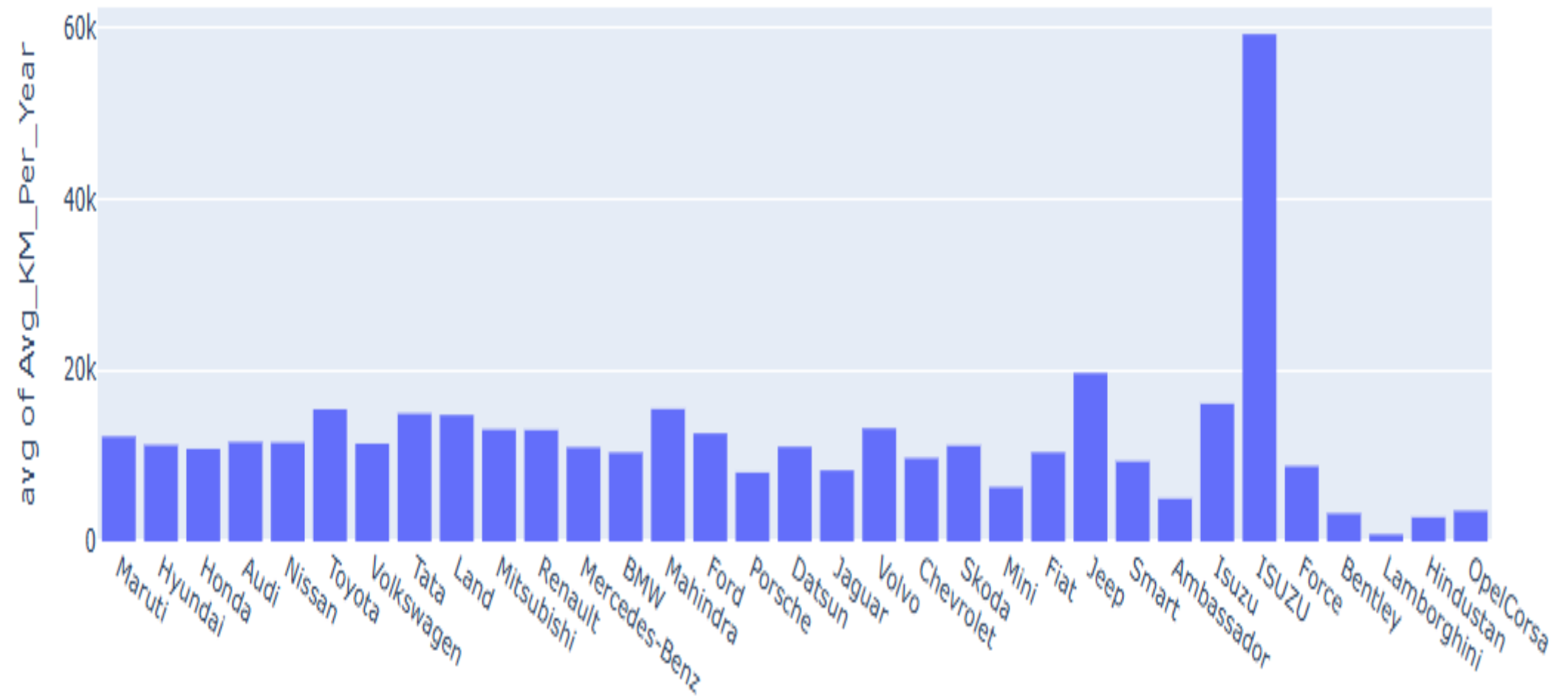
Diesel
petrol
Little natural gas (CNG)
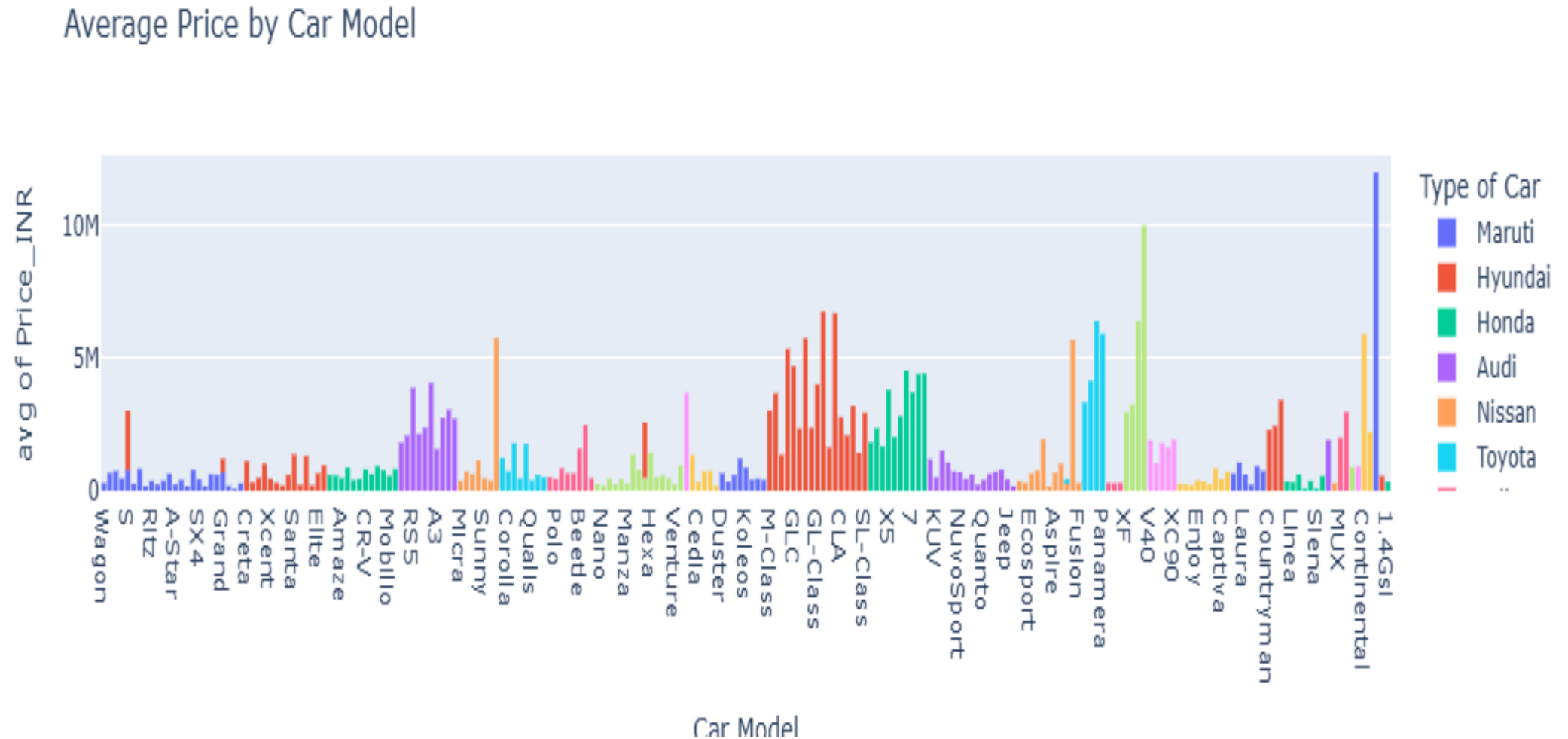
Resale Age Distribution by Location

Cities with a longer average resale age may have higher new car prices or residents prefer to wear the car until the end of its life.
Cities with a lower average resale age may reflect a culture of changing cars frequently or the presence of an active used car market.

The highest average annual kilometers is clearly visible for the Isuzu brand

What is the most expensive model of each type?

Average Price by Car Model

Name of the oldest car

Name	Location	Year	Kilometers_Driven	Fuel_Type	Transmission	Owner_Type	Mileage_kmpl	Engine_CC	Power_bhp	Seats	Price_INR
Hindustan Motors Contessa 2.0 DSL	Pune	1996	65000.0	Diesel	Manual	Second	14.1	1995	151.233333	5	565000.0