Road Accident EDA

Initial set up -

1. Imported pandas,numpy,matplotlib and seaborn
2. Imported dataframe as ra
4. dropped variable-total as it will effect describe
5. Renamed and adjusted all variables - 37 rows * 50 columns
6. ra.isnull().sum().sort_values(ascending=False) - to check null values
7. duplicate_var=ra.duplicated() - to check for duplicate variables

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Based on the dataset, The Road Accidents can be broadly grouped into 4 categories -

1. Kill count
2. Accident count
3. Minor injured count
4. Grievously injured count

Types of accidents caused by/to each of the above mentioned categories -

1. Pedestrians
2. Bicycle
3. 2 wheeler
4. Auto-Rickshaw
5. Car,Taxi,Vans and other LMV
6. Tuck/Lorry
7. Buses
8. Other non motor vehicle

To understand better about accidents caused to/by above mentioned 8 types -
Let’s frame some questions -

1st Question

Which city has highest number of accident for each group of accident

To solve this we have to first categorize each group -

- 1st category (Killed) City names with highest no. of kill count in each category
- Assigning group of kill count in -
- kill_count = no_pedst_killed, no_bicycle_killed, no_2wl_killed, no_autork_killed, no_car_tx_van_kill, no_truck_lorr_kill, no_bus_kill, no_othr_non_motor_kill

Then using idmax() we’ll get highest count of each particular category

- 2nd category (accident's stats)
- Assigning group of kill count in -
- accident_count = no_road_acc_pedst, 'no_bicycle_acc', 'no_2wl_acc', 'no_autork_acc','no_car_tx_van_acc', 'no_truck_lorr_acc', 'no_bus_acc', 'no_othr_acc'

- 3rd category (Grievously Injured's stats)
- Assigning group of kill count in -
- grvs_inj_count= 'no_pedst_grvs_inj', 'no_bicycle_grvs_inj', 'no_2wl_grvs_inj', 'no_autork_grvs_inj','no_car_tx_van_grvs_inj', 'no_truck_lorr_grvs_inj', 'no_bus_grvs_inj','no_othr_grvs_inj'

- 4th category - Minor involved stats
- Assigning group of kill count in -
- minor_inj_count = 'no_minor_pedst_inj', 'no_minor_bicycle_inj', 'no_minor_2wl_inj', 'no_minor_autork_inj','no_minor_car_tx_van_inj', 'no_minor_truck_lorr_inj', 'no_minor_bus_inj', 'no_othr_minor_inj'

1st category (Killed) -

```
highest_PEDESTRIAN_killed - Delhi
highest_BICYCLE_riders_killed - Delhi
highest_TWO-WHEELER_riders_killed - Chennai
highest_AUTO-RIKSHAWS_riders_killed - Allahabad/Prayagraj
highest_CARS,TAXIS,VANS AND LMVs_drivers_killed - Jaipur
highest_TRUCKS/LORRIES_drivers_killed - Jaipur
highest_BUS_drivers_killed - Chennai
highest_OTHER NON-MOTORIZED VEHICLE_drivers_killed - Lucknow
```

Delhi followed by Chennai and followed by Jaipur

2nd category (accidents) -

```
highest_PEDESTRIAN_accidents - Mumbai
highest_BICYCLE_accidents - Delhi
highest_TWO_WHEELER_accidents - Chennai
highest_AUTO-RIKSHAWS_accidents - Chennai
highest_CARS,TAXIS,VANS AND LMVs_accidents - Chennai
highest_TRUCKS/LORRIES_accidents - Chennai
highest_BUS_drivers_accidents - Chennai
highest_OTHER NON-MOTORIZED VEHICLE_accidents - Indore
```

Chennai - most frequent

3rd category - (Grievously Injured)

```
highest_PEDESTRIAN_greviously_injured - Mumbai
highest_BICYCLE_riders_greviously_injured - Jabalpur
highest_TWO_WHEELER_riders_greviously_injured - Bengaluru
highest_AUTO-RIKSHAWS_drivers_greviously_injured - Mallapuram
highest_CARS,TAXIS,VANS AND LMVs_drivers_greviously_injured - Mallapuram
highest_TRUCKS/LORRIES_drivers_greviously_injured - Mallapuram
highest_BUS_drivers_greviously_injured - Mallapuram
highest_OTHER NON-MOTORIZED VEHICLE_drivers_greviously_injured - Kolkata
```

Malappuram - most frequent

4th category (Minor involved) -

```
highest_MINOR_pedst_injured - Indore
highest_MINOR_BICYCLE_riders_injured - Jabalpur
highest_MINOR_TWO_WHEELER_injured - Chennai
highest_MINOR_AUTO-RIKSHAWS_injured - Chennai
highest_CARS,TAXIS,VANS AND LMVs_MINOR_injured - Chennai
highest_TRUCKS/LORRIES_MINOR_injured - Chennai
highest_BUS_MINOR_injured - Jaipur
highest_OTHER NON-MOTORIZED VEHICLE_MINOR_injured - Delhi
```

Chennai - most frequent

Now we have got the **highest count** for each group of accidents based on its category.

2nd Question

In each category - Top 5 cities with each type of accident -

1. Highest no. of pedestrians killed - accident_count - minor_injured - grvsl_inj
2. Is there a correlation b/w no. of accidents recorded and killed in accidents?

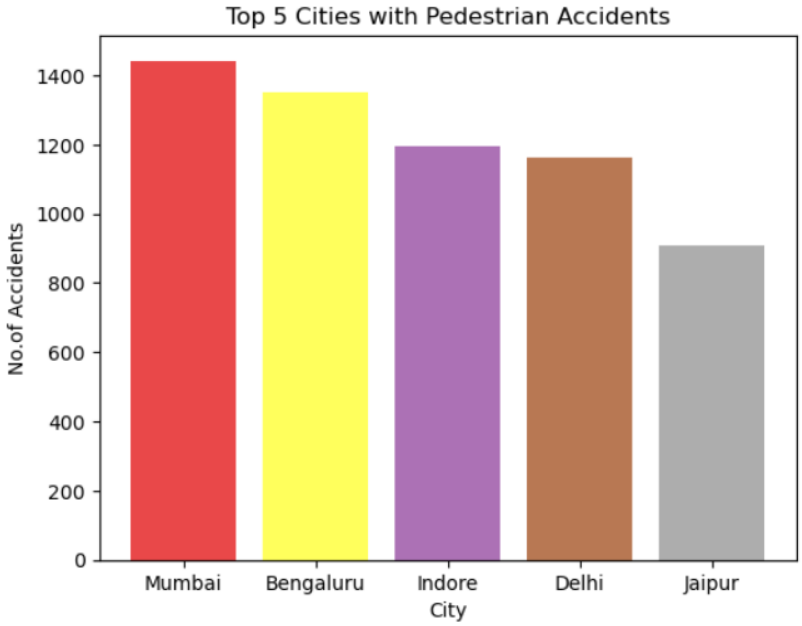
Solution -

Categories created - (count of all accidents irrespective of mode/cause of accident)

1st Category - Pedestrian Accidents -

total_pedst_acc - Includes -

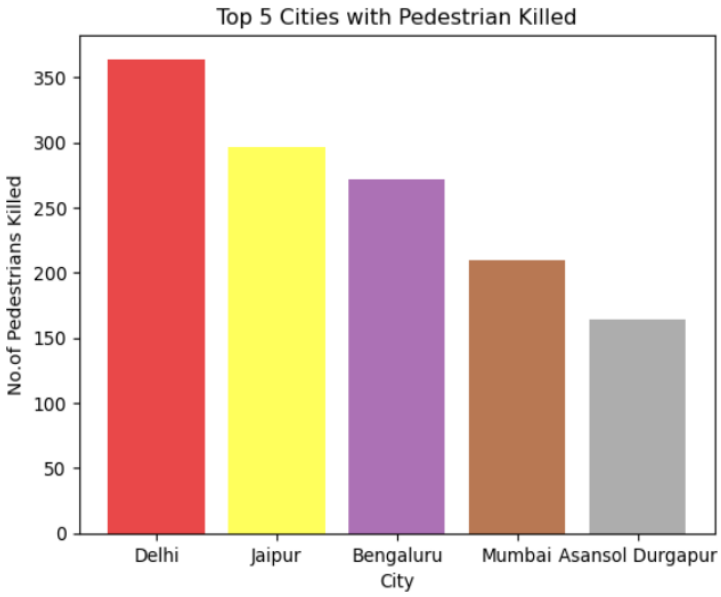
1. '*no_road_acc_pedst'*
2. *'no_pedst_killed'*
3. *'No_pedst_grvs_inj'*
4. *'No_minor_pedst_inj'*



This graph shows - *top_5_city_with_pedestrian_acc*

1. Mumbai 1442
2. Bengaluru 1352
3. Indore 1196
4. Delhi 1161
5. Jaipur 907

Pedestrian Killed -



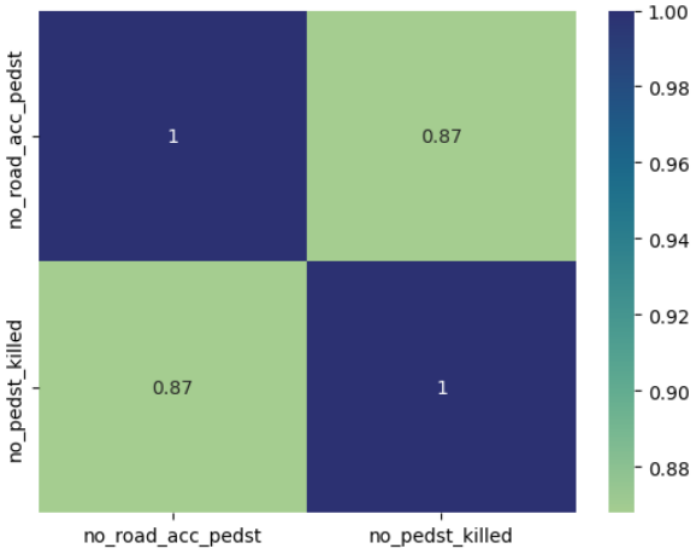
This graph shows - *top_5_city_with_pedestrian_killed*

1. Delhi 364
2. Jaipur 296
3. Bengaluru 272
4. Mumbai 210
5. Asansol Durgapur 164

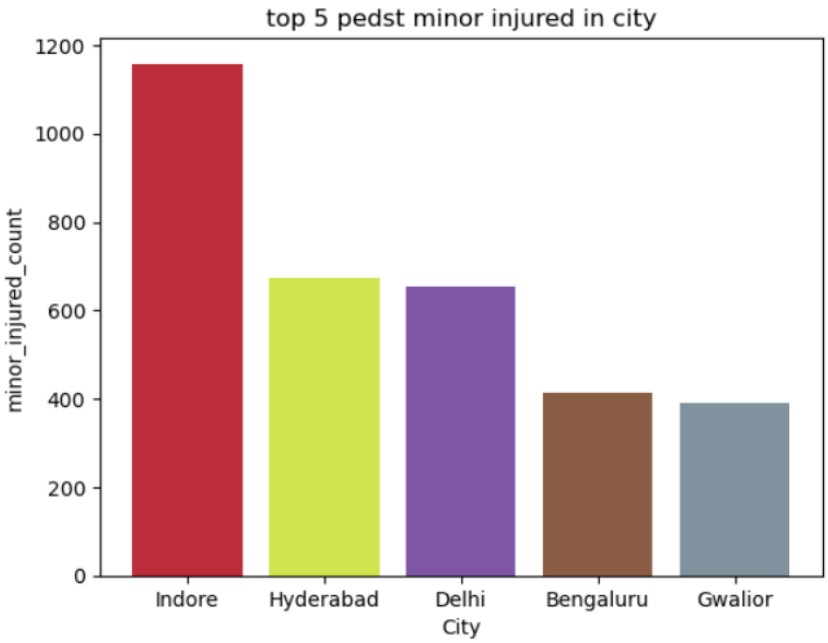
Inferences -

- Mumbai recorded **24%** more accidents than Delhi
- Jaipur (5th highest) recorded **42%** less accidents than Mumbai
- Though Mumbai has recorded highest road accidents but it is **42%** less than Delhi in kill count
- Mumbai,Delhi and Bengaluru are tier 1 city while rest are tier 2 cities which means despite of better road Structure for pedestrians in tier 1 cities, top 3 pedestrians killed are in tier 1 city

Correlation b/w number of Road Accidents and Pedestrians killed is **87%**



MINOR Pedestrian injured -



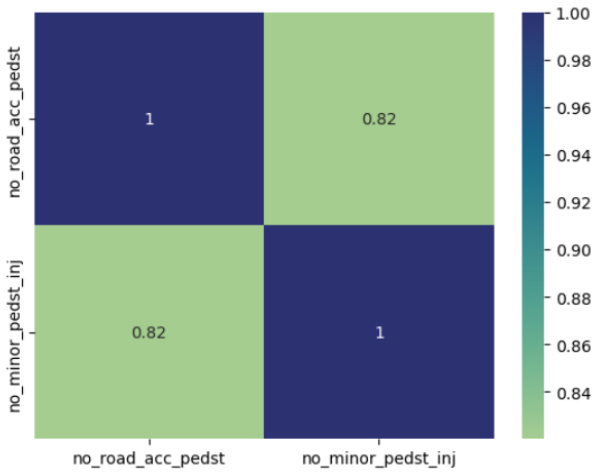
This graph shows - *top_5_city_with_minor_pedestrian_injured*

1. Indore : 1158
2. Hyderabad : 672
3. Delhi : 653
4. 'Bengaluru' : 414
5. 'Gwalior' : 390

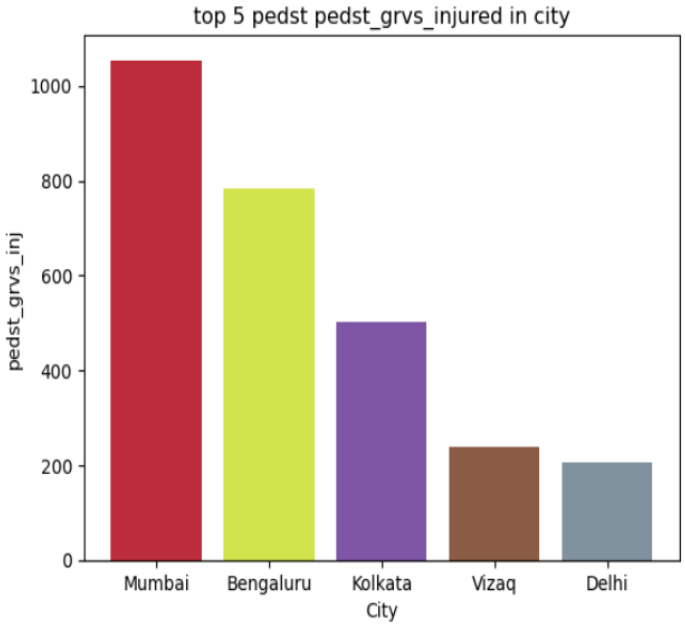
Inferences from top_5_city_with_minor_pedestrian_injured bar graph -

- Indore recorded 1158 minor accidents which is **76%** more than average of top 5 cities
- If we assume accident count of Bengaluru which is 1352 as total population then minor is 31% of total accidents

Correlation b/w number of Road Accidents and Minor Pedestrians injured is **82%**



Pedestrians Grievously injured -



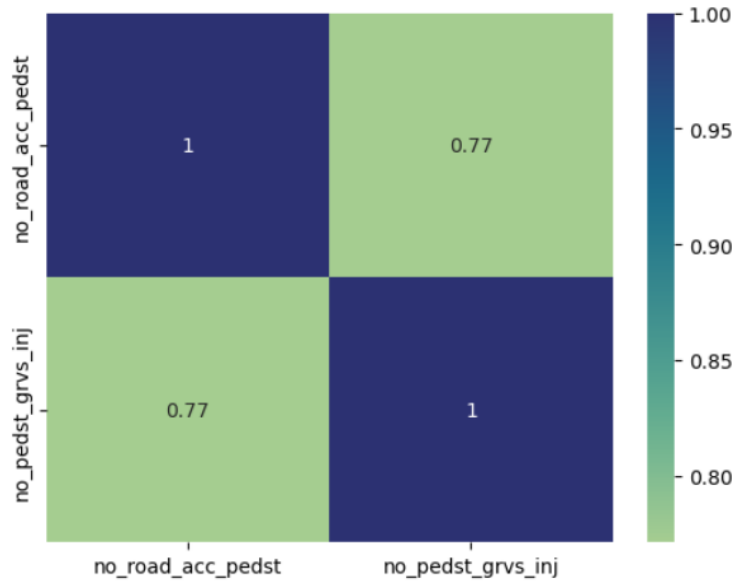
This graph shows - *top_5_city_with_pedestrian_grievously_injured*

1. 'Mumbai': 1054
2. 'Bengaluru': 783
3. 'Kolkata': 502
4. 'Vizag': 240
5. "Delhi': 206

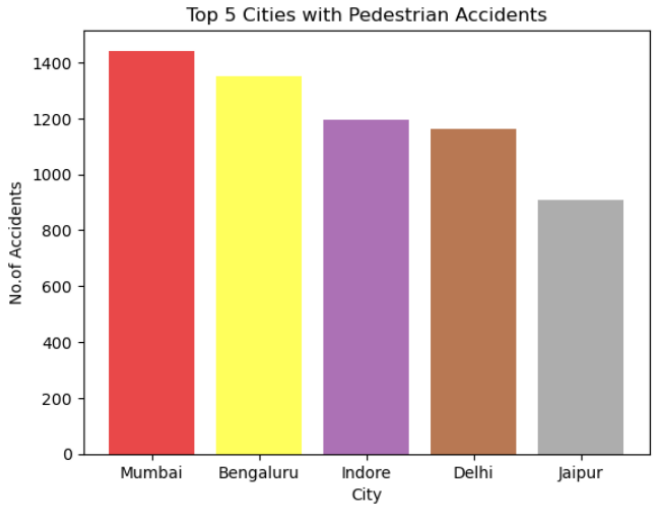
Inferences -

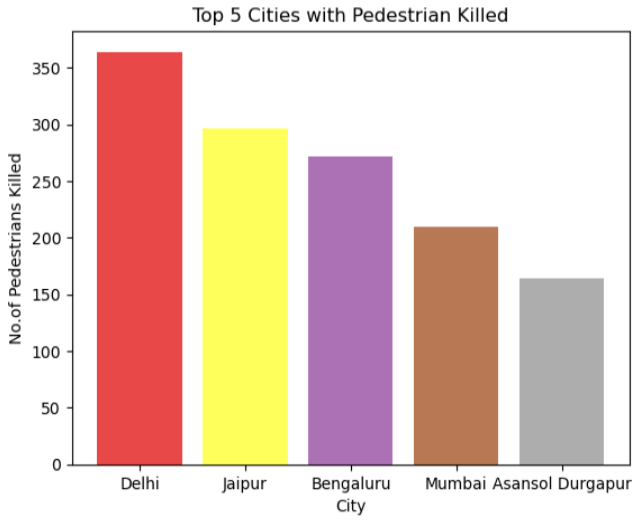
- Mumbai recorded **80%** more grievous accidents than Delhi, both being tier 1 cities
- Bengaluru's grievously injured count is **42%** less than total accidents recorded in the city
- Vizag is a tier 2 city, yet it recorded merely 30 less grievously injured pedestrians than Delhi

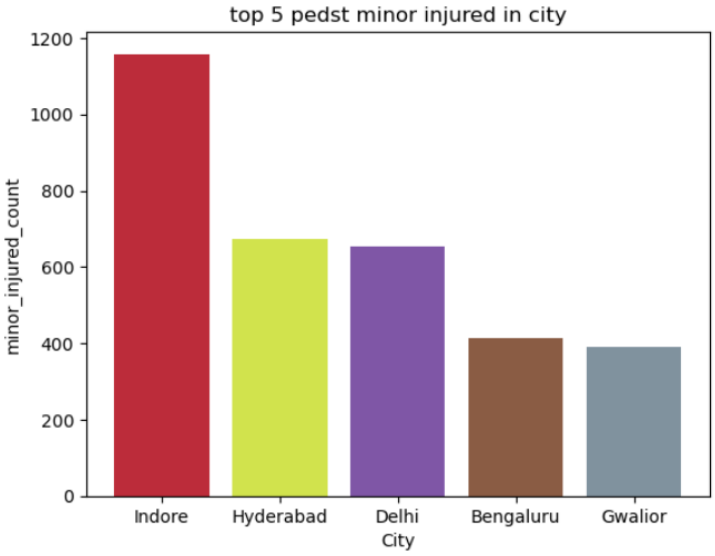
Correlation b/w number of Road Accidents and Pedestrians greviously_injured is **77%**

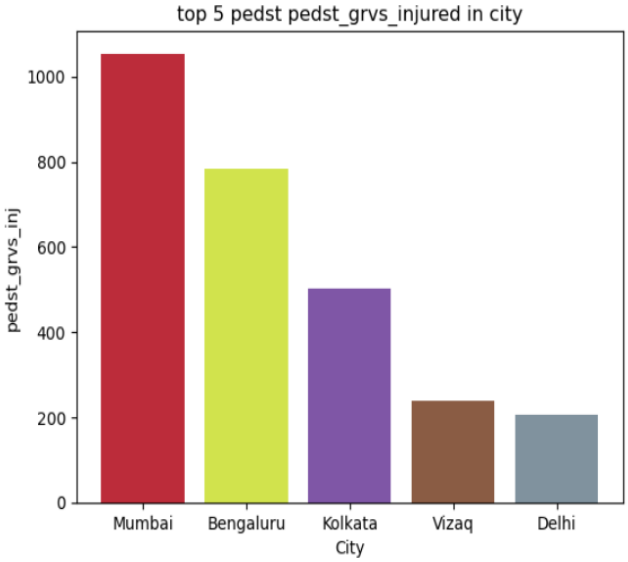


Pedestrians Accidents graph in one frame -

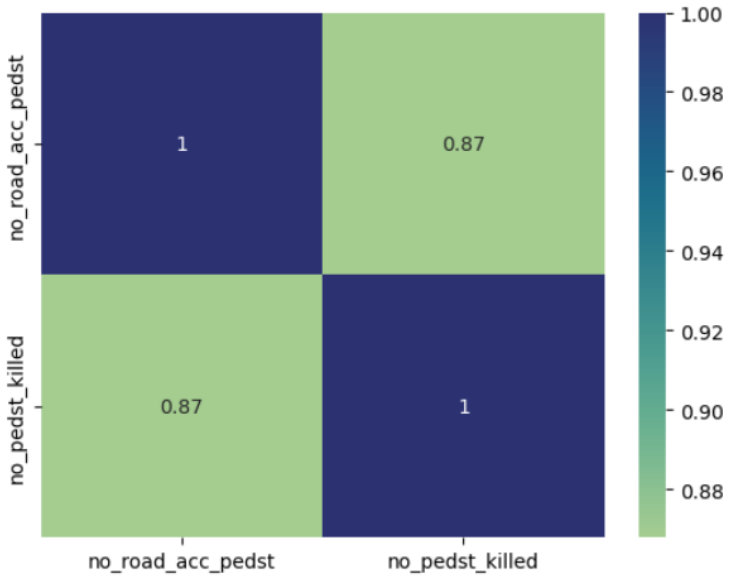


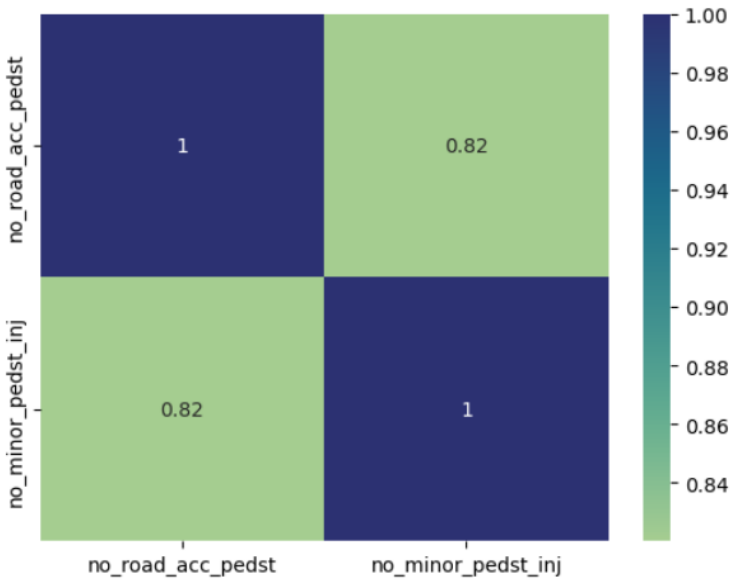


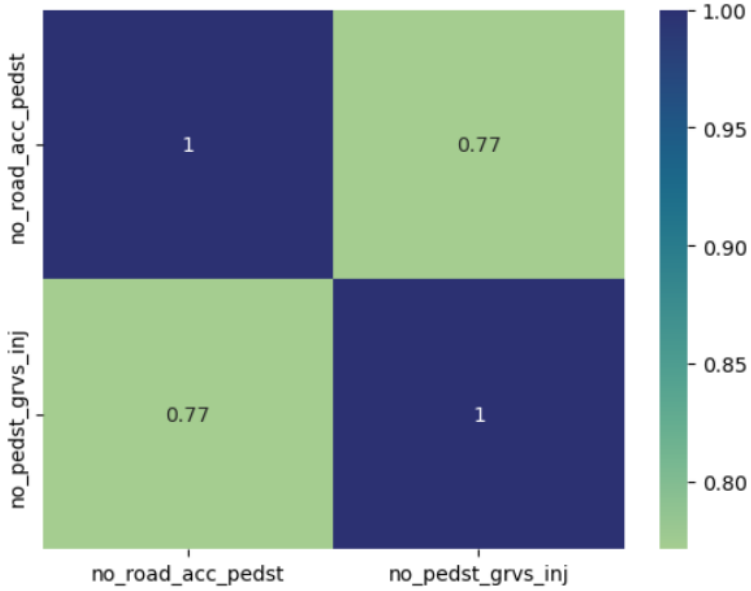




Pedestrians Accident's Correlation in one frame -





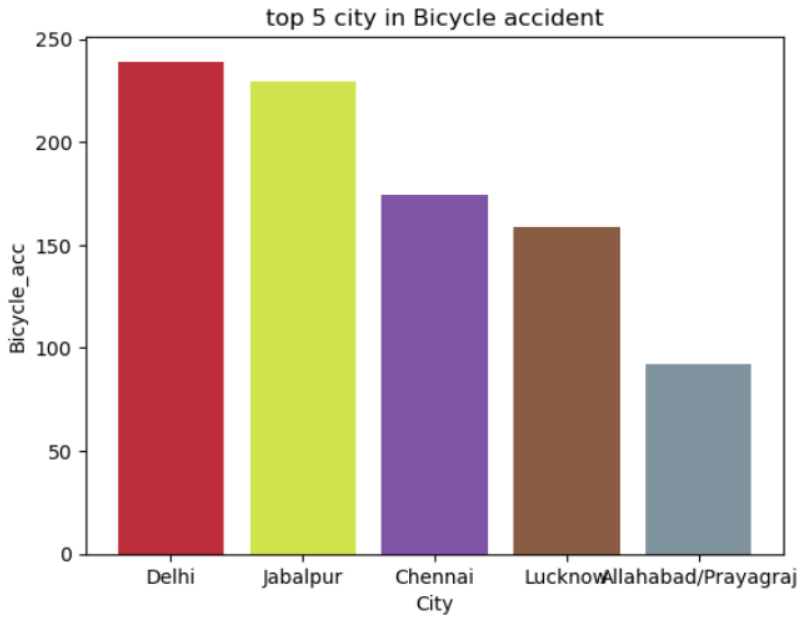


Pedestrian's accident

2nd Category - Bicycle Accidents -

total_bicycle_acc - Includes -

1. 'no_bicycle_acc'
2. 'no_bicycle_killed'
3. 'no_bicycle_grvs_inj'
4. 'no_minor_bicycle_inj'



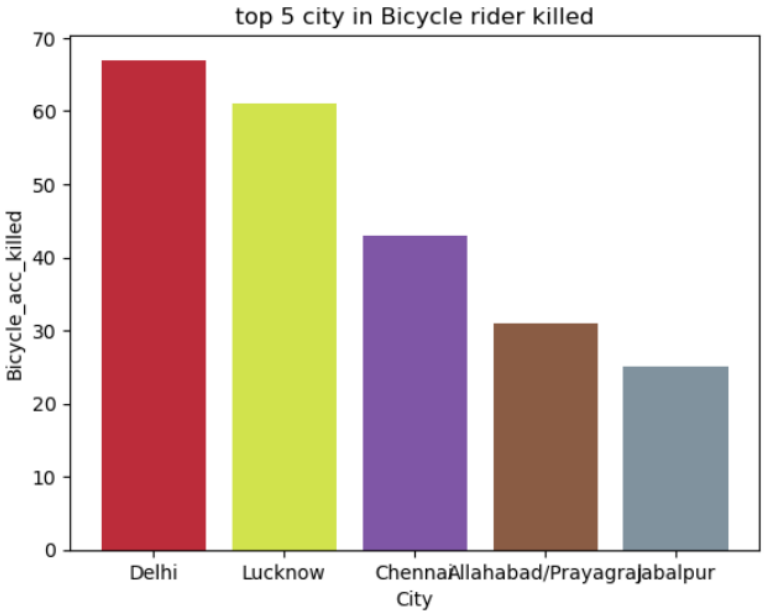
This graph shows - top_5_city_with_Bicycle_acc

1. Delhi 239
2. Jabalpur 229
3. Chennai 174
4. Lucknow 159
5. Allahabad/Prayagraj 92

Inferences -

- Allahabad/Prayagraj recorded **61%** less Bicycle accident than Delhi
- Jabalpur recorded **24%** more Bicycle accidents than Chennai

Bicycle Rider Killed -



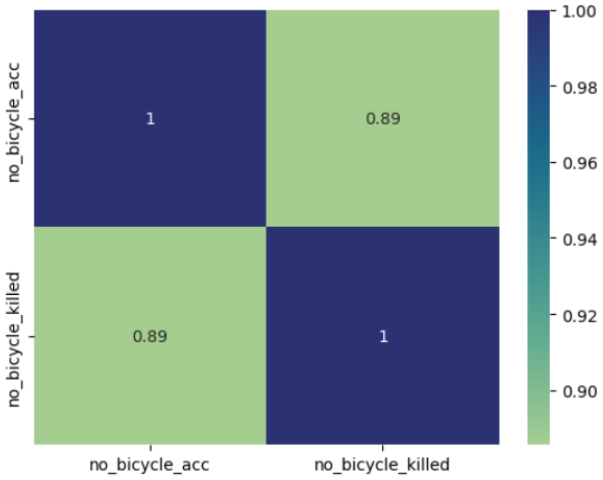
This graph shows - *top_5_city_with_bicycle_rider_killed*

1. Delhi 67
2. Lucknow 61
3. Chennai 43
4. Allahabad/Prayagraj 31
5. Jabalpur 25

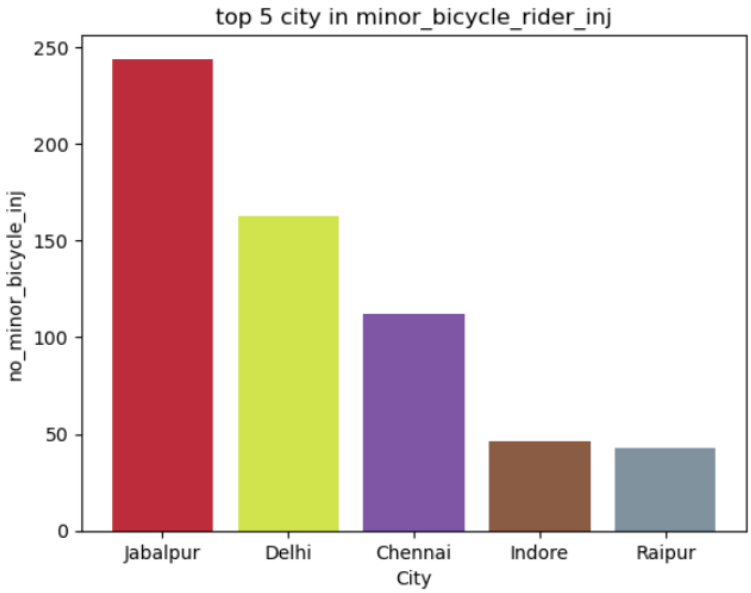
Inferences -

- Delhi recorded **71%** less death of Bicycle riders with reference to total Bicycle accidents recorded in Delhi
- Jabalpur recorded **62%** less Bicycle rider's death than Delhi while Mumbai recorded only 9 deaths
- Bangalore-which recorded *2nd* highest pedestrians grievously injured, recorded only 13 deaths for Bicycle riders

Correlation b/w number of Bicycle Accidents and Bicycle riders killed is **89%**



Bicycle Rider injured (minor) -



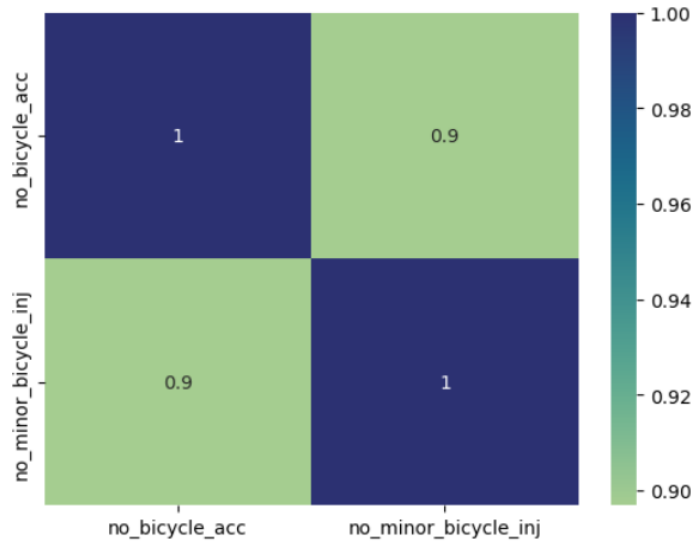
This graph shows - *top_5_city_with_minor_bicycle_rider_inj*

1. Jabalpur 224
2. Delhi 163
3. Chennai 112
4. Indore 46
5. Raipur 43

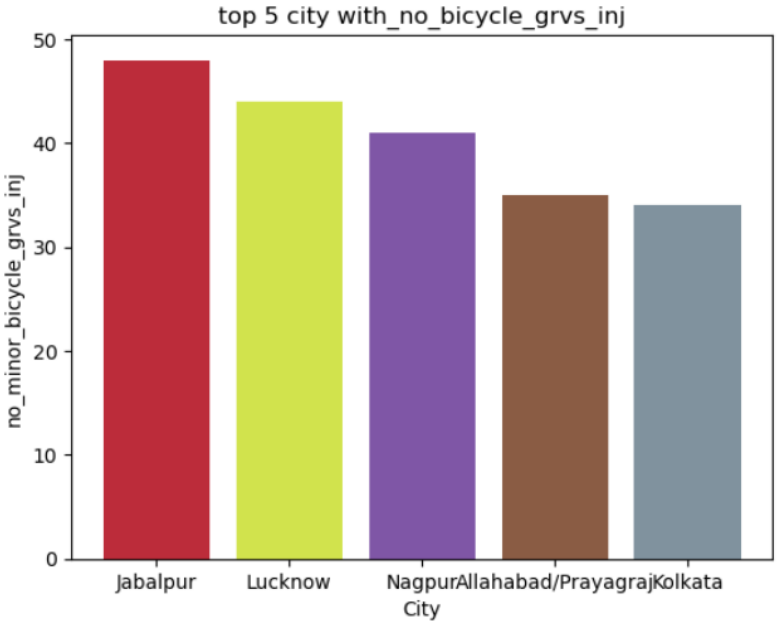
Inferences -

- Jabalpur recorded **88%** more minor bicycle riders injured than Bicycle rider killed in Jabalpur
- Delhi recorded 239 Bicycle accidents where as minor injured are 163 which is **28%** less
- Indore is a new entry in accident's list with a rank of 4th highest while capital is Bhopal
- Raipur - capital of Chhattisgarh is at ***5th***

Correlation b/w number of Bicycle Accidents and minor injured is **90%**



Bicycle Rider grievously injured -



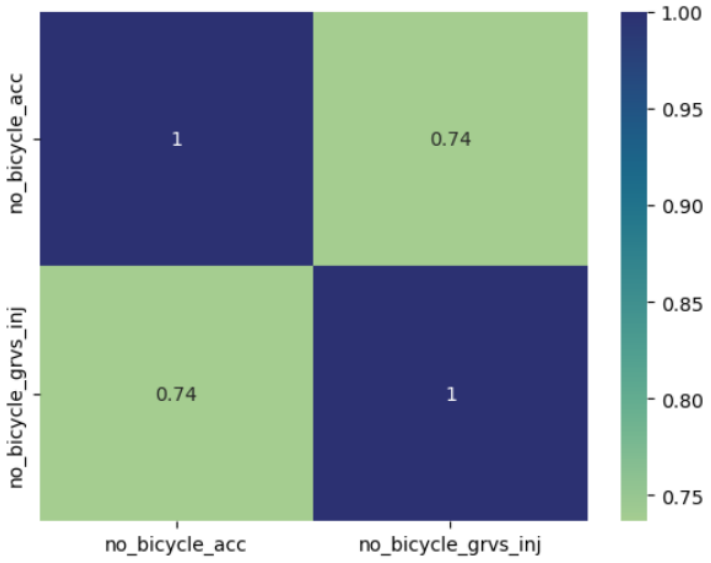
This graph shows - *top_5_city_with_no_bicycle_grvs_inj*

1. Jabalpur 48
2. Lucknow 44
3. Nagpur 41
4. Allahabad/Prayagraj 35
5. Kolkata 34

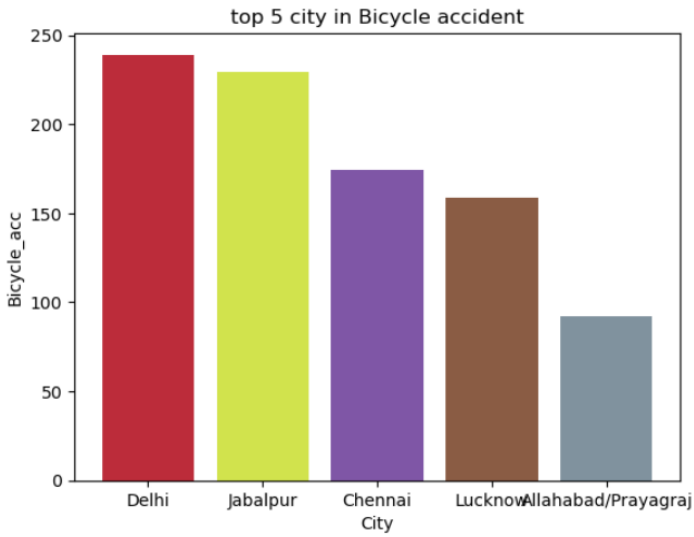
Inferences -

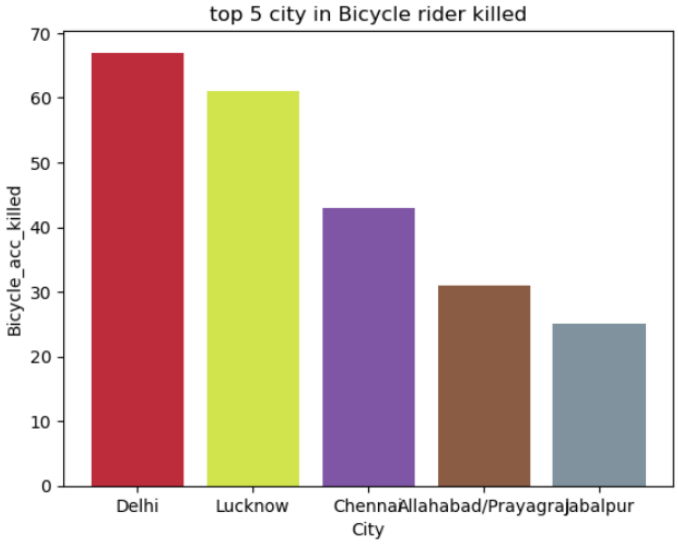
- Jabalpur recorded 229 in Bicycle accidents count, 25 in killed, 224 in minor injured and 48 in grievously injured
- Allahabad/Prayagraj has also recorded in all categories except injured

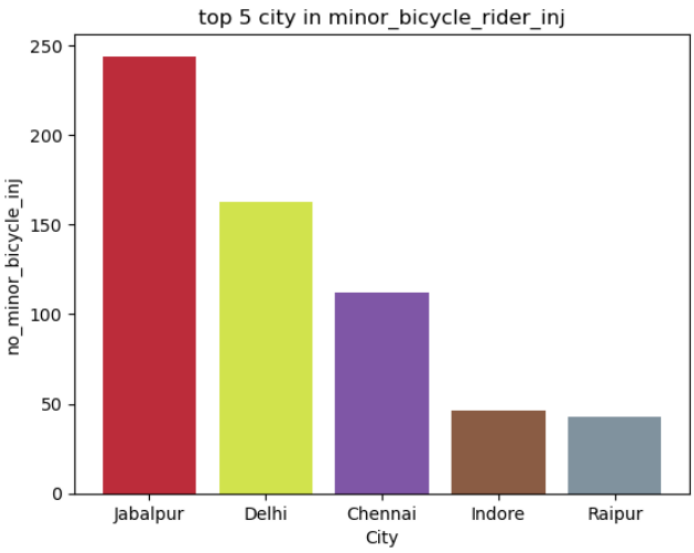
Correlation b/w number of Bicycle Accidents and grievously injured is **74%**

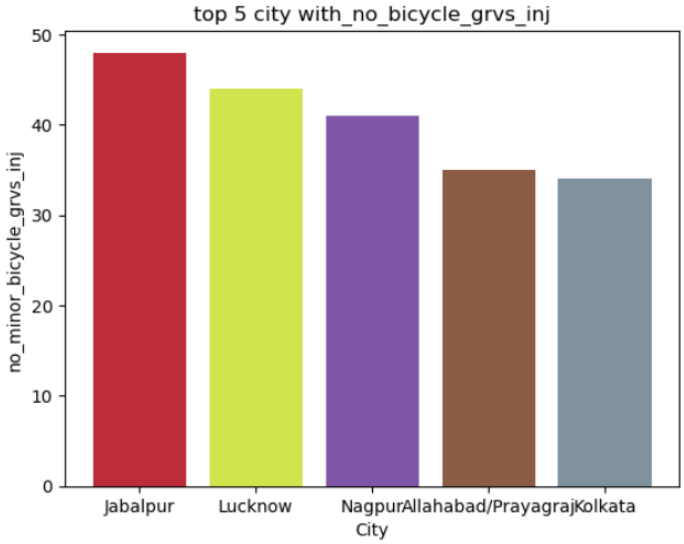


Bicycle Accidents graph in one frame -

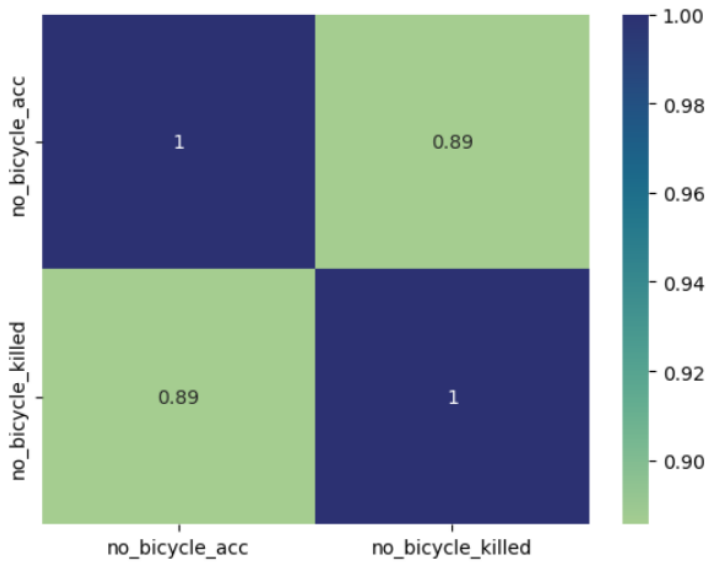


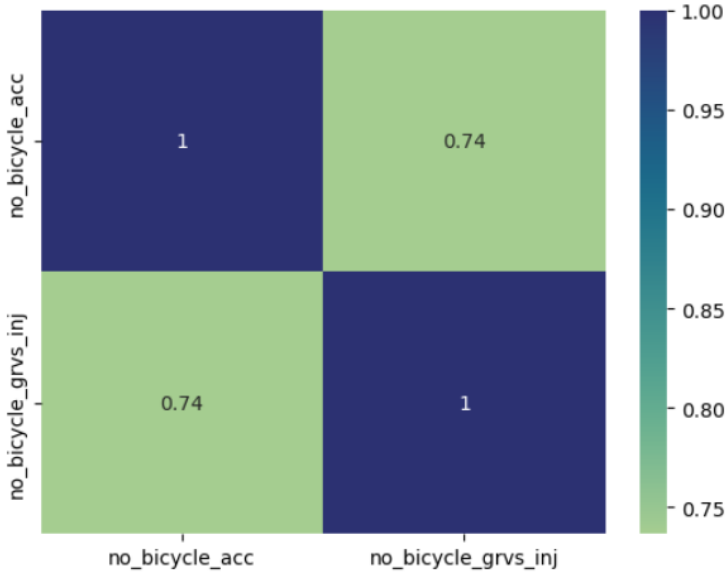


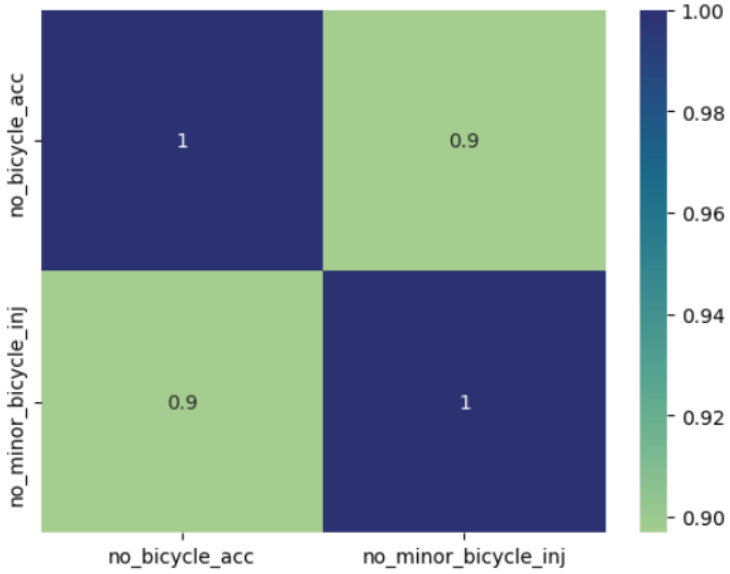




Bicycle Accidents correlation in one frame -



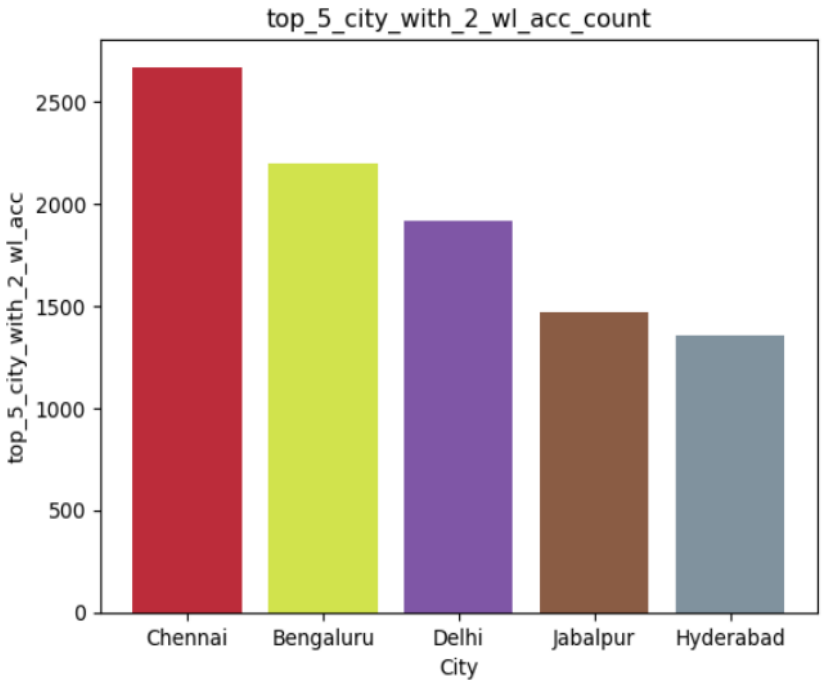




#Bicycle accident

3rd Category - 2 Wheeler Accidents -
total_2_wheeler_acc- Includes -

1. *'no_2wl_acc'*
2. *'no_2wl_killed'*
3. *'no_2wl_grvs_inj'*
4. *'no_minor_2wl_inj'*



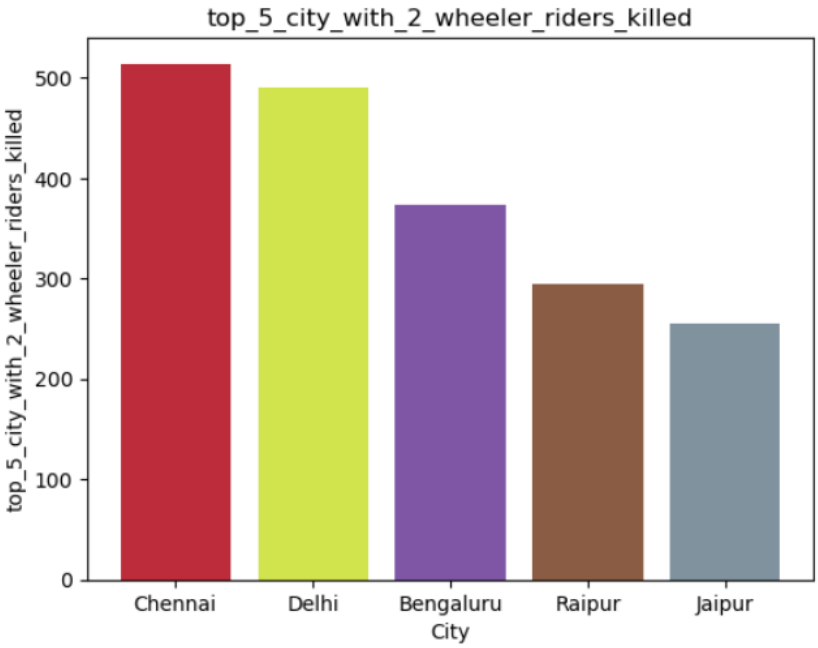
This graph shows - top_5_city_with_2_wl_acc_count

1. Chennai 2669
2. Bengaluru 2197
3. Delhi 1919
4. Jabalpur 1469
5. Hyderabad 1355

Inferences -

- **Highest numbers in this category**

2 Wheeler Riders killed -



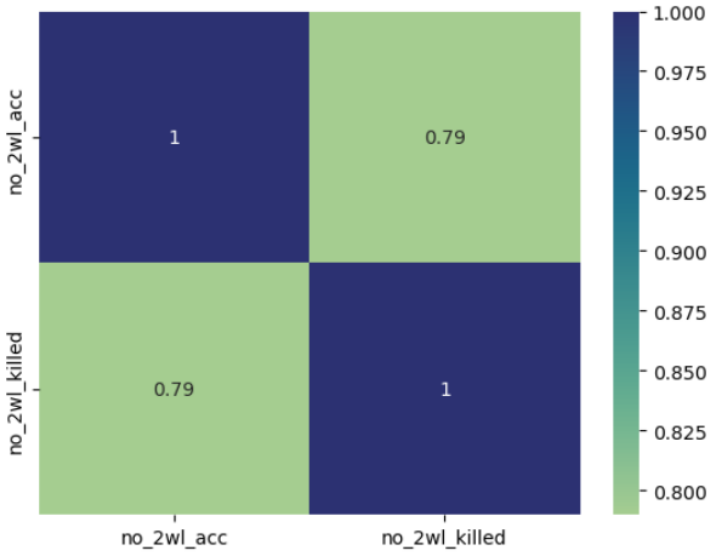
This graph shows - *top_5_city_with_2_wheeler_riders_killed*

1. Chennai 514
2. Delhi 490
3. Bengaluru 374
4. Raipur 294
5. Jaipur 255

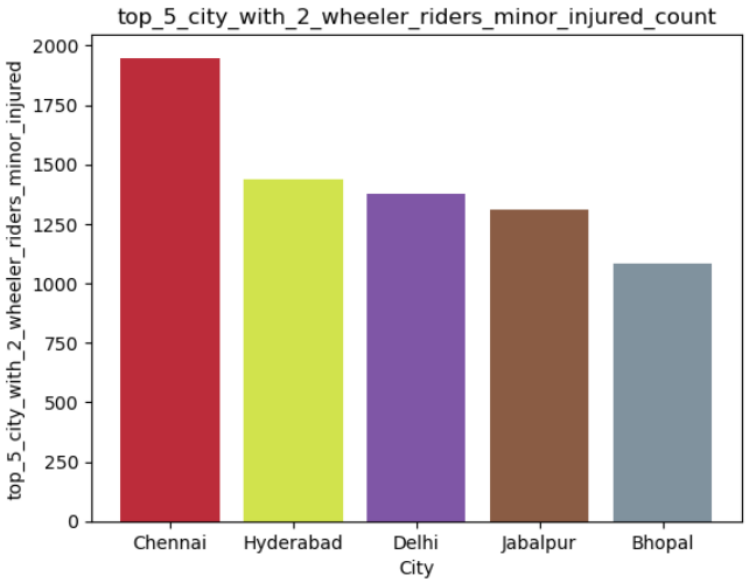
Inferences -

- *5 times* less count for Chennai than accidents recorded

Correlation b/w number of 2 wheeler accidents and riders killed is **79%**



2 Wheeler Riders minor injured -



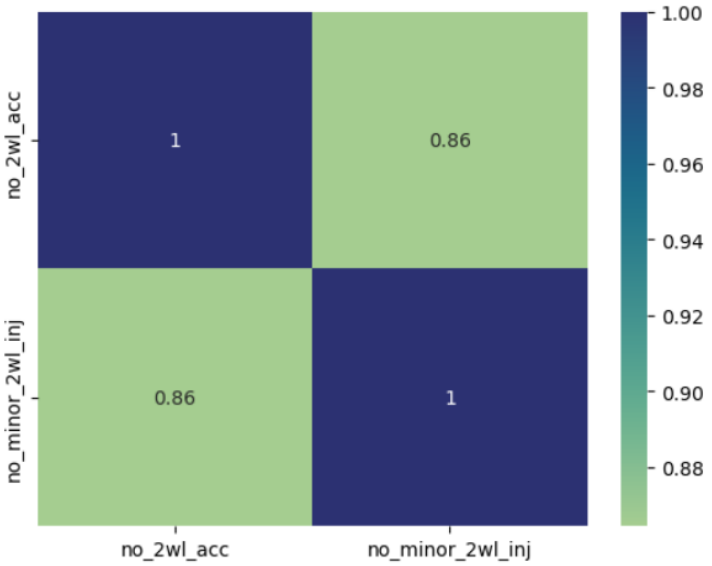
This graph shows - *top_5_city_with_2_wheeler_riders_minor_injured*

6. Chennai 1948
7. Delhi 1438
8. Bengaluru 1376
9. Raipur 1308
10. Jaipur 1085

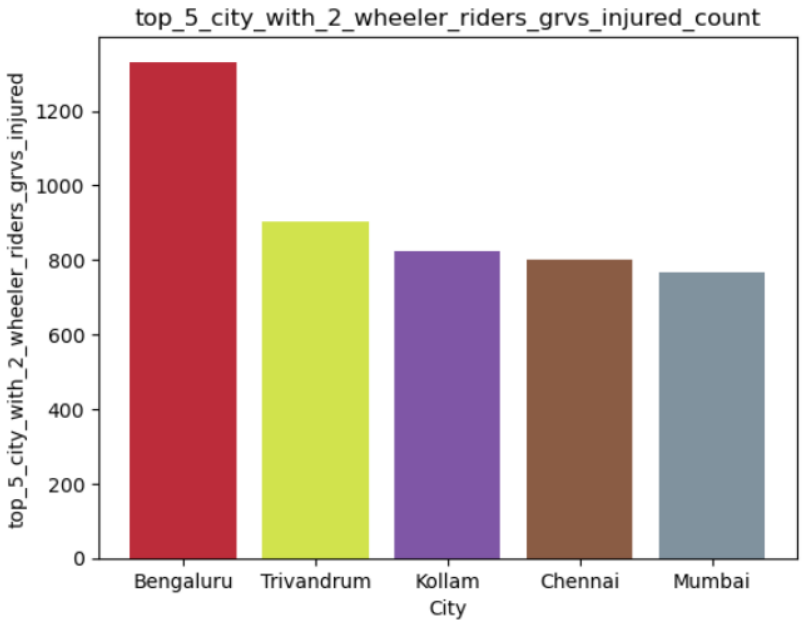
Inferences -

- *2nd* highest numbers in this category

Correlation b/w number of 2_wheeler Accidents and minor 2 wheeler injured is **86%**



2 Wheeler Riders grievously injured -



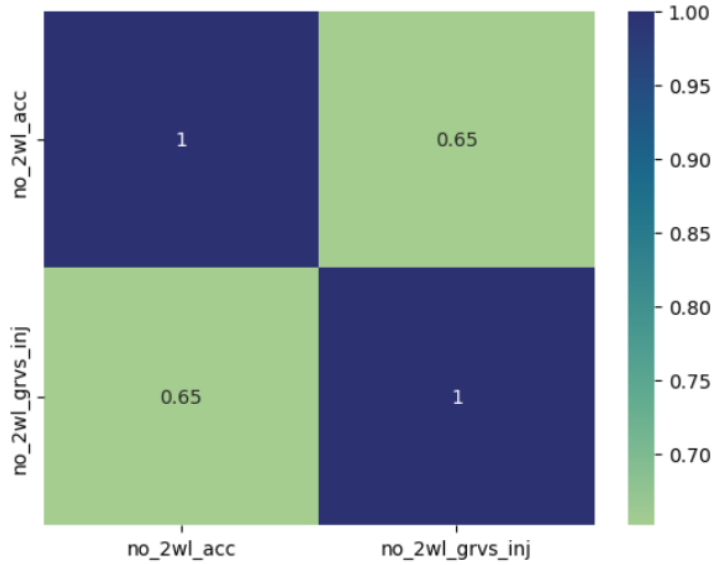
This graph shows - *top_5_city_with_2_wheeler_riders_minor_injured*

1. Bengaluru 1332
2. Trivandrum 903
3. Kollam 823
4. Chennai 803
5. Mumbai 768

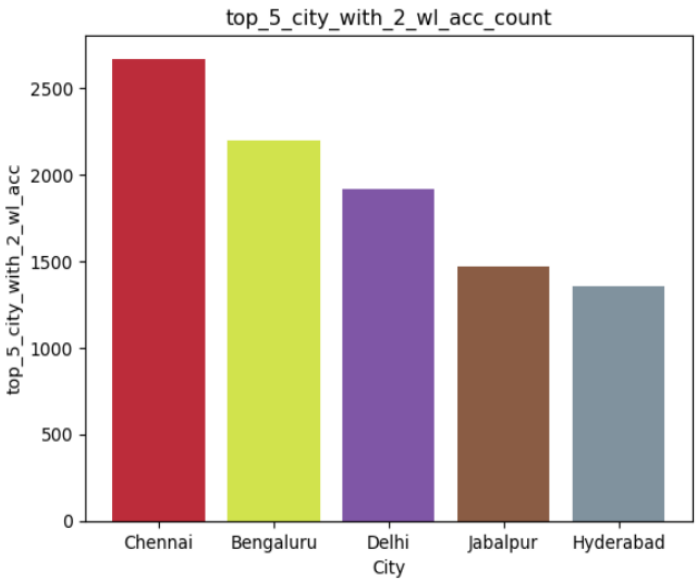
Inferences -

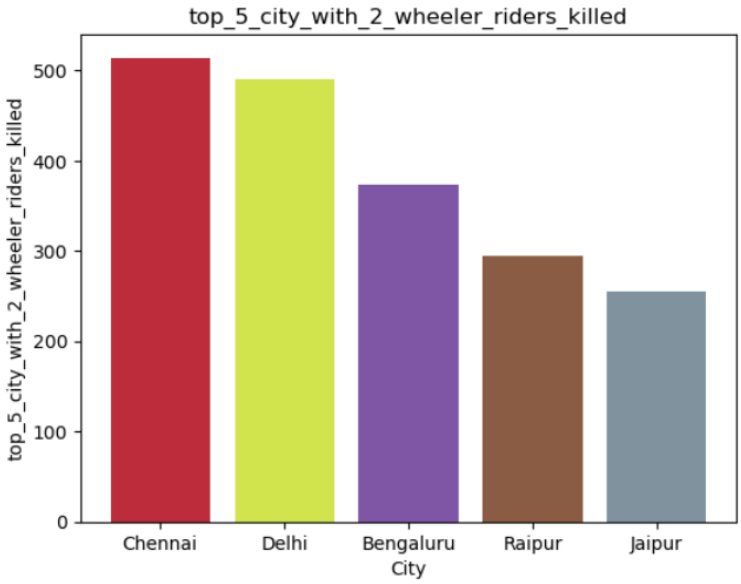
- Kollam being 4th largest district in Kerala is *2nd* highest in minor injured for this category

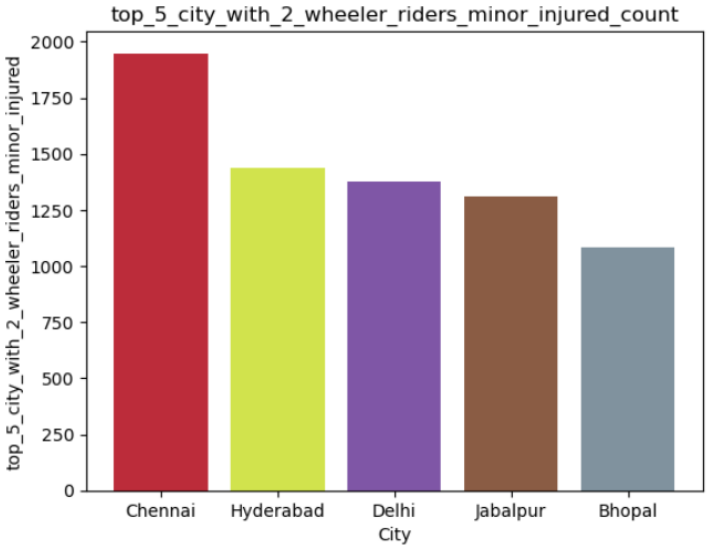
Correlation b/w number of 2_wheeler Accidents and 2 wheeler grievously injured is **65%**

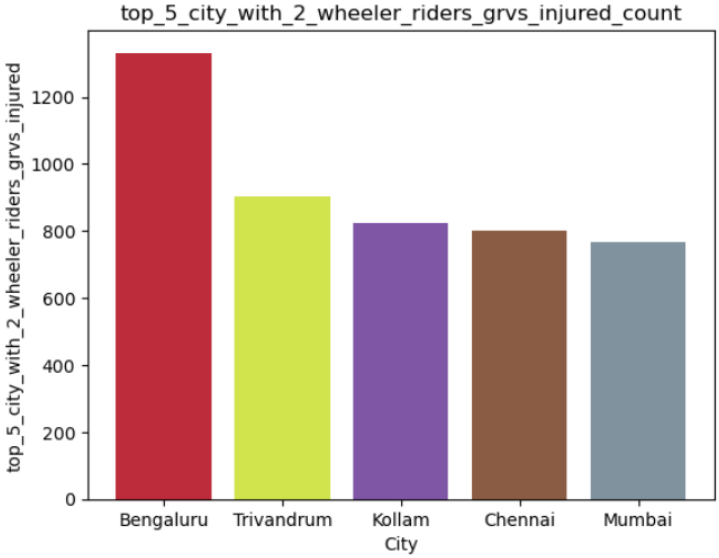


2 wheeler Accidents graph in one frame -

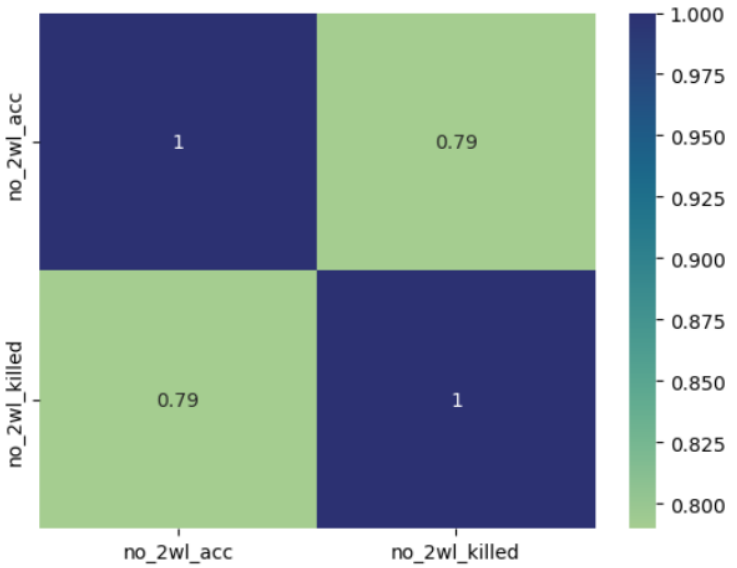


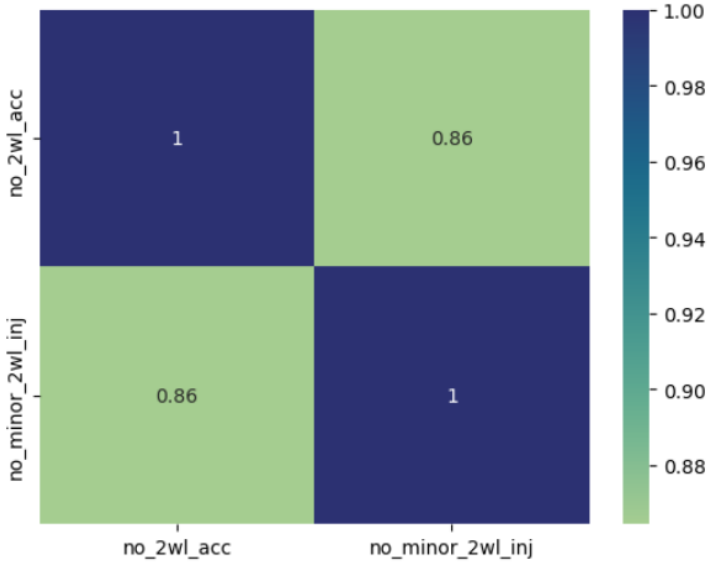


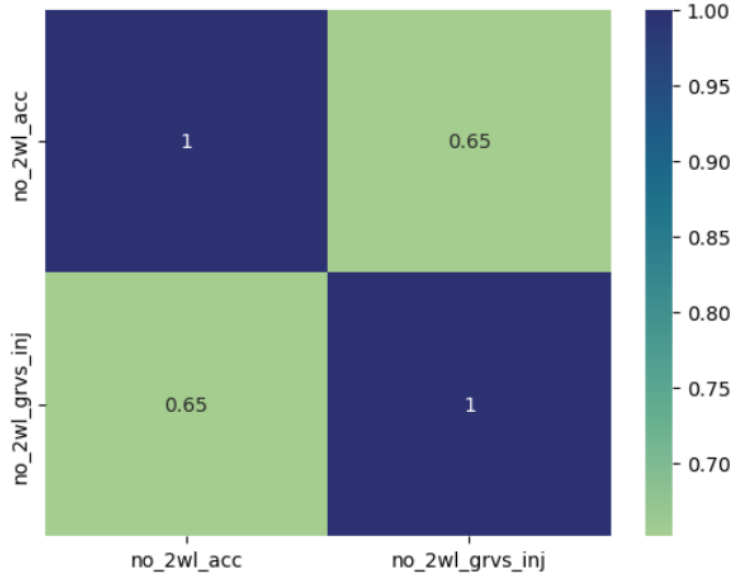




2 wheeler Accidents correlation graph in one frame -





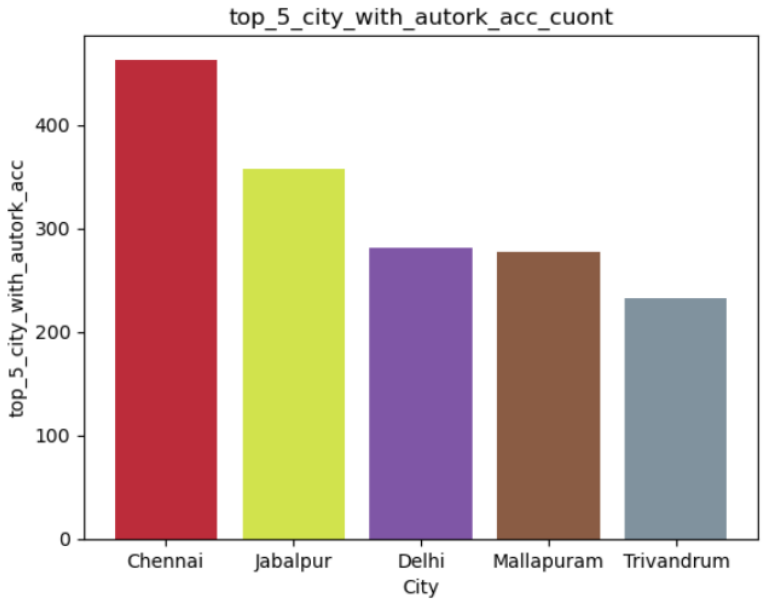


#2 wheeler accident

3rd Category - Auto-Rickshaw Accidents -

total_auto_rk_acc- Includes -

1. *'no_autork_acc'*
2. *'no_autork_killed'*
3. *'no_autork_grvs_inj'*
4. *'no_minor_autork_inj'*



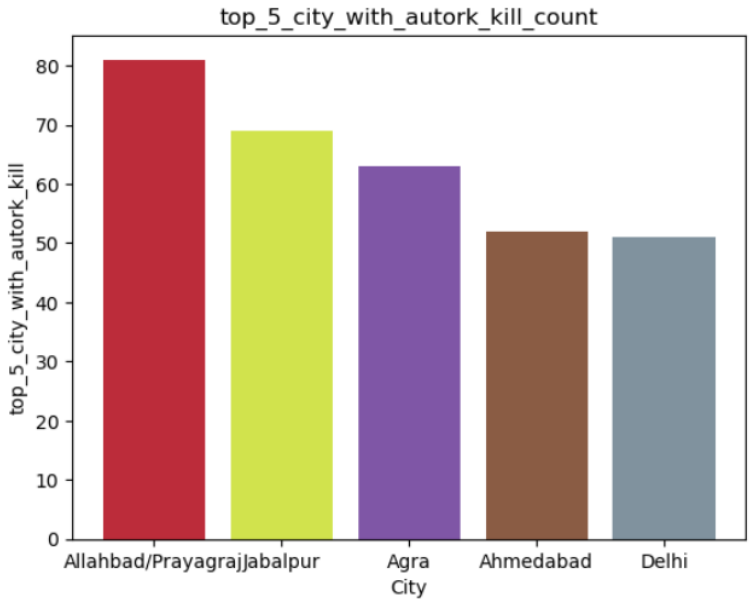
This graph shows - top_5_city_with_2_wl_acc_count

1. Chennai 463
2. Jabalpur 358
3. Delhi 281
4. Malappuram 277
5. Trivandrum 232

Inferences -

- Trivandrum being capital of Kerala is *5th* highest in 2 wheeler accidents count while Chennai- Capital of Tamil Nadu is at *1st*

Auto-Rickshaw rider killed -



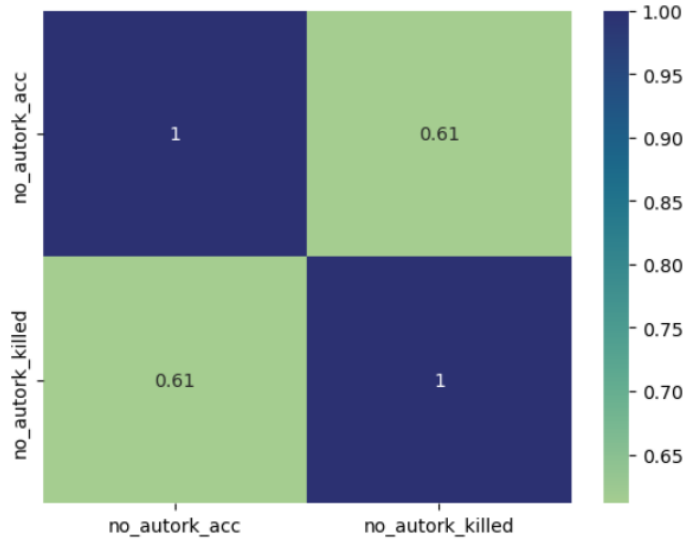
This graph shows - *top_5_city_with_autork_kill*

1. Allahabad/Prayagraj 81
2. Jabalpur 69
3. Agra 63
4. Ahmedabad 52
5. Delhi 51

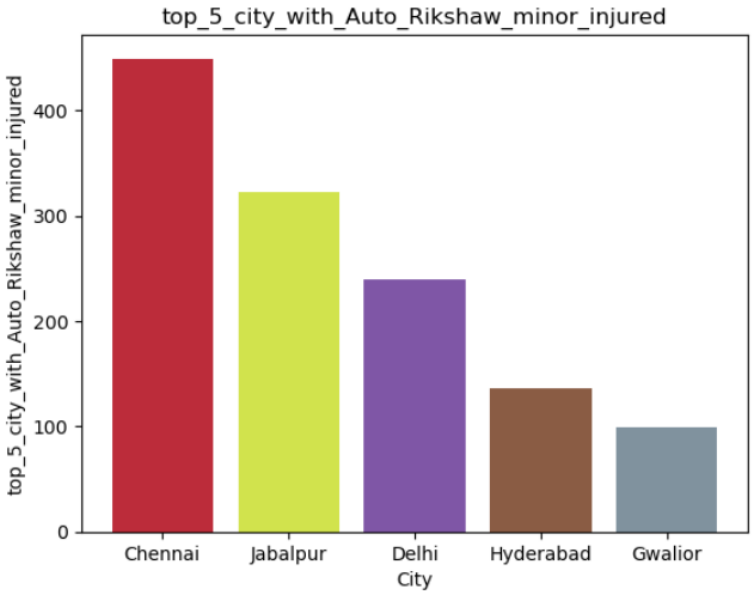
Inferences -

- Delhi, the capital has **37%** less auto-rickshaw kills than Allahabad/Prayagraj

Correlation b/w number of Auto_Rikshaw Accidents and Auto-Rikshaw rider killed is **61%**



Auto-Rickshaw minor injured -



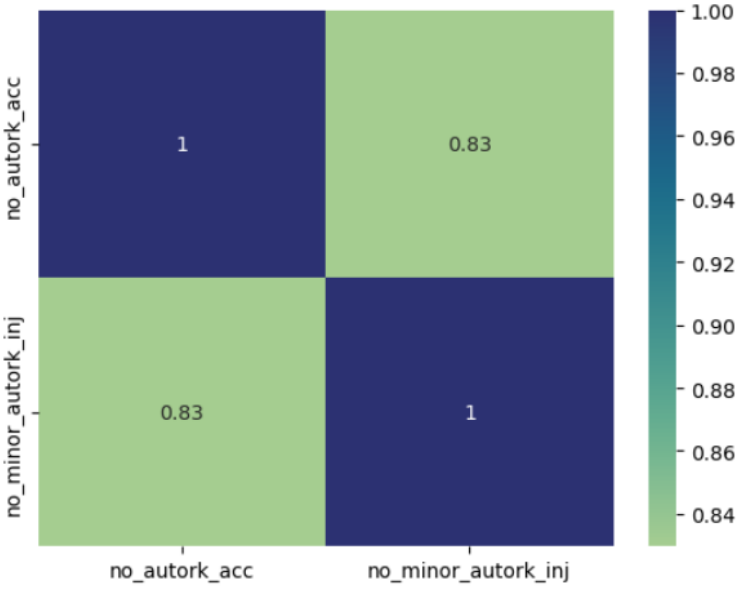
This graph shows - *top_5_city_with_Auto_Rikshaw_minor_injured*

1. Chennai 449
2. Jabalpur 323
3. Delhi 240
4. Hyderabad 136
5. Gwalior 99

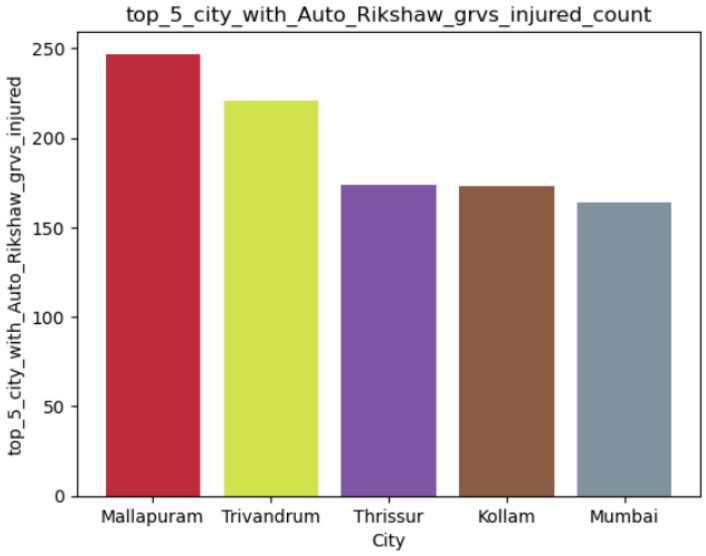
Inferences -

- Gwalior appeared only for the *1st* and only time in top 5 list of cities with highest accidents With *99* minors injured in/by auto-rickshaw

Correlation b/w number of Auto_Rikshaw Accidents and Auto-Rickshaw minor injured is **83%**



Auto-Rickshaw rider grievously injured -



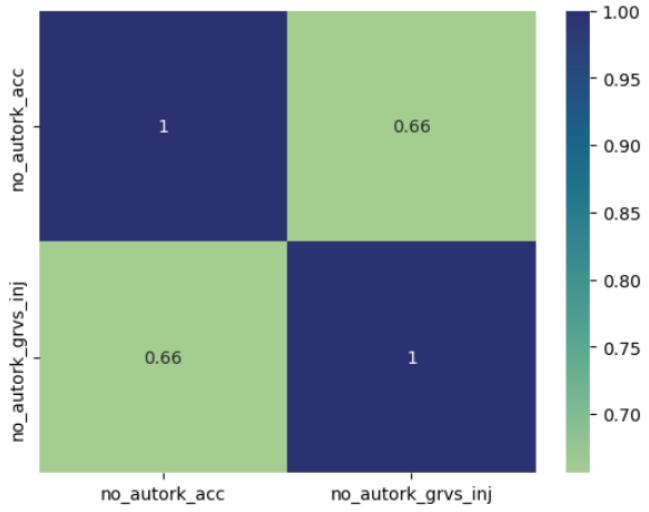
This graph shows - top_5_city_with_Auto_Rikshaw_minor_injured

1. Mallapuram 247
2. Trivandrum 221
3. Thrissus 174
4. Kollam 173
5. Mumbai 16

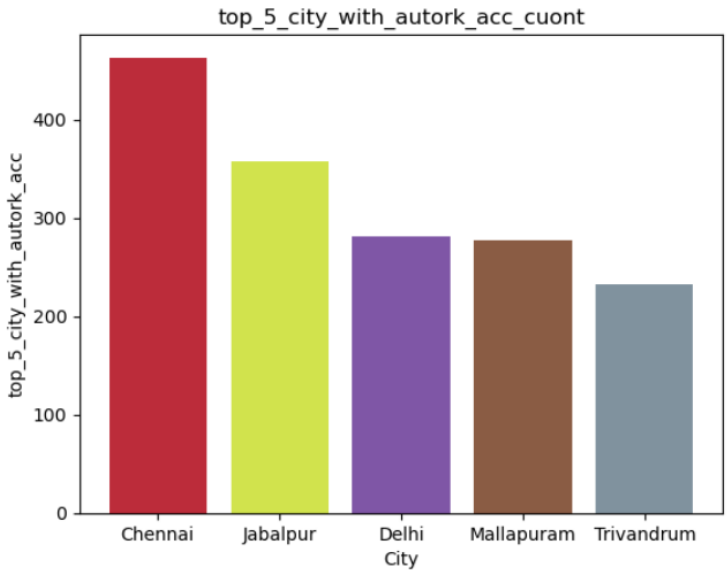
Inferences -

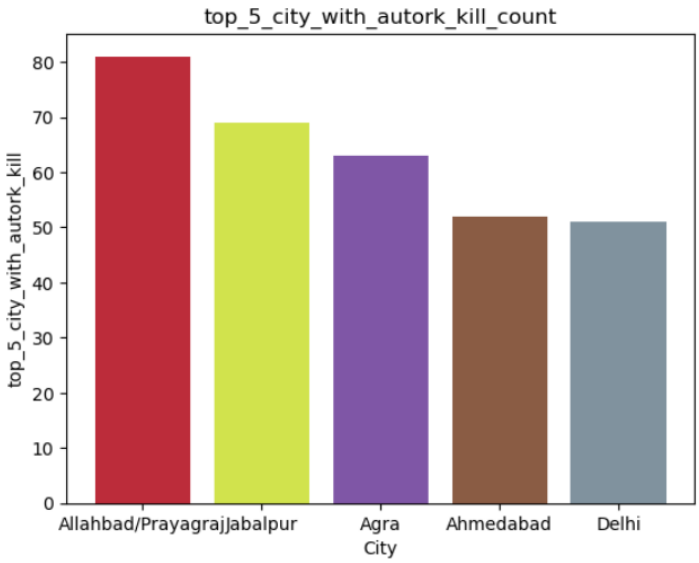
- Thrissur and Trivandrum appeared as a new entry in accidents where minor injured
- Thrissur and Trivandrum did not appear in 2 wheeler, pedestrians or car/van/lmv
- 4 out of 5 cities are South-Indian while Mumbai recorded just 16 minors

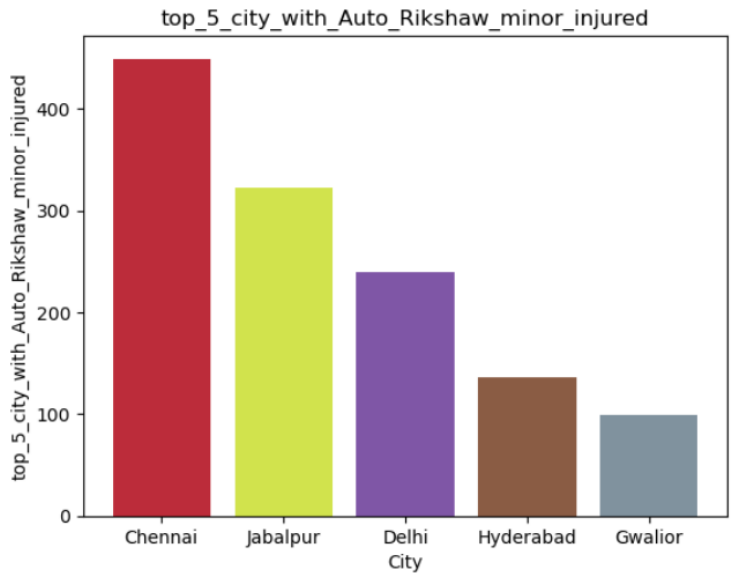
Correlation b/w number of Auto_Rikshaw Accidents and Auto-Rickshaw grievously injured is **66%**

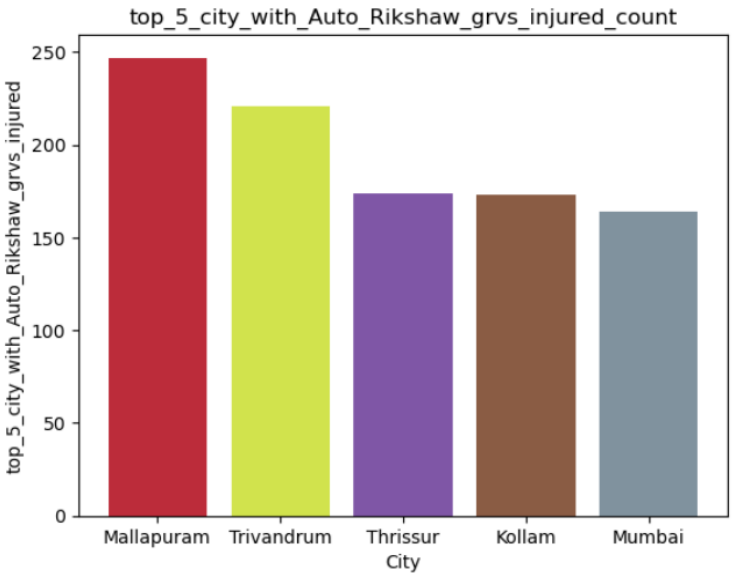


Auto-Rickshaws Accidents graph in one frame -

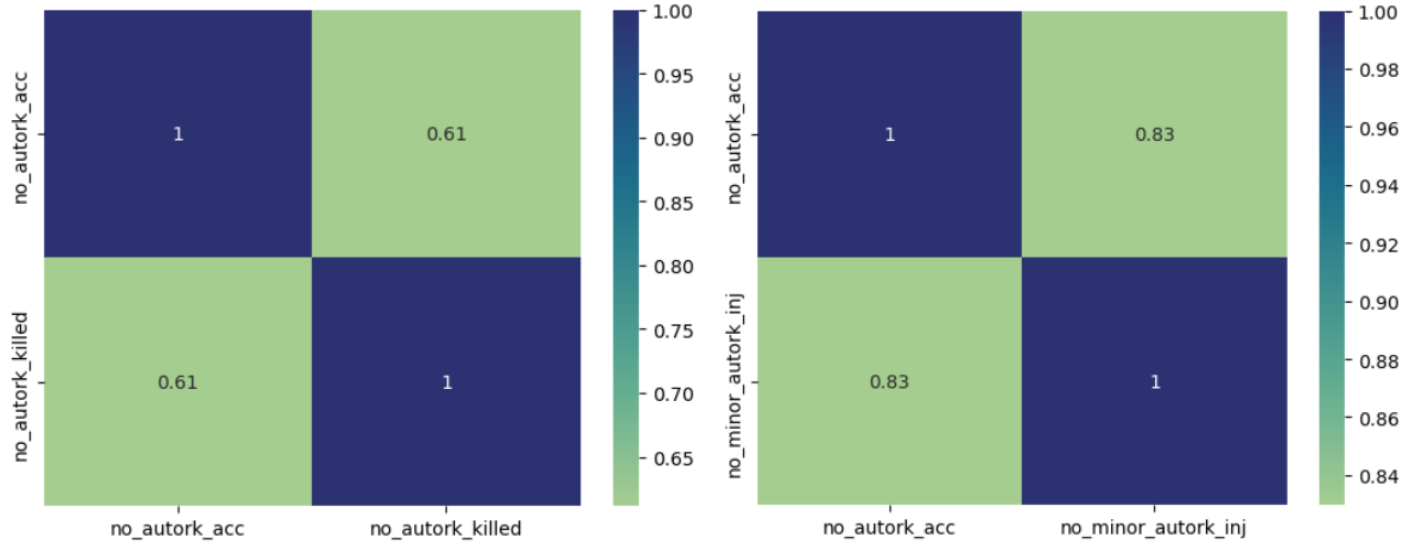


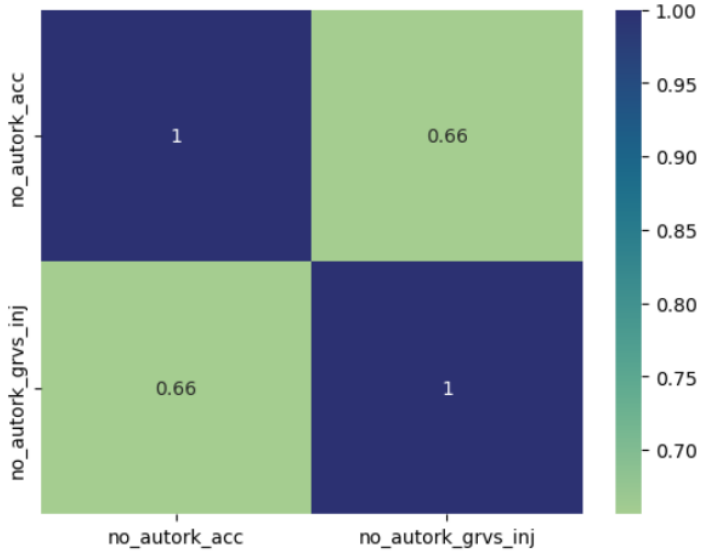






Auto-Rickshaws Accidents correlation graph in one frame -



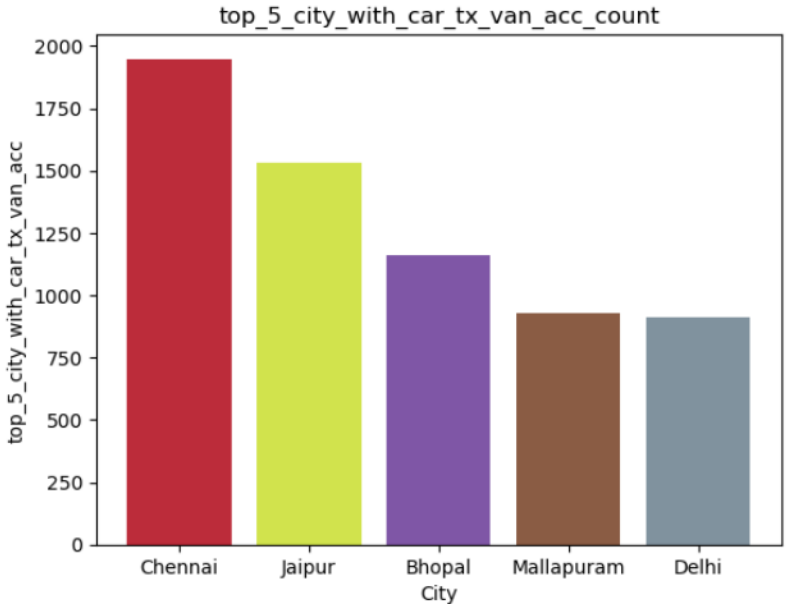


#Auto-Rickshaw

4th Category -Car,Taxi,Van and other LMV Accidents -

total_car_tx_van_acc- Includes -

1. *no_car_tx_van_acc*
2. *no_car_tx_van_kill*
3. *no_car_tx_van_grvs_inj*
4. *no_minor_car_tx_van_inj*



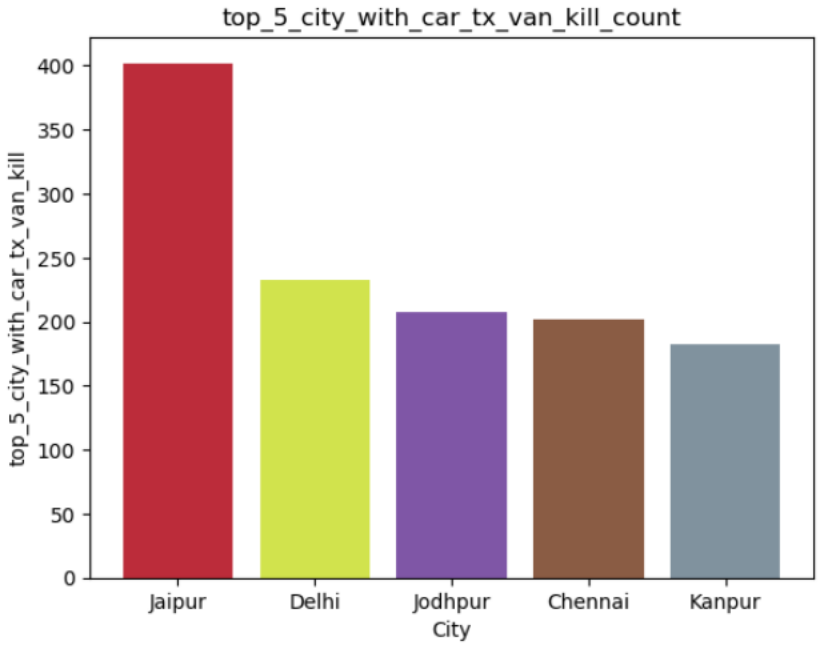
This graph shows - top_5_city_with_car_tx_van_acc

1. 'Chennai' 1948
2. 'Jaipur' 1530
3. 'Bhopal' 1163
4. 'Malappuram' 927
5. 'Delhi' 910

Inferences -

- Malappuram and Chennai are 2 South-Indian state where Chennai recorded **52%** more accidents
- Jaipur - capital of Rajasthan recorded **40%** more accidents than Delhi (Capital of India)
- **3rd** highest count category
- Chennai recorded same figures for 2 wheeler minor injured

Car,Taxi,Van and other LMV Accidents killed -



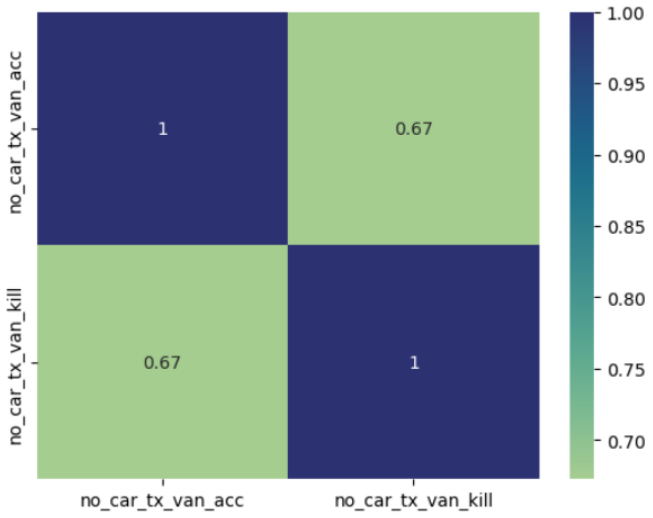
This graph shows - *top_5_city_with_car_tx_van_kill*

1. 'Jaipur' 402
2. 'Delhi' 233
3. 'Jodhpur' 207
4. 'Chennai' 202
5. 'Kanpur' 182

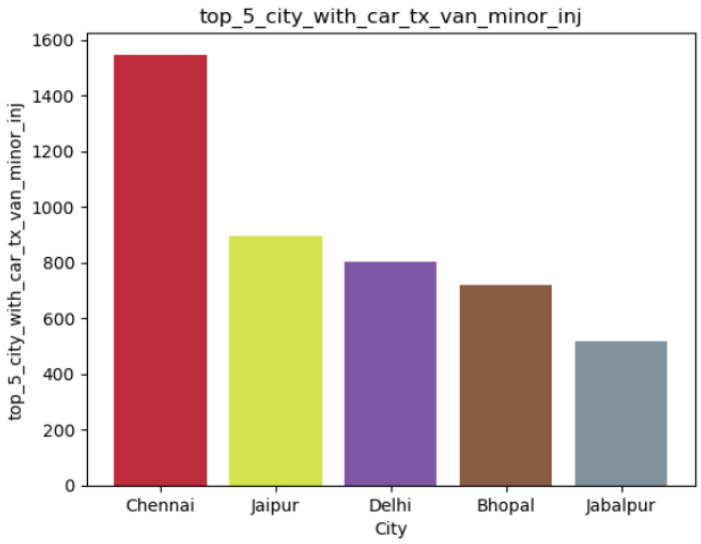
Inferences -

- Jaipur recorded **73%** less kills than accidents
- Jodhpur - another Rajasthani city recorded little more than Chennai, which had recorded highest accidents
- Kanpur - First city from Uttar Pradesh to come in top 5 list of accidents

Correlation b/w number of Car,Taxi,Van and other LMV Accidents & Car,Taxi,Van and other LMV riders killed is **67%**



Car,Taxi,Van and other LMV Accidents minor injured -



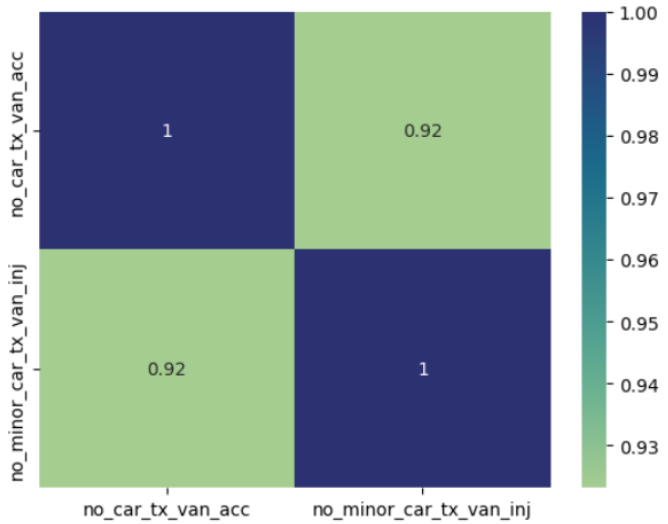
This graph shows - *top_5_city_with_car_tx_van_minor_inj*

1. 'Chennai' 1547
2. 'Jaipur' 895
3. 'Delhi' 802
4. 'Bhopal' 718
5. 'Jabalpur' 519

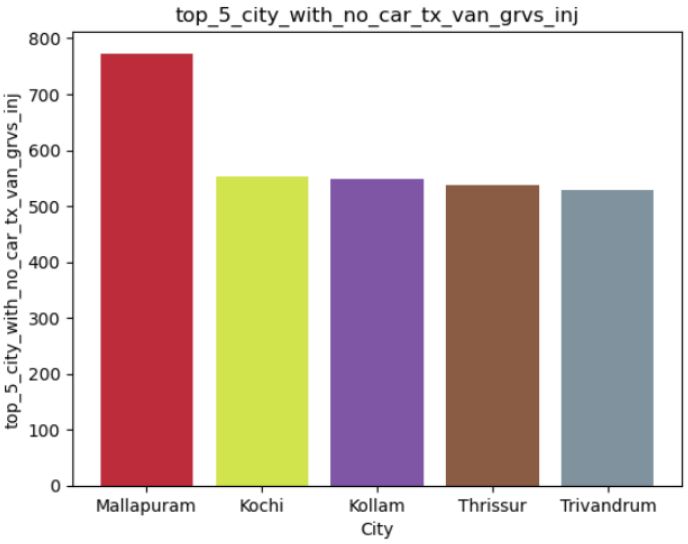
Inferences -

- Chennai again tops the list with highest minor accidents in this category,
  Though it was *4th* in highest killed list
- Chennai recorded **42%** more minor injured than Jaipur and **48%** more than Delhi
- 4th highest count category and highest correlation, same as - Truck/Lorry Accidents and killed

Correlation b/w number of Car,Taxi,Van and other LMV Accidents &
Car,Taxi,Van and other LMV minor injured is **92%**



Car,Taxi,Van and other LMV Accidents grievously injured -



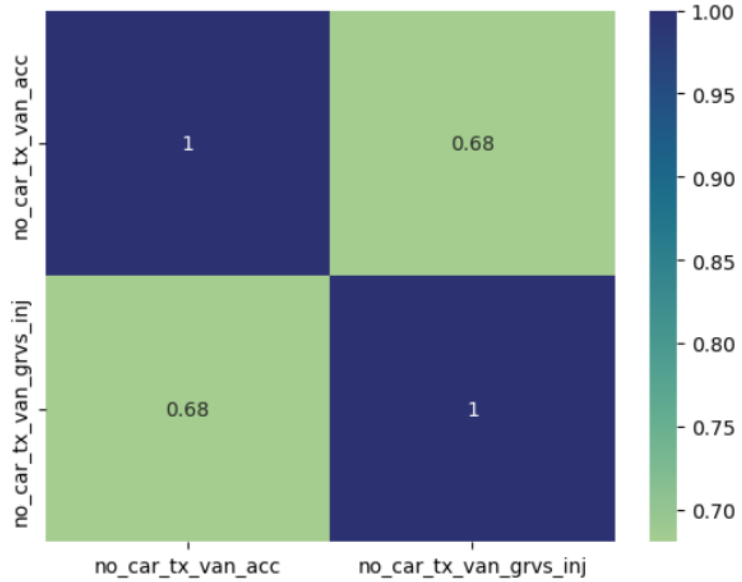
This graph shows - *top_5_city_with_no_car_tx_van_grvs_inj*

1. Mallapuram 773
2. 'Kochi' 552
3. 'Kollam' 549
4. 'Thrissur' 537
5. 'Trivandrum' 529

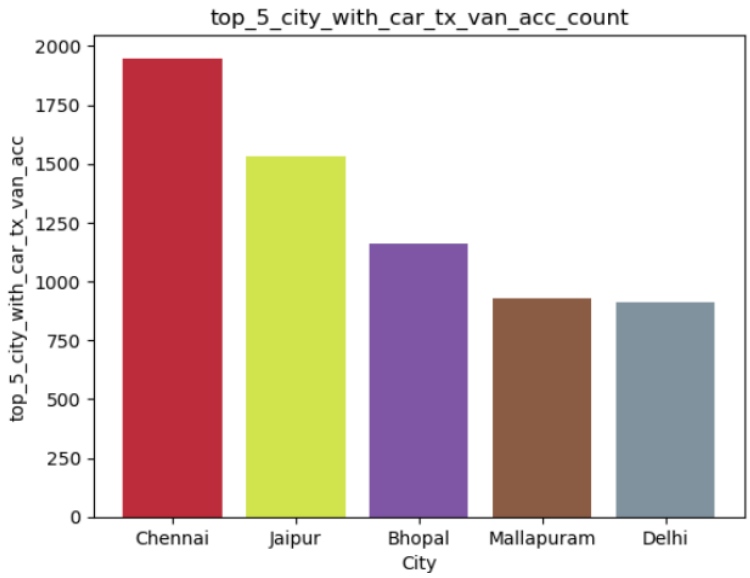
Inferences -

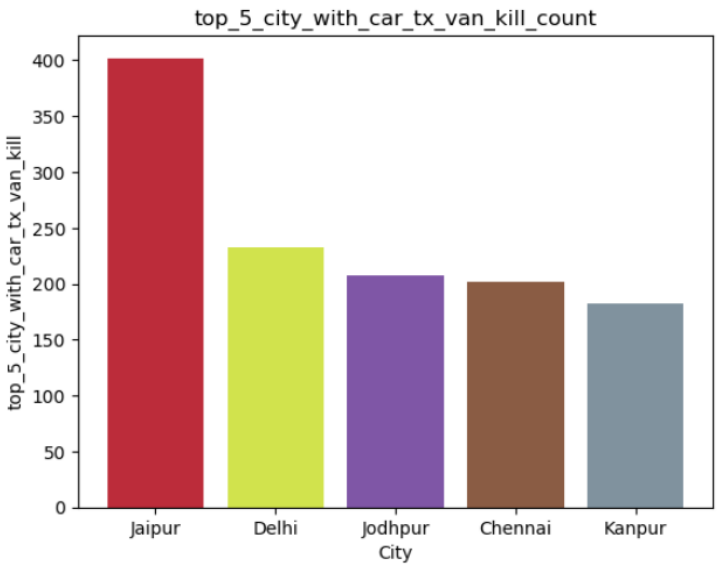
- Important to notice that all 5 are South-Indian states
- Malappuram recorded 927 total accidents while grievously injured is **16%** less

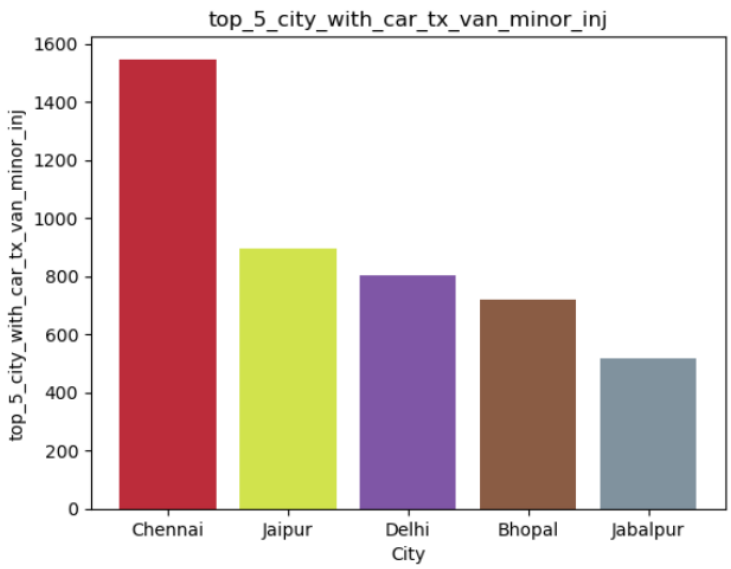
Correlation b/w number of Car,Taxi,Van and other LMV Accidents & Car,Taxi,Van and other LMV grievously injured is **68%**

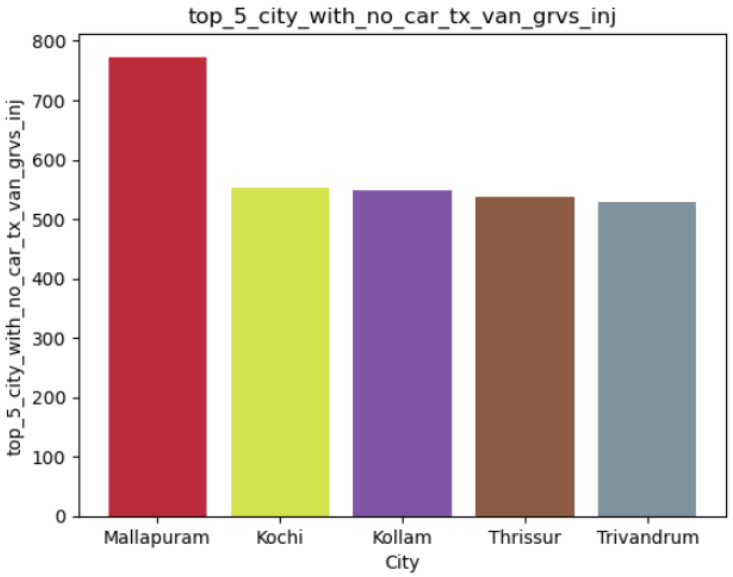


Car,Taxi,Van and other LMV Accidents graph in one frame -

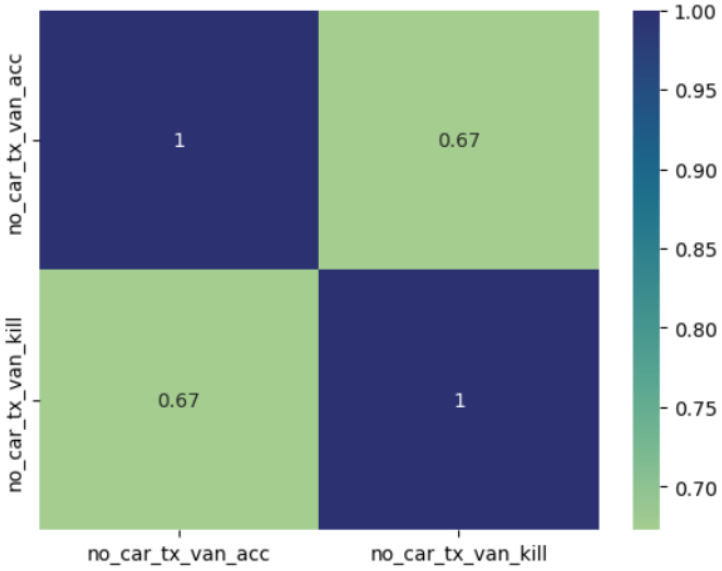


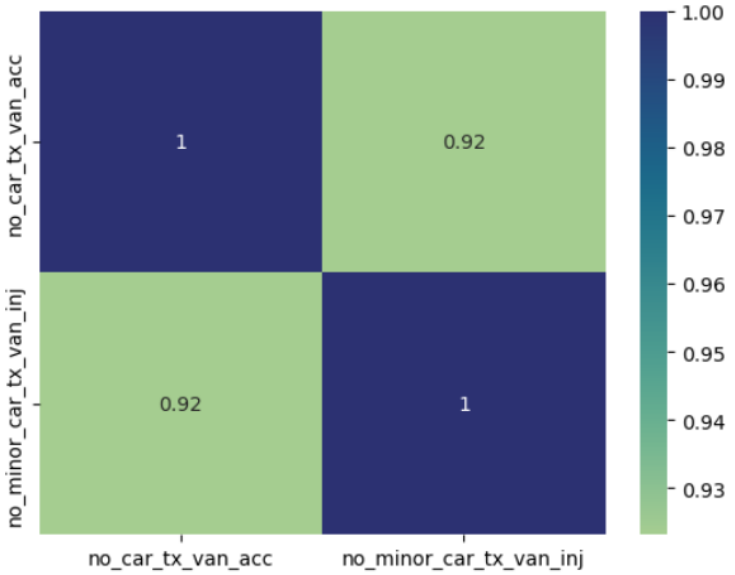


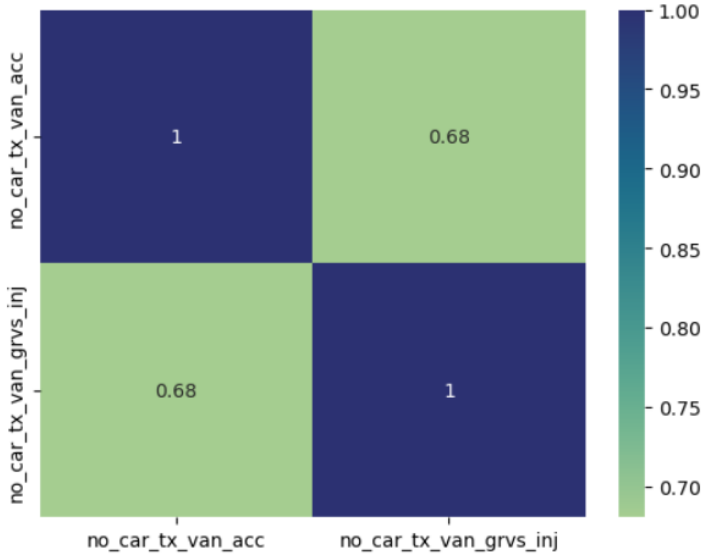




Car,Taxi,Van and other LMV Accidents correlation graph in one frame -





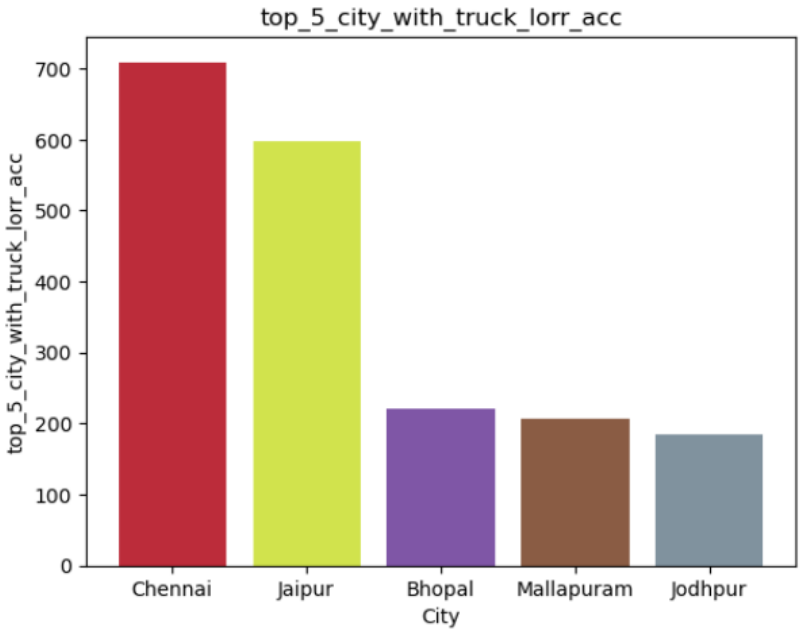


#Car,Taxi,Van and other LMV

5th Category - Truck/Lorry Accidents -

total_truck_lorr_acc- Includes -

1. *no_truck_lorr_acc*
2. *no_truck_lorr_kill*
3. *no_truck_lorr_grvs_inj*
4. *no_minor_truck_lorr_inj*



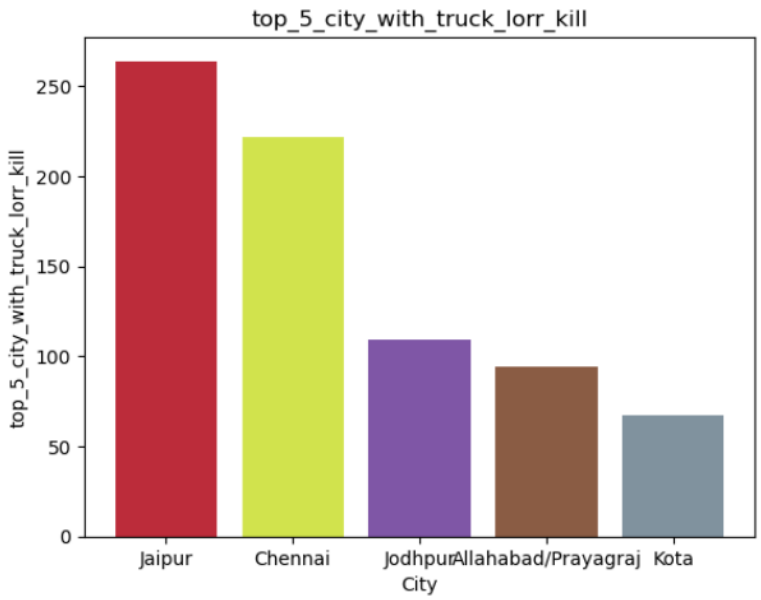
This graph shows - *top_5_city_with_truck_lorr_acc*

1. 'Chennai' 709
2. 'Jaipur' 598
3. 'Bhopal' 221
4. 'Malappuram' 207
5. 'Jodhpur' 184

Inferences -

- Chennai recorded highest in both Car,Taxi,Van and other LMV & Truck/Lorry accidents
- Difference of **63%** b/w Car,Taxi,Van and other LMV & Truck/Lorry accidents for Chennai

Truck/Lorry Accidents kill -



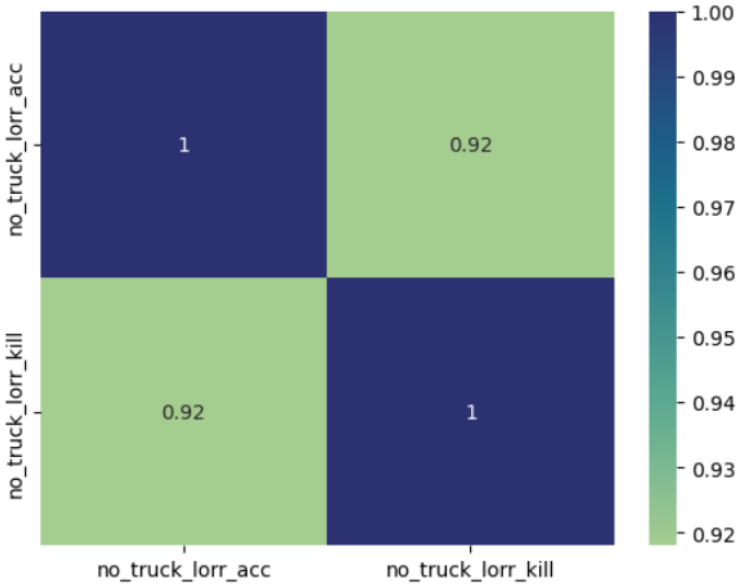
This graph shows - *top_5_city_with_truck_lorr_kill*

1. 'Jaipur' 264
2. 'Chennai' 222
3. 'Jodhpur' 109
4. Allahabad/Prayagraj 94
5. 'Kota' 67

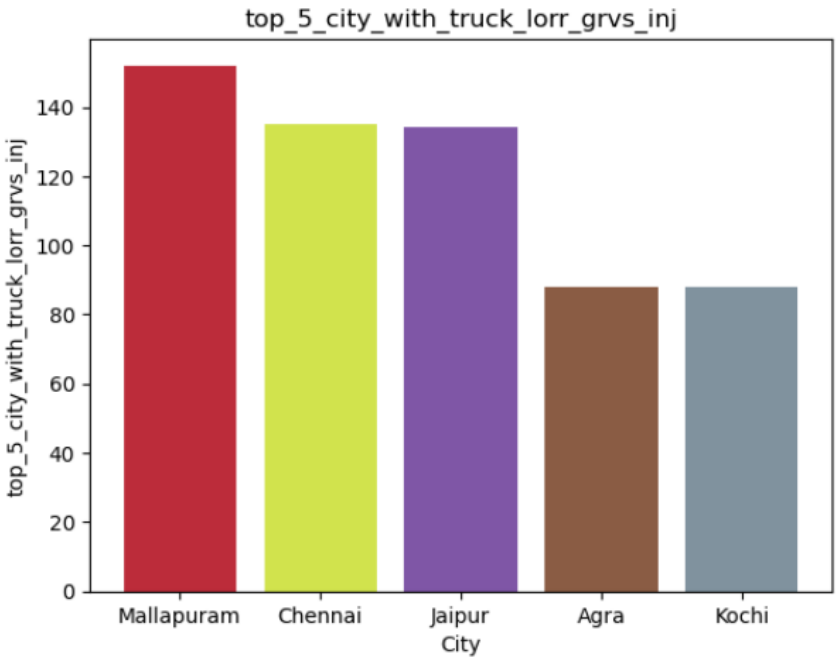
Inferences -

- Highest correlation - same as - Car,Taxi,Van and other LMV Accidents and minor injured
- 1st entry of **Kota**-another Rajasthani state which recorded 5 highest kills in truck/lorry
- Allahabad/Prayagraj - did not appear in top 5 list of car,taxi,van and other LMV
- Chennai - recorded as highest accidents city in car,taxi,van and other LMV is *2nd* highest in truck/lorry accident kills

Correlation b/w number of Truck/Lorry Accidents and killed is **92%**



Truck/Lorry Accidents grievously injured -



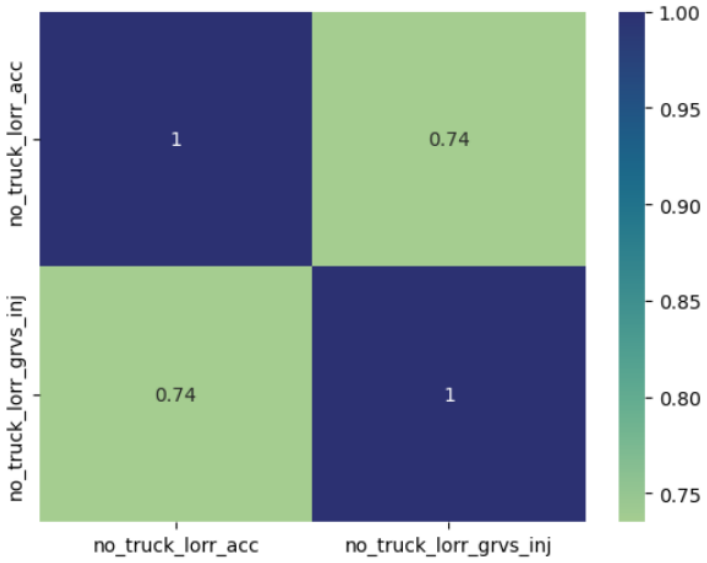
This graph shows - *top_5_city_with_truck_lorr_grvs_inj*

1. 'Mallapuram' 152
2. 'Chennai' 135
3. 'Jaipur' 134
4. 'Agra' 88
5. 'Kochi' 88

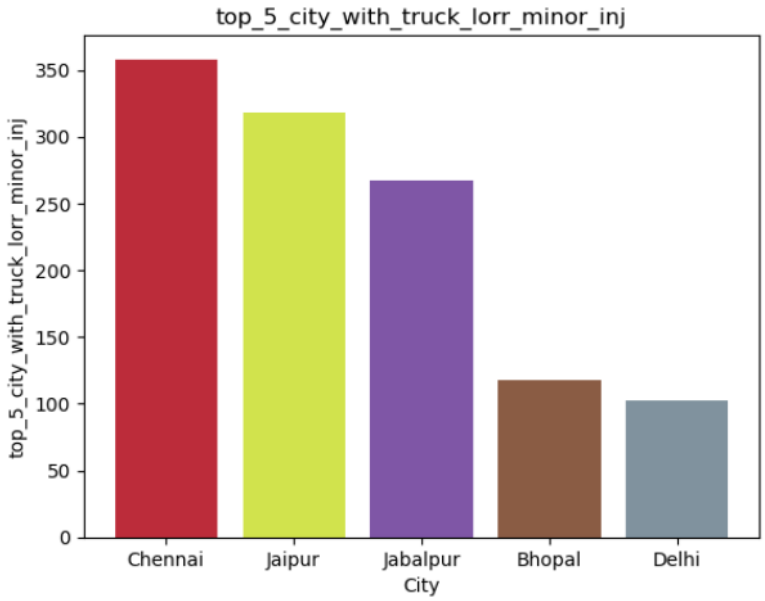
Inferences -

- Agra appeared for the 1st time in the top 5 list of accidents, same with Kochi

Correlation b/w number of Truck/Lorry Accidents and grievously injured is **74%**



Truck/Lorry Accidents minor injured -



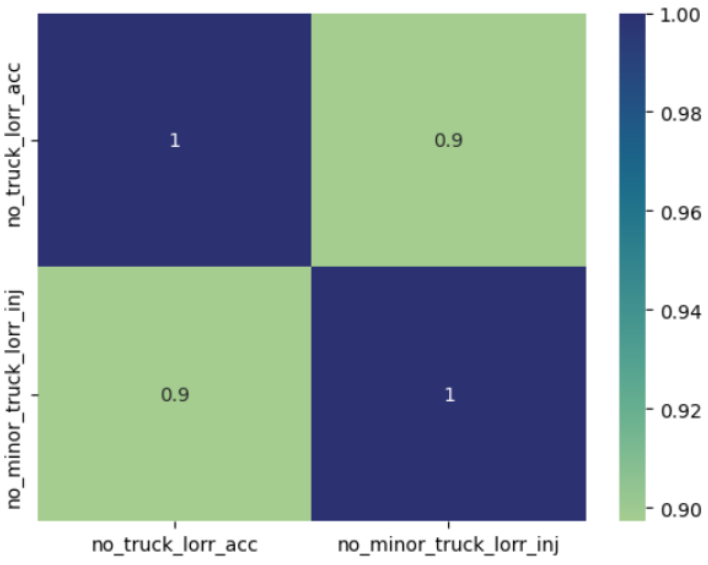
This graph shows - *top_5_city_with_truck_lorr_minor_inj*

1. 'Chennai' 358
2. 'Jaipur' 318
3. 'Jabalpur' 267
4. 'Bhopal' 118
5. 'Delhi' 102

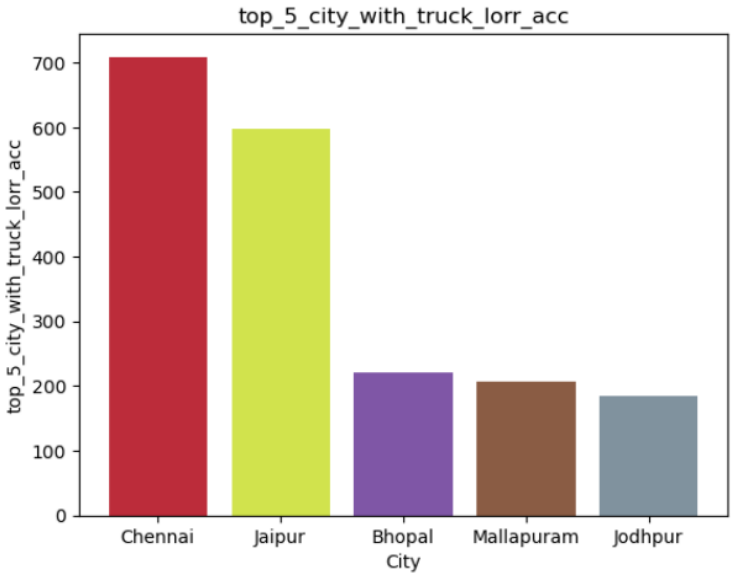
Inferences -

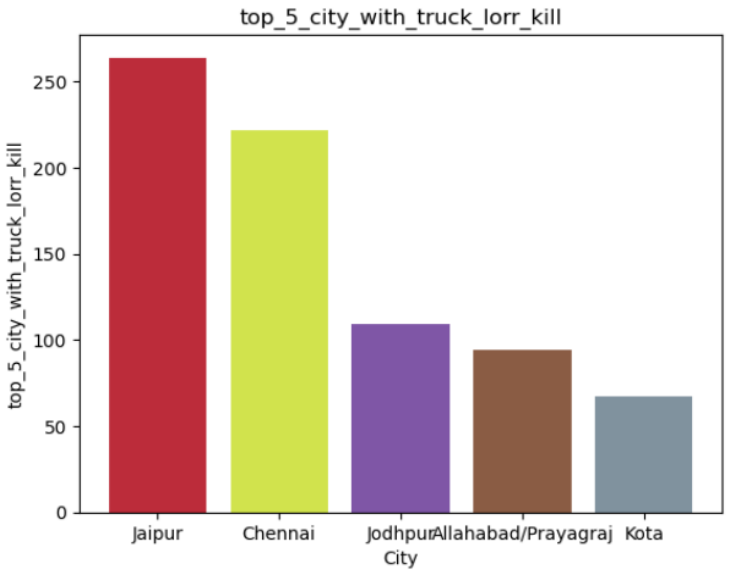
- Chennai has been in the top 2 highest for truck/lorry accidents
- High correlation

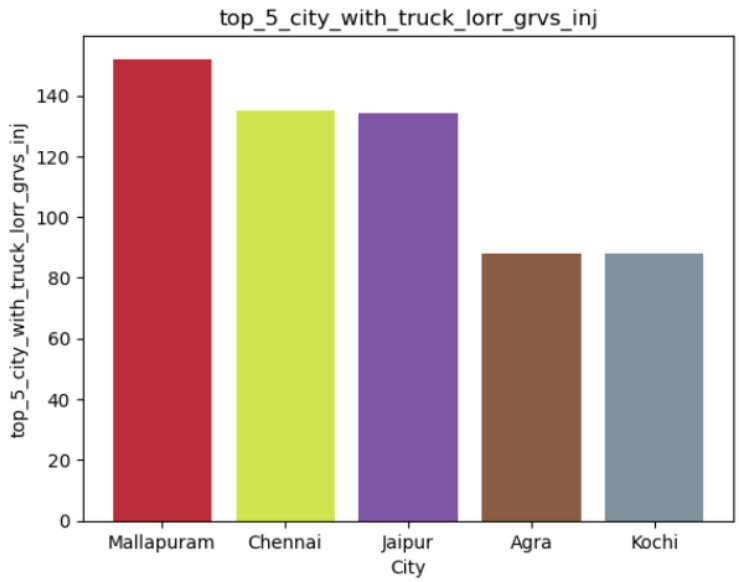
Correlation b/w number of Truck/Lorry Accidents and minor injured is **90%**

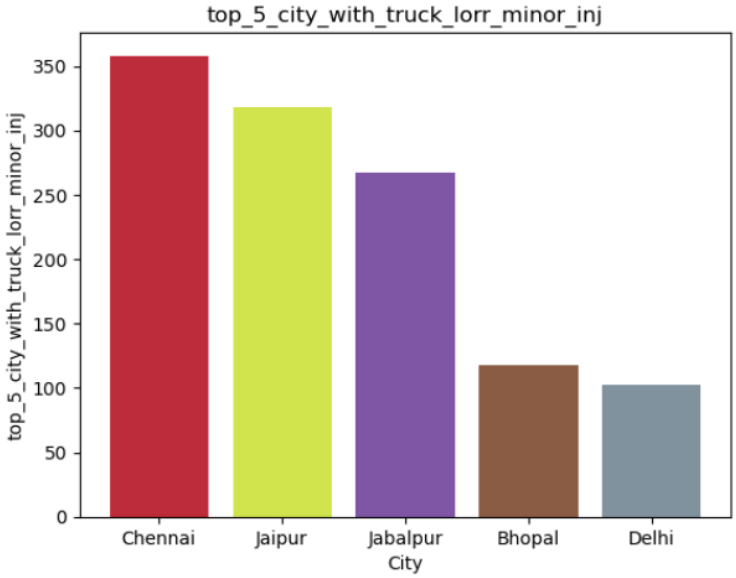


Truck/Lorry Accidents graph in one frame -

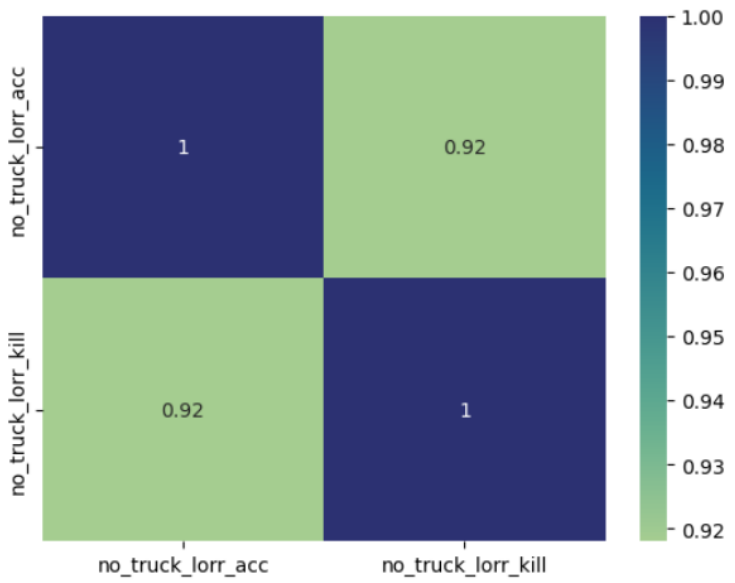


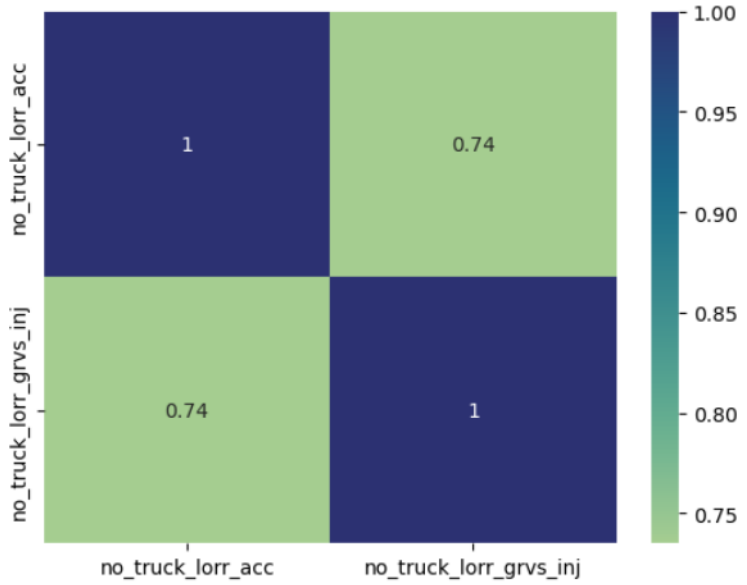


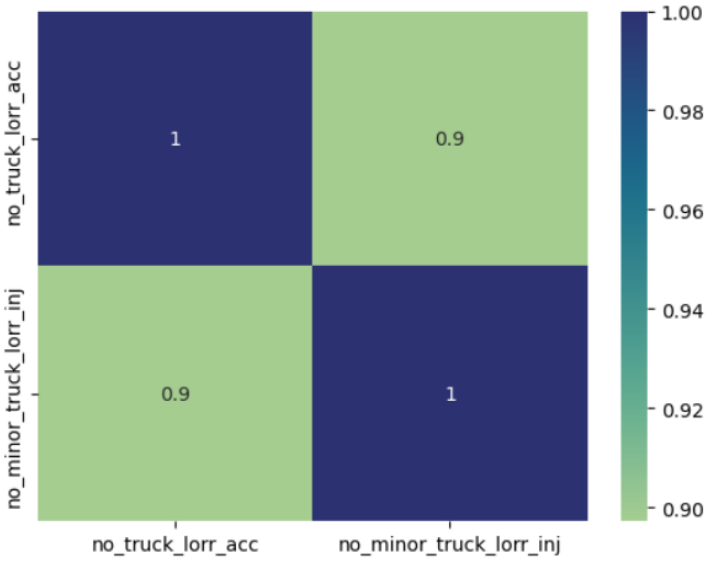




Truck/Lorry Accidents correlation graph in one frame -

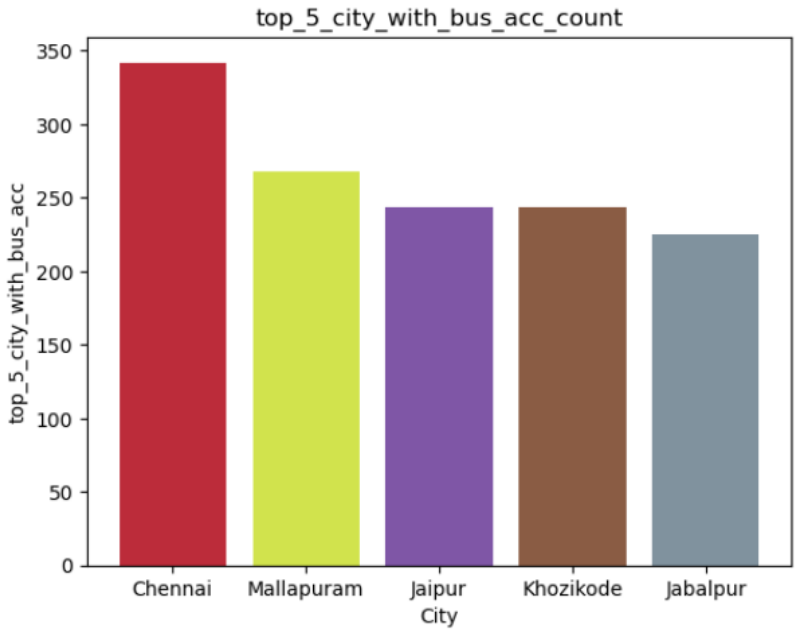






6th Category - Bus Accidents -
total_bus_acc - Includes -

1. *no_bus_acc*
2. *no_bus_kill*
3. *no_bus_grvs_inj*
4. *no_minor_bus_inj*



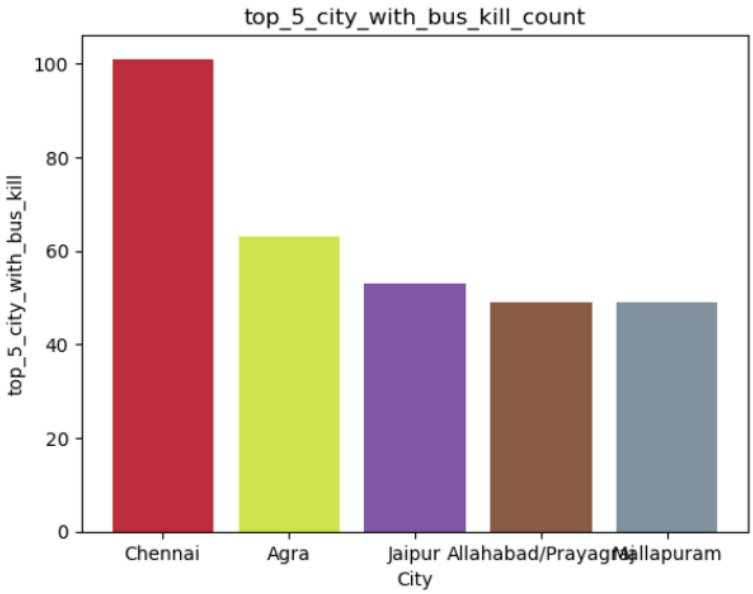
This graph shows - *top_5_city_with_bus_acc*

1. 'Chennai' 342
2. 'Mallapuram' 268
3. 'Jaipur' 244
4. 'Kozhikode' 244
5. 'Jabalpur' 225

Inferences -

- Chennai again recorded as highest city with bus accidents count
- Kozhikode is *4th* highest which appeared for the first time in highest accidents list
- Kozhikode and Jaipur recorded same count of bus accidents

Bus Accidents killed -



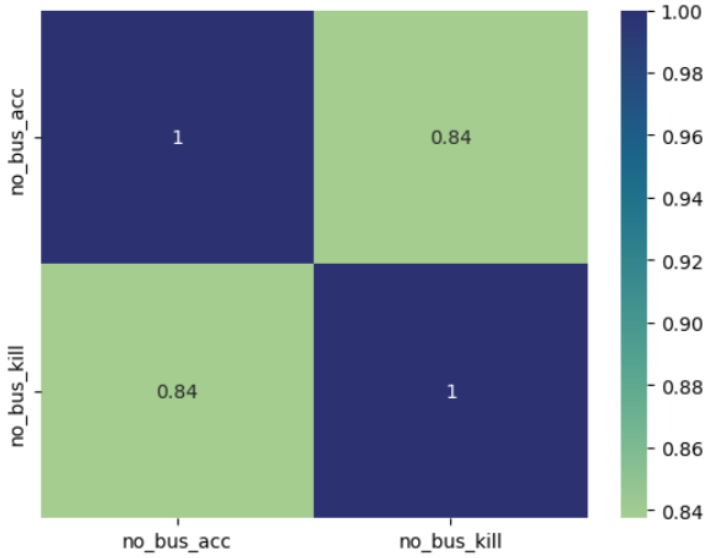
This graph shows - *top_5_city_with_bus_kill*

1. 'Chennai' 101
2. Agra 63
3. 'Jaipur' 53
4. Allahabad/Prayagraj 49
5. Malappuram 49

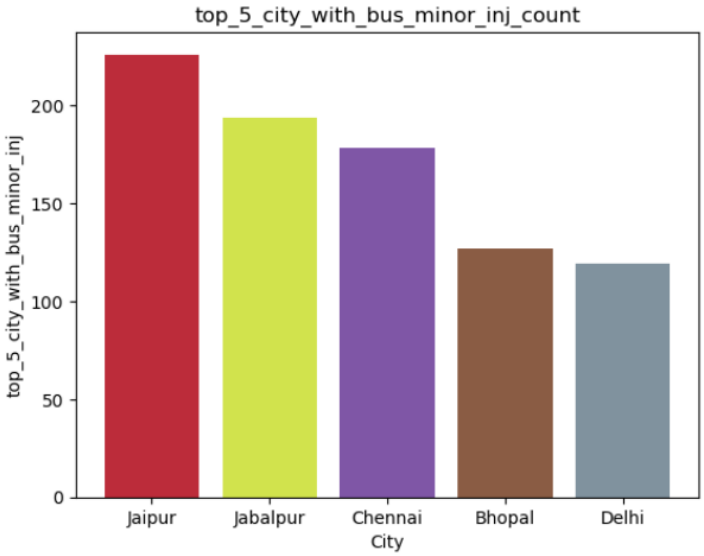
Inferences -

- Agra appeared for *2nd* time in highest accidents list

Correlation b/w number of Bus Accidents and killed is **84%**



Bus Accidents minor injured -



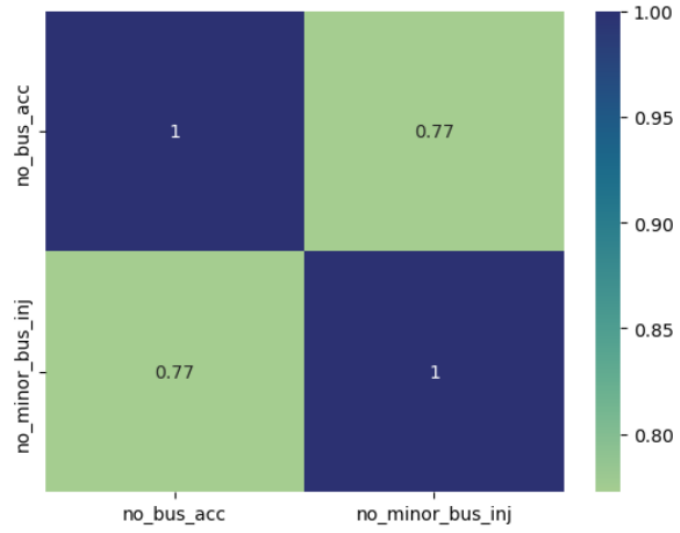
This graph shows - *top_5_city_with_bus_minor_inj*

1. 'Jaipur' 226
2. 'Jabalpur' 194
3. 'Chennai' 178
4. 'Bhopal' 127
5. 'Delhi' 119

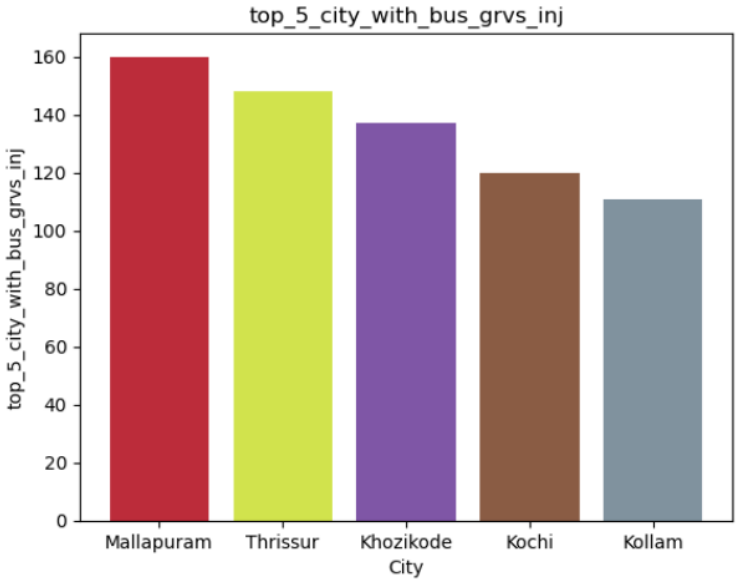
Inference -

- Jabalpur did not record any high number of accidents yet recorded **194** minors injured in bus accidents
- Chennai recorded roughly half of the count of accidents it recorded as total accidents recorded vs minor injured in accidents
- Bhopal recorded slightly *more* minor injured than Delhi

Correlation b/w number of bus accidents and minor injured is **77%**



Bus Accidents grievously injured -



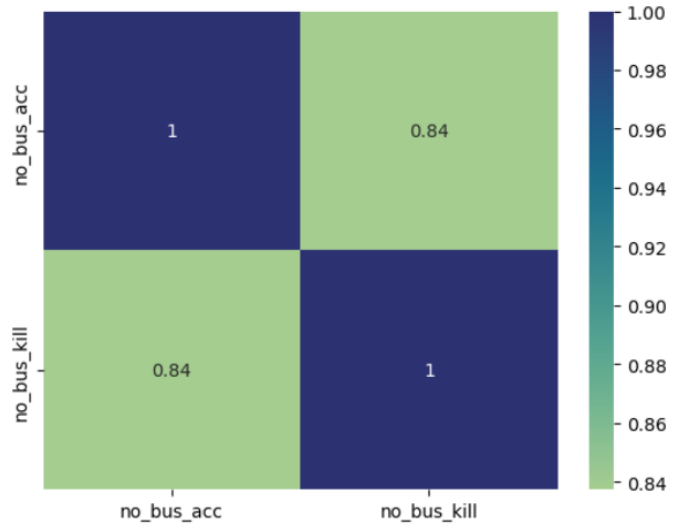
This graph shows - *top_5_city_with_bus_grvs_inj*

1. Mallapuram 160
2. Thrissur 148
3. Kozhikode 137
4. Kochi 120
5. Kollam 112

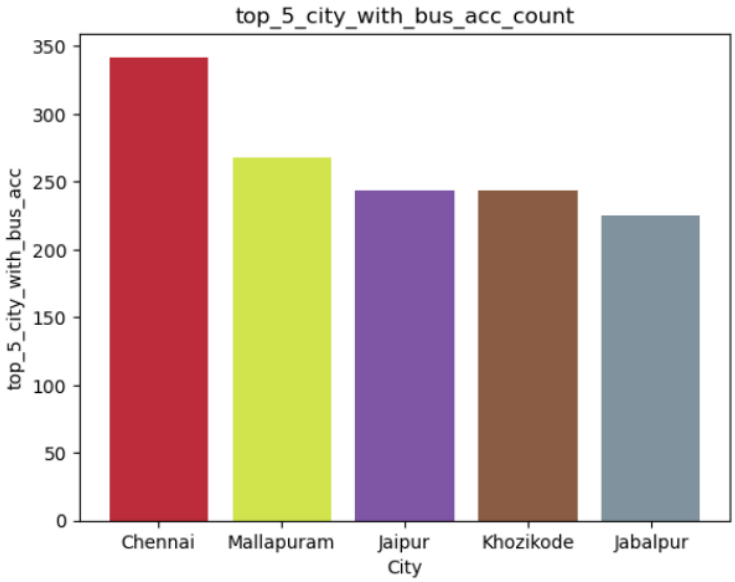
Inferences -

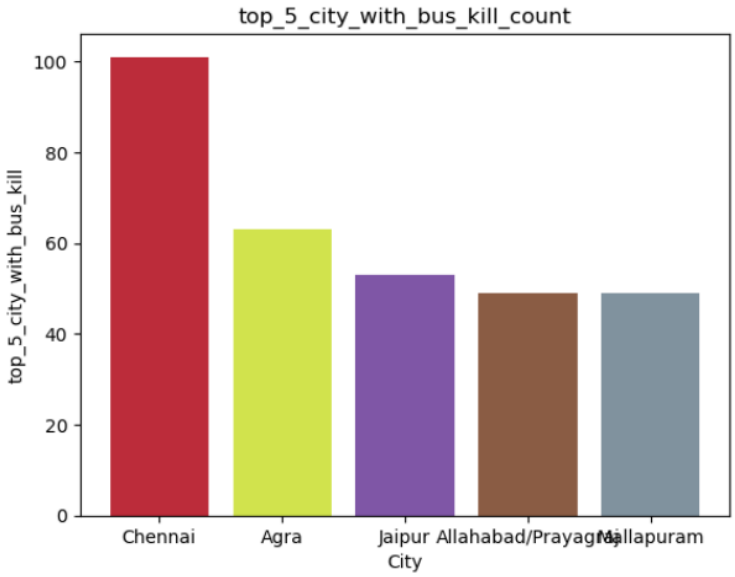
- Again, we can find all South-Indian cities - especially from Kerala and Tamil Nadu
- Malappuram being a district has higher count of bus riders/drivers grievously injured than the capital of Kerala - Trivandrum

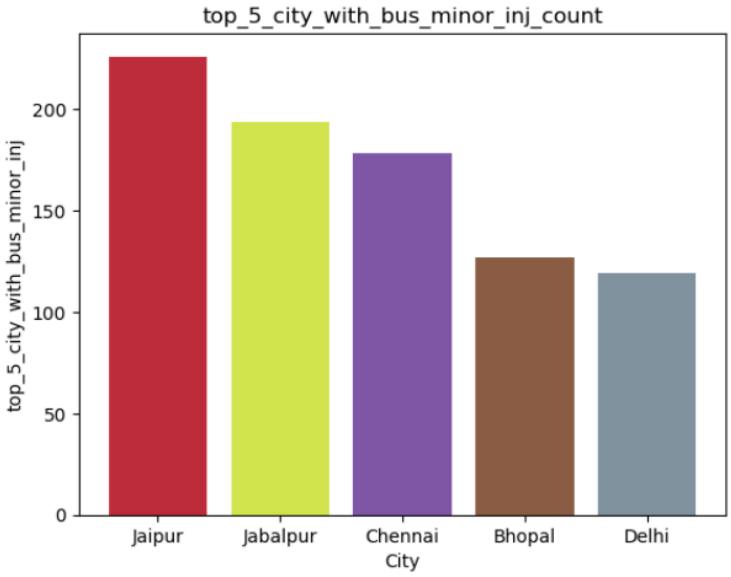
Correlation b/w number of bus accidents and grievously injured is **84%**

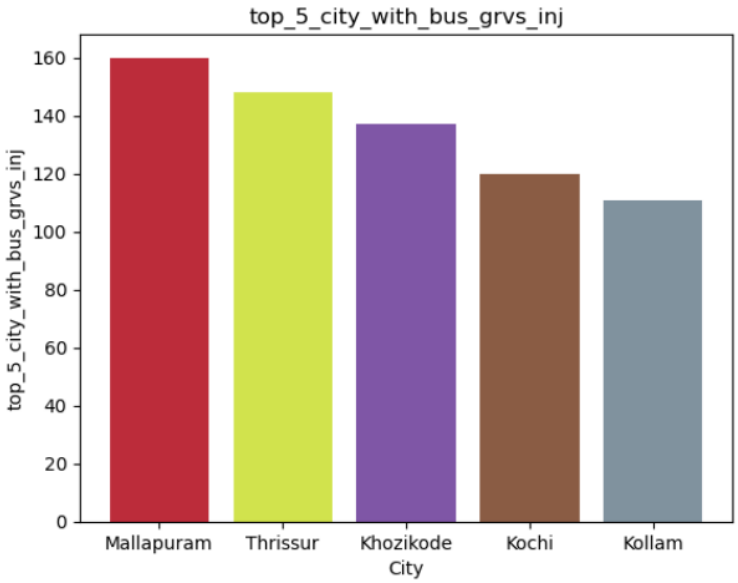
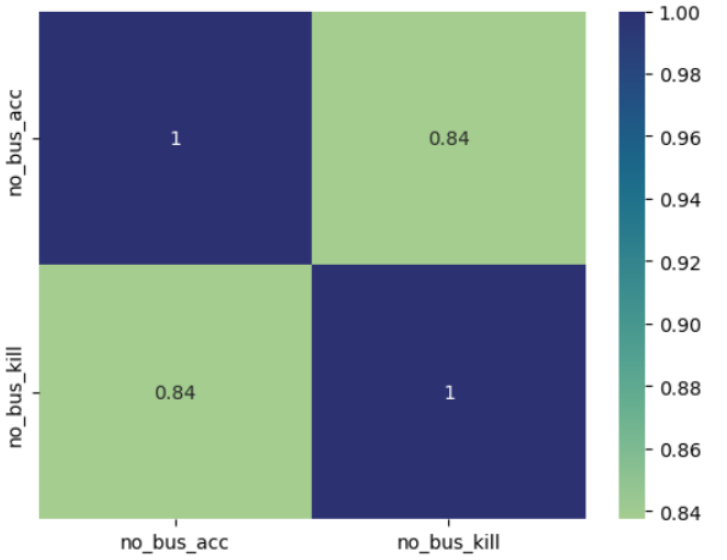
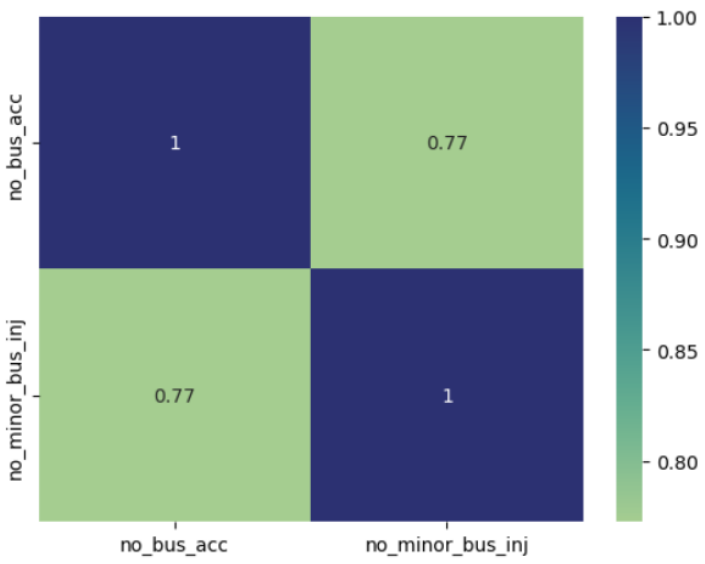
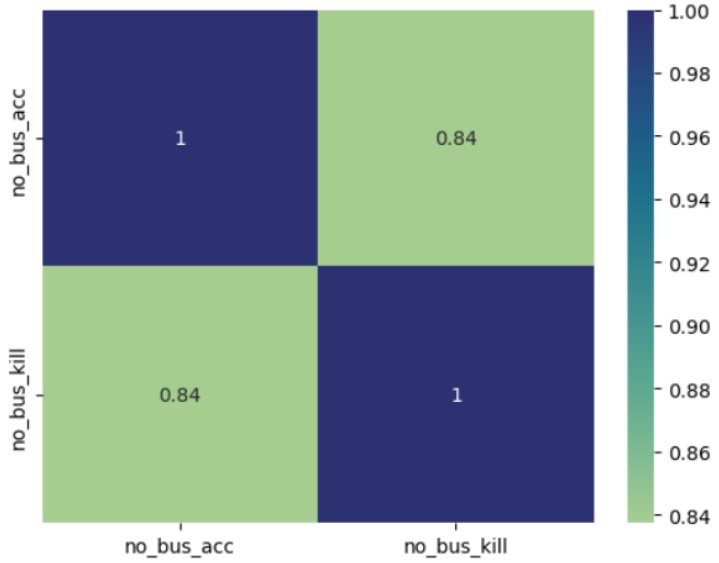


Bus Accidents graph in one frame -









Bus Accidents grievously graph in one frame -