



Comparative study of Women's Safety in Metropolitan Cities

Submitted to:

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GROUP PROJECT

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'Comparative Study of Women's Safety in Metropolitan Cities' This project helped us in doing a huge amount of research which gave us an opportunity to learn something new.

We would like to express our heartfelt gratitude to Mr. Mayur More for the tremendous help and guidance at each and every step from the selection of the topic till the final analysis.

Last but not the least, we would also like to thank the Statistics and IT Department for the knowledge they have provided to us which played a very important role in the accomplishment of this project.

Thank you!!

INTRODUCTION

Womens' safety in India is an issue of utmost importance to anyone living in the current times. Women are neither safe outside nor at home. Women travellers from other countries are also in a dubious state while travelling to India. Living in Indian metropolitan cities comes with its own advantages and disadvantages. Though metropolis provides feasibility to reach remote corners of the city, it is still quite challenging to reach safely at your destination. Challenges faced by women living in Indian metropolitan cities are innumerable, a survey was conducted to understand the perspectives of people living in metropolitan cities regarding the subject.

METHODOLOGY

The research is exploratory in nature,taking into consideration following:

- Universe: Four Metropolitan cities namely, Delhi NCR, Bengaluru,Mumbai,Kolkata, have been taken as the universe, and it is finite in nature.
- Target Population:People above the age of 18 living in these four metropolitan cities.
- Data Source: Data was collected from Primary and Secondary sources.
- Tool for collection of Primary data: Online questionnaire using google forms.
- Tool for collection of Secondary data: National Crime Records Bureau(NCRB).
- Sample size: 261
- Tools used for analysis: Microsoft Excel, R, Python, Tableau were mainly used to run the tests and carry out analysis of the received data. Chi-square tests for independence of attributes and Bayes theorem were used to draw inferences from the data.

CONFIDENTIALITY NOTE

The contents of the form and any attachments whatsoever are intended solely for research purposes. Our research scrutinizes the opinions of a group of respondents. Their individual responses were not shown to anyone.

PILOT SURVEY REPORT

In order to conduct the pilot survey, we first created an online questionnaire using Google Forms. We then distributed the form among 20 odd people and the responses were collected. At the same time, we also asked them for their constructive criticisms about the form. Their issues regarding the questionnaire and their suggestions are listed below:

- 11 out of 24 respondents felt that the questionnaire was short.
- In the question, “How effective will the following safety measures be in curbing crimes against women?”, some respondents suggested that an increase in the number of measures would be better.
- In the question, “What mode of public transportation do you prefer?”, many respondents proposed the incorporation of ‘Private Vehicles’ as a choice.
- Some respondents suggested the addition of government laws and policies in a question, testing awareness factors among the population.
- Some suggestions arose regarding the addition of a descriptive question, to make the questionnaire more interactive.

After methodical deliberations the following changes were made in the final questionnaire:

- In order to make up for the shortage of questions, we added a few more questions in the final questionnaire.
- We increased the number of choices in the question, “How effective will the following safety measures be in curbing crimes against women?”.
- In the question, “What mode of public transportation do you prefer?” We added “private vehicles” as an option.
- We added a question to check the awareness of a few government laws and policies.
- We added “What according to you should be the punishment for Rape?” as a descriptive question. We did not mark this question as required, due to its sensitive nature.
- Some questions were rephrased in the final form with respect to grammar

SURVEY DATA SUMMARY:

A total of **261 responses** were collected.

- Distribution of the responses from four major metropolitan cities of India (Delhi NCR, Mumbai, Bengaluru and Kolkata).
 - 127 responses were from Mumbai.
 - 72 responses were from Delhi NCR.
 - 41 responses were from Bengaluru.
 - 21 responses were from Kolkata.

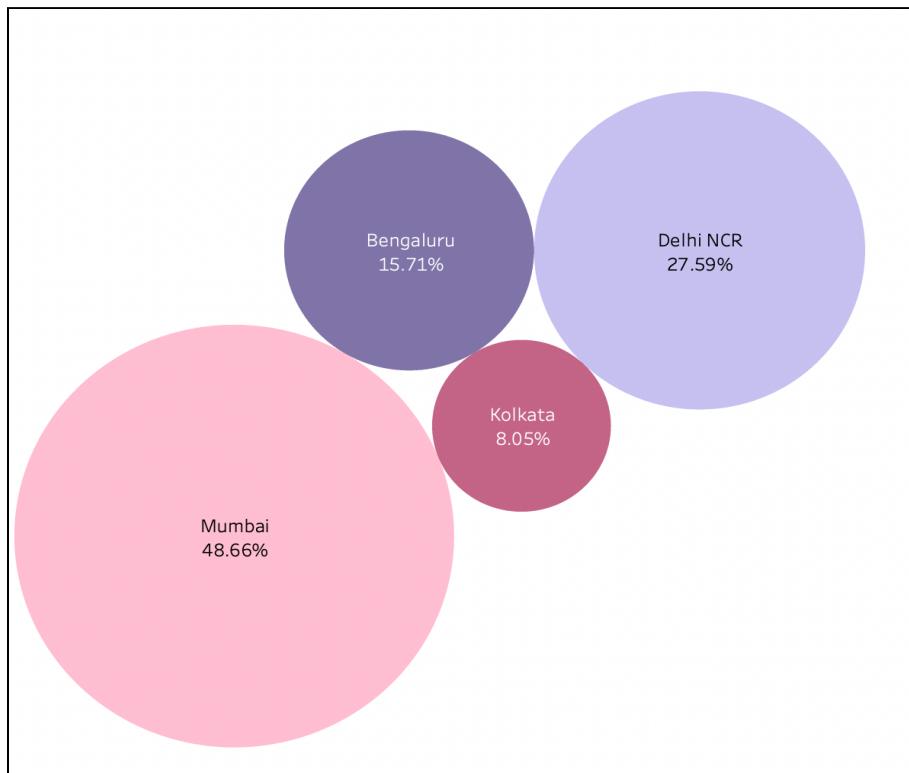


FIGURE 1

- Among the responses that we received,
 - 185(70.9%) respondents are people who are 'Studying',
 - 58(22.2%) respondents are people who are 'Working'.
 - 18(6.9%) are people who belong to neither of the above two groups.

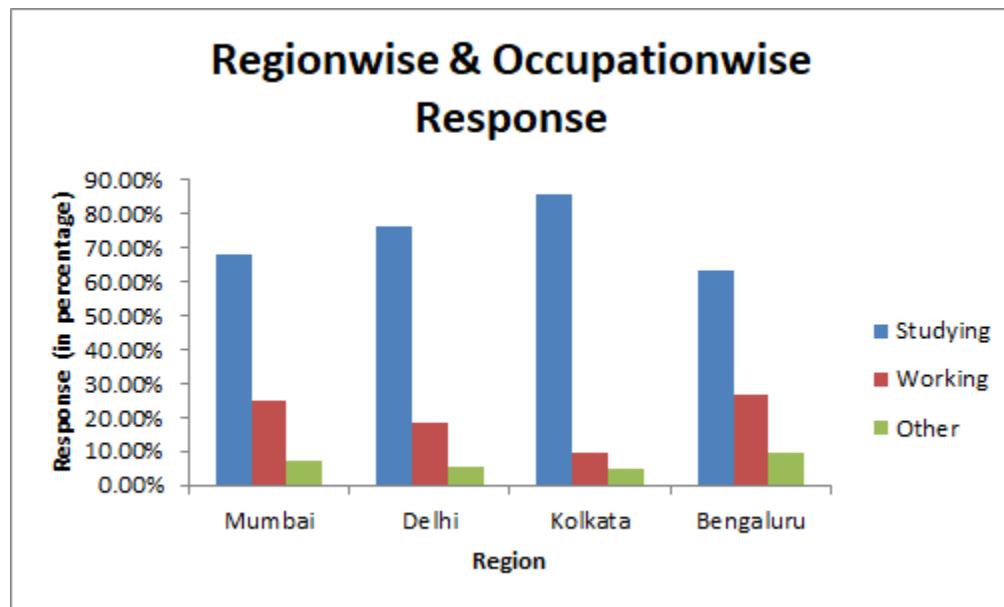


FIGURE 2

- Among the responses that we received,
 - 158(60.5%) respondents are people who are '*Female*',
 - 100(38.3%) respondents are people who are '*Male*'.
 - 3(1.1%) respondents preferred not to reveal their identity.

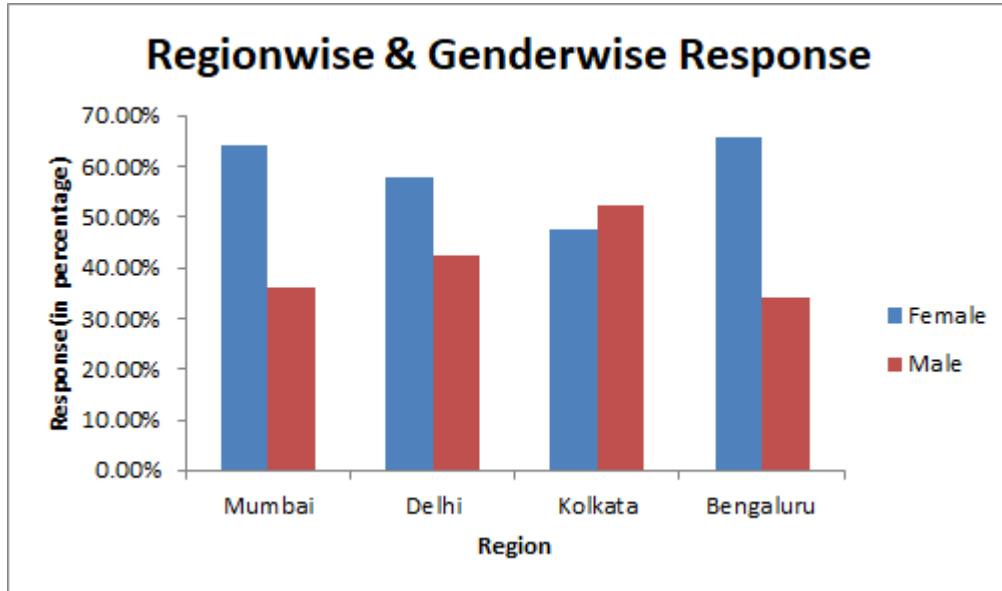


FIGURE 3

- Among the responses that we received,
 - 209(80.1%) respondents are people who are in *Age group:18-25*.
 - 25(9.6%) respondents are people who are in *Age group:26-33*.
 - 13(5%) are respondents who belong to *Age group:34-41*
 - 14(5.4%) are respondents who belong to *Age group:42 and above*

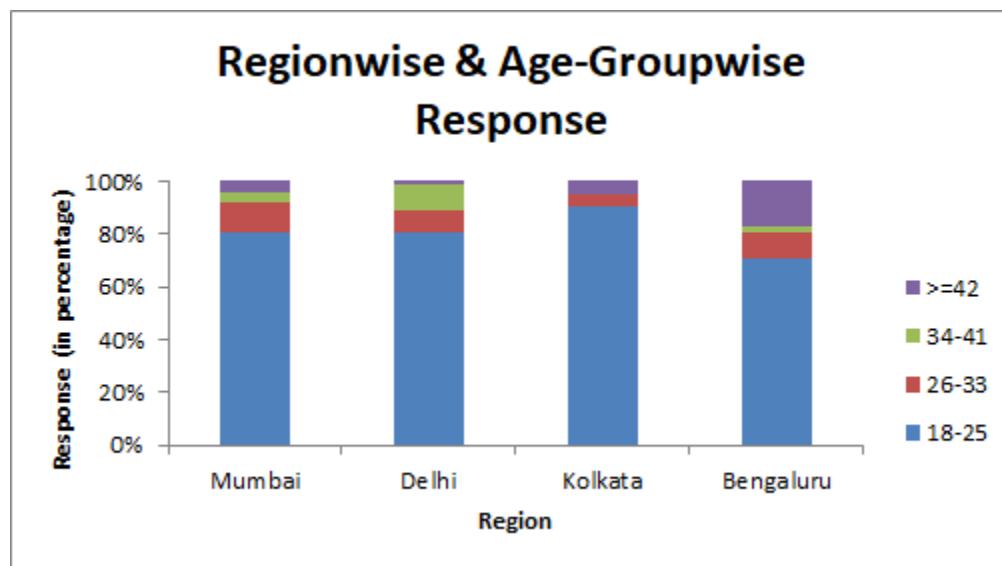


FIGURE 4

RESEARCH OBJECTIVES

Our major objectives include the following:

1. To infer which among the metropolitan cities taken under consideration(Delhi NCR, Bengaluru,Mumbai,Kolkata), are comparatively safer for women based on data from NCRB.
2. To observe the most common crimes against women .
3. To observe the most common crimes against women among the considered cities based on NCRB data.
4. To perceive people's opinion on the dependence of dressing and offences against women,self defence classes based on data from the survey and the level of satisfaction with police disposition in cases relating to crimes against women.
5. To analyse the current status of crimes against women by comparing it with past four year's data from NCRB and the survey conducted.
6. To learn which mode of transport and what safety measures are effective for women based on data from the survey.
7. To evaluate whether crime rate depends on literacy rate from data based on NCRB.
8. To understand the reaction of people witnessing women being eve teased /harassed from the survey conducted.

ASSESSMENT OF OBJECTIVE 1

Deriving from the NCRB data:

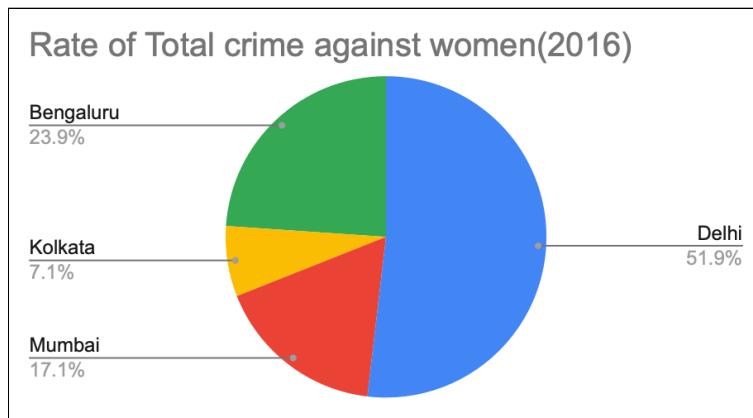


FIGURE 5

INSIGHT:

From the above pie chart, we see that Delhi contributes maximum to the rate of total crime against women among the four considered metropolitan cities in 2016. Delhi (51.9%) is followed by Bengaluru (23.0%), Mumbai (17.1%) and Kolkata (7.1%) in descending order.

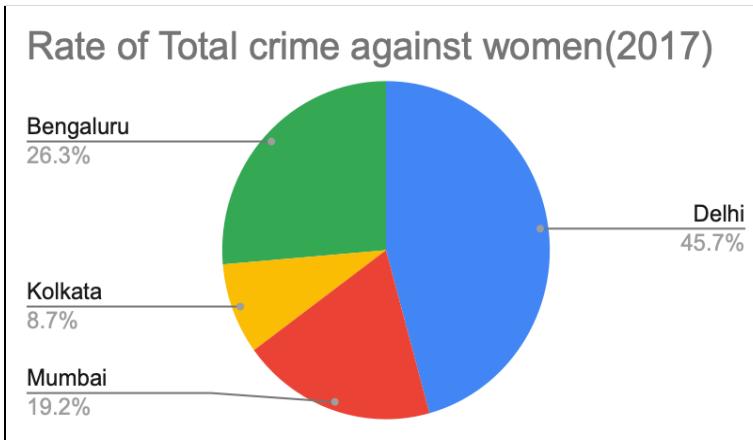


FIGURE 6

INSIGHT:

From the above pie chart, we see that Delhi contributes maximum to the rate of total crime against women among the four considered metropolitan cities in 2017. Delhi (45.7%) is followed by Bengaluru (26.3%), Mumbai (19.2%) and Kolkata (8.7%) in descending order.

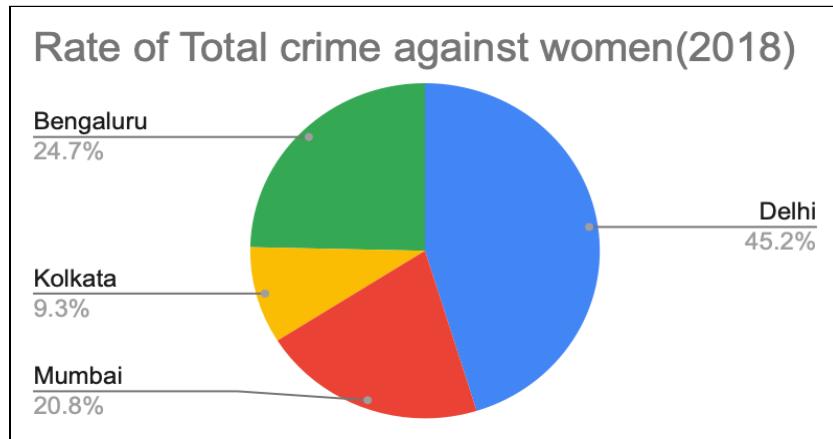


FIGURE 7

INSIGHT:

From the above pie chart, we see that Delhi contributes maximum to the rate of total crime against women among the four considered metropolitan cities in 2018. Delhi (45.2%) is followed by Bengaluru (24.7%), Mumbai (20.8%) and Kolkata (9.3%) in descending order.

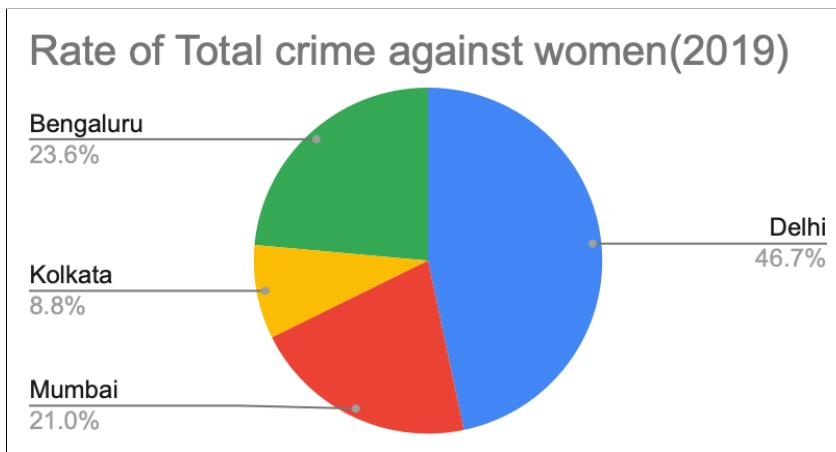


FIGURE 8

INSIGHT:

From the above pie chart, we see that Delhi contributes maximum to the rate of total crime against women among the four considered metropolitan cities in 2019. Delhi (46.7%) is followed by Bengaluru (23.6%), Mumbai (21%) and Kolkata (8.8%) in descending order.

CONCLUSION FROM THE ABOVE FOUR GRAPHS :

From the above pie charts we can conclude that, through the years 2016-19 ,Kolkata is comparatively safer among the four metropolitan cities that we have taken into consideration.Delhi is the most unsafe city from the list of the aforementioned cities.

ASSESSMENT OF OBJECTIVE 2

Deriving from the survey data:

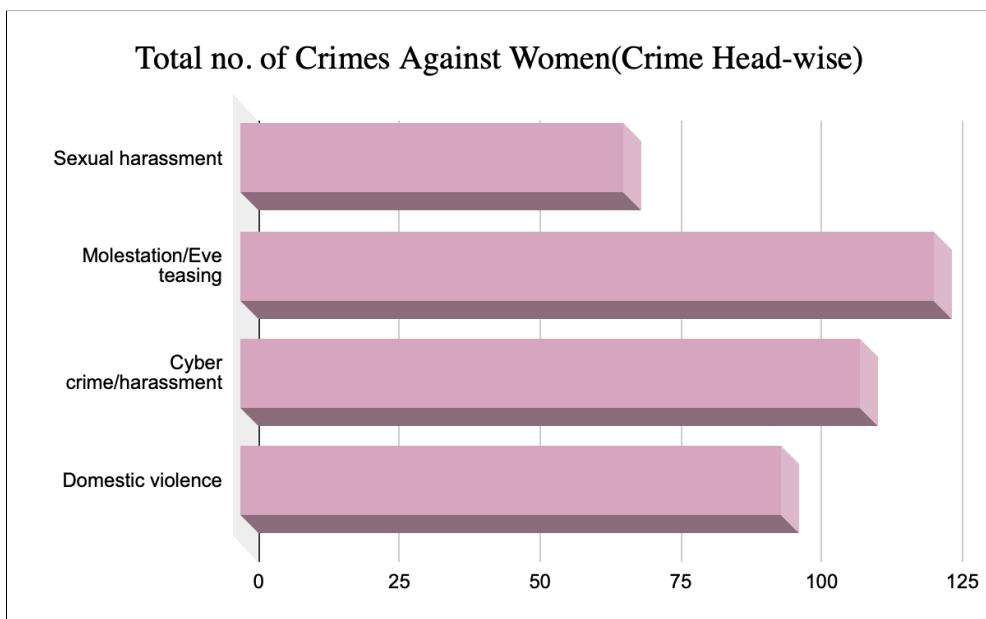


FIGURE 9

INSIGHT:

From the above horizontal bar diagram representing “Total no. of crimes against Women(Crime Head-wise)” we see that the most frequently occurring crime against women is Molestation/Eve-teasing which is followed by Cyber crime/harassment and Domestic violence . Comparatively, Sexual harassment cases are less in number although the number of occurrences is significant.

Deriving from the NCRB data:

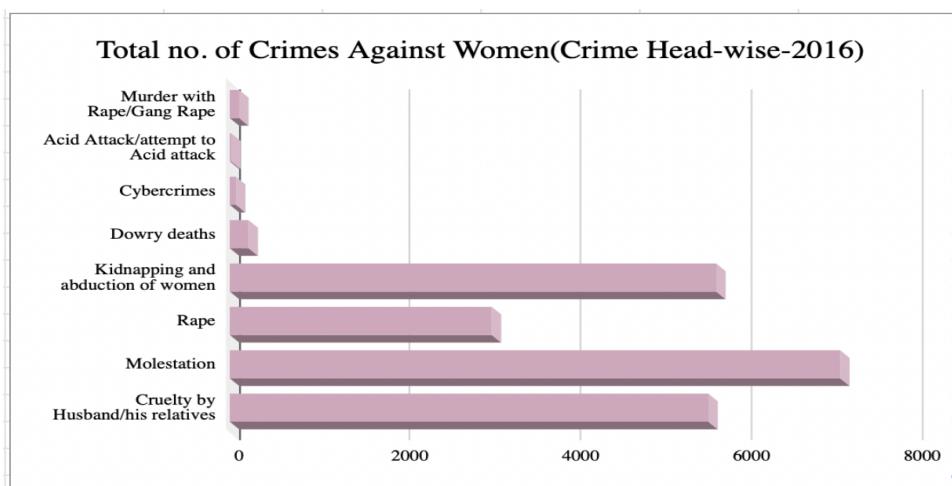


FIGURE 10

INSIGHT:

From the above horizontal bar diagram representing “Total no. of crimes against Women(Crime Head-wise)” we see that the most frequently occurring crime against women in 2016 is Molestation which is followed by Kidnapping and Abduction of women and Cruelty by Husband/his relatives. Comparatively, Rape cases are less in number although the number of occurrences is significant. The number of occurrences of Murder with Rape/Gang Rape, Acid attack/attempt to Acid attack, Cybercrimes and Dowry deaths are almost negligible in comparison to the others.

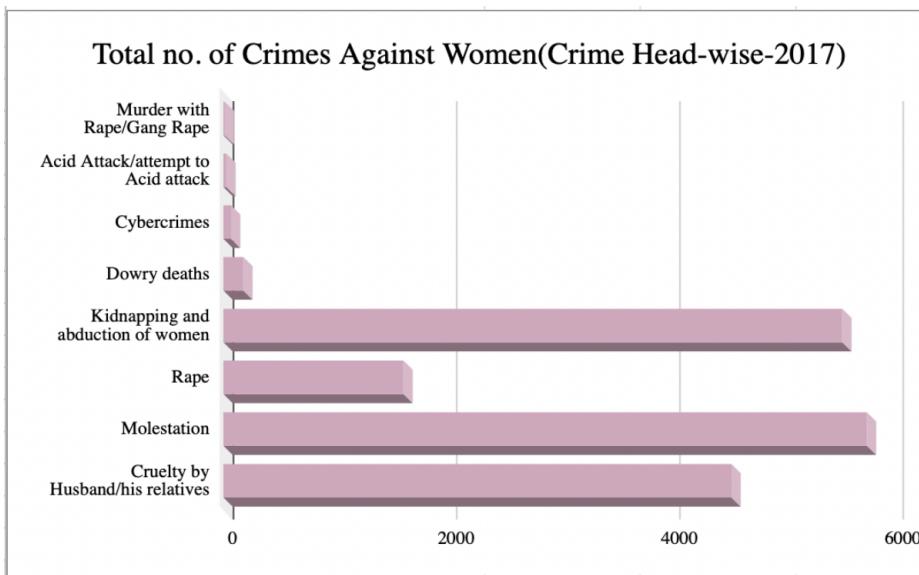


FIGURE 11

INSIGHT:

From the above horizontal bar diagram representing “Total no. of crimes against Women(Crime Head-wise)” we see that the most frequently occurring crime against women in 2017 is Molestation which is followed by Kidnapping and Abduction of women and Cruelty by Husband/his relatives. Comparatively, Rape cases are less in number although the number of occurrences is significant. The number of occurrences of Murder with Rape/Gang Rape, Acid attack/attempt to Acid attack, Cybercrimes and Dowry deaths are almost negligible in comparison to the others.

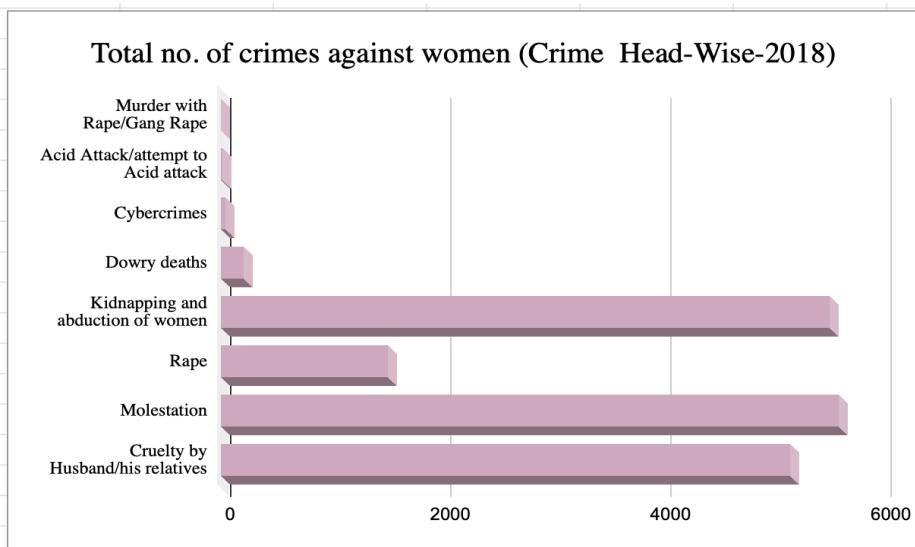


FIGURE 12

INSIGHT:

From the above horizontal bar diagram representing “Total no. of crimes against Women(Crime Head-wise)” we see that the most frequently occurring crime against women in 2017 is Molestation which is followed closely by Kidnapping and Abduction of women and then Cruelty by Husband/his relatives in decreasing order. Comparatively, Rape cases are less in number although the number of occurrences is significant. The number of occurrences of Murder with Rape/Gang Rape, Acid attack/attempt to Acid attack, Cybercrimes and Dowry deaths are almost negligible in comparison to the others.

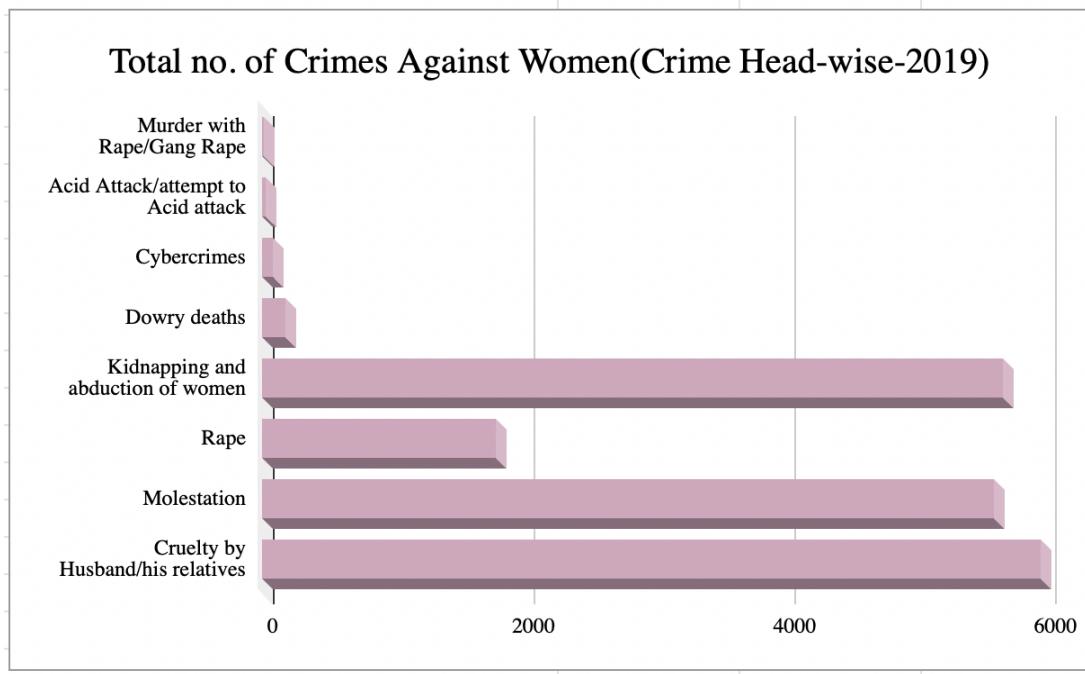


FIGURE 13

INSIGHT:

From the above horizontal bar diagram representing “Total no. of crimes against Women(Crime Head-wise)” we see that the most frequently occurring crime against women in 2019 is Cruelty by Husband/his relatives which is followed by Kidnapping and Abduction of women and Molestation. Comparatively, Rape cases are less in number although the number of occurrences is significant. The number of occurrences of Murder with Rape/Gang Rape, Acid attack/attempt to Acid attack, Cybercrimes and Dowry deaths are almost negligible in comparison to the others.

CONCLUSION:

We can conclude from the above analysis that the graphs obtained from primary data are aligned with the graphs from the secondary data.

ASSESSMENT OF OBJECTIVE 3

Deriving from the NCRB data:

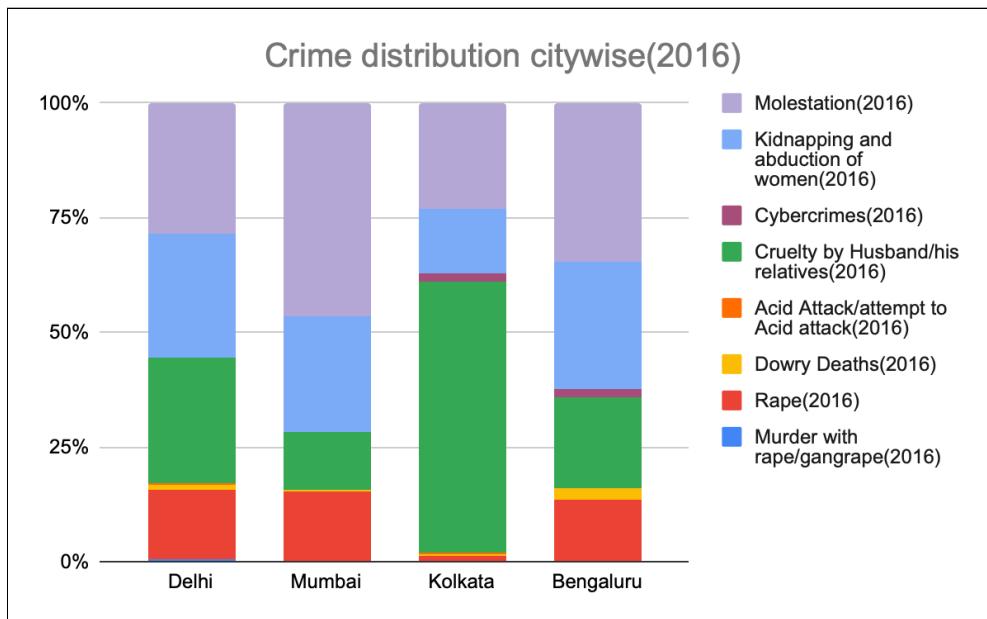


FIGURE 14

INSIGHT:

On studying the above graph, we conclude that in the year 2016:

- In Delhi NCR, Molestation, Kidnapping and abduction of women and Cruelty by husband/his relatives have the highest rate of occurrence and are approximately the same. Comparatively, a significant but lesser percentage of rape cases have occurred. Cybercrimes, Murder with Rape/Gang rape, Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.
- In Mumbai, we see the highest crime rate is of Molestation cases followed closely by Kidnapping and abduction of women. Comparatively, a significant but lesser percentage of rape cases have occurred. Cybercrimes, Murder with Rape/Gang rape, Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.
- In Kolkata, we see that the highest crime rate is of Cruelty by husband/his relatives. The second highest rate of occurrence is Molestation followed closely by Kidnapping and Abduction of women. The rate of occurrence of Cybercrimes, Dowry deaths, Rape, Murder with Rape/Gang rape and Acid attack/attempt to Acid attack are present although very less.
- In Bengaluru, we see that the highest crime rate is Molestation cases followed closely by Kidnapping and Abduction of women and Cruelty by husband/his relatives. Comparatively, a significant but lesser percentage of rape cases have occurred. The rate of occurrence of Cybercrimes, Murder with Rape/Gang rape, Dowry deaths and Acid attack/attempt to Acid attack are present although very less and almost negligible.

Overall, on comparison we see that:

- Molestation cases are quite significant in every city with the highest in Mumbai and lowest in Kolkata.
- Kidnapping and Abduction of women are also significant, with the higher percentage in Bengaluru and Delhi whereas lowest in Kolkata.

- For Cruelty by husbands/his relatives, we can see that Kolkata is on the top and Mumbai can be seen to be at the lowest .
- Dowry Deaths can be seen to be low everywhere.The highest cases reported are in Delhi and the lowest in Kolkata.
- Rape cases reported are at par in Mumbai and Delhi whereas the cases reported in Kolkata can be seen to be negligible.
- Cybercrimes,Acid attack/Attempt to Acid attack and Murder with Rape/Gang rape cases reported can be seen to be present although negligible.

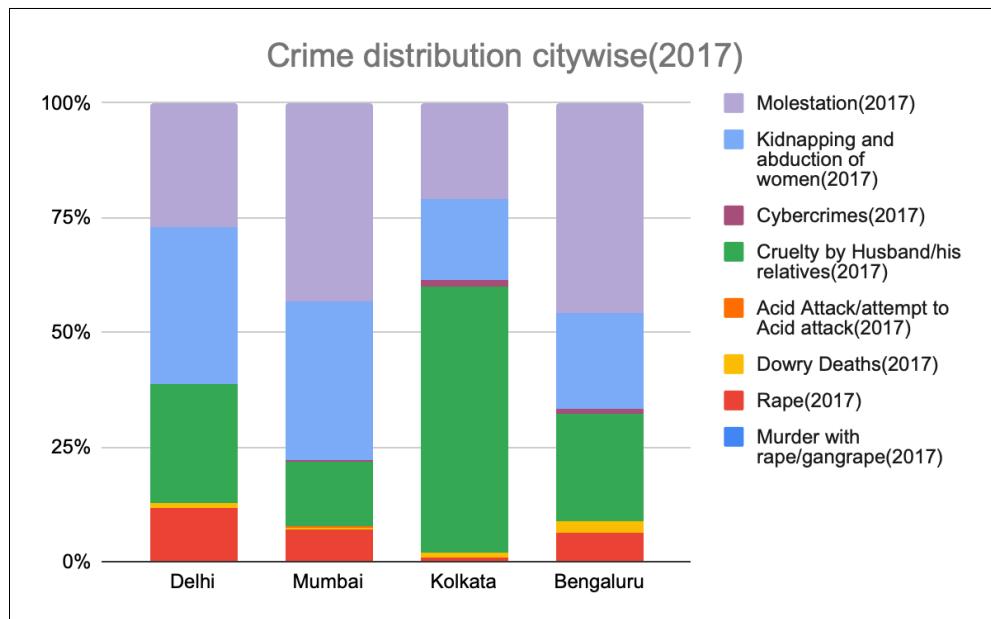


FIGURE 15

INSIGHT:

On studying the above graph,we conclude that in the year 2017:

- In Delhi NCR, Kidnapping and abduction of women has the highest rate of occurrence followed closely by Molestation and Cruelty by Husband/his relatives.Comparatively, a significant but lesser percentage of rape cases have occurred.Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.
- In Mumbai, we see the highest crime rate is of Molestation cases followed closely by Kidnapping and abduction of women.Comparatively, a significant but lesser percentage of rape cases have occurred.Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.
- In Kolkata, we see that the highest crime rate is of Cruelty by husband/his relatives. The second highest rate of occurrence is Molestation followed closely by Kidnapping and Abduction of women. The rate of occurrence of Cybercrimes,Dowry deaths,Rape,Murder with Rape/Gang rape and Acid attack/attempt to Acid attack are present although very less.
- In Bengaluru, we see that the highest crime rate is Molestation cases followed closely by Kidnapping and Abduction of women and Cruelty by husband/his relatives.Comparatively, a significant but lesser percentage of rape cases have occurred.The rate of occurrence of Cybercrimes,Dowry deaths,Murder with Rape/Gang rape, and Acid attack/attempt to Acid attack are present although very less and almost negligible.

Overall, on comparison we see that:

- Molestation cases are quite significant in every city with the highest in Bengaluru and lowest in Kolkata.
- Kidnapping and Abduction of women are also significant ,with the higher percentage in Mumbai and Delhi whereas lowest in Kolkata.
- For Cruelty by husbands/his relatives, we can see that Kolkata is on the top and Mumbai can be seen to be at the lowest .
- Dowry Deaths are seen to be low everywhere.The highest cases reported are in Bengaluru and the lowest in Mumbai.
- Rape cases reported are the highest in Delhi followed by Mumbai whereas the cases reported in Kolkata can be seen to be negligible.
- Cybercrimes,Acid attack/Attempt to Acid attack and Murder with Rape/Gang rape cases reported can be seen to be present although negligible.

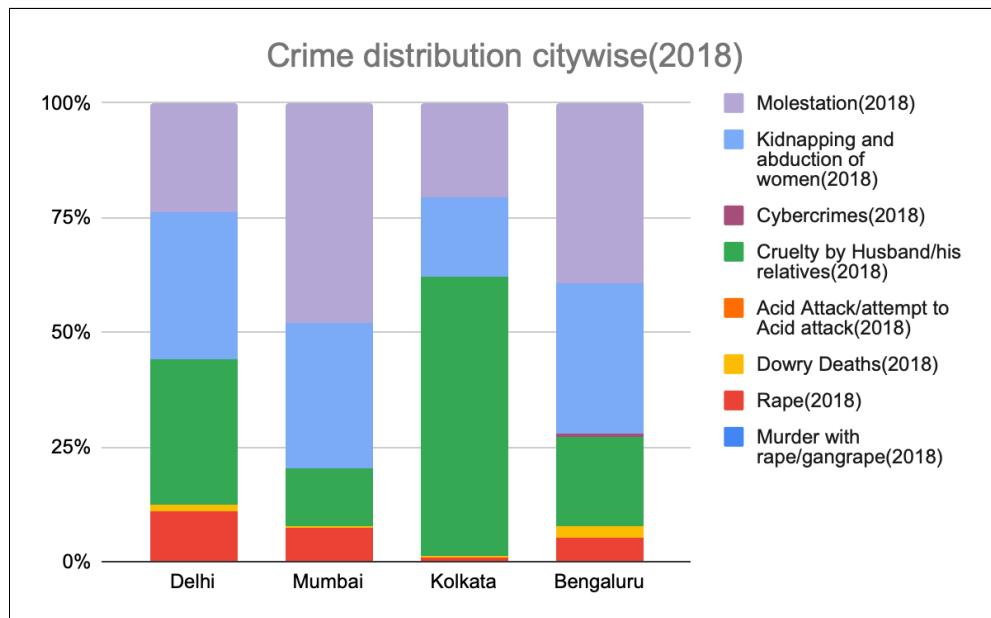


FIGURE 16

INSIGHT:

On studying the above graph,we conclude that in the year 2018:

- In Delhi NCR,Kidnapping and abduction of women and Cruelty by husband/his relatives have the highest rate of occurrence and are approximately the same followed by Molestation.Comparatively, a significant but lesser percentage of rape cases have occurred.Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.
- In Mumbai, we see the highest crime rate is of Molestation cases followed closely by Kidnapping and abduction of women.Comparatively, a significant but lesser percentage of rape cases and cruelty by husband /his relatives cases have occurred.Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.
- In Kolkata, we see that the highest crime rate is of Cruelty by husband/his relatives. The second highest rate of occurrence is Molestation followed closely by Kidnapping and Abduction of women. The rate of

occurrence of Cybercrimes,Dowry deaths,Rape,Murder with Rape/Gang rape and Acid attack/attempt to Acid attack are present although very less.

- In Bengaluru, we see that the highest crime rate is Molestation cases followed closely by Kidnapping and Abduction of women.Comparatively, a significant but lesser percentage of rape cases have occurred.The rate of occurrence of Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are present although very less and almost negligible.

Overall, on comparison we see that:

- Molestation cases are quite significant in every city with the highest in Mumbai and lowest in Kolkata.
- Kidnapping and Abduction of women are also significant ,with the higher percentage in Bengaluru and Delhi whereas lowest in Kolkata.
- For Cruelty by husbands/his relatives, we can see that Kolkata is on the top and Mumbai can be seen to be at the lowest .
- Dowry Deaths can be seen to be low everywhere.The highest cases reported are in Bengaluru and the lowest in Kolkata.
- Rape cases reported are at par in Mumbai and Delhi whereas the cases reported in Kolkata can be seen to be negligible.
- Cybercrimes,Acid attack/Attempt to Acid attack and Murder with Rape/Gang rape cases reported can be seen to be present although negligible.

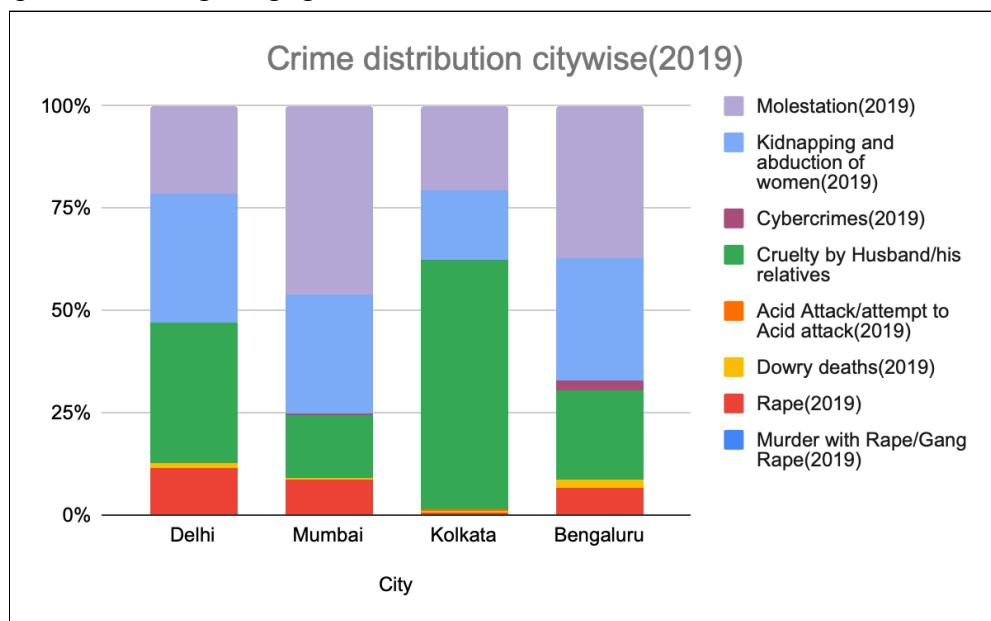


FIGURE 17

INSIGHT:

On studying the above graph,we conclude that in the year 2019:

- In Delhi NCR,Kidnapping and abduction of women and Cruelty by husband/his relatives have the highest rate of occurrence and are approximately the same followed by Molestation.Comparatively, a significant but lesser percentage of rape cases have occurred.Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.
- In Mumbai, we see the highest crime rate is of Molestation cases followed closely by Kidnapping and abduction of women.Comparatively, a significant but lesser percentage of rape cases and cruelty by

husband /his relatives cases have occurred.Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are almost negligible.

- In Kolkata, we see that the highest crime rate is of Cruelty by husband/his relatives. The second highest rate of occurrence is Molestation followed closely by Kidnapping and Abduction of women. The rate of occurrence of Cybercrimes,Dowry deaths,Rape,Murder with Rape/Gang rape and Acid attack/attempt to Acid attack are present although very less.
- In Bengaluru, we see that the highest crime rate is Molestation cases followed closely by Kidnapping and Abduction of women.Comparatively, a significant but lesser percentage of cruelty by husband/his relatives and rape cases have occurred.The rate of occurrence of Cybercrimes,Murder with Rape/Gang rape,Dowry deaths and Acid attack/attempt to Acid attack are present although very less and almost negligible.

Overall, on comparison we see that:

- Molestation cases are quite significant in every city with the highest in Mumbai and lowest in Kolkata.
- Kidnapping and Abduction of women are also significant ,with the higher percentage in Delhi whereas lowest in Kolkata.
- For Cruelty by husbands/his relatives, we can see that Kolkata is on the top and Mumbai can be seen to be at the lowest .
- Dowry Deaths can be seen to be low everywhere.The highest cases reported are in Bengaluru and the lowest in Kolkata.
- Rape cases reported are at par in Mumbai and Delhi whereas the cases reported in Kolkata can be seen to be negligible.
- Cybercrimes,Acid attack/Attempt to Acid attack and Murder with Rape/Gang rape cases reported can be seen to be present although negligible.

ASSESSMENT OF OBJECTIVE 4

Deriving from the survey data:

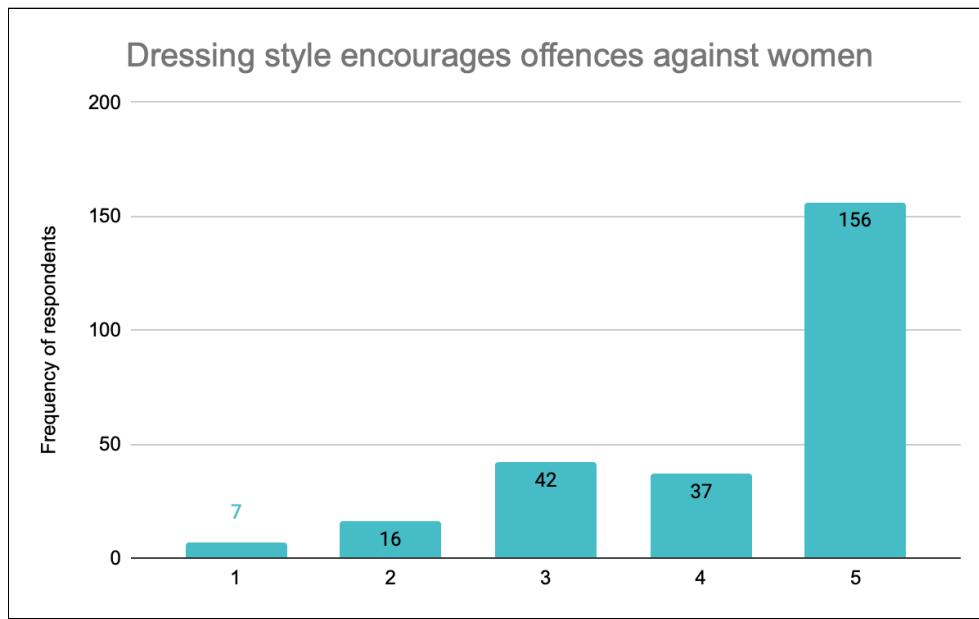


FIGURE 18: 1-Strongly agree,2-Agree,3-Neutral,4-Disagree,5-Strongly Disagree

INSIGHT:

From the above column diagram, we see that 7 respondents strongly agree ,16 respondents agree, 42 respondents are neutral, 37 disagree and 156 respondents strongly disagree with the view: "*Dressing style encourages offences against women.*" We can say that a majority of the respondents strongly disagree with the view:*"Dressing style encourages offences against women."*

Deriving from the survey data:

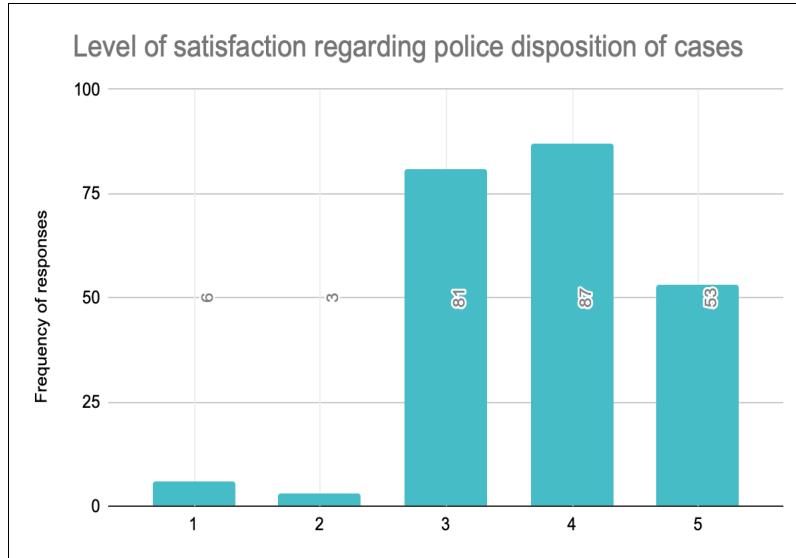


FIGURE 19: 1-Highly satisfied,2-Satisfied,3-Neutral,4-Dissatisfied,5-Highly dissatisfied.

INSIGHT:

From the above column diagram, we see that 6 respondents are highly satisfied ,3 respondents are satisfied, 81 respondents are neutral, 87 dissatisfied and 53 respondents strongly dissatisfied with the police disposition of the cases. We can say that a majority of the respondents are dissatisfied with the police disposition of the cases.

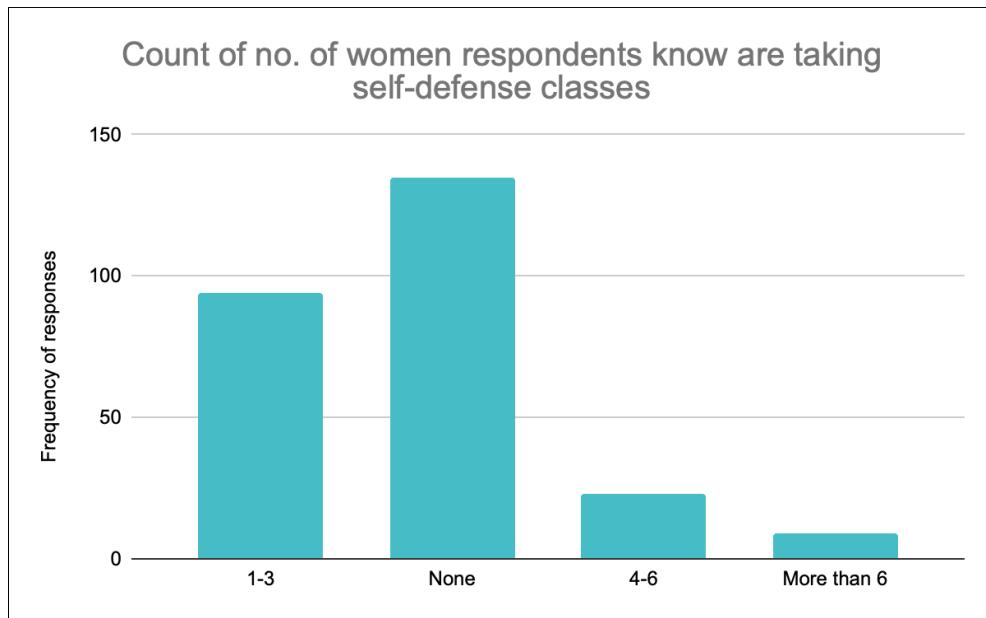


FIGURE 20

ASSESSMENT OF OBJECTIVE 5

Deriving from the NCRB data:

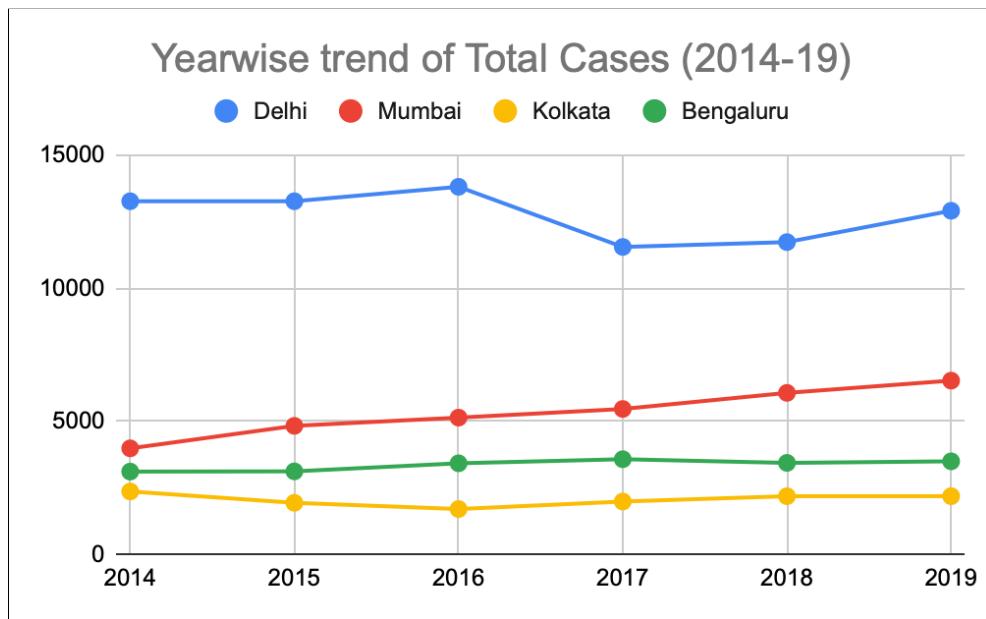


FIGURE 21

INSIGHT:

From the above graph, we can see that Delhi has the highest total number of crimes against women from 2014-19. Delhi is followed by Mumbai, Bengaluru and Kolkata in descending order. We can also see that there is a decrease in the total no. of crimes against women in Delhi from 2016 to 2017 after which there is a slowly increasing linear trend. In Mumbai, the total no. of crimes against women follow an increasing linear trend whereas in Bengaluru it is almost constant from 2014-19. In Kolkata, we see that there is a decrease in the total no. of crimes against women from 2014 to 2016 after which there is an increasing linear trend.

ASSESSMENT OF OBJECTIVE 6:

The following code has been used to manipulate and visualise the data collected from our survey :

CODE:

```
#subsets
df_2=df[df$Location=='Mumbai',]
df_3=df[df$Location=='Delhi NCR',]
df_4=df[df$Location=='Bengaluru',]
df_5=df[df$Location=='Kolkata',]
par(mfrow=c(2,2))

#MUMBAI
table(df_2$What.mode.of.transportation.do.you.suggest.for.women...Before.7.AM.)
table(df_2$What.mode.of.transportation.do.you.suggest.for.women...7.AM.TO.12.PM.)
table(df_2$What.mode.of.transportation.do.you.suggest.for.women...12.PM.TO.5.PM.)
table(df_2$What.mode.of.transportation.do.you.suggest.for.women...5.PM.TO.10.PM.)
table(df_2$What.mode.of.transportation.do.you.suggest.for.women...Post.10.PM.)
tabdf2=matrix(c(49,47,56,87,86,80,54,99,78,85,53,96,71,70,53,98,38,44,68,44),nrow=4,ncol=5)
rownames(tabdf2)=c("Buses","Cabs/Rickshaws","Private vehicles","Metro/local trains")
colnames(tabdf2)=c("Before 7 AM","7 AM to 12 PM","12 PM to 5 PM","5 PM to 10 PM","Post 10 PM")
tabdf2=as.table(tabdf2)
barplot(tabdf2,col=c("#006633","#009933","#66FF99","#66FFCC"),main="Mumbai",
,beside=TRUE)
legend("topright",pch=c(15,15),legend=rownames(tabdf2),col=c("#006633","#009933","#66FF99",
"#66FFCC"))

#DELHI NCR
table(df_3$What.mode.of.transportation.do.you.suggest.for.women...Before.7.AM.)
table(df_3$What.mode.of.transportation.do.you.suggest.for.women...7.AM.TO.12.PM.)
table(df_3$What.mode.of.transportation.do.you.suggest.for.women...12.PM.TO.5.PM.)
table(df_3$What.mode.of.transportation.do.you.suggest.for.women...5.PM.TO.10.PM.)
table(df_3$What.mode.of.transportation.do.you.suggest.for.women...Post.10.PM.)
tabdf3=matrix(c(17,39,37,22,7,25,39,45,38,17,36,28,26,32,42,37,61,61,50,28),nrow=4,ncol=5,
byrow=T)
rownames(tabdf3)=c("Buses","Cabs/Rickshaws","Private vehicles","Metro/local trains")
colnames(tabdf3)=c("Before 7 AM","7 AM to 12 PM","12 PM to 5 PM","5 PM to 10 PM","Post 10 PM")
tabdf3=as.table(tabdf3)
barplot(tabdf3,col=c("#006633","#009933","#66FF99","#66FFCC"),main="Delhi NCR",
,beside=TRUE)

#BENGALURU
table(df_4$What.mode.of.transportation.do.you.suggest.for.women...Before.7.AM.)
table(df_4$What.mode.of.transportation.do.you.suggest.for.women...7.AM.TO.12.PM.)
table(df_4$What.mode.of.transportation.do.you.suggest.for.women...12.PM.TO.5.PM.)
table(df_4$What.mode.of.transportation.do.you.suggest.for.women...5.PM.TO.10.PM.)
table(df_4$What.mode.of.transportation.do.you.suggest.for.women...Post.10.PM.)
```

```

tabdf4=matrix(c(21,33,35,28,21,18,28,27,19,15,16,21,18,20,18,25,32,30,24,20),nrow=4,ncol=5
,byrow = T)
rownames(tabdf4)=c("Buses","Cabs/Rickshaws","Private vehicles","Metro/local trains")
colnames(tabdf4)=c("Before 7 AM","7 AM to 12 PM","12 PM to 5 PM","5 PM to 10 PM","Post 10 PM")
tabdf4=as.table(tabdf4)
barplot(tabdf4,col=c("#006633","#009933","#66FF99","#66FFCC"),main="Bengaluru",
,beside=TRUE)
table(df_5$What.mode.of.transportation.do.you.suggest.for.women...Before.7.AM.)
table(df_5$What.mode.of.transportation.do.you.suggest.for.women...7.AM.TO.12.PM.)
table(df_5$What.mode.of.transportation.do.you.suggest.for.women...12.PM.TO.5.PM.)
table(df_5$What.mode.of.transportation.do.you.suggest.for.women...5.PM.TO.10.PM.)
table(df_5$What.mode.of.transportation.do.you.suggest.for.women...Post.10.PM.)
tabdf5=matrix(c(12,17,18,13,5,9,13,14,14,5,14,9,8,8,15,9,14,16,15,4),nrow=4,ncol=5,byrow = T)
rownames(tabdf5)=c("Buses","Cabs/Rickshaws","Private vehicles","Metro/local trains")
colnames(tabdf5)=c("Before 7 AM","7 AM to 12 PM","12 PM to 5 PM","5 PM to 10 PM","Post 10 PM")
tabdf5=as.table(tabdf5)
barplot(tabdf5,col=c("#006633","#009933","#66FF99","#66FFCC"),main="Kolkata",
,beside=TRUE)

```

OUTPUT:

Deriving from the survey data:

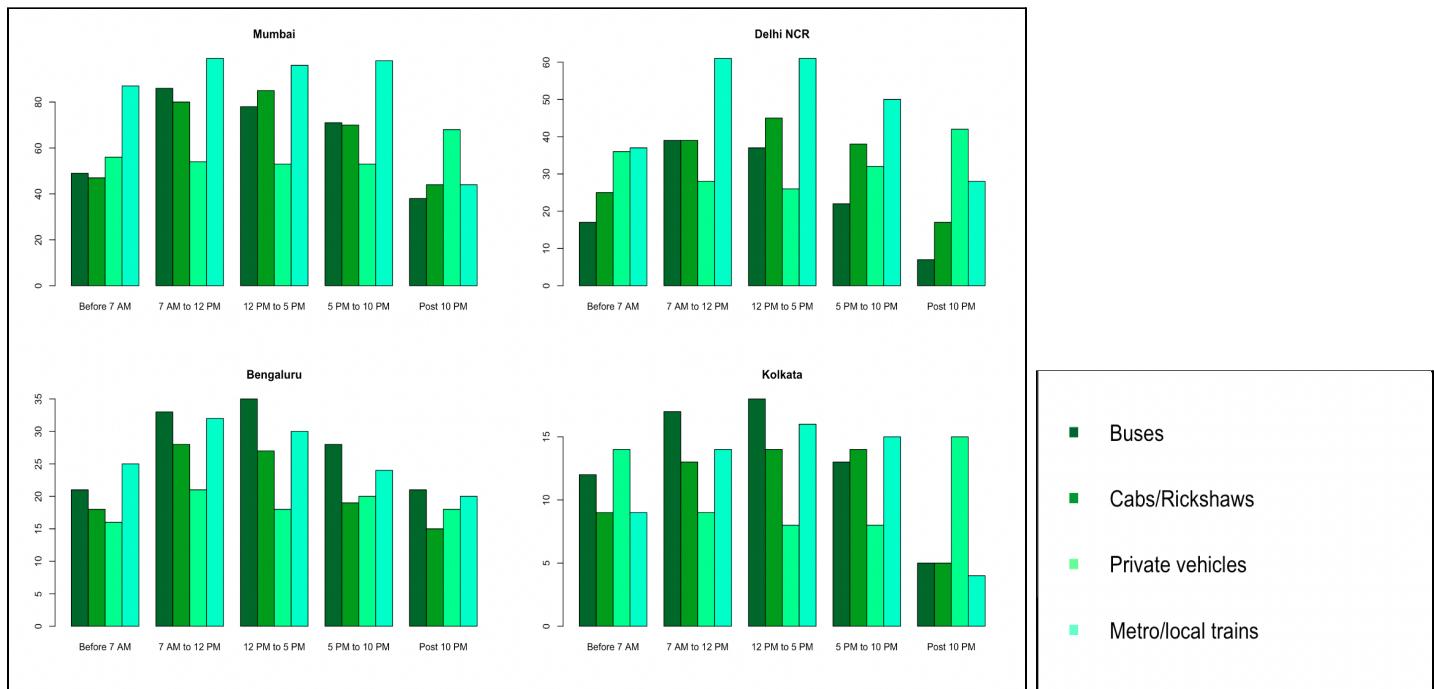


FIGURE 22

INSIGHT:

From the above graph, we can see that:

- Respondents from Mumbai prefer “Metro/Local trains” throughout the day except for “Post 10 PM” when respondents prefer “Private vehicles”.
- Respondents from Delhi NCR prefer “Metro/Local trains” throughout the day except for “Post 10 PM” when respondents prefer “Private vehicles”.
- Respondents from Bengaluru prefer “Metro/Local trains” before 7 AM and “Buses” for the rest of the day.
- Respondents from Kolkata prefer “Metro/Local trains” before 7 AM and Post 10 PM, “Buses” from 7 AM-12 noon and 12 noon -5 PM, and “Metro/Local trains” for 5 PM-10 PM.

ASSESSMENT OF OBJECTIVE 7:

Deriving from the NCRB data:

The Pearson correlation coefficient is a measure of the strength of a linear association between two variables and is denoted by r . The Pearson correlation coefficient, r , can take a range of values from +1 to -1. A value of 0 indicates that there is no association between the two variables. A value greater than 0 indicates a positive association; that is, as the value of one variable increases, so does the value of the other variable. A value less than 0 indicates a negative association; that is, as the value of one variable increases, the value of the other variable decreases.

Finding the Pearson’s correlation coefficient between “Rate of Total crime against women(2019)” and “Literacy rate”:

```
#correlation between literacy rate and crime rate
df[['Rate of Total crime against women(2019)', 'Literacy rate']].corr()
```

	Rate of Total crime against women(2019)	Literacy rate
Rate of Total crime against women(2019)	1.000000	-0.525135
Literacy rate	-0.525135	1.000000

FIGURE 23

INSIGHT:

We see that the Pearson’s correlation coefficient comes out to be -0.525135 which is justified because intuitively as Literacy rate increases “Rate of total crime against women” should decrease.

ASSESSMENT OF OBJECTIVE 8:

Deriving From Survey Data

We concluded the reaction of people witnessing women being eve teased /harassed from the survey conducted. The analysis is shown below in the table.

MUMBAI

Have you ever seen a woman being Eve Teased/Harassed ?								
Female	Yes					No	Total	
	Did you make an Effort to help the Victim ?					40	78	
	Yes			No	Total			
	Did you Register a Police Complaint ?					7	38	
	Yes	No	Total					
	8	23	31					
Male	Yes					No	Total	
	Did you make an Effort to help the Victim ?					26	45	
	Yes			No	Total			
	Did you Register a Police Complaint ?					4	19	
	Yes	No	Total					
	3	12	15					
Total	57					66	123	

DELHI

Have you ever seen a woman being Eve Teased/Harassed ?								
Female	Yes					No	Total	
	Did you make an Effort to help the Victim ?					16	36	
	Yes			No	Total			
	Did you Register a Police Complaint ?					5	20	
	Yes	No	Total					
	1	14	15					
Male	Yes					No	Total	
	Did you make an Effort to help the Victim ?					18	29	
	Yes			No	Total			

	Did you Register a Police Complaint ?			0	11		
	Yes	No	Total				
	5	6	11				
Total	31			34		65	

KOLKATA

Have you ever seen a woman being Eve Teased/Harassed ?

	Yes			No	Total		
	Did you make an Effort to help the Victim ?			5	10		
Female	Yes		No				
	Did you Register a Police Complaint ?		0				
	Yes	No	Total				
	1	4	5				
Male	Yes			No	Total		
	Did you make an Effort to help the Victim ?			6	11		
	Yes		No				
	Did you Register a Police Complaint ?		0				
	Yes	No	Total				
	0	5	5				
Total	10			11	21		

BENGALURU

Have you ever seen a woman being Eve Teased/Harassed ?

	Yes			No	Total		
	Did you make an Effort to help the Victim ?			14	26		
Female	Yes		No				
	Did you Register a Police Complaint ?		6				
	Yes	No	Total				
	0	6	6				
Male	Yes			No	Total		
	Did you make an Effort to help the Victim ?			13	14		
	Yes		No				

	Did you Register a Police Complaint ?			0	1		
Yes	No	Total					
0	1						
Total	13			27			40

RESULT :

For Mumbai Region :

- 1) 63.41 % of the population of Mumbai Region was Female & rest 36.59% of the population was Male.
- 2) 46.34% of them saw a woman being Eve-Teased/Harassed where 48.72 % were Female and 42.22% were Male.
- 3) 80.70 % of them made an effort to help the victim who has been harassed where 81.58% of them were Female and 78.95% were Male.
- 4) Only 23.91% registered a Police Complaint of which 25.81% Complaints filed by Female and 20% Complaints filed by Male.

For Delhi Region :

- 1) 55.38% of the population of Delhi Region was Female & rest 44.62% of the population was Male.
- 2) 47.69% of them saw a woman being Eve-Teased/Harassed where 55.56 % were Female and 37.93% were Male.
- 3) 83.87% of them made an effort to help the victim who has been harassed where 75% of them were Female and 100% were Male.
- 4) Only 23.08% registered a Police Complaint of which 6.67% Complaints filed by Female and 45.45% Complaints filed by Male.

For Kolkata Region :

- 1) 47.62% of the population of Kolkata Region was Female & rest 52.38% of the population was Male.
- 2) 47.62 % of them saw a woman being Eve-Teased/Harassed where 50 % were Female and 45.45% were Male.
- 3) All 100% of the observed population made an effort to help the victim who has been harassed.
- 4) Only 10% registered a Police Complaint of which 20% Complaints filed by Female and No Complaint filed by Male.i.e. 0%

For Bengaluru Region :

- 1) 65% of the population of Bengaluru Region was Female & rest 35% of the population was Male.
- 2) 32.5% of them saw a woman being Eve-Teased/Harassed where 46.15 % were Female and 7.14% were Male.
- 3) 53.85% of them made an effort to help the victim who has been harassed where 50% of them were Female and 100% were Male.
- 4) No Police Complaints were Registered by the Observed Population. i.e. 0%

STATISTICAL ANALYSIS

Analysing the perspective of a person on “Crime against women”with respect to gender.

Here we take crime perspective and gender into consideration.

Null hypothesis- A and B are independent i.e, Crime rates do not depend on gender.

Alternate hypothesis-A depends on B i.e, Crime rates depend on gender.

Related code:

```
df=read.csv("/Users/Downloads/Primary data Editions - Sheet1.csv")
df=df[df$Gender!="Prefer not to say",]
df_1=df[df$Do.you.feel.crimes.against.women.in.your.city..are.!=="Don't know",]
#contingency table
tab1=table(df_1$Gender,df_1$Do.you.feel.crimes.against.women.in.your.city..are.)
tab1
#chi-square test
chisq.test(df_1$Gender,df_1$Do.you.feel.crimes.against.women.in.your.city..are.)
```

Output:

```
Decreasing Increasing Same
Female      6      106    28
Male        14       46    19
> chisq.test(df_1$Gender,df_1$Do.you.feel.crimes.against.women.in.your.city..are.)

Pearson's Chi-squared test

data: df_1$Gender and df_1$Do.you.feel.crimes.against.women.in.your.city..are.
X-squared = 12.594, df = 2, p-value = 0.001842
> |
```

FIGURE 24

Contingency Table:

	Increasing	Decreasing	Same	Total
Female	6	106	28	140
Male	14	46	19	79
Total	20	152	47	219

Evidently, the p-value is less than 0.05.

Hence, Chi-square calculated < Chi-square tabulated.

Therefore, null hypothesis is not rejected.

Hence ,we conclude that Crime rates do not depend on Gender

Analysing the dependence of the effort taken by an individual to help a harassed victim with respect to gender.

Here we take efforts taken by witness to help the victim and gender into account

Null hypothesis: A and B are independent i.e; Effort taken is independent of gender.

Alternative hypothesis: A depends on B i.e, Effort taken depends on gender

Code & Outputs:

```
data=pd.read_csv("/content/Women's Safety in Metropolitan Cities. (Responses) - Form Responses 1.csv")
data1=data[['Gender','If yes, did you make an effort to help the victim?']]
data2=data1.dropna(subset=['If yes, did you make an effort to help the victim?'])
data2[(data2['Gender']=='Male')].shape[0]
52
data2[(data2['Gender']=='Female')].shape[0]
105
data2[(data2['Gender']=='Male')].value_counts()
Gender    If yes, did you make an effort to help the victim?
Male        Yes           37
                  No           15
dtype: int64
data2[(data2['Gender']=='Female')].value_counts()
Gender    If yes, did you make an effort to help the victim?
Female     Yes           63
                  No           42
dtype: int64
```

The dropna function was used to delete the null values .From above we can see that the number of responses of male and female were uneven so we considered the percentages in the table below. A chi-square test for independence of attributes was conducted to determine whether gender has any role to play in the help offered to a harassed victim.

Contingency Table:

Was effort taken?→ Gender ↓	Yes	No	Total
Male	71.15	28.84	99.99
Female	60	40	100
Total	131.15	68.84	199.99≈ 200

Using R, we calculate chi-square:

```
Input: x=c(71.15,60,28.84,40)
       y=matrix(x,nrow=2,ncol=2)
       y
       rt=chisq.test(y,correct=F)
       rt
Output: Pearson's Chi-squared test
data:y
X-squared = 2.7571, df = 1, p-value = 0.0968
Chi-square calculated is 2.7571
```

RESULT:

Using the Chi-square table, we compute the Chi-square tabulated which is 3.841.

Clearly, Chi-square calculated < Chi-square tabulated.

Therefore, null hypothesis is not rejected.

Hence, we conclude that taking effort to help a harassed victim has no relation to gender. It merely depends on an individual's compassion and empathetic attitude towards others' sufferings.

Analysing the dependence of crime rates on the cities taken under consideration.

Here we take crime perspective and gender into consideration.

A: Crime Rates

B: Cities

Null hypothesis- A and B are independent i.e, Crime rates do not depend on cities.

Alternate hypothesis- A depends on B i.e, Crime rates depend on cities.

Code :

```
locvcr=update[['Location','Do you feel crimes against women in your city are:']]
don't know=locvcr[(locvcr['Do you feel crimes against women in your city
are:']=='Don't know')].index
locvcr.drop(don't know,inplace=True)
locvcr1=locvcr[(locvcr['Location']=='Delhi NCR')]
locvcr1.value_counts()
Location  Do you feel crimes against women in your city  are:
```

```

Delhi NCR Increasing 40
    Same 16
    Decreasing 8
dtype: int64
locvcr1=locvcr[ (locvcr['Location']=='Mumbai')]
locvcr1.value_counts()
Location Do you feel crimes against women in your city are:
Mumbai Increasing 71
    Same 24
    Decreasing 8
dtype: int64
locvcr1=locvcr[ (locvcr['Location']=='Bengaluru')]
locvcr1.value_counts()
Location Do you feel crimes against women in your city are:
Bengaluru Increasing 31
    Same 3
    Decreasing 2
dtype: int64
locvcr1=locvcr[ (locvcr['Location']=='Kolkata')]
locvcr1.value_counts()
Location Do you feel crimes against women in your city are:
Kolkata Increasing 12
    Same 4
    Decreasing 2
dtype: int64

```

Here also we have considered the percentages as the number of responses from each city were uneven. We also deleted the ‘Don’t Know’ value for the testing. A chi-square test for independence of attributes was conducted to determine whether crime rates depend on a particular city.

Contingency Table:-

Cities→ Crime rates↓	Delhi NCR	Bengaluru	Kolkata	Mumbai	Total
Increasing	62.5	86.1	66.6	68.93	284.13
Decreasing	12.5	5.55	11.1	7.76	36.91
Same	25	8.3	22.22	23.30	78.82
Total	100	99.95	99.92	99.99	399.86 ≈ 400

Using R, we calculate chi-square:

```
Input: x=c(62.5,12.5,25,86.1,5.55,8.3,66.6,
         11.1,22.22,68.93,7.76,23.30)
       y=matrix(x,nrow=3,ncol=4)
       Y
       rt=chisq.test(y,correct=F)
       rt
```

Output: Pearson's Chi-squared test
data: y
X-squared = 16.801, df = 6, p-value = 0.01004

Chi-square calculated is 16.801

RESULT

Using the Chi-square table, we compute the Chi-square tabulated which is 12.592.

Clearly, Chi-square calculated > Chi-square tabulated

Therefore, null hypothesis is rejected.

Hence, we conclude that an increase or decrease in the crime rates may vary from city to city.

A SURVEY TO ANALYSE WOMEN'S SAFETY IN METROPOLITAN CITIES (Questionnaire)

Questions Responses 261 Settings



Women's Safety in Metropolitan Cities

Hello,
Hope you all are safe and fine.
We are conducting a survey on Women's Safety in Metropolitan Cities as a part of our college project.
These responses are anonymous, and we have no wrong answers!
It'd be great if you could spare a few minutes to fill out this form.

Thank You!

Your age: *

- 18-25
- 26-33
- 34-41
- 42 and above

Location *

- Delhi NCR
- Bengaluru
- Mumbai
- Kolkata
- Other...

Gender *

- Female
- Male
- Prefer not to say

Questions Responses 261 Settings

Occupation: *

Studying
 Working
 Other

Do you feel crimes against women in your city are: *

Increasing
 Decreasing
 Same
 Don't know

How satisfied are you with the disposal of the police in crimes related to women? *

1 2 3 4 5

Highly satisfied not at all satisfied

Are you aware of the following government policies? *

One stop center(OSC) scheme
 Sexual harassment of women at workplace(prevention, prohibition and redressal) act ,2013
 Protection of women from domestic violence act, 2005
 Indecent representation of women(prohibition) act,1986
 Other...

How much percentage of sexual harassment cases do you think leads to the acquittals of accused? *

25%
 50%
 75%
 90%

Do you agree/disagree that women are being harassed on social media? *

1 2 3 4 5

Strongly agree

Strongly disagree

Have you ever experienced/witnessed any of the following incidents against women ?

- Sexual harassment
- Molestation/Eve teasing
- Cyber crime/harassment
- Domestic violence
- Other...

Have you ever seen a woman being eve-teased/harassed? *

- Yes
- No

If yes, did you make an effort to help the victim?

- Yes
- No

If yes, did you register a police complaint?

- Yes
- No

Which of these safety tools do you think is effective? *

- Pepper Spray
- Mobile applications(eg: Safety pin, Raksha etc)
- Self-defence training
- Stun guns
- Other...

How many women you know are taking self-defense classes? *

- None
- 1-3
- 4-6
- More than 6

Do you agree or disagree with the following statement: Dressing style encourages offences against women. *

1 2 3 4 5
Strongly agree Strongly disagree

How effective will the following safety measures be in curbing crimes against women *

	Very Efficient	Efficient	Neutral	Inefficient
Strict punishment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Better police patrol...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Better parenting of ...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promoting safety ...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promoting sex edu...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What mode of transportation do you suggest for women? *

	Metro/local trains	Buses	Cabs/Rickshaws	Private vehicles
Before 7 AM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 AM TO 12 PM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 PM TO 5 PM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 PM TO 10 PM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Post 10 PM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How would you rate the lighting and surveillance systems in your city? *

1 2 3 4 5
Poor Excellent

According to you, how safe are women in your city? *

1 2 3 4 5
Safest Not at all safe

What according to you should be the punishment for Rape?

Short-answer text _____

CONCLUSION AND SUGGESTIONS:

1. Promoting awareness of government policies and reforms may help in curbing the rates of crime against women.
2. Women can involve themselves in self-defence activities, can install mobile applications, can carry pepper spray and other such paraphernalia to protect themselves.
3. Better police patrolling, better parenting of sons, promoting sex-education can be favourable in declining crime rates against women.
4. Swift court and police disposal in crimes against women can instill fear in the minds of abusers.
5. Improving the surveillance systems and lighting facilities on streets can act in favour of women's safety.
6. Capital punishment may be the only solution for a heinous crime like rape, as suggested by our respondents.

LIMITATIONS.

Following are some suggestions for the questionnaire to be improved for further study:

1. Respondents may not have been 100% truthful while filling questionnaires.
2. Lack of accessibility as responses in our survey are from particular states.
3. Inconvenience in availability as responses in our survey are from particular states.
4. Varied sample sizes from different cities taken under consideration.
5. Analysing data can give different results under different test hypotheses.
6. The sample size of 'prefer not to say' under gender was redundant.

REFERENCES.

1. <https://ncrb.gov.in/en/crime-in-india>
2. <https://www.safecity.in/safety-of-women-in-metropolitan-cities/>