

# PROJECT REPORT

**“COMPARATIVE STUDY ON THE  
EFFECTS OF CONSUMPTION AND  
THEIR SIDE EFFECTS OF  
ALCOHOL AND TOBACCO FOR  
THE YEAR 2016-17 AND 2019-20:  
A STATISTICAL APPROACH”**



## PREPARED BY

ROHAN MARTHAK  
BHAVIN CHHATROLA  
KIRTAN SONDAGAR  
SHABBIR BHARMAL



**H & H. B. KOTAK INSTITUTE OF SCIENCE**  
**RAJKOT**  
**CERTIFICATE**

This is to certify that the project entitled

**“COMPARATIVE STUDY ON THE EFFECTS OF  
CONSUMPTION AND THEIR SIDE EFFECTS OF ALCOHOL  
AND TOBACCO FOR THE YEAR 2016-17 AND 2019-20: A  
STATISTICAL APPROACH”**

Is prepared by

<b>Sr No.</b>	<b>Enrolment No.</b>	<b>Name</b>
1	003201212296	Rohan R. Marthak
2	003201212403	Kirtan M. Sondagar
3	003201212174	Bhavin H. Chhatrola
4	003201212142	Shabbir M. Bharmal

Students of semester 5 & 6 B.Sc. (CBCS). As the partial fulfilment for the requirement of the degree, **Bachelor of science in statistics** at department of statistics, H. & H. B. Kotak institute of science, Saurashtra university, Rajkot.

Record of their work carried out by them under the guidance of **Dr. Mayur Savsani, Dr. Khyati Mehta** and **Dr. Divya Kataria** during the academic year 2023-24.

**Date:**

**Place: Rajkot.**

**Guide**

**(Dr. Mayur Savsani)**

**Head**

**(Dr. Khyati Mehta)**

\_\_\_\_\_  
**Examiner signature**



# H & H. B. KOTAK INSTITUTE OF SCIENCE RAJKOT

## PROJECT

### “COMPARATIVE STUDY ON THE EFFECTS OF CONSUMPTION AND THEIR SIDE EFFECTS OF ALCOHOL AND TOBACCO FOR THE YEAR 2016-17 AND 2019-20: A STATISTICAL APPROACH”

**Name of the students**

**(B.Sc. Semester 5 & 6 2023-24)**

Sr No.	Enrolment No.	Name	Roll No.	signature
1	003201212296	Rohan R. Marthak	6	
2	003201212403	Kirtan M. Sondagar	10	
3	003201212174	Bhavin H. Chhatrola	1	
4	003201212142	Shabbir M. Bharmal	13	

### NAME OF THE GUIDES

---

Dr. Khyati Mehta

---

Dr. Mayur Savsani

---

Dr. Divya Kataria

DEPARTMENT OF STATISTICS

H. & H.B. KOTAK INSTITUTE OF SCIENCE, RAJKOT

SAURASHTRA UNIVERSITY RAJKOT 2023-24.

## ACKNOWLEDGEMENT

We are whole heartedly and sincerely thankful to everyone, who has contributed for the help in our project. Their kind and gentle guidance has made us able to complete this task.

We are really very glad to present our project that can be helpful in future studies and made us able to work together and co-operate with each other and do something extra from our syllabus and for extra knowledge.

We are grateful to our guide **Dr. Khyati Mehta** for his constant encouragement, continuous support, and care during our project work. Their extensive knowledge, unfailing optimism and easy nature have made this project work an exciting and enjoyable experience, which will shape our future. Without her valuable efforts helping us, we would not have been able to complete the project.

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# CHAPTER 1: INTRODUCTION

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## TOBBACO AND ALCOHOL CONSUMPTION IN INDIA

Abuse of legal substances in India includes alcohol and tobacco, which are the major risk factors for various non-communicable diseases and deaths.

Tobacco and alcohol consumption in India vary across regions, cultures, and demographics. Tobacco use is a significant public health concern, with a high prevalence of smoking and smokeless tobacco consumption. The government has implemented various measures to control tobacco use, including graphic health warnings on tobacco products and public awareness campaigns. Alcohol consumption is also prevalent in India, with a diverse drinking culture. However, patterns of alcohol consumption differ across states and communities. Some states have imposed restrictions on the sale and consumption of alcohol, while others have more liberal policies.

According to the Global Adult Tobacco Survey (GATS) conducted in 2016–17, the overall prevalence of smoking tobacco use is 10.38% and smokeless tobacco use is 21.38% in India. Of all adults, 28.6% currently consume tobacco either in smoke or smokeless form, including 42.4% of men and 14.2% of women. As per NFHS-5, around **38%** of men and 8.9% of women consume any kind of tobacco in India. Among these, tobacco consumption in rural area is more than urban area for both men and women.

It is important to note that these trends can change over time, and the government continues to work on addressing public health issues related to tobacco and alcohol. Public awareness and education play crucial roles in tackling these challenges.

Tobacco abuse and addiction kill more than one million people in India, which is one-sixth of the world deaths due to tobacco usage and accounts for 9.5% of all deaths in India

According to the WHO, there are three million deaths yearly annually, due to alcohol consumption, which constitutes around 5.3% of total deaths globally and 5.1% of the global burden of disability-adjusted life years (DALYs) due to alcohol consumption.

## **BURDEN OF TOBACCO AND ALCOHOL CONSUMPTION**

Alcohol and tobacco are legal substances that are often abused in India and constitute major risk factors for various diseases, also increasing the burden of non-communicable diseases, especially when these substances are used by the General public.

Tobacco is depressant can cause feelings of alertness and energy. Nicotine, the primary psychoactive ingredient in tobacco, is highly addictive and can lead to dependence and range of negative health outcomes.

Alcohol, on the other hand, is a stimulant that can cause feelings of relaxation and euphoria, but it can also lead to addiction and a range of negative health outcomes. Alcohol misuse can lead to poor performance at school and work family problems, unprotected sex and sexually transmitted diseases violence memory blackouts, unintentional injuries, accidents and overdoses, and organ damage and disease.

According to Brain Facts, smoking tobacco and drinking alcohol have noticeable effects on our bodies and our brains. The same qualities that trigger pleasure and relaxation are also what can make tobacco and alcohol addictive.

It is important to note that the use of alcohol and tobacco is associated with a wide range of negative impacts on young people's mental and physical health as well as on their wellbeing over the short and long term.

### **Tobacco-related Cancers in India**

Tobacco use is a significant contributor to the burden of cancer in India. It is associated with various types of cancers, including esophagus, urinary bladder, stomach, pancreas, cervix, and haematopoietic system. Tobacco is also linked to other major health problems such as coronary artery disease, obstructive airway disease, peripheral vascular disease, and pregnancy complications. The prevalence of tobacco use has increased in India, particularly among men, the poor, those living in rural areas, and the illiterate. The burden of tobacco-related cancers is expected to increase in the future, making it crucial to implement measures to control their incidence and spread.



## **Types of Tobacco-related Cancers**

The International Agency for Research on Cancer (IARC) has identified 10 sites as tobacco-related cancers. These include lip, tongue, mouth, oropharynx, hypopharynx, pharynx unspecified, esophagus, larynx, lung, and urinary bladder. These sites have been adopted for the projection of tobacco-related cancers in India. Lung cancer is the leading tobacco-related cancer among men, followed by mouth, tongue, and esophagus cancers. The burden of these cancers is expected to increase in both rural and urban areas of India.

## **Burden of Tobacco-related Cancers**

The burden of tobacco-related cancers in India is significant. Registry data from various states and union territories show that tobacco-related cancers account for a considerable proportion of cancer cases in both men and women. In men, tobacco-related cancers are responsible for 24 to 64 percent of cancers, while in women, they account for about 7 to 42 percent of cancers. The burden of tobacco-related cancers is higher in rural areas of Bihar, Uttar Pradesh, and West Bengal, while in urban areas, Maharashtra, Tamil Nadu, West Bengal, and Uttar Pradesh have the highest numbers of cases.

# **RECOMMENDATION**

## **Tobacco consumption:**

### **1. Prevention and Education:**

- Implement comprehensive anti-tobacco education programs in schools and communities.
- Use graphic health warnings on tobacco products to visually depict the risks.

### **2. Policy and Regulation:**

- Advocate for and support strict tobacco control policies, including higher taxes and smoke-free public spaces.
- Enforce age restrictions on tobacco purchases to prevent underage use.

### **3. Cessation Support:**

- Ensure accessibility to smoking cessation resources, such as counselling services, nicotine replacement therapy, and prescription medications.
- Integrate smoking cessation programs into healthcare services.

### **4. Social Norms:**

- Foster a societal shift in norms by promoting a smoke-free culture through media campaigns and community engagement.
- Encourage smoke-free policies in workplaces and public areas.

## **Alcohol Consumption:**

### **1. Moderation Messaging:**

- Develop public health campaigns emphasizing the importance of moderate alcohol consumption.
- Dispel myths about the perceived health benefits of excessive alcohol intake.

### **2. Standard Drink Education:**

- Educate the public on what constitutes a standard drink to help individuals track and control their alcohol intake.
- Include clear labelling on alcoholic beverages indicating alcohol content.

### **3. Community Engagement:**

- Facilitate community events and discussions to address the social aspects of drinking and promote responsible Behaviour.
- Collaborate with alcohol retailers to encourage responsible serving practices.

### **4. Treatment and Support:**

- Enhance access to treatment programs for individuals struggling with alcohol addiction.
- Provide resources for family members and friends to support those with alcohol use disorders.

### **5. Regulation and Pricing:**

- Advocate for policies that regulate alcohol advertising and marketing to prevent glamorization.
- Consider implementing pricing strategies (e.g., minimum unit pricing) to deter excessive alcohol consumption.

## **CHAPTER 2: RESEARCH METHODOLOGY**

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### **OBJECTIVE OF STUDY**

- 1. Determining the rate of individuals using tobacco and alcohol consumption:**
- 2. It is necessary to discuss and know the reasons why tobacco and alcohol consumption is more in some states and less in some states.**
- 3. Determining the rate of cancer caused by tobacco.**

### **DATA COLLECTION**

- 1. Type of data Collection: “Secondary Data”**
- 2. Source of Data:**
  - “Report by tata institutes of social science, Mumbai -(GATS-2)”
  - “Report by ministry of health and family welfare, coordinated by the international institute for population science, Mumbai - (NFHS 4-5)”
- 3. Duration of data: 2016-17 & 2019-20**

### **NATURE OF DATA**

Data has been taken from 30 different states of India. moreover, the study is mainly based on secondary data. The data of consumption of tobacco and alcohol is selected from GATS-2 and NFHS-5. the study is explanatory.

## **HYPOTHESIS**

Based on data collection and sampling design we have identified following hypotheses for study.

### **Hypotheses based on t-test**

1. There is no significant difference in overall tobacco consumption between year 2016 and 2020.
2. There is no significant difference in men tobacco consumption between year 2016 and 2020.
3. There is no significant difference in woman tobacco consumption between year 2016 and 2020.
4. There is no significant difference in overall alcohol consumption between year 2016 and 2020.
5. There is no significant difference in men alcohol consumption between year 2016 and 2020.
6. There is no significant difference in woman alcohol consumption between year 2016 and 2020.
7. There is no significant difference in overall cancer cases caused by tobacco between year 2016 and 2020.
8. There is no significant difference in men cancer cases caused by tobacco between year 2016 and 2020.
9. There is no significant difference in woman cancer cases caused by tobacco between year 2016 and 2020.

### **Hypothesis based on analysis of variance.**

1. There is no significant difference in various types of consumptions and effect due to tobacco cancer in gender with respect to given year.

## TESTING OF HYPOTHESIS

Testing of hypothesis is a statistical process used to determine whether a hypothesis about a population parameter is supported by the data or not. In other words, it is a way to make an inference about a population based on a sample of data.

**The process of testing a hypothesis involves the following steps:**

1. **Formulate the Null and Alternative Hypothesis:** The null hypothesis ( $H_0$ ) is the statement we are testing, while the alternative hypothesis ( $H_1$ ) is the opposite of the null hypothesis.
2. **Determine the Test Statistic and its Distribution:** The test statistic is a value that measures how far the sample data is from what we would expect if the null hypothesis is true. The distribution of the test statistic is determined by the null hypothesis and the sample size.
3. **Set the Level of Significance:** The level of significance is the probability of rejecting the null hypothesis when it is true. It is usually set at 0.05 (5%).
4. **Calculate the P-value:** The P-value is the probability of getting a result as extreme or more extreme than the one observed, assuming the null hypothesis is true.
5. **Decision:** If the P-value is less than or equal to the level of significance, we reject the null hypothesis and accept the alternative hypothesis. If the P-value is greater than the level of significance, we fail to reject the null hypothesis.
6. **Interpret the Results:** We interpret the results based on the decision we made in step 5. If we reject the null hypothesis, we conclude that there is evidence to support the alternative hypothesis. If we fail to reject the null hypothesis, we conclude that there is not enough evidence to support the alternative hypothesis.

## TOOLS OF ANALYSIS

For Data analysis, we have carried out all analysis using Microsoft excel. For given hypotheses, we have used t-test and two-way ANOVA to check the significance of it.

### 1. Two sample t test

A **two-sample test** is used to determine whether two population means are equal.

#### Assumption

For the results of a two-sample t-test to be valid, the following assumptions should be met:

- The observations in one sample should be independent of the observations in the other sample.
- The data should be approximately normally distributed.
- The two samples should have approximately the same variance. If this assumption is not met, you should instead perform Welch's t-test.
- The data in both samples was obtained using a random sampling method.

#### Formula

A two-sample t-test always uses the following null hypothesis:

- **H<sub>0</sub>:**  $\mu_1 = \mu_2$  (the two-population means are equal)

The alternative hypothesis can be either two-tailed, left-tailed, or right-tailed:

- **H<sub>1</sub> (two-tailed):**  $\mu_1 \neq \mu_2$  (the two-population means are not equal)
- **H<sub>1</sub> (left-tailed):**  $\mu_1 < \mu_2$  (population 1 mean is less than population 2 mean)
- **H<sub>1</sub> (right-tailed):**  $\mu_1 > \mu_2$  (population 1 mean is greater than population 2 mean)

We use the following formula to calculate the test statistic t:

**Test statistic:**

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2(\frac{1}{n_1} + \frac{1}{n_2})}}$$

where  $\bar{x}_1$  and  $\bar{x}_2$  are the sample means,  $n_1$  and  $n_2$  are the sample sizes, and where  $s_p$  is calculated as:

$$s = \sqrt{\frac{\Sigma(x_i - \bar{x})^2 + \Sigma(y_i - \bar{y})^2}{n_1 + n_2 - 2}}$$

If the p-value that corresponds to the test statistic t with  $(n_1+n_2-1)$  degrees of freedom is less than your chosen significance level (common choices are 0.10, 0.05, and 0.01) then you can reject the null hypothesis.

## **2. Two-way ANOVA**

Analysis of Variance is a statistical technique used to analyse the differences between groups or treatments in an experiment with two independent variables or factors.

For example, in a study of the effects of a new drug on blood pressure, one factor may be the dosage level of the drug (low, medium, or high) and the other factor may be the gender of the patients (male or female).

The two factors in this case are "drug dosage" and "gender", each with multiple levels, and the response variable is blood pressure.



The analysis of two-way ANOVA consists of partitioning the total variation in the data into three components: the variation due to the drug dosage factor, the variation due to the gender factor, and the variation due to the interaction between the two factors.

The sum of squares for each of these components is then calculated, and the degrees of freedom for each component are determined.

Once these values are calculated, an F-test is performed to determine whether there are significant differences between the groups or treatments.

Source of Variation	d.f.	SS	MS	F <sub>0</sub>
Factor A (between groups)	a-1	$SSA = \sum_{i=1}^a n_i (\bar{y}_i - \bar{y}_{..})^2$	$MSA = \frac{SSA}{(a-1)}$	$\frac{MSA}{MSE}$
Factor B (between groups)	b-1	$SSB = \sum_{j=1}^b n_j (\bar{y}_j - \bar{y}_{..})^2$	$MSB = \frac{SSB}{(b-1)}$	$\frac{MSB}{MSE}$
Error (within groups)	(a-1)(b-1)	$SSE = SST - SSA - SSB$	$MSE = \frac{SSE}{(a-1)(b-1)}$	
Total	N-1	$SST = \sum_{i=1}^a \sum_{j=1}^b (y_{ij} - \bar{y}_{..})^2$		

Overall, the analysis of two-way ANOVA provides a way to determine the effect of two independent variables on a response variable and to identify any significant interactions between them.

Here if  $F\{cal\} < F\{tab\}$  then we accept our null hypotheses at a given level of significance otherwise we reject our null hypotheses.

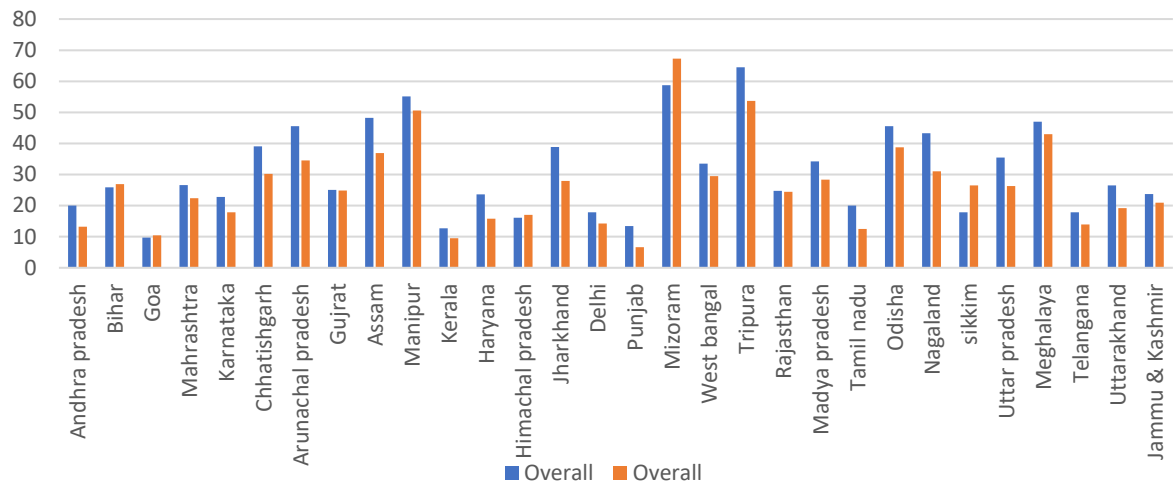
## CHAPTER 3: DATA ANALYSIS

### CURRENT TOBACCO USE AMONG ADULTS AGED 15 OR ABOVE, BY GENDER ACCORDING TO STATES 2016-17 AND 2019-20

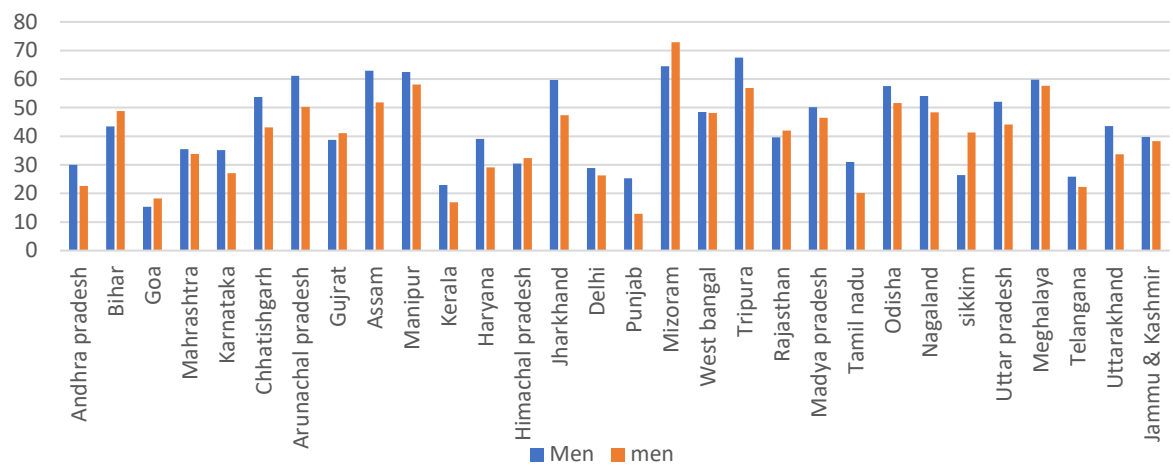
TABLE 3.1

	2016-17			2019-20		
State	Overall	Men	Women	Overall	men	Women
Andhra Pradesh	20	30	10.1	13.2	22.6	3.8
Bihar	25.9	43.4	6.9	26.9	48.8	5
Goa	9.7	15.3	4	10.4	18.2	2.6
Mahrashtra	26.6	35.5	17	22.35	33.8	10.9
Karnataka	22.8	35.2	10.3	17.8	27.1	8.5
Chhatishgarh	39.1	53.7	24.6	30.2	43.1	17.3
Arunachal Pradesh	45.5	61.1	28.7	34.55	50.3	18.8
Gujrat	25.1	38.7	10.4	24.9	41.1	8.7
Assam	48.2	62.9	32.9	36.95	51.8	22.1
Manipur	55.1	62.5	47.8	50.6	58.1	43.1
Kerala	12.7	22.9	3.6	9.55	16.9	2.2
Haryana	23.6	39.1	6.3	15.8	29.1	2.5
Himachal pradesh	16.1	30.4	1.7	17	32.3	1.7
Jharkhand	38.9	59.7	17	27.9	47.4	8.4
Delhi	17.8	28.9	4.8	14.25	26.3	2.2
Punjab	13.4	25.3	0.5	6.65	12.9	0.4
Mizoram	58.7	64.5	61.4	67.25	72.9	61.6
West bangal	33.5	48.5	17.9	29.45	48.1	10.8
Tripura	64.5	67.5	61.4	53.65	56.9	50.4
Rajasthan	24.7	39.6	9	24.45	42	6.9
Madya pradesh	34.2	50.2	17.3	28.35	46.5	10.2
Tamil nadu	20	31	9.3	12.5	20.1	4.9
Odisha	45.6	57.6	33.6	38.8	51.6	26
Nagaland	43.3	54.1	31.7	31.05	48.4	13.7
sikkim	17.9	26.4	8.4	26.5	41.3	11.7
Uttar pradesh	35.5	52.1	17.7	26.25	44.1	8.4
Meghalaya	47	59.8	34.2	42.95	57.7	28.2
Telangana	17.8	25.9	9.8	13.95	22.3	5.6
Uttarakhand	26.5	43.6	9.3	19.15	33.7	4.6
Jammu & Kashmir	23.7	39.7	6.2	20.95	38.3	3.6

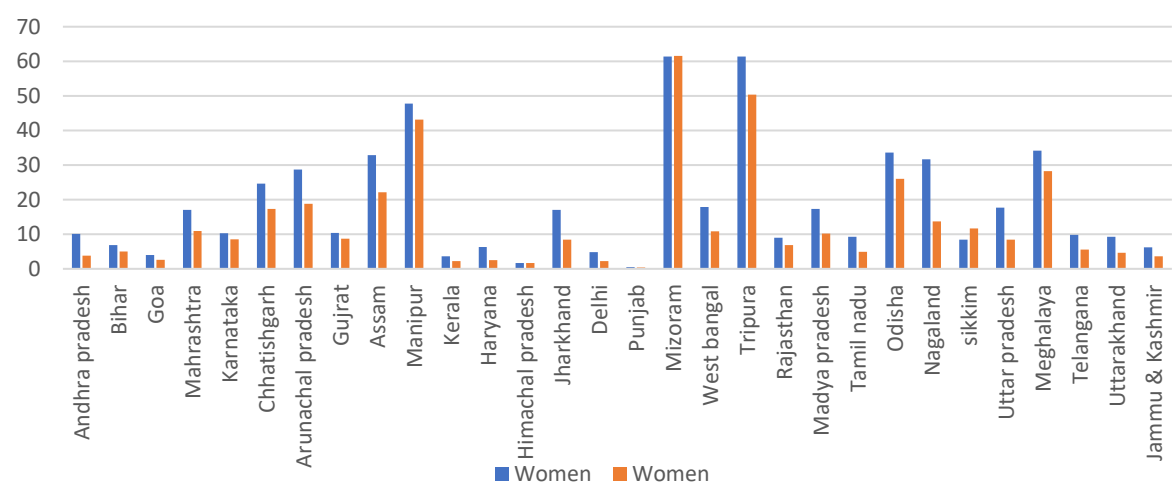
**Chart 3.1.1 Overall tobacco consumption for year 2016-17 & 2019-20**



**Chart 3.1.2 Men tobacco consumption for year 2016-17 and 2019-20**



**Chart 3.1.3 Women tobacco consumption for year 2016-17 & 2019-20**



## Overall tobacco consumption between year 2016-17 & 2019-20

**H<sub>0</sub>:** There is no significant difference in overall tobacco consumption between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in overall tobacco consumption between year 2016-17 and 2019-20.

Table 3.1.1

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>31.11333333</b>	<b>26.475</b>
<b>Variance</b>	<b>212.3832644</b>	<b>194.2518534</b>
<b>Observations</b>	<b>30</b>	<b>30</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>Df</b>	<b>58</b>	
<b>t Stat</b>	<b>1.259853776</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.106383998</b>	
<b>t Critical one-tail</b>	<b>1.671552762</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.212767995</b>	
<b>t Critical two-tail</b>	<b>2.001717484</b>	

### Interpretation:

Here, P-value of two sample t test is  $0.212767 > 0.05$ .

∴ Test is Insignificant.

∴ We accept our H<sub>0</sub> at 5% level of significance.

Therefore, there is no significant difference in overall tobacco consumption between year 2016 and 2020.

## **Tobacco consumption in men between the year 2016-17 & 2019-20**

**H<sub>0</sub>:** There is no significant difference in men tobacco consumption between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in men tobacco consumption between year 202016-17 and 2019-20.

Table 3.1.2

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>43.50333333</b>	<b>39.45666667</b>
<b>Variance</b>	<b>214.9155057</b>	<b>210.0839195</b>
<b>Observations</b>	<b>30</b>	<b>30</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>Df</b>	<b>58</b>	
<b>t Stat</b>	<b>1.075137198</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.143382791</b>	
<b>t Critical one-tail</b>	<b>1.671552762</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.286765581</b>	
<b>t Critical two-tail</b>	<b>2.001717484</b>	

### **Interpretation:**

Here, P-value of two sample t test is  $0.286765581 > 0.05$ .

∴ Test is Insignificant.

∴ We accept our H<sub>0</sub> at 5% level of significance.

Therefore, there no is significant difference in men tobacco consumption between year 2016 and 2020.

## Tobacco consumption in women between the year 2016-17 & 2019-20

**H<sub>0</sub>:** There is no significant difference in woman tobacco consumption between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in woman tobacco consumption between year 2016-17 and 2019-20.

Table 3.1.3

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>1.08078274</b>	<b>0.89851585</b>
<b>Variance</b>	<b>0.21038771</b>	<b>0.2331376</b>
<b>Observations</b>	<b>30</b>	<b>30</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>df</b>	<b>58</b>	
<b>t Stat</b>	<b>1.4990261</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.06964524</b>	
<b>t Critical one-tail</b>	<b>1.67155276</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.13929047</b>	
<b>t Critical two-tail</b>	<b>2.00171748</b>	

### Interpretation:

Here, P-value of two sample t test is  $0.13929047 > 0.05$ .

∴ Test is Insignificant.

∴ We accept our H<sub>0</sub> at 5% level of significance.

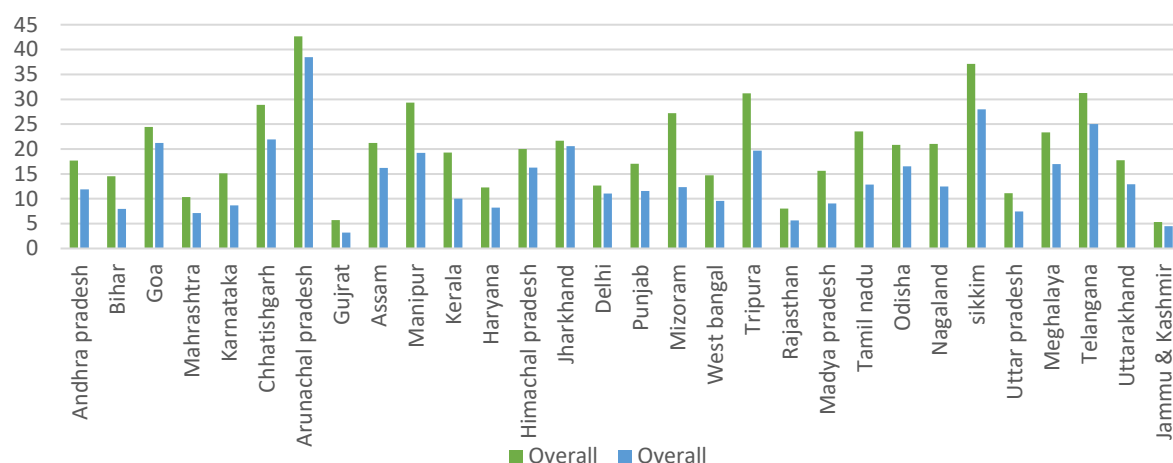
Therefore, there is no significant difference in women tobacco consumption between year 2016 and 2020.

# CURRENT ALCOHOL USE AMONG ADULTS AGED 15 OR ABOVE, BY GENDER ACCORDING TO STATES, 2016-17 AND 2019-20

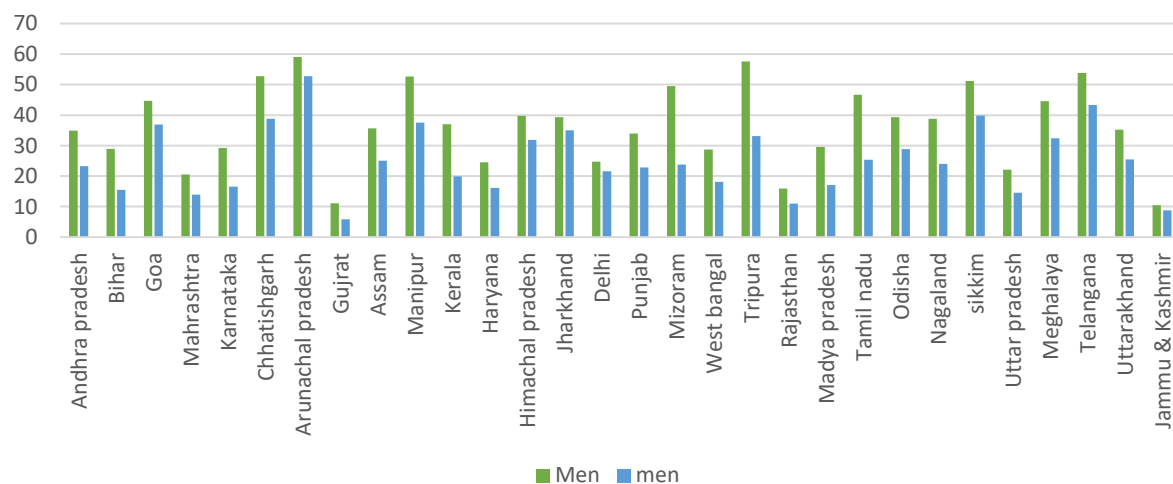
**TABLE 3.2**

	<b>2016-17</b>			<b>2019-20</b>		
<b>State</b>	<b>Overall</b>	<b>Men</b>	<b>Women</b>	<b>Overall</b>	<b>men</b>	<b>Women</b>
<b>Andhra pradesh</b>	17.65	34.9	0.4	11.9	23.3	0.5
<b>Bihar</b>	14.55	28.9	0.2	7.95	15.5	0.4
<b>Goa</b>	24.45	44.7	4.2	21.2	36.9	5.5
<b>Mahrashtra</b>	10.35	20.5	0.2	7.15	13.9	0.4
<b>Karnataka</b>	15.1	29.2	1	8.7	16.5	0.9
<b>Chhatishgarh</b>	28.85	52.7	5	21.9	38.8	5
<b>Arunachal pradesh</b>	42.65	59	26.3	38.45	52.7	24.2
<b>Gujrat</b>	5.7	11.1	0.3	3.2	5.8	0.6
<b>Assam</b>	21.25	35.6	6.9	16.2	25.1	7.3
<b>Manipur</b>	29.35	52.6	6.1	19.2	37.5	0.9
<b>Kerala</b>	19.3	37	1.6	10.05	19.9	0.2
<b>Haryana</b>	12.3	24.5	0.1	8.2	16.1	0.3
<b>Himachal pradesh</b>	20	39.7	0.3	16.25	31.9	0.6
<b>Jharkhand</b>	21.7	39.3	4.1	20.55	35	6.1
<b>Delhi</b>	12.65	24.7	0.6	11.05	21.6	0.5
<b>Punjab</b>	17.05	34	0.1	11.55	22.8	0.3
<b>Mizoram</b>	27.2	49.5	4.9	12.35	23.8	0.9
<b>West bangal</b>	14.75	28.7	0.8	9.6	18.1	1.1
<b>Tripura</b>	31.2	57.6	4.8	19.65	33.1	6.2
<b>Rajasthan</b>	8	15.9	0.1	5.65	11	0.3
<b>Madya pradesh</b>	15.6	29.6	1.6	9.05	17.1	1
<b>Tamil nadu</b>	23.55	46.7	0.4	12.85	25.4	0.3
<b>Odisha</b>	20.85	39.3	2.4	16.55	28.8	4.3
<b>Nagaland</b>	21.05	38.8	3.3	12.45	24	0.9
<b>sikkim</b>	37.1	51.2	23	28	39.8	16.2
<b>Uttar pradesh</b>	11.1	22.1	0.1	7.45	14.6	0.3
<b>Meghalaya</b>	23.35	44.6	2.1	16.95	32.4	1.5
<b>Telangana</b>	31.25	53.8	8.7	25	43.3	6.7
<b>Uttarakhand</b>	17.75	35.2	0.3	12.9	25.5	0.3
<b>Jammu &amp; Kashmir</b>	5.3	10.5	0.1	4.5	8.8	0.2

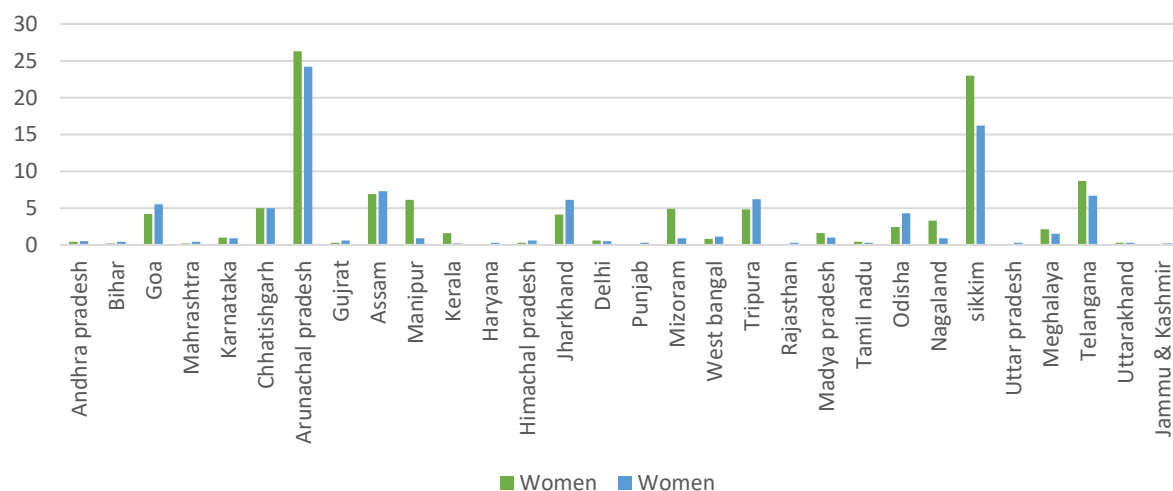
**Chart 3.2.1 Overall alcohol consumption for year 2016-17 & 2018-19**



**Chart 3.2.2 Men alcohol consumption for year 2016-17 & 2019-20**



**Chart 3.2.3 Women alcohol consumption for year 2016-17 & 2019-20**





## Overall alcohol consumption between the year 2016-17 & 2019-20

**H<sub>0</sub>:** There is no significant difference in overall alcohol consumption between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in overall alcohol consumption between year 2016-17 and 2019-20.

Table 3.2.1

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>20.03166667</b>	<b>14.215</b>
<b>Variance</b>	<b>79.15629023</b>	<b>58.81537069</b>
<b>Observations</b>	<b>30</b>	<b>30</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>Df</b>	<b>57</b>	
<b>t Stat</b>	<b>2.712313326</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.004408918</b>	
<b>t Critical one-tail</b>	<b>1.672028888</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.008817836</b>	
<b>t Critical two-tail</b>	<b>2.002465459</b>	

### Interpretation:

Here, p-value of two sample t test is  $0.008817836 < 0.05$ .

∴ Test is significant.

∴ We reject our H<sub>0</sub> at 5% level of significance.

Therefore, there is significant difference in overall alcohol consumption between year 2016-17 and 2019-20.

## Alcohol consumption in men between the year 2016-17 & 2019-20

**H<sub>0</sub>:** There is no significant difference in men alcohol consumption between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in overall alcohol consumption between year 2016-17 and 2019-20.

Table 3.2.2

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>36.39666667</b>	<b>25.3</b>
<b>Variance</b>	<b>177.5327471</b>	<b>122.3303448</b>
<b>Observations</b>	<b>30</b>	<b>30</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>Df</b>	<b>56</b>	
<b>t Stat</b>	<b>3.509875085</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.000446391</b>	
<b>t Critical one-tail</b>	<b>1.672522303</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.000892782</b>	
<b>t Critical two-tail</b>	<b>2.003240719</b>	

### Interpretation:

Here, p-value of two sample t test is  $0.00892782 < 0.05$ .

∴ Test is significant.

∴ We reject our H<sub>0</sub> at 5% level of significance.

Therefore, there is significant difference in men alcohol consumption between year 2016-17 and 2019-20.

## Alcohol consumption in women between the year 2016-17 & 2019-20

**H<sub>0</sub>:** There is no significant difference in woman alcohol consumption between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in woman alcohol consumption between year 2016-17 and 2019-20.

Table 3.2.3

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>0.03999305</b>	<b>0.05302849</b>
<b>Variance</b>	<b>0.55144421</b>	<b>0.36754671</b>
<b>Observations</b>	<b>30</b>	<b>30</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>df</b>	<b>56</b>	
<b>t Stat</b>	<b>0.07447844</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.47044756</b>	
<b>t Critical one-tail</b>	<b>1.6725223</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.94089511</b>	
<b>t Critical two-tail</b>	<b>2.00324072</b>	

### Interpretation:

Here, p-value of two sample t test is  $0.94089511 > 0.05$ .

∴ Test is Insignificant.

∴ We accept our H<sub>0</sub> at 5% level of significance.

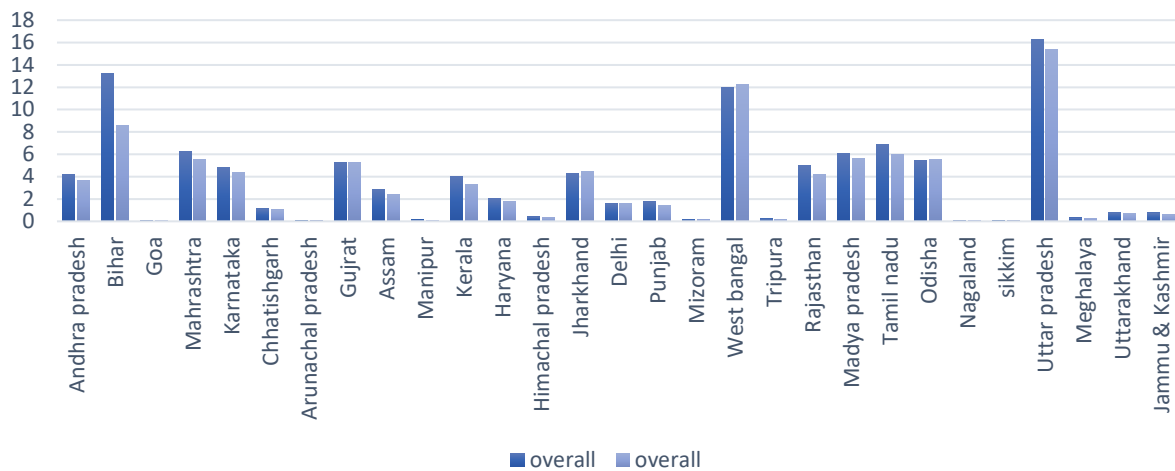
Therefore, there is no significant difference in women alcohol consumption between year 2016-17 and 2019-20.

## BURDEN OF TOBACCO RELATED CANCERS IN INDIA AND ITS STATES, 2016-17 AND 2019-20

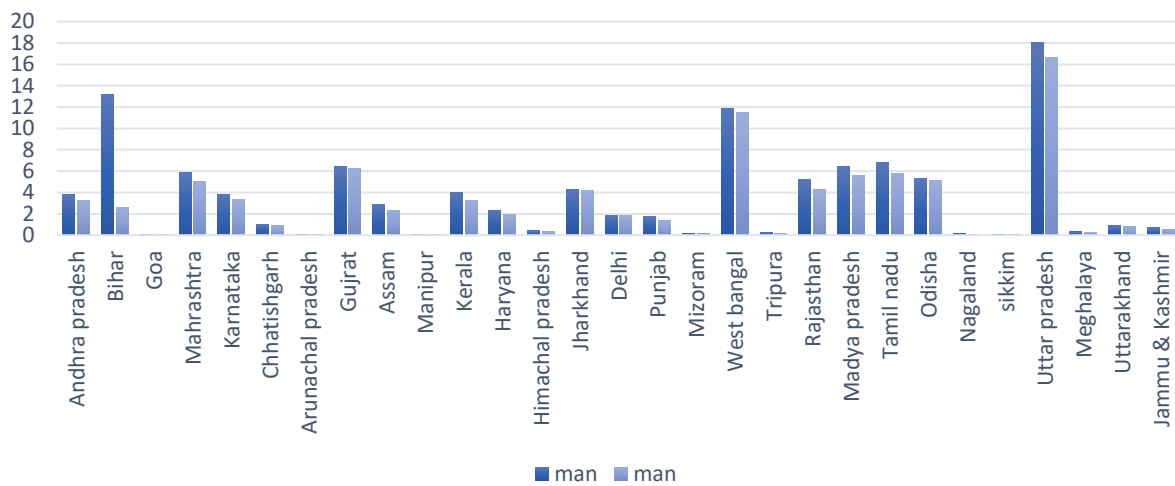
Table 3.3

	2016-17			2019-20		
State	overall	man	women	overall	man	women
Andhra pradesh	4.188222	3.812	4.564444	3.640105	3.213846	4.066364
Bihar	13.22809	13.2084	13.24778	8.569462	2.568923	14.57
Goa	0.120044	0.1112	0.128889	0.11628	0.108923	0.123636
Mahrashtra	6.253267	5.8732	6.633333	5.539566	5.042769	6.036364
Karnataka	4.845489	3.8132	5.877778	4.404909	3.348	5.461818
Chhatishgarh	1.135578	1.0456	1.225556	1.016084	0.903077	1.129091
Arunachal pradesh	0.045289	0.0428	0.047778	0.037685	0.034462	0.040909
Gujrat	5.244022	6.4336	4.054444	5.222503	6.290462	4.154545
Assam	2.820844	2.8528	2.788889	2.399559	2.341846	2.457273
Manipur	0.129667	0.096	0.163333	0.109531	0.078154	0.140909
Kerala	4.037133	3.9876	4.086667	3.334783	3.251385	3.418182
Haryana	2.076022	2.3076	1.844444	1.758825	1.904923	1.612727
Himachal pradesh	0.429844	0.4008	0.458889	0.354552	0.320923	0.388182
Jharkhand	4.275578	4.2456	4.305556	4.483846	4.207692	4.76
Delhi	1.580667	1.858	1.303333	1.604895	1.846154	1.363636
Punjab	1.751667	1.73	1.773333	1.450559	1.393846	1.507273
Mizoram	0.1566	0.1432	0.17	0.151937	0.135692	0.168182
West bangal	11.94271	11.8432	12.04222	12.28651	11.49938	13.07364
Tripura	0.228356	0.2556	0.201111	0.190049	0.206462	0.173636
Rajasthan	4.9874	5.2048	4.77	4.218133	4.273538	4.162727
Madya pradesh	6.114467	6.4056	5.823333	5.619497	5.613538	5.625455
Tamil nadu	6.898333	6.8	6.996667	5.954434	5.785231	6.123636
Odisha	5.430044	5.2912	5.568889	5.571685	5.122462	6.020909
Nagaland	0.107733	0.1388	0.076667	0.089336	0.112308	0.066364
sikkim	0.039844	0.0308	0.048889	0.035664	0.027692	0.043636
Uttar pradesh	16.27096	18.0808	14.46111	15.39901	16.62985	14.16818
Meghalaya	0.314489	0.3112	0.317778	0.272357	0.271077	0.273636
Uttarakhand	0.797689	0.8676	0.727778	0.746755	0.791692	0.701818
Jammu & Kashmir	0.748267	0.7132	0.783333	0.624643	0.572923	0.676364

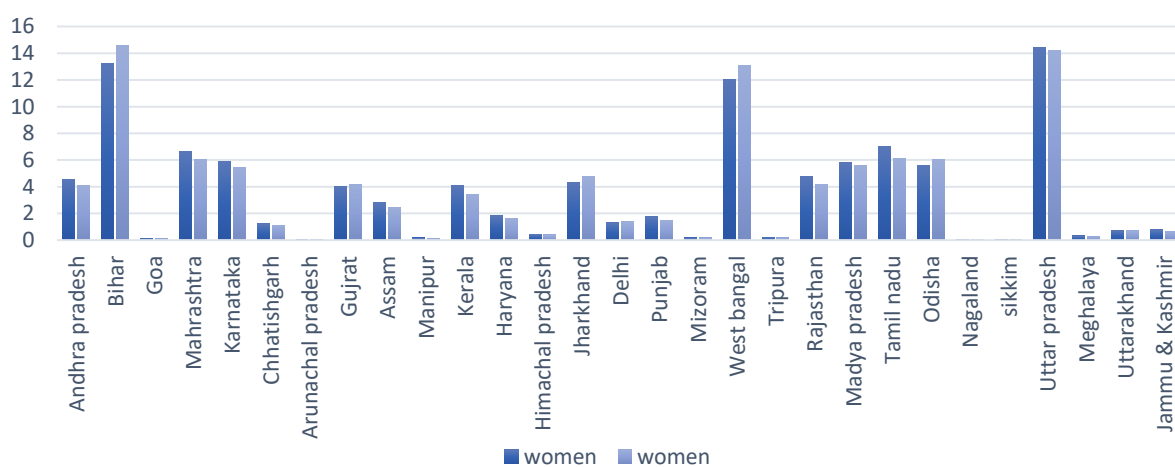
**Chart 3.3.1 Overall tobacco related cancer for year 2016-17 & 2019-20**



**Chart 3.3.2 Tobacco related cancer in men for year 2016-17 & 2019-20**



**Chart 3.3.3 Tobacco related cancer in women for year 2016-17 & 2019-20**



## Overall tobacco related cancer between the year 2016-17 & 2019-20

**H<sub>0</sub>:** There is no significant difference in overall cancer cases caused by tobacco between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in overall cancer cases caused by tobacco between year 2016-17 and 2019-20.

Table 3.3.1

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>0.12876585</b>	<b>0.07739798</b>
<b>Variance</b>	<b>0.59789241</b>	<b>0.60575199</b>
<b>Observations</b>	<b>29</b>	<b>29</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>df</b>	<b>56</b>	
<b>t Stat</b>	<b>0.25213985</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.40092805</b>	
<b>t Critical one-tail</b>	<b>1.6725223</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.80185609</b>	
<b>t Critical two-tail</b>	<b>2.00324072</b>	

### Interpretation:

Here, p-value of two sample t test is  $0.80185609 > 0.05$ .

∴ Test is Insignificant.

∴ We accept our H<sub>0</sub> at 5% level of significance.

Therefore, there is no significant difference in overall cancer cases caused by tobacco between year 2016-17 and 2019-20.

## **Tobacco related cancer in men between the year 2016-17 & 2019-20**

**H<sub>0</sub>:** There is no significant difference in men cancer cases caused by tobacco between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in men cancer cases caused by tobacco between year 2016-17 and 2019-20.

Table 3.3.2

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>0.12364266</b>	<b>0.04247481</b>
<b>Variance</b>	<b>0.62187412</b>	<b>0.60267955</b>
<b>Observations</b>	<b>29</b>	<b>29</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>df</b>	<b>56</b>	
<b>t Stat</b>	<b>0.39499728</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.34717272</b>	
<b>t Critical one-tail</b>	<b>1.6725223</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.69434544</b>	
<b>t Critical two-tail</b>	<b>2.00324072</b>	

### **Interpretation:**

Here, p-value of two sample t test is  $0.80185609 > 0.05$ .

∴ Test is Insignificant.

∴ We accept our H<sub>0</sub> at 5% level of significance.

Therefore, there is no significant difference in men cancer cases caused by tobacco between year 2016-17 and 2019-20.

## Tobacco related cancer in women between the year 2016-17 & 2019-20

**H<sub>0</sub>:** There is no significant difference in woman cancer cases caused by tobacco between year 2016-17 and 2019-20.

**H<sub>1</sub>:** There is significant difference in woman cancer cases caused by tobacco between year 2016-17 and 2019-20.

Table 3.3.3

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	<b>0.12739772</b>	<b>0.09555078</b>
<b>Variance</b>	<b>0.58590075</b>	<b>0.61295573</b>
<b>Observations</b>	<b>29</b>	<b>29</b>
<b>Hypothesized Mean Difference</b>	<b>0</b>	
<b>df</b>	<b>56</b>	
<b>t Stat</b>	<b>0.15663295</b>	
<b>P(T&lt;=t) one-tail</b>	<b>0.43804873</b>	
<b>t Critical one-tail</b>	<b>1.6725223</b>	
<b>P(T&lt;=t) two-tail</b>	<b>0.87609746</b>	
<b>t Critical two-tail</b>	<b>2.00324072</b>	

### Interpretation:

Here, p-value of two sample t test is  $0.87609746 > 0.05$ .

∴ Test is Insignificant.

∴ We accept our H<sub>0</sub> at 5% level of significance.

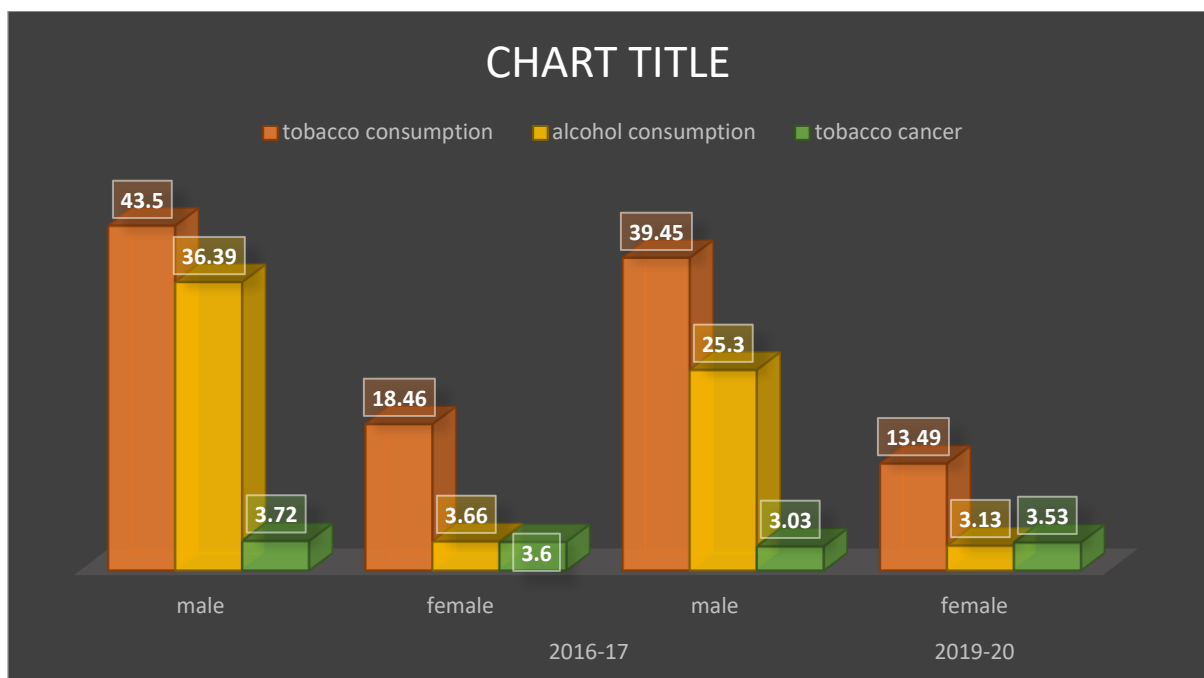
Therefore, there is no significant difference in women cancer cases caused by tobacco between year 2016-17 and 2019-20.



## Analysis of data with the test of ANALYSIS OF VARIANCE

Table 3.4

year	gender	tobacco consumption	alcohol consumption	tobacco cancer
2016-17	male	43.50	36.39	3.72
	female	18.46	3.66	3.60
	male	39.45	25.3	3.03
	female	13.49	3.13	3.53



**H<sub>0</sub>:** There is no significant difference in various types of consumptions and effect due to tobacco cancer in gender with respect to given year.

**H<sub>1</sub>:** There is significant difference in various types of consumptions and effect due to tobacco cancer in gender with respect to given year.

### Calculation:

<i>SUMMARY</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Row 1	3	83.62	27.87	450.14
Row 2	3	25.72	8.57	73.26
Row 3	3	67.78	22.59	337.19
Row 4	3	20.15	6.71	34.45
Column 1	4	114.91	28.72	223.64
Column 2	4	68.49	17.12	271.73
Column 3	4	13.88	3.47	0.09

Table no. 3.4.1

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	974.83	3	324.94	3.81	0.07	4.75
Columns	1278.51	2	639.25	7.49	0.02	5.14
Error	511.59	6	85.26			
Total	2764.94	11				

### Interpretation:

From ANOVA, we can conclude that calculate value of F-ratio is smaller than F-critical value for rows and its p-value is 0.076. While for columns, we can see that p-value is 0.02 which is smaller than 0.05. Hence, we accept the null hypothesis for gender-wise comparison based on given years and we reject the null hypothesis for consumption of alcohol, tobacco and tobacco cancer based on given years.

So, we can say that, there is significant difference in various types of consumptions and effect due to tobacco cancer in gender with respect to given year.

## CHAPTER 4: CONCLUSION

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The subject of the present study is **“Comparative study on the effects of consumption and their side effects of Alcohol and Tobacco for the year 2016-17 and 2019-20: A Statistical Approach”**. The study covers data on tobacco consumption, alcohol consumption and tobacco related cancer from 30 different states of India is based on secondary data which is collected from “GATS-2 & NFHS-4,5”. The main objective of study is to determine the rate of individuals using tobacco and alcohol Consumption and also determine the cancer due to tobacco.

**From this research we found out following conclusion:**

**1. Based on t-test:**

- **From the table 3.1.1**, we can conclude that overall tobacco consumption by male and female is not significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.21 which is greater than 0.05.
- **From the table 3.1.2**, we can observe that tobacco consumption by men is not significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.28 which is greater than 0.05.
- **From the table 3.1.3**, we can observe that tobacco consumption by women is not significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.13 which is greater than 0.05.

- **From the table 3.2.1**, we can conclude that overall alcohol consumption by male and female is significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.008 which is less than 0.05.
- **From the table 3.2.2**, we can observe that alcohol consumption by men is significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.0008 which is less than 0.05.
- **From the table 3.2.3**, we can observe that alcohol consumption by women is not significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.94 which is greater than 0.05.
- **From the table 3.3.1**, we can conclude that overall tobacco related cancer by male and female is not significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.80 which is greater than 0.05.
- **From the table 3.3.2**, we can observe that tobacco related cancer by men is not significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.69 which is greater than 0.05.
- **From the table 3.3.3**, we can observe that tobacco related cancer by women is not significantly different with respect to year 2016-17 and 2019-20. Also, the p-value is 0.87 which is greater than 0.05.

## 2. Based on Analysis of variance test:

- **From the table 3.4.1** we can conclude that calculate value of F-ratio is smaller than F-critical value for rows and its p-value is 0.076. While for columns, we can see that p-value is 0.02 which is smaller than 0.05. Hence, we accept the null hypothesis for gender-wise comparison based on given years and we reject the null hypothesis for consumption of alcohol, tobacco and tobacco cancer based on given years.

## CHAPTER 5: LIMITATIONS AND SIGNIFICANCE

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### **LIMITATIONS:**

#### **Data Availability and Reliability:**

The study's reliability heavily depends on the availability and accuracy of data for both alcohol and tobacco consumption and their side effects. If the data for the specified years is incomplete or unreliable, it can affect the validity of the findings. Also, historical data can also help to identify the alcohol and tobacco consumption trend. Which can lead to spread awareness about how to decline the consumption rate in various states. Because of less amount of data significance of other factors cannot be considered for the reliability and other parameters.

#### **Temporal Changes and Trends:**

The study covers two different time periods (2016-17 and 2019-20), and external factors such as policy changes, social attitudes, and economic conditions could influence alcohol and tobacco consumption. Without accounting for these changes, it might be challenging to attribute observed effects solely to the substances.

#### **Diverse Individual Responses:**

Alcohol and tobacco affect individuals differently based on factors such as age, gender, genetics, and overall health. A comparative study might oversimplify the diverse responses within each group, potentially missing nuances in the data.

**Regional Disparities:**

The study may not account for regional variations in consumption patterns and side effects. Different regions may have distinct cultural norms, prevalence rates, and access to healthcare, influencing the observed results.

**SIGNIFICANCE:****Public Health Awareness:**

Understanding the comparative effects of alcohol and tobacco consumption can contribute to public health awareness. It provides insights into the potential risks associated with these substances, helping policymakers and healthcare professionals develop targeted interventions and education campaigns.

**Policy Implications:**

The study's findings may have implications for public health policies and regulations related to alcohol and tobacco. If certain trends or patterns are identified, policymakers can use this information to implement or adjust policies aimed at reducing harmful effects and promoting healthier behaviours.

**Preventive Healthcare Strategies:**

Knowledge about the side effects of alcohol and tobacco can aid in the development of preventive healthcare strategies. Healthcare providers can use this information to educate the public, screen for potential issues, and offer interventions to reduce the overall burden of related health issues.

**Resource Allocation:**

Identifying the comparative impact of alcohol and tobacco on public health can assist in resource allocation for healthcare services. This knowledge allows for better distribution of resources to address the specific health needs arising from alcohol and tobacco consumption.

**Research Direction:**

The study provides a foundation for further research in the field. It can inspire more in-depth investigations into specific aspects of alcohol and tobacco consumption, leading to a better understanding of the mechanisms behind their effects and potential avenues for targeted interventions.

In conclusion, while the study has its own limitations, it holds significance in informing public health strategies, guiding policy decisions, and laying the groundwork for future research in the critical area of substance consumption and its associated side effects.

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