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ORIGINAL

Comprehensive Examination of Coffee Consumption Patterns and Their Impact on Liver Cancer Risk

Examen exhaustivo de los patrones de consumo de café y su impacto en el riesgo de cáncer de hígado

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ABSTRACT

Coffee consumption has drawn increasing attention for its possible protective belongings against liver cancer, especially among high-risk populations. This research was designed to thoroughly examine the association among coffee intake and liver cancer risk diagonally diverse demographic groups. A cross-sectional survey involving 300 participants was conducted, collecting data on key variables, including age, smoking, alcohol consumption, and levels of coffee intake. Statistical analyses were accomplished utilizing SPSS software, employing logistic regression and chi-square tests to inspect the associations among coffee consumption, demographic factors, and liver cancer risk. The outcomes exposed that higher quantity of coffee intake were crucially linked to a reduced risk of liver cancer compared to lower consumption levels, suggesting a possible dose-response relationship. Among the demographic factors analyzed, age emerged as a substantial risk factor for liver cancer, with older individuals evincing a higher likelihood of expanding the disease. Additionally, smoking and alcohol consumption were recognized as significant lifestyle behaviors providing to liver cancer risk, further emphasizing the complicated nature of the disease. These findings highlight coffee's possible as a protective dietary intervention for commuting liver cancer risk, especially in populations at greater risk due to age or other lifestyle factors. The study emphasizes the importance of incorporating coffee consumption into broader dietary and public health approaches for cancer prevention. Moreover, it advocates for further research to unravel the mechanisms underlying coffee's protective effects and to advance adjusted dietary and lifestyle recommendations aimed at appreciably reducing liver cancer risk, eventually promoting improved health outcomes in unprotected populations.

Keywords: Drinking Coffee; Risk of Liver Cancer; Health Prevention; Demographic Factors.

RESUMEN

El consumo de café ha suscitado un interés creciente por sus posibles propiedades protectoras contra el cáncer de hígado, especialmente entre las poblaciones de alto riesgo. Esta investigación se diseñó para examinar

a fondo la asociación entre el consumo de café y el riesgo de cáncer de hígado en grupos demográficos muy diversos. Se llevó a cabo una encuesta transversal en la que participaron 300 personas, en la que se recopilaron datos sobre variables clave, como la edad, el tabaquismo, el consumo de alcohol y los niveles de consumo de café. Los análisis estadísticos se realizaron utilizando el software SPSS, empleando regresión logística y pruebas de chi-cuadrado para inspeccionar las asociaciones entre el consumo de café, los factores demográficos y el riesgo de cáncer de hígado. Los resultados revelaron que un mayor consumo de café estaba estrechamente relacionado con un menor riesgo de cáncer de hígado en comparación con niveles de consumo más bajos, lo que sugiere una posible relación dosis-respuesta. Entre los factores demográficos analizados, la edad se reveló como un factor de riesgo importante para el cáncer de hígado, ya que las personas de más edad mostraban una mayor probabilidad de desarrollar la enfermedad. Además, se reconoció que el tabaquismo y el consumo de alcohol eran hábitos de vida importantes que contribuían al riesgo de cáncer de hígado, lo que ponía aún más de relieve la naturaleza compleja de la enfermedad. Estos hallazgos ponen de relieve el posible papel del café como intervención dietética protectora para reducir el riesgo de cáncer de hígado, especialmente en poblaciones con mayor riesgo debido a la edad u otros factores relacionados con el estilo de vida. El estudio destaca la importancia de incorporar el consumo de café en enfoques dietéticos y de salud pública más amplios para la prevención del cáncer. Además, aboga por seguir investigando para desentrañar los mecanismos que subyacen a los efectos protectores del café y por avanzar en las recomendaciones dietéticas y de estilo de vida ajustadas destinadas a reducir de forma apreciable el riesgo de cáncer de hígado, promoviendo en última instancia la mejora de los resultados de salud en las poblaciones desprotegidas.

Palabras clave: Consumo de Café; Riesgo de Cáncer de Hígado; Prevención de la Salud; Factores Demográficos.

INTRODUCTION

Coffee has been the most extensively drank beverage in the world for thousands of years. In addition, it contains hundreds of physiologically active polyphenols, triterpenes, and additional antioxidants that have been studied for their potential to offer health advantages, to its stimulant properties from caffeine.[1] Coffee consumption and its harmful consequences are displayed in figure 1.

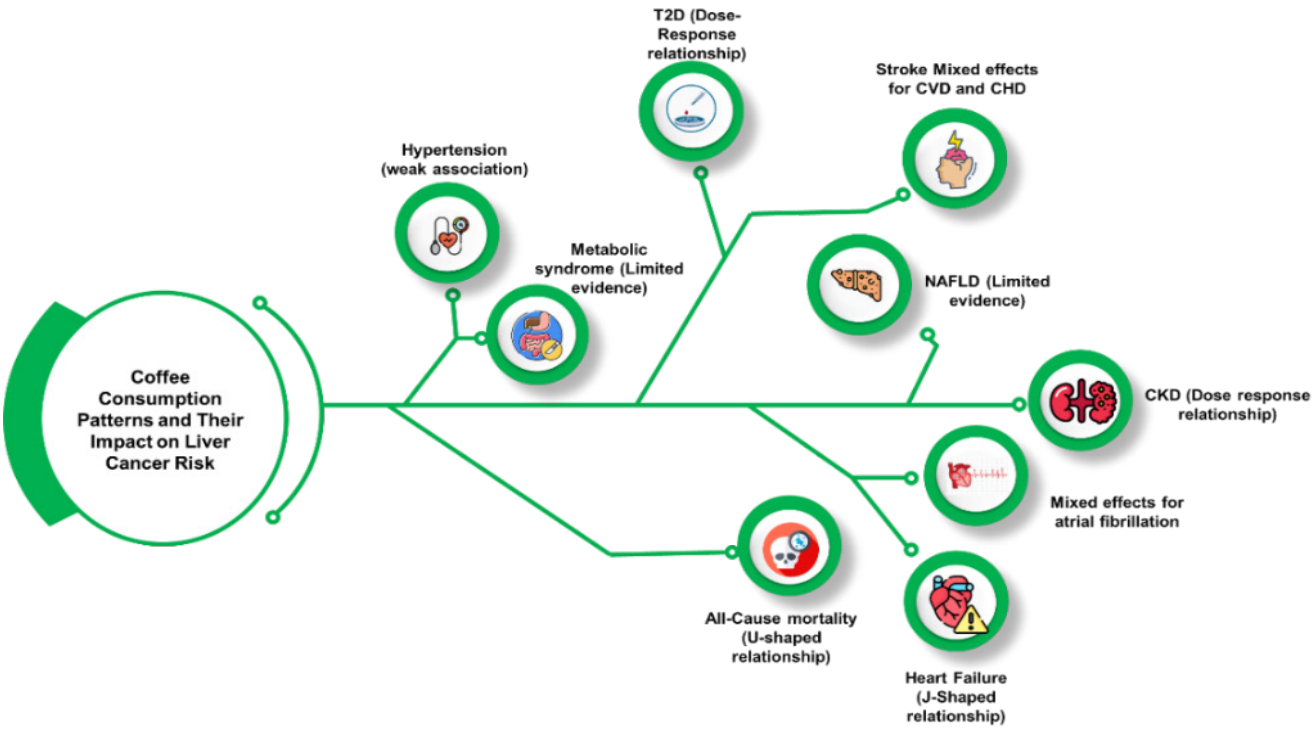


Figure 1. Coffee intake and detrimental effects on the liver cancer risk

Coffee consumption has been connected to a slight of association with heart conditions, metabolic disorders, and various chronic illnesses. For epidemiological research on coffee intake and its relationship to preventing illnesses, liver cancer has been selected as the primary research goal among such conditions.[2] The underlying

causes of cirrhosis are closely related to Hepatocellular Carcinoma (HCC), which accounts for the bulk of liver cancer. Non-Alcoholic Fatty Liver Disease (NAFLD) and hepatitis B and C viruses. Obesity, cigarette smoking, and excessive alcohol use were additional risk issues that contributed to the growth of liver illness and cancer. There was a lot of interest in finding preventative methods that might lower risk, especially in at-risk groups, because liver cancer was fast spreading and becoming a more significant burden on a worldwide scale. Treating the conditions becomes extremely challenging in manifests.[3] There was a negative correlation with the risk of liver cancer. Based on that, regular coffee drinkers might have a reduced chance of liver cancer compared to non-drinkers. Coffee's anti-inflammatory and antioxidant qualities, as well as its ability to increase liver enzyme levels have all been linked to protective benefits. More significantly, investigation recommends that coffee's non-caffeine components might have protective effects since both doped and decaffeinated coffee might have the aforementioned advantages.[4] Epidemiological researches propose coffee consumption is associated with condensed risks of specific cancers, including liver, endometrial, biliary tract, and colon cancers, though variations occur due to designs and demographics. There is currently strong, but insufficient, evidence linking coffee to the prevention of liver cancer. Many were predicated on self-reported information that was probably skewed. The exact mechanism by which coffee provides its protective benefits remains unclear. Additionally, different coffee varieties and brewing techniques might be used, and personal genetic variations might also have an impact on the results.[5] To gain a better knowledge of the connection between coffee and liver cancer, it was crucial to closely monitor the trend of coffee intake while taking into account a variety of influencing variables, including behaviors, past medical conditions, and dietary habits. To provide a grasp subtleties of coffee consumption habits and their important correlation with lowering the worldwide incidence of liver cancer.[6] To determine whether coffee intake and the occurrence of developing liver cancer are related in a dose-response way and whether consuming more coffee might be preventive. It would also consider how different coffee varieties, such as normal and decaffeinated, and ways of brewing affect the condition of the liver. Including individual-level factors like age, gender, lifestyle choices, and prior liver disease past events that would determine coffee's whole impact on liver cancer risk. The findings could contribute to public health recommendations that reduce the incidence of the type of cancer globally. A thorough examination of the connection among coffee intake and liver cancer risks in various groups is the goal of the research.[7]

Design of the research: section 2 provides an overview of related work; in section 3, the methodology gets established; section 4 displays the performance; and section 5 provides an illustration of the discussion and conclusion.

Related Work

The research [8] drinking coffee lowers the chances of developing cancer. The beneficial effects were often credited to the quantity of antioxidants with polyphenols and anti-inflammatory substances, such as chromogenic acids, caffeine, cafestol, and kahweol, among others. It was obvious that further epidemiologic trainings must be carried out before firm, scientifically supported suggestions about coffee intake could be established.

The benefits of consuming coffee were not due to caffeine and persist for members irrespective of the quality of their food; investigated the connection between coffee intake and steatosis and liver damage. Participants in the 2017–2018 who were 20 years of age or older were given 24-hour food memory tests and transient ultrasounds.[9] Decaffeinated coffee and tea were used as controls, and caffeine did not cause the positive effects of coffee consumption.

The research designed to assess differences in causes of death among HCC patients based on CLD etiology. [10] A total of 3977 patients were categorized in alcohol-related, all-negative, Hepatitis C (HCV) viruses, and Hepatitis B (HBV). The findings indicated that the primary cause of death was HCC-related longevity, except in alcohol-related cases and specific subgroups. The findings emphasize the importance of managing comorbidities in HCC patients.

The association between long-term liver disease results and the revision looked into coffee consumption, covering ground, instant, and decaffeinated coffees. Incident HCC, incident Chronic Liver Disease (CLD) or steatosis, incident CLD mortality, and incident hazard ratios were estimated using Cox regression. According to the results,[11] coffee users had lower adjusted hazard ratios (HR) for CLD, steatosis, CLD-related mortality, and HCC than non-drinkers. Compared to all varieties combined, the correlations for ground, instant, and decaffeinated coffee were comparable the causal relationships between coffee drinking and a variety of malignancies were examined.

Mendelian randomization (MR analyses) that were both univariate and multivariable was performed.[12] The bulk of the malignancies inspected did not have convincing proof of a fundamental link between innately forecast coffee drinking and the disease. However, coffee intake linked to genetic predisposition was linked to a higher incidence of multiple myeloma.

The revision [13] examined the connection among coffee consumption and intestinal cancer incidence and death in the nations that consume the most coffee. Using Spearman's correlation coefficient, ecological research

was conducted. The Worldwide Agency for Research's incidence/mortality rates database and the World Atlas' coffee consumption statistics were used for information.

The research explored the coffee's chemopreventive and therapeutic effects on diseases, including parkinson's, cardiovascular conditions, and various neurological disorders.[14] Epidemiological data showed higher coffee consumption was associated with reduced disease incidence and therapeutic potential, particularly for breast and colon cancers. Mechanisms include Nrf2-regulated oxidative stress pathways, receptor involvement (AhR AND NR4A1), epigenetic changes, and gut microbiome contributions. The outcomes recommend coffee extracts might have clinical applications, warranting further research into the possible for treating inflammatory diseases and cancer.

To assess the relationship between ultra-processed the food and the risk of liver cancer in the investigation.[15] A cohort of 73 119 participants was assessed using food frequency questionaries, with ultra-processed food intake classified by the Nova system. Higher consumption of ultra-processed foods, especially ultra-processed grains, processed protein foods, and mixed dishes, was associated with an increased risk of liver cancer after 13,9 years of follow-up. Ultra-processed drinks showed no discernible correlation.

METHOD

Investigation Design

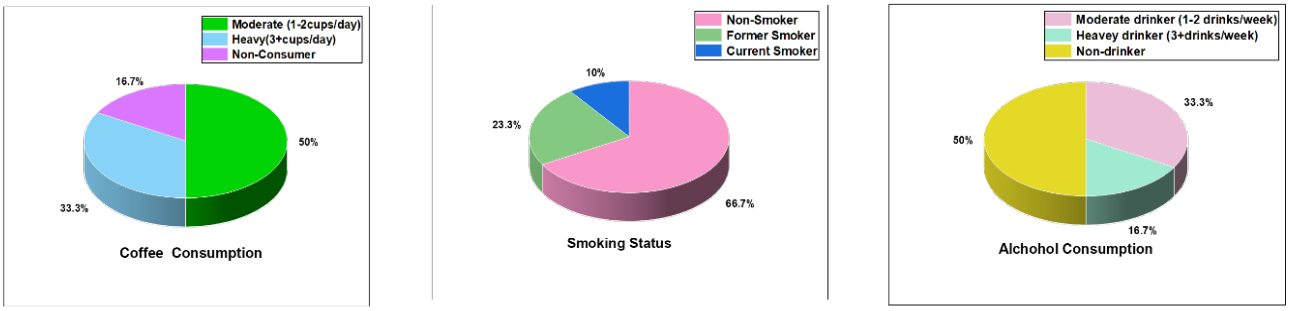
The cross-sectional observational research focuses on the association between coffee drinking and the risk of liver cancer. Three hundred of the five hundred people will be selected and subjected to a standardized questionnaire for analysis. To determine how coffee use, lifestyle, health problems, and sociodemographic profiles relate to the prevalence of liver cancer, data will be gathered. The provide substantial support to the research on eating habits and health results, particularly about coffee's potential protective benefits against liver cancer. It will also have illuminated how coffee drinking may affect liver health and lower the risk of cancer.

Research Population

The research sample includes a very balanced demographic profile with 300 respondents, evenly split between men and women (50 percent male and 50 percent female). The sample's age distribution reveals that those aged 40 to 49 make up the largest group (26,7 %). 25 % of people aged 30-39, 20 % of those aged 18-29, 18,3 % of people aged 50-59, and 10 % of people aged 60 and above. According to coffee consumption habits, 16,7 % of people do not drink coffee, 33,3 % drink heavily, and 50 % drink moderately. The majority of respondents (66,7 %) don't smoke, followed by past smokers (23,3 %) and current smokers (10 %). About the same percentage of people consume alcohol: 50 % do not drink, 33,3 % moderately drink coffee, and 16,7 % are heavy drinkers. Demographic data is displayed in table 1 and figure 2 (a, b, and c).

Table 1. Displays the demographic factors

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	150	50
	Female	150	50
Age	18-29	60	20
	30-39	75	25
	40-49	80	26,70
	50-59	55	18,30
	60+	30	10
Level of Education	Secondary School	60	20
	Undergraduate Degree	150	50
	Postgraduate Degree	60	20
	Doctor of Philosophy	30	10
Coffee Consumption	Non-consumer	50	16,70
	Moderate (1-2 cups/day)	150	50
	Heavy (3+ cups/day)	100	33,30
Smoking Status	Non-smoker	200	66,70
	Former smoker	70	23,30
	Current smoker	30	10
Alcohol Consumption	Non-drinker	150	50
	Moderate drinker (1-2 drinks/week)	100	33,30
	Heavy drinker (3+ drinks/week)	50	16,70



(a) **(b)** **(c)**

Figure 2. Pie Chart for (a) Coffee Consumption, (b) Smoking Status, (c) Alcohol Consumption

Statistical Analysis

Using IBM SPSS software (version 26), the research's statistical analysis was completed. It uses two main techniques: chi-square testing and logistic regression. The relationship between a binomial outcome measure, such as the prevalence of liver cancer, and several variables, including lifestyle factors, age, gender, and coffee use, is ascertained through the application of logistic regression. The accomplished by applying chi-square tests to the relationships between categorical variables, which aided in identifying noteworthy patterns in the relationship between liver health and coffee use. The wide- ranging factor helped assess the possible dangers related to coffee drinking.

RESULTS

Analysing Logistic Regression

Logistic regression utilizing multiple predictor variables that produce a binary result, logistic regression is a form of regression that forecasts the likelihood of a particular class or event occurring. It enables researchers to efficiently evaluate the impact of each variable by modelling the link between the predictor factors and the binary result.

Table 2. Displays the Logistic Regression Analysis

Predictor Variable	Odds Ratio (OR)	Robust Standard Error (RSE)	95 % Confidence Interval (CI)	p-value
Age				
30-39	1,25	0,15	(0,85, 1,83)	0,27
40-49	1,55	0,20	(1,02, 2,36)	0,04
50-59	1,90	0,25	(1,20, 2,98)	0,005
60+	2,10	0,30	(1,25, 3,56)	0,004
Gender				
Male & Female	1,10	0,12	(0,75, 1,62)	0,62
Coffee Consumption				
Moderate (1-2 cups/day)	0,70	0,11	(0,45, 1,08)	0,10
Heavy (3+ cups/day)	0,40	0,09	(0,20, 0,80)	0,01
Smoking Status				
Former smoker	1,30	0,20	(0,80, 2,10)	0,30
Current smoker	1,70	0,25	(0,90, 3,20)	0,10
Alcohol Consumption				
Moderate drinker (1-2 drinks/week)	1,20	0,15	(0,80, 1,80)	0,35
Heavy drinker (3+ drinks/week)	1,50	0,20	(0,80, 2,80)	0,20

The following figure 3 and table 2 and give a description of the findings from the logistic regression research that was conducted. In comparison to the reference group of 18–29 years, patients in the 50–59-year age group had odds of 1,90, p = 0,005, while those in the 60+ year age group had extremely significant elevated chances, p = 0,004. There was no correlation between smoking status, gender, and ORs close to 1. While moderate coffee drinking was almost significant (OR = 0,70, p = 0,10), heavy Coffee consumers were connected to a decreased

risk (OR = 0,40, p = 0,01). Current smokers were more at risk among smokers (OR = 1,70, p = 0,10). Additional analysis showed that drinking alcohol did not predict any statistically significant association, even though the chances were higher for moderate drinkers (OR = 1,20, p = 0,35) and heavy drinkers (OR = 1,50, p = 0,20). Age and coffee use were shown to be the main risk factors for liver cancer.

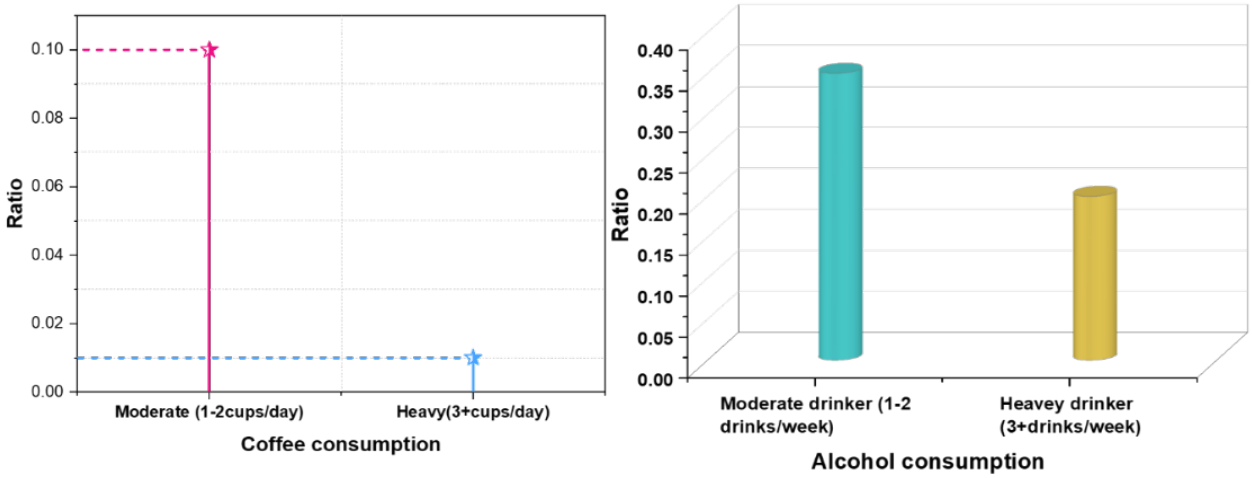


Figure 3. Finding of Logistic Regression Analysis

Chi-square test

When examining the relationship between categorical variables, chi-square is employed. It compares the anticipated and observed frequencies. When the idea that the actual patterns are simply the result of expectations is not tenable. By indicating that the measured distributions deviate considerably from chance frequencies, chi-square tests determine if there is any importance to the connection between categories of variables.

Table 3. Displays the chi-squared test

Demographic Variable	Category	Expected Frequency (E)	Observed Frequency (O)	(O - E)	$(O - E)^2$	$(O - E)^2 / E$	Chi-Square Value
Age Group	18-29	50	58	8	64	1,28	26,37
	30-39	70	76	6	36	0,51	
	40-49	60	70	10	100	1,67	
	50-59	60	50	-10	100	1,67	
	60+	60	46	-14	196	3,27	
Coffee Consumption	Non-consumer	75	40	-35	1225	16,33	20,67
	Moderate (1-2 cups/day)	150	150	0	0	0	
	Heavy (3+ cups/day)	75	110	35	1225	16,33	
Smoking Status	Non-smoker	180	190	10	100	0,56	5,66
	Former smoker	90	75	-15	225	2,50	
	Current smoker	30	35	5	25	0,83	
Alcohol Consumption	Non-drinker	150	130	-20	400	2,67	18,50
	Moderate drinker (1-2 drinks/week)	75	90	15	225	3,00	
	Heavy drinker (3+ drinks/ week)	75	80	5	25	0,33	

Table 3 and figure 4 show the findings of a chi-square analysis that looked at the relationship between demographic characteristics and the possibility of liver cancer. In some categories of the age group variable, observed frequencies exceeded predicted values. In the age range of 18 to 29, the disparities were O = 58 and E = 50. The observed frequency was lower than the predicted frequency for the group aged 60 and over. Consequently, the corresponding chi-square values for these two groups were correspondingly 26,37 and 3,27. With chi-square values of 16,33 and 20,67, respectively, the coffee consumption patterns of the heavy drinkers

and non-consumer's groups similarly showed stark variations, indicating a strongly substantial departure from the anticipated pace of consumption. While there were only slight variations in smoking status, there was a significant difference in alcohol use, with moderate drinkers (O = 90, E = 75) and non-drinkers (O = 130, E = 150) contributing to the total chi-square calculation. These results showed several lifestyle and demographic variables influencing the chance of getting the specific malignancy.

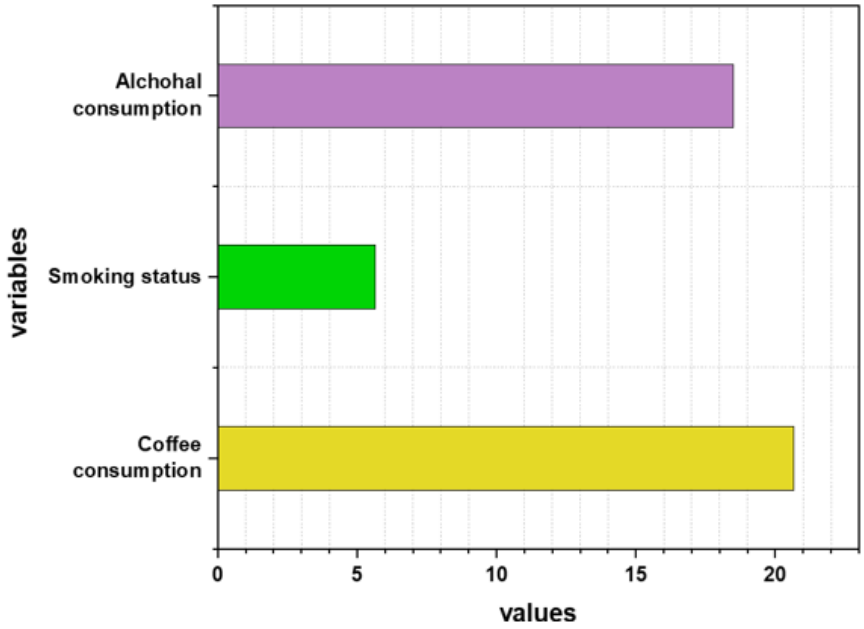


Figure 4. Finding of Chi-Square Set

DISCUSSION

Significant findings from logistic regression and chi-square analyses explored the relationship between coffee consumption habits and liver cancer incidence. The results of the chi-square and logistic regression research, lifestyle decisions and age are major risk factors for liver cancer. Results from logistic regression indicate that the chance for liver cancer occurrence rises with age and that it is especially high in those aged 50–59 (OR = 1,90, p = 0,005) and 60+ (OR = 2,10, p = 0,004). The list is further expanded by coffee use, which is strongly linked to a reduction in risk (OR = 0,40, p = 0,01). In the cohort, smoking status has less effect on the risk of liver cancer. Smoking status had higher chances, but the change was not statistically substantial. For age groups, the chi-square test reveals a substantial discrepancy between the measured and anticipated rates. Importantly, it was shown that age had a significant deviation with groups of people aged 18–29 (O = 58, E = 50, chi-square = 26,37) and older (O = 46, E = 60, chi-square = 3,27), proving that age influences the risk potentiality of liver cancer. It has been discovered that these are currently important considerations when assessing an individual's risk of emerging liver cancer. It identifies a specific area for prevention and health care.

CONCLUSIONS

The association between lifestyle choices and health outcomes has advanced significantly as a result of thorough investigation of coffee consumption patterns and trends that affect the risk of liver cancer development. Age is a significant predictor of the disease's growth, according to the results, and the likelihood of getting it increases with age. Even senior age groups showed substantial odds ratios. Participants aged 60 and older and those of 50–59 had substantial odds ratios (ORs), indicating a significant probability of major effects. Coffee is listed in the category of putative prevention since it has been inversely related to a decreased possibility of liver cancer. The confirms research that show coffee has a high concentration of healthy compounds. The include antioxidants and support the functioning of the liver. The significance of several demographic characteristics in the event, such as age confounders towards liver cancer incidence and different unique groups was further highlighted using chi-square analysis. Nevertheless, the investigation found no significant association between gender or prior smoking and liver cancer incidence.

Limitation and future scope

The reliance on data provided by participants, which may contain recall bias, limits the research. Furthermore, the research lacks the long-term evaluation necessary to prove causation. Future research ought to concentrate on the molecular processes that underlie these correlations as well as coffee's function in

cancer preventive measures. Researchers might look at whether coffee type and preparation techniques are related to a higher risk of liver cancer in certain demographics.

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CONFLICT OF INTEREST

None.

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