An overview of Cardiovascular diseases burden among alcoholics and non-alcoholics in a rural area of Tamilnadu – A comparative cross sectional study.

Authors:

1. **Dr.Munish.N M.D.*** - Assistant Professor, Velammal Medical College Hospital & Research Institute, Madurai, Tamilnadu, India.

2. **Dr.Manish Goyal**, Assistant Professor, Institute of Integrated & Honours Studies, Kurukshetra University, Kurukshetra.

*Correspondence:

Dr.Munish.N-M.D.

E-mail: munishn75@gmail.com.

ABSTRACT

Background: Alcohol consumption is the world's third largest risk factor for disease and disability; in middle- income countries, it is the greatest risk. Alcohol is attributed to nearly 3.2% of all deaths and results in a loss of 4% of total DALYs. **Aim & Objective**: 1. To estimate the burden of cardiovascular diseases among the alcoholics; 2. To compare the burden of cardiovascular diseases between alcoholics and non alcoholics. **Methods**: This study was conducted in the Milaganoor village in South Tamilnadu with alcohol habit; All male with alcohol consuming habit above 13 years of age were included in the study and none were excluded from the study. The data was using a semi structured questionnaire. The data collected were consolidated and analyzed using SPSS software; The descriptive statistics were used in the study. **Results**: In my study there were 1200 male and 1500 female. In only 900 males were with alcohol habit; 62.2% of the male alcoholics were illiterate; Among alcoholics 46.6% belonged to 31-45 years of age; 25.5% of the people belonged to 15-30 years of age and 15.5% of the alcoholics belonged to 46-60 years of age. On seeing the education of the alcoholics majority of the alcoholics were illiterate and only 25.5% of the alcoholic population were with primary form of education. When seeing the education of the non alcoholics majority i.e. 33.3% of the non alcoholics were with secondary education followed by 26.6% of the non alcoholics were with primary form of education and 16.6% of the alcoholics had higher secondary form of education. It is found that 91 out of 900 alcoholics had history of coronary artery disease whereas only 8 out of 300 non alcoholics population had history of coronary artery disease. From this it is evident that alcoholic has positive correlation and it is statistically significant p-value (0.00082). In the same way congestive heart failure was seen high 45 out of 900 in the alcoholic population when compared to the non alcoholic population 5 out of 300 which is also statistically significant p value (0.019). While studying the systemic hypertension, among alcoholics and non alcoholics it is found that pressure was high among alcoholics 150 out of 900 and only 30 out 300 alcoholics had blood pressure which is also statistically significant p value <0.05.

Conclusion: It can be concluded that early age of onset and peer pressure are the alarming challenges for the eradication of this social evil. Low education and having a family history of

alcohol use are more at risk to it. Health education is the most required intervention to reduce the burden of alcohol use.

Keywords: cardiovascular diseases, burden, alcoholics, rural area, Tamilnadu, comparative cross sectional study.

INTRODUCTION

Alcoholism is a social evil, and alcohol related morbidities and incidents even though significantly alarming are almost neglected by primary care physicians and policy makers. According to world health organization (WHO) - global burden of disease update, around 125 million people were affected worldwide by alcohol use disorders, 40.5 million peoples were moderately and severely disabled due to alcohol dependence and problem use and 19.9 million years lost due to disability due to alcohol use disorders.[1] The 2015 WHO fact sheet shows that 3.3 million deaths i.e. 5.9% of all deaths were due to harmful use of alcohol.[2] Alcohol consumption is the world's third largest risk factor for disease and disability; in middle- income countries, it is the greatest risk. Approximately 4.5% of the global burden of disease and injury is attributable to alcohol. Alcohol is the causal factor in 60 types of diseases and injuries and a component cause in 200 others. Alcohol is attributed to nearly 3.2% of all deaths and results in a loss of 4% of total DALYs. Alcoholism is one of the leading causes of death and disability in India. In India, the estimated numbers of alcohol users in 2005 were 62.5 million with 17.4% of them being dependent users and 20-30% of hospital admissions are due to alcohol-related problems.[3] Although there are many studies on alcohol use in North India very few community based studies have been conducted on the pattern of alcohol consumption and the factors influencing the habit of alcohol intake among the rural community of south India especially in rural part of Tamilnadu. This type of study will be useful for understanding the problem of alcohol use and also help in taking specific interventional measures at the community level. So I conducted a cross sectional study to study the pattern of alcohol use and to assess the factors influencing it rural Tamilnadu, southern India.

METHODOLOGY

Study area and design

This cross sectional study was conducted in the Milaganoor panchayat of Manamadurai taluk which is located in the Sivagangai district of Tamilnadu catering 2700 population from 5 villages of corresponding to this panchayat.

Sampling unit

The primary sampling unit was an individual household.

Sample Size estimation

Minimum sample size required was 1000 subjects, based on 10% prevalence rate[4], a precision of 20% and a non response rate of 10%. We decided to include residents who were aged 13 years and above, from the selected area, as study subjects.

nclusion Criteria

All male with alcohol consuming habit above 13 years of age were included in the study

Exclusion criteria

None were excluded from the study as all gave their willingness to participate in the study.

Study tool

After obtaining their informed consent, the respondents were interviewed using a semi structured questionnaire. Data on socio-demographic details and presence of any morbid conditions were collected. Data on consumption of alcohol use and others forms of substance abuse was also collected. Socio-economic status was assessed, based on the regular scale. A History of alcohol intake, smoking or chewing tobacco was recorded. All the details pertaining to the source of alcohol, quantity of alcohol intake per day, type of alcohol taken by them, Foods taken immediately after consuming alcohol, and habits pertaining to substance abuse, type of alcohol and the amount spent for the purchase of alcohol per day were recorded. This questionnaire was translated to the local language (Tamil) and it was translated back into English to ensure its reliability and validity. A pilot study was conducted before initiation of the study, to look for the feasibility of administration of questionnaire.

Ethical Committee Approval

This study was conducted after getting proper approval from the Institutional Ethics Committee IEC No: VMCIEC/112/2022 on 02.12.2022. A written informed was consent was obtained from all participants before collecting data. For this purpose, a participant information sheet (in Tamil) indicating the purpose of the study, procedure of maintaining confidentiality, and right not to participate in the study was provided to the participants. Health education regarding the ill effects of alcohol consumption was given to all alcohol consumers who had participated in the study.

Method of data collection

Prior permission was obtained from the village president and local leaders for conduction the study. A village leaders meeting was conducted, during which the purpose of the study methods which had to be adopted and the possible implications of the results were discussed. Following the village leaders meeting, village mapping and social mapping of the area was done, in order to know the study area and to plan for data collection. Data was collected by making house to house visits and interviewing the subjects by using the questionnaire. Informed consent was obtained from the study subjects. If the designated house was locked during the visit, the house was noted and revisit was conducted on the left out houses on another day. The study was done as a part of a people welfare project for the community health workers of the particular village who were given training on administration of questionnaire and data collection process, under the supervision of the investigators.

Data Analysis

Data was entered and analysis by using SPSS version 16.0 for windows. The findings were expressed in terms of proportions and other descriptive statistics.

RESULTS

While seeing the socio demographic pattern of all the study subjects it is observed that 46% are males in the total population of 2700 and 54% are females; From the above 2700 population only 75% of the male are with alcohol drinking habit and rest 25% of the males were without drinking habit and none of the female population had drinking habit. On seeing the age distribution of the total subjects 41.6% of the population were between the age group of 31 to 45 years and the next group i.e. 24.1% were in the age group of 15-30 years of age and the next 15% were in the age group of 46-60 years of age. While observing the education of the total study subjects majority of the population 50.4% were illiterate; 25.8% of the population were with primary education and only 15% of the people were with secondary form of education and only 2.9% of the group were graduates. On seeing the occupation of the study subjects majority of the population 45.5% were unskilled workers; 33.7% of the population were skilled and semiskilled workers and only 0.2% were professional in this population; The most one another observation is 13% of the population were unemployed.

TABLE 1: SOCIO-DEMOGRAPHIC PROFILE OF STUDY SUBJECTS (ALL MALES)

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Sex		
Male	1200	46%
Female	1500	54%
Total	2700	100%
Alcohol drinking habit		
Male		
Yes	900	75%
No	300	25%
Female		
yes	0	0%
no	1500	100%
(age wise) – male	**(n=1200)**	
<15 years	80	6.6%
15 – 30	290	24.1%
31 - 45	500	41.6%
46- 60	180	15%
61 – 75	70	5.8%
>75	80	6.6%

Total	**1200**	100%
Education		
Illiterate	605	50.4%
Primary	310	25.8%
Secondary	180	15%
Higher secondary	70	5.8%
Graduate or above	35	2.9%
Occupation		
Professional	3	0.2%
Semi – professional	50	4.1%
Clerical shop owner	35	2.9%
Skilled, semi-skilled worker	405	33.7%
Unskilled worker	547	45.5%
Unemployed	160	13%
Socioeconomic status(BGP)	0	0%
Upper class	35	2.9%
Upper middle class	90	7.5%
Middle class	185	15.4%
Lower middle class	890	74.1%
Lower class		
Marital status		
Married	910	75.8%
Unmarried	260	21.6%
Widowed	10	0.8%
Divorced / separated	20	1.6%
Religion		
Hindu	1200	100%
Christian	0	0%
Muslim	0	0%
Type of Family		
Nuclear	1170	97.5%
Joint	30	2.5%
Three- generation	0	0%
Ownership of the house		
Owned	1180	98.3%
Rented	20	1.6%

While seeing the socio economic status of the study population 74.1% of them belonged to lower class; 15.4% belonged to lower middle class group and only 7.5% of the population belonged to middle class. When seeing the marital status of the study population majority 75.8% of the subjects were married; 21.6% of the population were unmarried; 0.8% and 1.6% were widowed and divorced/separated respectively. On examining the religion of the study group all the study population were Hindus; 98.3% of the were with own house and 1.6% were living in the rented house. Majority 97.5% of the study subjects were living as nuclear type of family and only 2.5% were living jointly. In the same population 98.3% were having own house and the rest were without own house.

TABLE 2: SOCIO-DEMOGRAPHIC PROFILE OF THE ALCOHOLICS

When seeing the age distribution of the alcoholics 46.6% belonged to 31-45 years of age; 25.5% of the people belonged to 15-30 years of age and 15.5% of the alcoholics belonged to 46-60 years of age. On seeing the education of the alcoholics majority of the alcoholics were illiterate and only 25.5% of the alcoholic population were with primary form of education; only 1.1% of the alcoholics were educated as graduates. When observing the socio economic status of the alcoholics 80% of them belonged to lower class and next 13.3% of them belonged to lower middle class and only 5.5% of the alcoholics belonged to middle class. Marital status of the alcoholics was studied in which it is seen that 78.3% of the were married and 20% of the were unmarried; when seeing the religion of the alcoholics all the alcoholics were hindus. On observing the type of family 98.8% of the were living as nuclear family and 1.1% were living as joint family. When looking into the ownership of the house 98.8% were with own house and only 1.1% were living in rented house.

VARIABLE	FREQUENCY (N=900)	%
Alcohol drinking habit **Male**		
Yes	900	75%
No	300	25%
Female		
yes	0	0%
no	1500	100%
Alcohol drinking habit (age wise) – male		
<15 years	30	3.3%
15 – 30	230	25.5%
31 - 45	420	46.6%
46- 60	140	15.5%

61 – 75	55	6.1%
>75	25	2.7%
Total	**900**	100%
Education		
Illiterate	560	62.2%
Primary	230	25.5%
Secondary	80	8.8%
Higher secondary	20	2.2%
Graduate or above	10	1.1%
Total	**900**	100%
Occupation		
Professional	0	0%
Semi – professional	10	1.1%
Clerical shop owner	15	1.6%
Skilled, semi-skilled worker	325	36.1%
Unskilled worker	450	50%
Unemployed	100	11.1%
Total	**900**	100%
Socioeconomic status(BGP)	0	0%
Upper class	10	1.1%
Upper middle class	50	5.5%
Middle class	120	13.3%
Lower middle class	720	80%
Lower class	**900**	100%
Total		
Marital status		
Married	705	78.3%
Unmarried	180	20%
Widowed	0	0%
Divorced / separated	15	1.6%
Religion		
Hindu	900	100%
Christian	0	0%
Muslim	0	
Type of Family		
Nuclear	890	98.8%
Joint	10	1.1%
Three- generation	0	0%
Total	100	100%

Ownership of the house		
Owned	890	98.8%
Rented	10	1.1%
Total	900	100%

Table 3: SOCIO-DEMOGRAPHIC PROFILE OF THE NON-ALCOHOLICS

When seeing the socio demographic profile of the study subjects a total of 300 people were without alcohol drinking habit. When seeing the age distribution of the non alcoholics 26.6% of the non alcoholics were in the age group of 31-45 years followed by 20% of the non alcoholics were in the age group of 15-30 years. About 18.3% of the non alcoholics were above 75 years of age. Less than 15 years of age group non alcoholics constituted for about 16.6%. On observing the education of the non alcoholics majority i.e. 33.3% of the non alcoholics were with secondary education followed by 26.6% of the non alcoholics were with primary form of education and 16.6% of the alcoholics had higher secondary form of education. While seeing the occupation of the non alcoholics majority 32.3% of them were unskilled workers; followed by 26.6% of them were skilled and semiskilled workers and 20% of the non alcoholics were as shop owners; In this non alcoholics group only 6.6% were unemployed.

VARIABLE	FREQUENCY (N=900)	%
Alcohol drinking habit Male		
Yes	900	75%
No	300	25%
Total	**1200**	100%
Subjects without Alcohol drinking habit (age wise) – male	n=300	
<15 years	50	16.6%
15 – 30	60	20 %
31 - 45	80	26.6%
46- 60	40	13.3%
61 – 75	15	5%
>75	55	18.3%
Total	**300**	100%
Education		
Illiterate	45	15%
Primary	80	26.6%
Secondary	100	33.3%

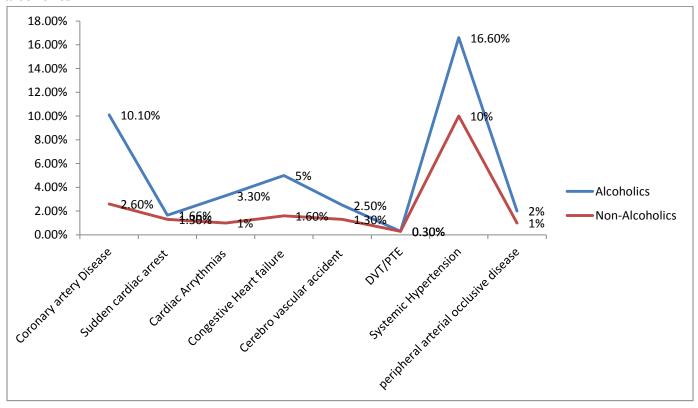|		
Higher secondary	50	16.6%
Graduate or above	25	8.3%
Total	**300**	100%
Occupation		
Professional	3	1%
Semi – professional	40	13.3%
Clerical shop owner	60	20%
Skilled, semi-skilled worker	80	26.6%
Unskilled worker	97	32.3%
Unemployed	20	6.6%
Total	**300**	100%
Socioeconomic status(BGP)	0	0%
Upper class	25	8.3%
Upper middle class	40	13.3%
Middle class	65	21.6%
Lower middle class	170	56.6%
Lower class	**300**	100%
Total		
Marital status		
Married	205	68.3%
Unmarried	80	26.6%
Widowed	10	3.3%
Divorced / separated	5	1.6%
Total	**300**	100%
Religion		
Hindu	300	100%
Christian	0	0%
Muslim	0	0%
Total	**300**	100%
Type of Family		
Nuclear	280	93.3%
Joint	20	6.6%
Three- generation	0	0%
Total	**300**	100%
Ownership of the house		
Owned	290	96.6%
Rented	10	3.3%
Total	**300**	100%

In this same group 56.6% belonged to lower class; 21.6% belonged to lower middle class and none belonged to upper class. When seeing the marital status of the non-alcoholics majority of them were married and only 26.6% of them were unmarried. In the same group 1.6% of them were divorced or separated. Similar to the alcoholics all non alcoholics were Hindus and 93.3% were living as nuclear type of family and only 6.6% were living as joint family. In this same non alcoholic group 96.6% were having and living in own house and only 3.3% were living in rented house.

Table 4: cardiovascular diseases among alcoholics and non alcoholics

Cardiovascular diseases	Alcoholics (n=900)	%	Non-alcoholics (n=300)	%	X^2 square with Yates Correction	P-value
Coronary artery disease	91	10.1%	8	2.6%	15.5047	.000082**
Sudden cardiac arrest	15	1.66%	4	1.3%	0.0178	0.893787
Cardiac Arrhythmias	30	3.3%	3	1%	3.7496	0.052821
Congestive heart failure	45	5%	5	1.6%	5.4539	0.019525*
Cerebro-vascular accident	23	2.5%	4	1.3%	1.023	0.311804
DVT/PTE	3	0.3%	1	0.3%	0.3344	0.563052
Systemic Hypertension	150	16.6%	30	10%	7.329	0.006785**
Peripheral arterial occlusive disease	18	2%	3	1%	0.7916	0.373607

Figure 1: Line diagram showing % of cardio vascular diseases among alcoholics and non-alcoholics

When seeing the chance of occurrence of cardiovascular diseases among alcoholics and non alcoholics. It is found that 91 out of 900 alcoholics had history of coronary artery disease whereas only 8 out of 300 non alcoholics population had history of coronary artery disease. From this it is evident that alcoholic has positive correlation and it is statistically significant p-value (0.00082). In the same way congestive heart failure was seen high 45 out of 900 in the alcoholic population when compared to the non alcoholic population 5 out of 300 which is also statistically significant p value (0.019). While studying the systemic hypertension, among alcoholics and non alcoholics it is found that pressure was high among alcoholics 150 out of 900 and only 30 out 300 alcoholics had blood pressure which is also statistically significant p value <0.05. On studying the history of Sudden cardiac arrest, Arrythmias, cerebro-vascular accident, DVT/PTE and peripheral arterial occlusive disease it was all found to be statistically insignificant not less than <0.05 and didn't show any positive correlation.

DISCUSSION

In a study done by M.N.Krishnan et al age-adjusted coronary artery disease was 3.5% in which males affected were 4.8% but in our study it is as high as 10% among alcoholics and 2.6% among non-alcoholics and its statistically significant in our study. In the same study prevalence of CAD was higher in rural 13.2% than the urban area 11.3% and it was statistically significant (p=0.038) and no difference was seen between urban and rural areas pertaining to prevalence of

definite coronary artery disease. In this same study hypertension was found in 26.24% of the rural men whereas in our rural study population 16.6% of the hypertensive individuals were alcoholics and 10% of the hypertensive individual were non-alcoholics.[5] In a study by AK Agarwal et al 51.9% of the men were with history of hypertension which is one of the risk factor for peripheral arterial occlusive disease and coronary artery disease. In the same study coronary artery disease was present in 28% of the study subjects especially 26.5% of the men whereas only 10.1% of the alcoholics were with coronary artery disease. In the same study 28.6% of the patients had symptomatic peripheral artery disease in which 52.38% had coronary artery disease.[6] In a study by Indrani Sen et al on aorto-iliac occlusive disease majority of patients 81% presented with critical limb ischemia with co-morbidities like coronary artery disease in 5% of the subjects and hypertension in 40 patients.[7] In the study by Binu Areekal et al study on the risk factors for cardiovascular disease among adults 41.4% were current alcoholics, 13.1% were ex alcoholics in which 24.1% showed social consumption of alcohol. Whereas in our study 10.1% of the alcoholics had history of coronary artery disease which is high when compared to the individuals without alcohol consuming habit.[8] In study by T N Sugathan et al on behavioral risk factor for non communicable risk factors, alcohol drinking habit was found 70 percent more among the younger age group people than the older age group i.e. more than 65 year of age which is similar to our study. In our study alcohol drinking habit was seen in 46.6% of the study subjects which much younger to the older group of alcoholics accounting for only 6 to 8 percent.[9] In a study by Kavi et al self reported hypertension was seen in 20.2% of the cardio vascular diseases whereas in our study hypertension was seen 16.6% of the alcoholics, and 10% of the non alcoholics and it is also statistically significant. In our study it is found that coronary artery disease was found in 10.1% of the alcoholics and in 2.6% of the non alcoholics and it is also statistically significant.[10] In a study done by Syed Esam Mahmood et al 14.7% of the study subjects were with alcohol consuming habit and 20.9% of the study subjects had history of hypertension whereas in our study 10.1% of the alcoholics were suffering from coronary artery disease and 16.6% of the alcoholics had history of hypertension and both were statistically significant.[11] In a study by Raja Ram Dhungana it is found that one quarter of the cardiovascular disease patients i.e. 29.4% had alcohol consuming habit and the history of hypertension was found in almost 34.6% of the cardio vascular disease patients whichis slightly higher in numbers when compared to our study.[12] In a study by Syam Sundar Junapadi and Babu Rao alcohol use was 30.7% in rural area and it is slightly higher than urban area and it is much higher than our study. In the same study hypertension was noticed in 20% of the rural patient which is almost similar to our study.[14] In a study by Badal Chandra Bhakat and vani Madhavi Hypertension was noticed as a risk factor in 41.3% of the study subjects which is very high when compared to our study.[15] In a study done by Chaudhary et al 34.12% of the cardiovascular disease patient had habit of drinking alcohol whereas in our study is it comparatively less accounting for 10.1% alcoholics had history of cardiovascular diseases.[16] In another population based study done by Ashok Kumar Agarwal et al on cardiovascular diseases out of 3760 patients Ischemic heart disease was seen in 35 patients; 59 patients had history of hypertension. When seeing the age of

the patients with cardiovascular diseases it is more commonly seen among the people more than 35 years. When taking the riskfactors for cardiovascular diseases alcohol consuming habit was seen among 94 people in which 12 patients developed cardiovascular diseases out of alcohol drinking habit. Whereas in our study 91 alcoholics developed coronary artery disease disease out of 900 alcoholics and only 8 out of 300 non alcoholic subjects developed had history of coronary artery disease and is also statistically significant. In the same study by Ashok Kumar Agarwal et al on cardiovascular diseases hypertension was seen in 59 subjects where as it was seen in 150 subjects out 900 alcohol consumers and systemic hypertension was seen only in 30 out of 300 non alcoholic subjects and it is also statistically significant p value <0.05.[17] In a study done by R Gupta e al cardiovascular disease like hypertension was seen in 17.9% and 34.6%; Alcohol drinking habit was seen in 6.7% of the coronary artery disease patient and 3.8% of the cardiovascular disease patients whereas in our study it is similar to the above study i.e. 2.5% of the alcoholics were suffering from cerebro vascular accident and 10.1% of the alcoholics were with coronary artery disease.[18]

Limitations of the study

In my study Alcohol consumption habits; pattern of drinking and the factors were all self-reported by the participants, so there could be a chance for recall and response biases.

CONCLUSION

Problems of alcohol use in India have attracted the attention of public health policy makers and research workers. Most common reason for the starting and continuation of drinking was peer pressure. Thus, emphasis should be made on the factors which are related to the early initiation of alcohol use and steps should be taken to prevent the youths from being influenced by their peers. The role of primary care physician is very important in organizing effective health education measures with the help of his team. The behavior change can be initiated and maintained with persistent motivation and support from primary care team.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. World Health Organization. Global burden of disease 2004. Geneva: WHO. 2012. Available at: www.who.int/.../global_burden_disease/2004.../en/index.html. Accessed on 25 February 2023.

2. WHO. Alcohol. WHO. Available at: http://www. who.int/mediacentre/factsheets/fs349/en/. Accessed on 11 July 2023.

3. Ray R. National survey on extent, pattern and trends of drug abuse in India. Ministry of Social Justice and Empowerment, New Delhi: Government of India and United Nations Office on Drugs and Crime; 2004.

4. Mohan D, Chopra A, Sethi H. The co-occurrence of tobacco & alcohol in general population of metropolis Delhi. *Indian J Med Res*. 2002; 116:150-54.

5. Krishnan MN, Zachariah G, Venugopal K, Mohanan PP, Harikrishnan S, Sanjay G, Jeyaseelan L, Thankappan KR. Prevalence of coronary artery disease and its risk factors in Kerala, South India: a community-based cross-sectional study. BMC Cardiovasc Disord. 2016 Jan 14;16:12. doi: 10.1186/s12872-016-0189-3. PMID: 26769341; PMCID: PMC4712491.

6. Agarwal AK, Singh M, Arya V, Garg U, Singh VP, Jain V. Prevalence of peripheral arterial disease in type 2 diabetes mellitus and its correlation with coronary artery disease and its risk factors. J Assoc Physicians India. 2012 Jul;60:28-32. PMID: 23405538.

7. Sen I, Stephen E, Agarwal S. Clinical profile of aortoiliac occlusive disease and outcomes of aortobifemoral bypass in India. J Vasc Surg. 2013 Feb;57(2 Suppl):20S-5S. doi: 10.1016/j.jvs.2012.06.113. PMID: 23336851.

8. Areekal B, Bhaskar A, Antony L, Siva PM, George R, Joseph MD, et al. Prevalence of risk factors for cardiovascular disease among adults older than 30 years in a rural area in central Kerala, India. Int J Med Sci Public Health 2015; 4:1655-1660.

9. Sugathan TN, Soman CR, Sankaranarayanan K. Behavioural risk factors for non communicable diseases among adults in Kerala, India. Indian J Med Res. 2008 Jun;127(6):555-63. PMID: 18765874.

10. Kavi A, Walvekar PR, Patil RS. Biological risk factors for coronary artery disease among adults residing in rural area of North Karnataka, India. J Family Med Prim Care 2019; 8:148-53.

11. Mahmood SEsam, Bhardwaj P, Srivastava JPrakash, Mathur KPrasad, Zaidi Z Haider, Shaifali I. Sociodemographic risk factors of cardiovascular disease in rural Lucknow. International Journal of Medicine and Public health. 2012;2(1): 56-61.

12. Dhungana RR, Thapa P, Devkota S, Banik PC, Gurung Y, Mumu SJ, Shayami A, Ali L. Prevalence of cardiovascular disease risk factors: A community-based cross-sectional study in a peri-urban community of Kathmandu, Nepal. Indian Heart J. 2018 Dec;70 Suppl 3(Suppl 3):S20-S27. doi: 10.1016/j.ihj.2018.03.003. Epub 2018 Mar 10. PMID: 30595258; PMCID: PMC6309148.

13. Mahmood SS, Levy D, Vasan RS, Wang TJ. The Framingham Heart Study and the epidemiology of cardiovascular disease: a historical perspective. Lancet. 2014 Mar 15;383(9921):999-1008. doi: 10.1016/S0140-6736(13)61752-3. Epub 2013 Sep 29. PMID: 24084292; PMCID: PMC4159698.

14. Junapudi SS, Rao BB. A comparative study of cardiovascular disease risk factors among urban and rural population South Indian city. Int J Community Med Public Health 2017;4:4623-9.
15. Bhakat BC, Madhavi KV. Cardiovascular Disease Risk among Rural Population of South India. Int Healthc Res J. 2019;3(1):32-34. doi: 10.26440/IHRJ/0301.04.521071.
16. Chaudhary, Shailendra & Nagargoje, M. & Kubde, S. & Gupta, S. & Mishra, S. (2011). Prevalence of cardiovascular diseases risk factors among auto-rickshaw drivers. Indian Journal of Community Health. 22.
17. Agarwal, Ashok Kumar, Mohammad Yuns and Jamal Ahmad. "An Epidemiological Study Of Cardiovascular Diseases In Rural Community Of Jawan Block, Aligarh, U.P., India." Indian Journal of Community Medicine 21 (1996): 22.
18. Gupta R, Guptha S, Sharma KK, Gupta A, Deedwania P. Regional variations in cardiovascular risk factors in India: India heart watch. *World J Cardiol* 2012; 4(4): 112-120 Available from: URL: http://www.wjgnet.com/1949-8462/full/v4/i4/112.htm DOI: http://dx.doi.org/10.4330/wjc.v4.i4.112.