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Survival Analysis of Adult Cardiac Patients and Prevalence of Cardiovascular Disease Risk factors: A Case study of Jimma University Specialized Hospital, Ethiopia

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Abstract
Background:Cardiovascular disease is the leading cause of mortality and morbidity in the world. Although a large proportion of CVDs is preventable, they continue to be a burden in hospital mainly because preventive measures are inadequate. This research is aimed to study the survival analysis of cardiac patients and prevalence of cardiovascular disease risk factors.*Methods:* The data for this study was collected from Jimma University Specialized Hospital, Jimma, Ethiopia. All cardiac patients who were greater than 15 years of age in cardiac follow up unit between 1st January 2010 and 1st January 2012 was included in the study.*Results:* The study shows that among 342 CVD s patients, 175 (51.2%) were male while 167 (48.8%) were female. The findings discovered prevalence of various risk factors in the study population. The prevalence of smoking cigarette (15.8%), chew kchat (18.1%), alcohol (12.3%),184(53.8%) regular base line pulse rate and 158(46.2%) irregular base line pulse rate, 321(93.9%) of negative diabetic mellitus and 21(6.1%) positive diabetic mellitus observed.
Conclusion: Baseline pulse rate, diabetic mellitus and hypertension have an impact on the life status of patients because they more associated with survival status. So after the diagnosis patients with Baseline pulse rate, diabetic mellitus and hypertension should get enough treatment.
Key words: Cardiovascular Disease, Survival Analysis, Prevalence

Introduction

Cardiovascular disease is the leading cause of mortality and morbidity in the world (1). Cardiovascular disease is a leading cause of death and an important cause of hospitalization, high health care costs and reduced quality of life in world (2). Cardiovascular disease (CVD) is the leading no communicable disease; nearly half of the 36 million deaths due to non-communicable diseases (NCDs) are caused by CVDs (2).

Although CVDs are responsible for over 17.3 million deaths per year and are the leading causes of death in the world. About 80 % of the global burden of CVD deaths occurs in low- and middle-income countries, and CVD is predicted to be the leading cause of death and disability worldwide by 2020 mainly because it will increase in low- and middle-income countries (3).

CVDs are also major leading cause of mortality in the developed country. In 2008, cardiovascular disease claimed the lives of 7,663 Coloradans. In 2006, in the United States, more than 831,000 Americans died of cardiovascular disease (2). However, over the past two decades, cardiovascular mortality rates have declined substantially in high-income countries (4-6).

Twice as many deaths from cardiovascular diseases now occur in developing countries as in developed countries (9). These diseases affect younger populations and lead to premature mortality in developing countries (10, 11). These due to lack of prevention or effective management of CVD risk factors (12, 13). Stroke and cervical cancer occur at younger ages and in larger numbers in the African region than in developed countries (14). Age-specific death rates for chronic diseases are higher in many low-income and middle-income countries than in high-income countries (15).

In Sub Saharan Africa overweight and obesity are leading risk factors for a number of chronic diseases, including CVD, diabetes mellitus, and cancer. Obesity is a leading determinant of hypertension, dyslipidaemia, and diabetes mellitus [16].

In Ghana, earlier studies revealed a hypertension preva-lence of 4.5% among rural dwellers while in Nigeria the prevalence of hypertension was found to be 10% in rural areas (17,18). Studies in Tanzania have reported high rates of hypertension in both urban and rural areas, particularly among the obese and elderly (19).

In Ethiopia, studies on the cardiovascular risk factors and complications of diabetes are lacking (20).

Methodology

Study Design

A retrospective study design was conducted on cardiac patients who enrolled to the cardiac follow up clinic of Jimma university specialized hospital during the two year period from 2010 to 2012.

Data Source

The data for this study was collected from Jimma University Specialized Hospital, Jimma, Ethiopia. All variables were extracted from the patient's medical register card at JUSH.

Study Population

All cardiac patients who were 15 years old and older, and placed under cardiac follow up any time in between 1st January 2010 to 1st January 2012 in Jimma University Specialized Hospital was included in the study. Therefore, among the total of 2500 cardiac patients registered from 2010 to 2012, only those cardiac patients satisfy inclusion criteria was included in this study.

Data Collection Tools, Procedures and Quality

Data Collection Tools: Record review tool was prepared. The data was extracted and collected by two staff nurses and one data clerk working at the Cardiac follow up room of the hospital. Data collectors were given a training to review the documents as per the record review tool.

Data Collection Procedure: Before going to collect data, the records to be reviewed (both baseline and follow up records) was identified by their registration/card number. Then, two staff nurses together with two data clerk who were all working at Cardiac follow up room of the hospital were extracting and review the charts. Then after the data was collected, data feeding were followed per patient by using SPSS.

Data Quality: Training on record review was given to data collectors for two days before data collection task. The record to be reviewed was pre-tested for consistency of understanding the review tools and completeness of data items on 5% study subjects. Supervision on every aspect of the review was given by all investigators. The review checklist filled was gathered and checked for completeness by the principal investigator and supervisors on daily basis.

Inclusion and Exclusion Criteria

The study was considering cardiac patients who were under follow-up at Jimma University Specialized Hospital except patients who were age less than 15 years.

Method of Data Analysis

The finding of this work was done through descriptive statistics and inferential statistics. In the descriptive statistics, the prevalence of cardiac disease risk factors, proportion of death in cardiac disease, survival probability pattern or trend and percent of different variables was obtained. Survival analysis involves the modeling and analysis of data having a principal end point, the time until an event occurs (survival time of cardiac patients). In the inferential statistics, mainly chi-square test, correlation and survival analysis were employed**.** By using Cox-regression model, the significant determinant factors of cardiac disease patient mortality were identified.

Ethical Consideration

Ethical clearance was obtained from Jimma University, College of Public Health and Medicine. And, the official ethical clearance also obtained from Jimma University Specialized Hospital medical director. Careful recruitment and training for data collectors was undertaken. To maintain the confidentiality, the data collector (two nurses and one data clerk) was extracting the necessary data from the patient baseline and follow up card.

Result and Discussion

A study shows that among 342 CVD patients, 175 (51.2%) were male while 167 (48.8%) were female. 232 (67.8%) patients were from rural and 110(32.2%) patients were from urban. The age distribution of patients lies with minimum of 15 and maximum of 87 years old. Of 342 CVD patients, 288(84.2%) were married and 54(15.8%) were unmarried (Table 1).

Table 1: Socio-demographic characteristics of respondents

		Frequency	**Percent**
Sex	Male	175	51.2
	Female	167	48.8
Age in Years	<25	54	15.8
	25-34	37	10.8
	35-44	57	16.7
	45-54	88	25.7
	>=55	106	31
Place of Residence	Rural	232	67.8
	Urban	110	32.2
Marital Status	Married	288	84.2
	Single	54	15.8
	Total	342	100

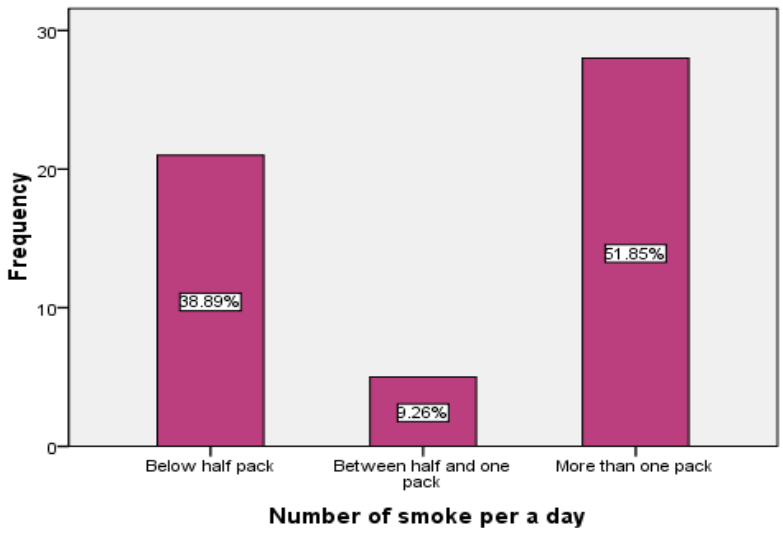
Smoking cigarette, chewing kchat and alcohol use are mostly practiced among CVD patients in JUSH, it was accounted, 54 (15.8%), 62(18.1%) and 42(12.3%) respectively (Table 2).

Table 2: Distribution of smoking cigarette, chewing chat and alcohol use

		Frequency	Percent
Smoking Cigarette	No	288	84.2
	Yes	54	15.8
Chewing chat	No	280	81.9
	Yes	62	18.1
Alcohol use	No	300	87.7
	Yes	42	12.3
	Total	342	100

54 of patients smoke cigarette from them 28 (51.9%) smokes more than one pack per a day while 5(9.3%) and 21 (38.9%) of them smokes one half to one pack and less than half of pack per a day respectively (Figure 1).

Figure 1: Number of smokers per a day



The Table below represents 44(12.9 %) of cardiac patients had a cholesterol level ,184(53.8%) regular base line pulse rate and 158(46.2%) irregular base line pulse rate observed , 321(93.9%) of negative diabetic mellitus and 21(6.1) positive diabetic mellitus observed. The prevalence of diabetes and hypertension observed for all patients were 6.1% and 10.8%, respectively (Table 3).

Table 3: Distribution of clinical variables

		Frequency	Percent
Baseline Cholesterol level	Yes	44	12.9
	No	17	5
	Unknown	281	82.2
Baseline pulse rate	Regular	184	53.8
	Irregular	158	46.2
Diabetic mellitus	Negative	321	93.9
	Positive	21	6.1
Hyepertension	<140/90mmHg	305	89.2
	>=140/90 mmHg	37	10.8
	Total	342	100

The study shows that among 342 CVD s patients, 175 (51.2%) were male while 167 (48.8%) where female. Place of residence increases the risk of exposure to cardiovascular disease risk factors and are detrimental to cardiovascular health.

Table 4: Association between status of patients and demographic information.

		Status		Total		
		Censored	Event		Chi-square	p-Value
Sex	Male	145	30	175	1.04	0.307
		82.90%	17.10%	100.00%		
	Female	145	22	167		
		86.80%	13.20%	100.00%		
Age in year	<25	47	7	54	1.24	0.87
		87.00%	13.00%	100.00%		
	25-34	31	6	37		
		83.80%	16.20%	100.00%		
	35-44	47	10	57		
		82.50%	17.50%	100.00%		
	45-54	77	11	88		
		87.50%	12.50%	100.00%		
	>=55	88	18	106		
		83.00%	17.00%	100.00%		
Marital Status	Married	246	42	288	0.546	0.46
		85.40%	14.60%	100.00%		
	Single	44	10	54		
		81.50%	18.50%	100.00%		
Place of Residence	Rural	203	29	232	4.09	0.043
		87.50%	12.50%	100.00%		
	Urban	87	23	110		
		79.10%	20.90%	100.00%		
Total		290	52	342		
		84.80%	15.20%	100.00%		

The chi-square table shows that CVD has a significance association to smoking status, chewing chat and alcohol use.

Table 5: Bivariate analysis of cardiovascular risk factors

		Status		Total		
		Censored	Event		Chi-square	p-Value
Smoking	No	251	37	288	7.86	0.005
		87.20%	12.80%	100.00%		
	Yes	39	15	54		
		72.20%	27.80%	100.00%		
Chewing Khat	No	243	37	280	4.75	0.029
		86.80%	13.20%	100.00%		
	Yes	47	15	62		
		75.80%	24.20%	100.00%		
Alcohol use	No	260	40	300	6.64	0.01
		86.70%	13.30%	100.00%		
	Yes	30	12	42		
		71.40%	28.60%	100.00%		
Total		290	52	342		
		84.80%	15.20%	100.00%		

Of CVD patients in Jimma University Specialized Hospital, majorities of the diagnosed patients were IHD (32.46%) where as the smallest was DCM+IMD (0.58%). This shows us the higher prevalence of IHD observed next to HHD (22.51%) and VHD (21.64%) (Figure 2).

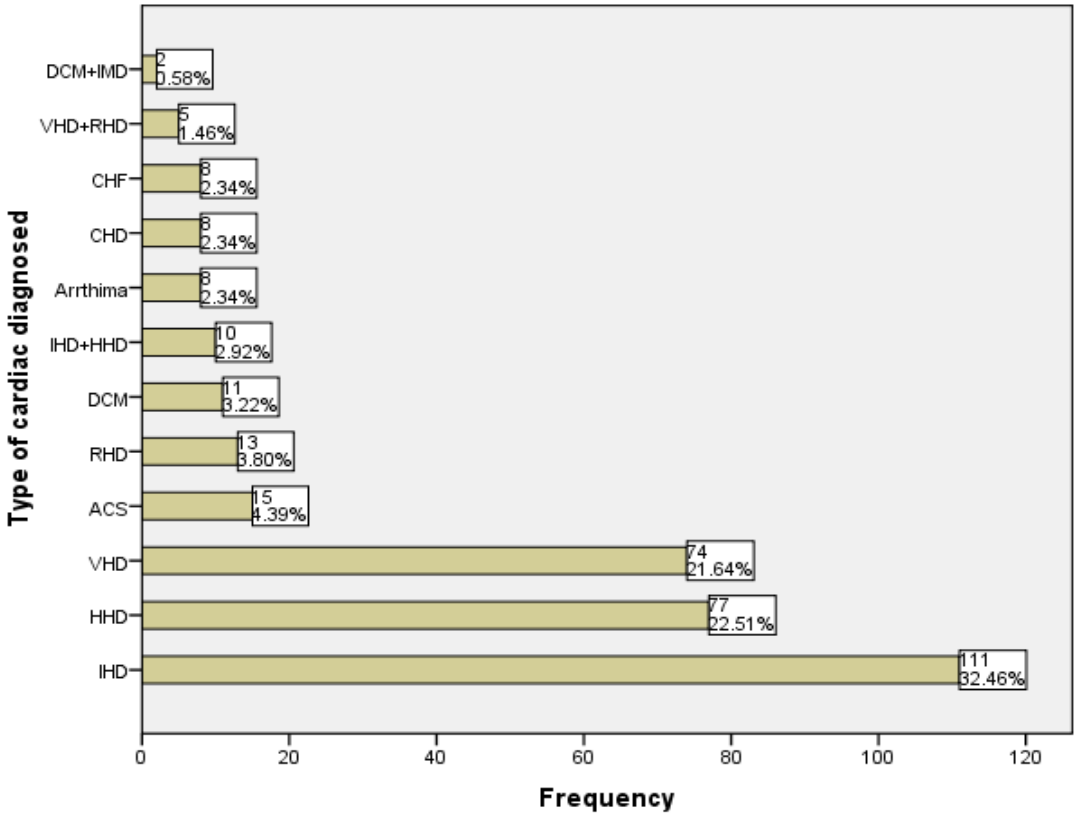


Figure 2: Type of cardiac diagnosed

Chi square test showed us an association between different clinical variables and status of patients in cardiac follow up. Clinical variables like base line pulse rate, diabetic mellitus and hypertension have a significant association with the status of respondents.

Table 6: Association between clinical variables and status of patients.

		Status		Total		
		Censored	Event (Death)		Chi-square	p-Value
Baseline Cholesterol level	Yes	37	7	44	1.013	0.603
		84.10%	15.90%	100.00%		
	No	13	4	17		
		76.50%	23.50%	100.00%		
	Unknown	240	41	281		
		85.40%	14.60%	100.00%		
Baseline pulse rate	Regular	164	20	184	5.80	0.016
		89.10%	10.90%	100.00%		
	Irregular	126	32	158		
		79.70%	20.30%	100.00%		
Diabetic mellitus	Negative	283	38	321	31.33	<0.001
		88.2%	11.8%	100.0%		
	Positive	7	14	21		
		33.3%	66.7%	100.0%		
Hypertension	<140/90mmHg	267	38	305	16.48	<0.001
		87.50%	12.50%	100.00%		
	>=140/90 mmHg	23	14	37		
		62.20%	37.80%	100.00%		
Total		290	52	342		
		84.80%	15.20%	100.00%		

The short-term survival probability was clearly described for the cardiac patients. Those who had survived with taking alcohol and smoking cigarette had greater probability of dying than non alcohol user and

smoker. The excess risk for death was significantly higher for alcohol user and smoker than for non alcohol user and smoker in between 10 to 40 months but did not differ significantly before 10 month and after 40 month.

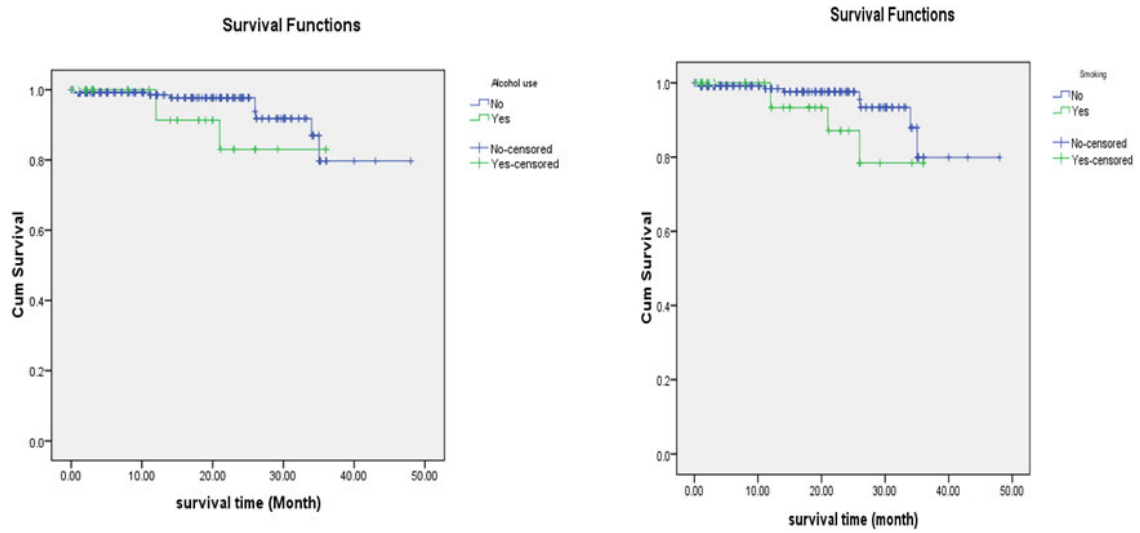


Figure 3: Kaplan-Meier estimates of the survival probability for cardiac patients who were taking alcohol and smoking cigarette respectively.

Results from the Cox regression model identify significant risk factors that are associated to CVD, smoking status (COR=1.6, CI; 0.92 - 2.77 & AOR=0.92, CI; 0.44 - 1.92 ; P<0.001), Chewing chat (COR= 2.17, CI; 1.22 - 3.89 & AOR=1.70, CI; 0.83 - 3.48; P<0.001), Alcohol use (COR= 2.63, CI; 1.45 - 4.74 & AOR=1.9, CI; 0.95 - 3.77; P<0.05), Baseline pulse rate Irregular(COR= 2.00, CI; 1.14 - 3.50 & AOR=1.99 , CI; 1.120 - 3.536; P<0.05), Diabetic mellitus (COR= 4.81 , CI; 2.60 - 8.89 & AOR=2.54 , CI; 0.95 - 3.77; P<0.05), & Hypertension >=140/90 mmHg(COR= 3.38 , CI; 1.83 - 6.24 & AOR=2.39 , CI; 1.16 - 4.92 ; P<0.05) (Table 7).

Table 7: Cox-regression for some clinical variables

		Status			
	Total	**Censored**	**Event**	**COR[95%CI]**	**AOR[95%CI]**
Residence Urban	110	87	23	1.606[0.928, 2.777]	
	32.20%	79.10%	20.90%		
Smoking	55	39	16	2.193[1.216, 3.954]**	.924 [.445, 1.921]
	16.10%	70.90%	29.10%		
Chewing chat	62	45	17	2.178[1.220, 3.890]**	1.708[.838, 3.481]
	18.10%	72.60%	27.40%		
Alcohol use	50	34	16	2.630[1.459, 4.740]**	1.9[.957, 3.771]
	14.60%	68.00%	32.00%		
Baseline pulse rate Irregular	158	126	32	2.002[1.144, 3.502]*	1.99[1.120, 3.536]*
	46.20%	79.70%	20.30%		
Diabetic mellitus	21	7	14	4.814 [2.605, 8.894]**	2.545[1.155,5.608]*
	6.10%	33.30%	66.70%		
Hyepertension >=140/90 mmHg	37	23	14	3.383[1.832, 6.248]**	2.394 [1.164, 4.923]*
	10.8	62.+ 20%	37.80%		

Conclusion and Recommendation

Conclusion

The findings discovered prevalence of various risk factors in the study population. Baseline pulse rate, diabetic mellitus and hypertension have an impact on the status of patients. Daily smoking, regular chat chewing, and drinking of alcohol were significantly associated with the survival status of patients. Older patients had a considerably poorer chance of being free of cardiovascular events than younger patients during follow-up.

Clinical variables like base line pulse rate, diabetic mellitus and hypertension have a significant association with the survival status of respondents. As the age of the patients increased the excess risk for death was significantly higher for alcohol user and smoker than for non alcohol user and non smoker.

Recommendation

Based on the result of the study, we recommend the following points;

- Government and non-government organization should give prominence on awareness creation on those identified risk factors specially chewing kchat and smoking cigarette.
- Baseline pulse rate, diabetic mellitus and hypertension have an impact on the status of patients because they more associated with survival status. So after the diagnosis patients with Baseline pulse rate, diabetic mellitus and hypertension should get enough treatment.
- Future studies also needed to assess the level of awareness, treatment, and control of these risk factors.

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Discussion

This statistical analysis of the prevalence of cardiovascular diseases risk factor shows smoking cigarette, chewing kchat and alcohol use were mostly practiced. These diseases affect younger populations and lead to premature mortality in developing countries (10, 11). But in this finding these diseases affect older populations. These due to lack of prevention or effective management of CVD risk factors (12,13).

From clinical variables; cholesterol level, irregular base line pulse rate, and diabetic mellitus observed as cardiovascular diseases risk factors. In Sub Saharan Africa overweight and obesity are leading risk factors for a number of chronic diseases, including CVD, diabetes mellitus, and cancer. Obesity is a leading determinant of hypertension, dyslipidaemia, and diabetes mellitus [16].

In Ghana, earlier studies revealed a hypertension prevalence of 4.5% among rural dwellers while in Nigeria the prevalence of hypertension was found to be 10% in rural areas (17, 18). Studies in Tanzania have reported high rates of hypertension in both urban and rural areas, particularly among the obese and elderly (19). In Ethiopia, studies on the cardiovascular risk factors and complications of diabetes are lacking (20).

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