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Prevalence of arrhythmias in heavy vehicle drivers

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ABSTRACT

Objective: In our study we aimed to determine the frequency of arrhythmias that we believe may affect driving safety. Methods and Results: Two hundred drivers were randomly selected from the heavy vehicle driver population (82 bus and 118 truck drivers, p = 0.08, q = 0.92, N = 1200, α = 0.01, d = 0.045). A questionnaire was completed via face to face interviews with the individuals including questions about their personal socio-demographic characteristics and symptoms for arrhythmias. An electrocardiography (ECG) was taken of the study participants using the Cardioline Delta 3 Plus Digital ECG machine. The cardiologist at the clinic evaluated the questionnaire and ECG for presence of arrhythmias. When indicated, ambulatory electrocardiography (Holter Monitoring) was performed for 24 hours in 133 individuals (71 drivers and 62 control). In cases that had Holter examination; ventricular ectopy was identified in 25.4% and 22.6%, and supra-ventricular ectopy in 45.1% and 35.5% in the driver and the control groups; respectively. Ventricular tachycardia was detected in 2 patients. Arrhythmia frequencies were 59.1%, 54.8% and 57.1% in drivers, control and both groups respectively. Statistical differences between drivers and control group for rhythm disorders were not detected. Conclusions: Arrhythmias with lethal and devastating potential; need to be diagnosed and treated in professional drivers with extreme caution. The follow up and screening for heart diseases has a crucial role in preventing accidents and occupational diseases in drivers.

Keywords: Arrhythmia; Supra-Ventricular Ectopy; Ventricular Ectopy; Drivers; Prevalence

1. INTRODUCTION

Arrhythmias (or dysrhythmias) are problems that affect the electrical system of the heart muscle, producing abnormal heart rhythms. The prevalence of atrial and ventricular arrhythmias tend to increase with age, even when there's no overt sign of heart disease. Acquired heart disease is the most important factor making a person prone to arrhythmias. The main causes are atherosclerosis, high blood pressure and inflammatory or degenerative conditions. Many chemical agents may cause arrhythmias, sometimes with serious consequences. Known factors include high or low blood and tissue concentrations of a variety of minerals. Alcohol, cigarettes and recreational drugs can provoke arrhythmias. So can various cardiac medications. Even drugs used to treat an arrhythmia may cause another arrhythmia [1].

Most people with heart diseases are able to continue to drive. However this relies on the heart condition and presence of symptoms. Whether a heart rhythm problem will affect driving or not depends on the type of arrhythmia. For most people as long as their arrhythmia is well controlled, driving may continue. However one may need to stop driving if the abnormal heart rhythm has caused or is likely to cause incapacity (unable/inability to drive). Once the underlying cause has been identified and symptoms controlled for at least once month, the patient may continue driving again [2]. Patients with ventricular arrhythmias are often restricted from driving by their physicians for several months. Over the past few years, however, more data have become available suggesting that it is safe to drive within three months of their ventricular tachyarrhythmia [3].

This study was conducted to explore the current health condition of the drivers in terms of cardiac disease. Since the heavy burden caused to the drivers cardiac health may be effected and hence may cause traffic accidents and occupational disease which makes this a potentially life threatening condition. Significant information regarding the current status may add to literature and be a pivotal study for further investigations. Even law makers may give attention to the study for further arrangements in this field of occupation.

In our study we aimed to determine the frequency of arrhythmia that has potential to affect driving safety.

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2. METHODS

This cross-sectional type study was conducted between November 2004 and September 2006. The number of registered heavy vehicle drivers to Sivas Professional Driver Association is 1200 (492 bus and 708 truck drivers). A total of 200 male persons (82 bus and 118 truck drivers) were randomly selected from the heavy vehicle driver population ($p = 0.08$, $q = 0.92$, $N = 1200$, $\alpha = 0.01$, $d = 0.045$). Two hundred non-driver persons of the same age group constituted the control group. Ninety percent were reached for the sample. A total of 181 heavy vehicle drivers were included in the study (75 bus and 106 truck drivers). Drivers with a constant job were included into the study. We reached the drivers via Sivas Professional Driver Association registry and asked for their participation and given informed consent. Drivers in a firm were reached by going to their firms and given information about the study. The drivers that were working for themselves were asked by phone calls and their participation into the study were provided. The ones that were unwilling to participate and did not come to their appointments two times were excluded from the study. No other exclusion criteria were accepted other than these.

Working as a driver before, unemployment, students and retired persons were excluded from the control group. No professional driver was present in the control group. Two cases that were realized to be professional driver, eleven cases that did not come to their appointment and 8 cases that needed further investigations were excluded from the control group (Totally 179 persons).

The current study was approved by Cumhuriyet University Ethic Committee and participant's confidentiality was guaranteed and the cases were told to feel free to withdraw from the study without any consequences whatsoever.

This study was planned as two steps and on non-work day. First step was conducted in Department of Public Health, Faculty of Medicine Building (outside of hospital) Cumhuriyet University. A questionnaire was completed in face to face interviews with the individuals who were asked questions about their personal sociodemographic characteristics and symptoms for arrhythmia. The questions of the questionnaire were oriented to the cardiac history and possible symptoms in arrhythmias. The question were established by the cardiology fellows that participated in the study. However the questionnaire was not validated for detection of arrhythmias which was not a primary objective of the current study. An electrocardiography (ECG) was taken of the study participants using the Cardioline Delta 3 Plus Digital ECG machine.

In the second stage of the study, a patient file was created for every participant which included the questionnaire and ECG. An appointment was made for the patient at Cumhuriyet University Medical Faculty Teaching Hospital Cardiology Outpatient Clinic. The cardiologist at the clinic evaluated the questionnaire and ECG for arrhythmias and, when indicated, ambulatory electrocardiography (Holter Monitoring) was performed for 24 hours in 133 individuals (71 driver and 62 control). A Holter monitor is a portable device for continuously monitoring various electrical activity of the cardiovascular system for at least 24 hours. It is frequently used for detecting arrhythmias and for checking the success of the drugs or therapies to control the arrhythmias.

The data were entered into the computer using the SPSS program. Student's t test and Chi square test were used in the statistical evaluation.

3. RESULTS

The mean age of the study participants was 40.32 ± 8.58 years. There was no significant difference between the study and control groups for mean age. The distributions of some of the risk factors for the study and control groups was given in **Table 1**.

Table 1. The distribution of some of the risk factors for the study and control groups.

	Drivers		Control	
	n	%*	n	%*
Blood Pressure, ($\chi^2 = 3.92$, $p < 0.05$)				
Hypertensive	38	21.0	23	12.8
Normotensive	143	79.0	156	87.2
Cigarette Status, ($\chi^2 = 3{,}63$, $p > 0.05$)				
Current Smokers	114	63.0	95	53.1
Not current smokers	67	27.6	84	41.3
Regularly Physical Activity, ($\chi^2 = 3.43$, $p > 0.05$)				
Yes	25	13.8	38	21.8
No	156	86.2	141	78.8
Body Mass Index, ($\chi^2 = 9.33$, $p < 0.05$)				
Normal	41	22.7	60	33.5
Overweight	87	48.0	88	49.2
Obese	53	29.3	31	17.3
Balanced Diet, ($\chi^2 = 0.45$, $p > 0.05$)				
Yes	105	58.0	111	62.0
No	76	42.0	68	38.0
Family history of Cardiovascular Disease, ($\chi^2 = 5.67$, $p < 0.05$)				
Yes	35	19.3	54	30.2
No	146	80.7	125	69.8
Alcohol Consumption, ($\chi^2 = 0.10$ $p > 0.05$)				
Yes	34	1.7	36	3.9
No	147	81.2	143	79.9

We evaluated the drivers for presence of cardiac risk factors. Among drivers 48.0% cases were were mildly obese and 29.3% were obese, compared to 49.2% and 17.3%, respectively, for the control group ($p < 0.05$). Blood pressure readings revealed presence of hypertension in 21.0% of the drivers and 12.8% of the control group ($p < 0.05$). Fifth-eight percent of the drivers and 62.0% of the control group had a balanced diet ($p > 0.05$). The prevalence of a history of heart disease in a first degree relative in drivers and the control group were 19.3% and 30.2%; respectively ($p > 0.05$). The prevalence of cigarette smoking in the drivers and in the control group was 63.0% and 53.1% ($p < 0.05$). The majority of both the drivers (81.2%) and the control groups (79.9%) consumed no alcohol ($p > 0.05$). The ECG of the cases were obtained. An example ECG of a case is given in **Figure 1**.

The distribution of answers to questions related to arrhythmia according to study and control group was given in **Table 2**.

The frequencies of feeling irregularities in heart rhythm were 36.5% and 31.3% while feeling pauses were 18.8% and 11.2% in the driver and control group; respectively. The frequencies of having acceleration in heart rhythm during rest were 21.5% and 19.0%, while having deceleration were 16.0% and 6.7% in the driver and control groups; respectively.

24 hours of ambulatory electrocardiography monitoring was performed in 130 individuals (71 driver and 62 control). Means of basic rhythm parameters obtained from Holter monitoring according to driver and control group were given in **Table 3**.

The prevalences of rhythm disorders was given in **Table 4**.

In the Holter study frequencies of having ventricular ectopy were 25.4% and 22.6%, while having supra-ventricular ectopy were 45.1% and 35.5% in driver and control groups respectively. Ventricular tachycardia was detected in 2 patients with supra-ventricular ectopy. Overall frequencies of having some sort of arrhythmia were determined as 59.1%, 54.8% and 57.1% in drivers, control and both groups respectively. Statistical differences between drivers and control group for rhythm disorders were not detected.

In total, 360 people the prevalences of ventricular, supra ventricular and arrhythmia were identified as 8.9%,

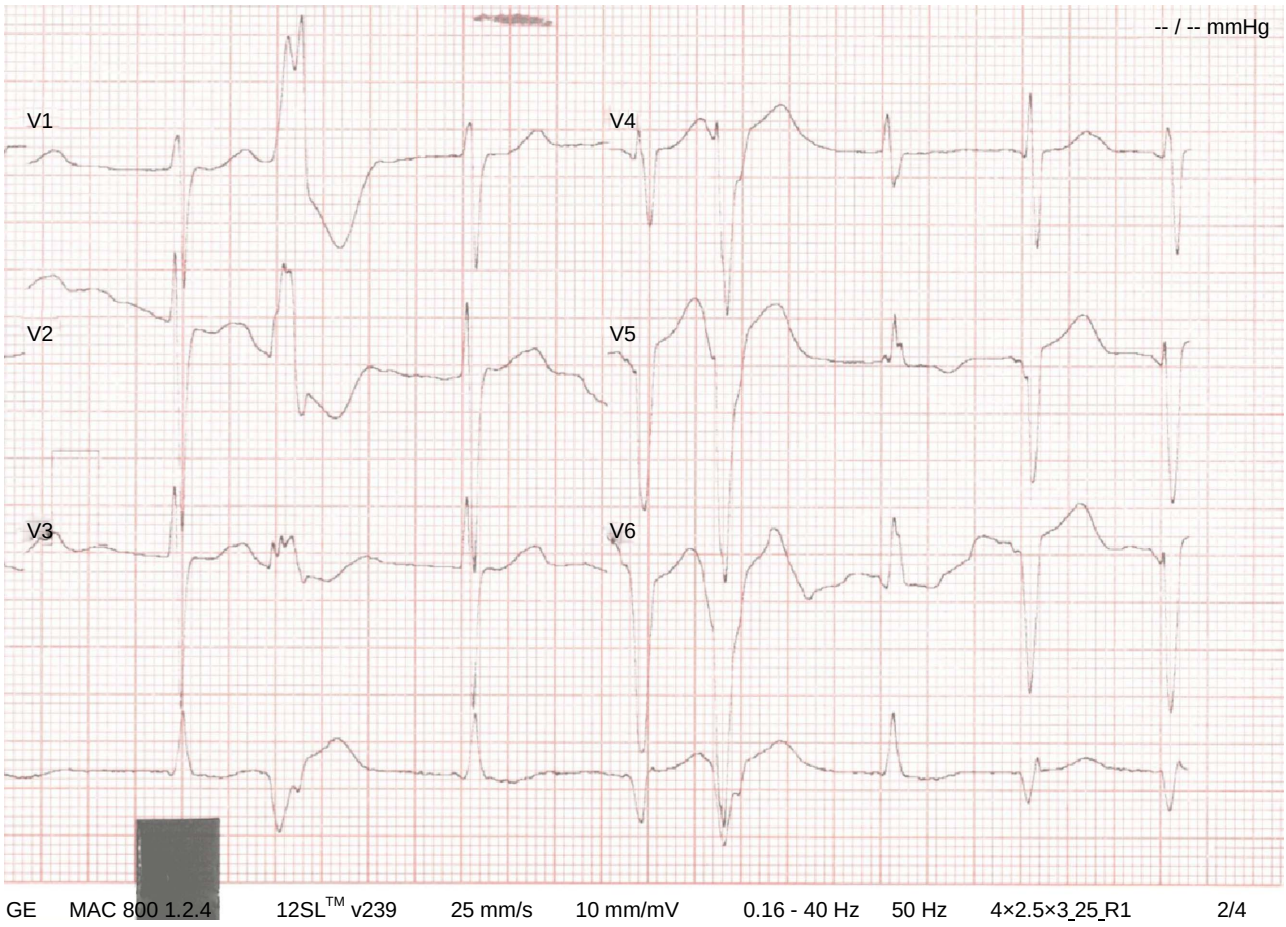

Figure 1. An ECG of a patient showing ventricular extrasystoles of different origins and aberrant conduction in some beats.

Table 2. The distribution of answers to questions related to arrhythmia according to study and control group.

	Drivers (181)		Control (179)		Total	
	n	%	n	%	n	%
Have you ever felt an *irregularity in your heartbeat*? (χ^2 = 1.08, p > 0.05)						
Yes	66	36.5	56	31.3	122	33.9
No	115	63.5	123	68.7	238	66.1
Have you ever fainted? (χ^2 = 3.19, p > 0.05)						
Yes	10	5.5	19	10.6	29	8.1
No	171	94.5	160	89.4	331	91.9
Have you ever felt a chest pain with palpitations? (χ^2 = 1.42 p > 0.05)						
Yes	36	19.9	45	25.1	81	22.5
No	145	80.1	134	74.9	279	77.5
Have you ever felt an acceleration in your heartbeat rest in case? (χ^2 = 0.36, p > 0.05)						
Yes	39	21.5	34	19.0	73	20.3
No	142	78.5	145	81.0	287	79.7
Have you ever felt a deceleration in your heartbeat rest in case? (χ^2 = 7.74, p < 0.05)						
Yes	29	16.0	12	6.7	41	11.4
No	152	84.0	167	93.3	319	88.6
Have you ever felt a pause in your *heartbeat*? (χ^2 = 4.09, p < 0.05)						
Yes	34	18.8	20	11.2	54	15.0
No	147	81.2	159	88.8	306	85.0

16.4% and 21.1% respectively.

4. DISCUSSION

Patients with arrhythmias may experience complete or partial loss of consciousness, and questions about activities that are safe for them arise every day. Experience in Europe also suggests that the impact of arrhythmia-induced loss of consciousness is a relatively minor factor in road accidents. Approximately 0.1% of reported road accidents are attributed to medical causes, and only 10% to 25% of these are due to cardiac events [4]. Among 3000 cases surveyed from the records of the Medical Control Unit of the Virginia Commonwealth Department of Motor Vehicles, only 6% were deemed related to cardiovascular disease, and of these, only a fraction (14%) appeared to be associated with cardiac arrhythmias [5].

Rigou *et al.* determined that 43.4% of university students had ventricular arrhythmias (12 males and 18 females) [6]. In a study conducted by Gogolashvili *et al.* in Krasnoiarsk region the prevalences of supraventricular

Table 3. Means of basic rhythm parameters.

	Driver (n=71)	Control (n = 62)	p value
	X ± SE	X ± SE	
Basic Rhythm			
Average rate	75.59 ± 1.18	77.43 ± 2.76	p > 0.05
Minimum rate	49.2 ± 1.77	50.07 ± 2.69	p > 0.05
Maximum rate	128.74 ± 3.01	129.86 ± 3.98	p > 0.05

Table 4. The frequencies of rhythm disorders for driver and control group according to Holter monitoring.

Holter applied individuals	***Drivers* (71)**		***Control* (62)**		***Total* (133)**	
	n	**%***	**n**	**%***	**n**	**%***
VE (χ^2 = 0.03, p > 0.05)	18	25.4	14	22.6	32	24.0
SVE (χ^2 = 0.9, p > 0.05)	32	45.1	22	35.5	59	44.4
VE + SVE (χ^2 = 2.03, p > 0.05)	8	11.3	2	3.3	10	7.5
Ventricular tachycardia (χ^2 = 0.04, p > 0.05)	2	2.8	-	-	2	1.5
Any kind of arrhythmia (χ^2 = 0.11, p > 0.05)	42	59.1	34	54.8	76	57.1
Whole individuals	***Drivers* (181)**		***Control* (179)**		***Total* (360)**	
	n	**%***	**n**	**%***	**n**	**%***
VE (χ^2 = 0.27, p > 0.05)	18	9.9	14	7.8	32	8.9
SVE (χ^2 = 1.65, p > 0.05)	32	17.7	22	12.3	59	16.4
VE + SVE (χ^2 = 2.51, p > 0.05)	8	4.4	2	1.1	10	2.8
Ventricular tachycardia (χ^2 = 0.49, p > 0.05)	2	1.1	-		2	0.6
Any kind of arrhythmia (χ^2 = 0.72, p > 0.05)	42	23.2	34	19.0	76	21.1

*Column percent, VE: ventricular ectopy, SVE: supra ventricular ectopy.

and ventricular ectopies were reported as in 56.7% and 34.4%, respectively [7].

Komsuoğlu *et al.* in their study conducted in 130 elderly patients, reported that according to the Lown grades, in grade 1, ventricular premature complexes had very high prevalence in healthy subjects, in grade 2, ventricular premature complexes had a high prevalence in hypertensives with left ventricular hypertrophy (73.5% and 48.8%, respectively). The results of his study demonstrated that ventricular premature complexes were common in hypertensive patients and healthy elderly but did not cause high complexity in either group. Ventricular premature complexes detected by ambulatory ECG monitoring in healthy, active subjects and in untreated hypertensive patients were not an independent risk factor in elderly patients in his study [8]. In a study by Engel and Burckhardt conducted in 35 healthy volunteers with a mean age of 24 years the prevalences for ventricular and supraventricular premature contractions were recorded occasionally in 31% and with greater frequency in 6% [9]. In a review by Paparella *et al.* the prevalences for supra-ventricular premature beats has been reported as in 10% - 20% of subjects less than 20 years, in 30% - 60% of those between 20 and 60 years, in 90% of subjects older than 75 years [10]. The frequency of having of one or more premature ventricular beats (PVBs) was reported as 61% by Rasmussen *et al.* [11]. In a study conducted by Turner *et al*. the arrhythmia prevalence was reported as 80% (13.5% ventricular, 38.4% supra-ventricular and 48.1% combined) [12]. In a study conducted by Adey *et al*. in Burckhardt the frequencies of ventricular, supraventricular and combined ectopy were reported as 16%, 10.5% and 10.5; respectively [13]. Hanne-Paparo *et al*. found a 6.2% prevalence for isolated atrial or ventricular premature contractions in athletes [14]. The prevalence of frequent than 1:10 premature beats was reported as 11% in Onat's study [15]. The prevalences of arrhythmias were higher than Adey, Hanne-Paparo and Onat's work while lower than the other studies in our study.

Researches related to the frequency of arrhythmias in different societies and groups have been made. We think our study may add to the current data in the literature about the topic.

5. CONCLUSION

Arrhythmias having lethal and devastating potential need careful examination and follow-up. Although the body mass index, family history cardiovascular disease and blood pressure were significantly different in heavy vehicle drivers compared to the control group these did not cause significant difference in terms of arrhythmias. Periodic health check-ups for heavy vehicle drivers would allow for the diagnosis of any heart disease at an early stage and the initiation of necessary treatment.

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