ORIGINAL ARTICLE

Differences in the number of autopsies and causes of death between the months of Ramadan and control months and between two cities, Ankara and Bursa in Turkey

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ABSTRACT

Aim To investigate differences in the number of autopsies and causes of deaths affected by spiritual factors and concentration during Ramadan and to compare the results from two cities, Ankara and Bursa.

Methods Autopsies performed in morgue departments of the Council of Forensic Medicine, Ministry of Justice, in Ankara and Bursa during Ramadan and non-Ramadan (control) months between 2003 and 2006 were retrospectively investigated for age, sex, cause of death, manner of death and blood toxicological analyses.

Results The number of autopsies was significantly higher in Ramadan months than in the control months in Bursa, but low and insignificant in Ankara. A significant decline in traumatic deaths was observed during Ramadan ($p < 0.05$).

Conclusion During Ramadan, while rates of homicidal deaths displayed a relatively steep decline in females, the rates of homicide were increased in males. This might be due to a decrease in natural deaths and accidents. To make further comments, conducting studies evaluating detailed socio-demographic features and assessing relevant psychological states of the victims can be beneficial.

Key words: traumatic death, autopsy, seasonal variations

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INTRODUCTION

Forensic autopsy is generally performed in cases of violent deaths such as homicides, suicides and accidents, and also sudden, unexpected and suspicious deaths. Physicians who perform necropsies should evaluate cases completely (1). Whether seasonal or monthly changes occur in the incidence of violent deaths has been an interesting subject of research. Several studies from India, Columbia, Finland, Russia and Japan have revealed seasonal variations in homicidal, suicidal and natural deaths. When they peak varies from country to country (2-8). Ramadan is a period of worship for Muslims which lasts for 29 or 30 days according to Lunar calendar and during which Muslims refrain from eating, drinking and sexual intercourse from dawn to sunset. According to Gregorian calendar, every year Ramadan comes 10 days earlier than the previous year. To our knowledge, there have not been any studies investigating possible changes in the nature and the number of forensic deaths in different seasons. Ankara and Bursa are developed, industrialized and the most populated two cities of Turkey. Ankara is the capital metropolitan city of Turkey which has different demographic characteristics from Bursa. In this study, changes in the incidence of forensic deaths in the month of Ramadan relative to control months were investigated, and data from Ankara and Bursa were compared.

MATERIAL AND METHODS

In this study, autopsies performed in Group Presidency of *Morgue Specialization* Department of the State *Institute* of Forensic Medicine of Ankara and Bursa cities during 4-year period between 2003 and 2006 in Ramadan, and non-Ramadan (control) months were retrospectively analyzed. The number and rate of autopsies, age, gender, cause and manner of death, and hematotoxicological analyses were evaluated. This study required a seasonal analysis of autopsies. Ramadan Group included Ramadan months of the four years, i.e. 2003, 2004, 2005 and 2006. Control months corresponded to one-month periods of the same years following Ramadan (Table 1).

Statistical analyses were performed by using chi-square test, t-test and one way ANOVA. This investigation was conducted with the permission obtained from the Scientific Research Committee of the Presidency of Council of Forensic Medicine.

RESULTS

From 2003 and 2006, totally 3831 autopsies in Ankara, and 3187 in Bursa cities were conducted, of which 486 (288 in Ankara, and 198 in Bursa) performed in the month of Ramadan, and 582 (313 in Ankara, and 269 in Bursa) performed in the control months were analyzed retrospectively.

Table 1. Time interval s investigated in Ramadan and control groups

Years	Ramadan group		Control group	
2003	October 27	November 24	November 27	December 26
2004	October 15	November 13	November 16	December 14
2005	October 5	November 2	November 6	December 4
2006	September 24	October 22	October 27	November 24

A significant decrease in autopsies in the month of Ramadan was noted. Without considering the impact of the years, although statistical analysis indicated a lower rate of autopsies in the month of Ramadan in Bursa, no significant difference was found for Ankara. When both cities were considered in combination, a significant drop in the rates of autopsies performed in the month of Ramadan was detected (Table 2).

Table 2. Counts and percent of cases for the month of Ramadan in Ankara and Bursa during the 2003-2006

	No (%) of cases					
	Ankara		Bursa		Ankara & Bursa	
Years	Ramadan	p	Ramadan	p	Ramadan	p
2003	58 (11.9)	0.280	48 (9.9)	0.043	106 (21.8)	0.023
2004	66 (13.6)	0.393	33 (6.8)	0.008	99 (20.4)	0.036
2005	77 (15.8)	0.384	60 (12.3)	0.129	137 (28.2)	0.149
2006	87 (17.9)	0.488	57 (11.7)	0.406	144 (29.6)	0.408
Total	288 (59.3)	0.071	198 (40.7)	0.002	486 (100)	0.000

A comparison of autopsies in Ankara and Bursa between years showed a significant difference in the number of autopsies during the Ramadan in Bursa between 2004 and 2006. Regardless of the year, comparatively decreased rates of autopsies were seen in Bursa. Generally speaking, as seen in Table 3, the number of autopsies performed was significantly lower in Bursa than in Ankara.

When 28 cases aged < 1 year, 13 cases whose age was undetermined and four cases whose both age and gender could not be identified (which amounted to 45 cases) were excluded, the mean age of all the cases was 42.39 ± 19.92 years. Mean ages of the cases in Bursa and Ankara were 43.10 ± 20.87 and 41.80 ± 19.11 years, respectively. Mean ages of the autopsied cases in the month of Ramadan and the control months were 42.49 ± 19.20, and 42.30 ± 20.51 years, respectively.

Mean ages of the cases dying from traumatic and natural causes were 39.44 ± 18.78 and 48.20 ± 21.83 years, respectively. T-test demonstrated that the mean age of the cases dying from traumas were significantly lower than that of the cases dying from natural causes with 95% confidence interval.

Gender and age groups of the cases were not independent of each other. The incidence of autopsies in females was lower than that of the male population, and a significant difference was found between genders in the number of autopsies in different age groups (p= 0.006).

Autopsies revealed that 376 cases died of natural causes and 692 cases died of traumatic causes. When traumatic deaths in Ramadan were compared with those in control months, a significant decrease in the traumatic death rate was detected in Ramadan (p= 0.003). A significant difference was found between male and female decedents in the Ramadan and control groups (p= 0.000).

Table 3. Comparison of autopsy rates in Ankara and Bursa during the months of Ramadan

	No (%) of cases		
Years	**Ankara**	**Bursa**	**p**
2003	58 (54.7)	48 (45.3)	0.382
2004	66 (66.7)	33 (33.3)	0.001
2005	77 (56.2)	60 (43.8)	0.171
2006	87 (60.4)	57 (39.6)	0.015
Total	288 (59.3)	198 (40.7)	0.000

Suicidal attempts rates increased in the months of Ramadan for both genders. In the months of Ramadan, murderous acts were much less frequently seen in females than in males (Table 4).

Cardiovascular diseases which caused death in 55% of cases of natural deaths were acute myocardial infarction (n=93), heart failure (n=44) and cardiac tamponade (n=9).

In hematotoxicological analyses, no active substances were detected in the blood samples of 859 cases. However, active ingredients such as cannabinoid derivative tetra-hydro cannabinol (THC) in six cases, ethanol in 185 cases and opiate active substance 3,4 methylenedioxy-N-methylamphetamine (MDMA) in three cases, opiate and cannabinoid in two cases, opiate and ethanol in two cases, ethanol and cannabinoid in three cases and ethanol and methanol in two cases were detected. Hematotoxicological analyses showed toxic substances in 113 (54.1%) cases in the control group and in 96 (45.9%) cases in the Ramadan group. The distribution of substances detected in blood samples of the cases in the Ramadan, and control groups is presented in Table 5. In Bursa toxic substance use during the month of Ramadan significantly decreased (p= 0.028).

Table 5. Distribution of toxic substances used in Ankara and Bursa in Ramadan and control groups

		No (%) of cases		
City	**Substance used**	**Control**	**Ramadan**	**Total**
Ankara	(-)	247 (41.1)	212 (35.3)	459 (76.4)
	Ethanol	63 (10.4)	73 (12.1)	136 (22.6)
	Methanol	1 (0.2)	0	1 (0.2)
	Opiates	1 (0.1)	1(0.17)	2 (0.3)
	Mixture Substance	1 (0.2)	2 (0.3)	3 (0.5)
Total		313 (52.1)	288 (47.9)	601 (100)
Bursa	(-)	222 (47.5)	178 (38.1)	400 (85.7)
	Cannabinoid met.	1 (0.2)	5 (1.07)	6 (1.3)
	Ethanol	38 (8.1)	11 (2.4)	49 (10.5)
	Methanol	2 (0.4)	3 (0.6)	5 (1.07)
	Opiates	1 (0.2)	0	1 (0.2)
	Mixture Substance	5 (1.1)	1 (0.2)	6 (1.3)
Total		269 (57.6)	198 (42.4)	467 (100%)

DISCUSSION

In almost every country in the world, mortality rates display seasonal patterns depending on the cause, manner and scene of death (9). A correlation between seasonality and death is generally known to exist in many countries and regions. Numerous studies on the seasonal frequency of many causes of death such as cardiac, respiratory and infectious diseases in the countries within the middle latitude zone have been performed (10). Regional properties, climate, environmental conditions, socioeconomic status and demographic characteristics should be considered in the evaluation of the seasonal impact (9, 10).

Table 4. Distribution of causes of death in the Ramadan and control groups

	No (%) of cases								
Manner of death	**Control Group**			**Ramadan**			**Ramadan & Control**		
	Females	**Males**	**Total**	**Females**	**Males**	**Total**	**Females**	**Males**	**Total**
	20 (3.4)	68 (11.7)	88 (15.2)	27 (5.6)	71 (14.7)	98 (20.2)	47 (4.4)	139 (13.1)	186 (17.5)
	47 (8.1)	114 (19.7)	161(27.8)	31(6.4)	75 (15.5)	106 (21.9)	78 (7.3)	189 (17.8)	267 (25.1)
Natural death	46 (7.9)	158 (27.2)	204 (35.2)	40 (8.3)	128 (26.4)	168 (34.7)	86 (8.1)	286 (26.9)	372 (35.0)
Homicide	17 (2.9)	110 (19.0)	127 (21.9)	9 (1.9)	103 (21.3)	112 (23.1)	26 (2.4)	213 (20.0)	239 (22.5)
TOTAL	130 (22.4)	450 (77.6)	580 (100.0)	107 (22.1)	377 (77.9)	484 (100.0)	237 (22.3)	827 (77.7)	1064 (100.0)

Diyarbakır Institute of Forensic Medicine reported that 84.19% autopsies performed in 2008 showed traumatic deaths with a mean age of 28.1±19 years and a male to female ratio of 2.08 (11). In Istanbul during the period of 3 years, the mean age of 160 autopsied cases of traumatic deaths was 32.9±15.6 years with a male to female ratio of 3.57 (12). In various studies on traumatic deaths from other countries, mean ages of the decedents ranged between 42 and 46 years. The male to female ratio was reported to be 1.86 in one study but, this ratio varied from 2.23 to 2.86 in other studies (13-17). In this study, the mean age of the traumatic deaths was significantly lower than that of the natural deaths.

In this study, the incidence of autopsies on females was lower than that of autopsies on males. The mean age of traumatic deaths was low with a higher male to female ratio when compared with the results of the studies performed in other countries (2,3,7). This difference can be explained by the younger population in Turkey in comparison with populations of many other Western countries, and still lower rates of involvement of women in social life activities (3,5).

Compared with the control group, a significant decrease in the rate of traumatic deaths in the months of Ramadan was detected in this study. However, the incidence of suicides relatively increased in the months of Ramadan for both sexes, being more strikingly among females. Compared with the non-Ramadan months, this increase in the incidence of suicidal attempts in almost all months of Ramadan during the study period of 4 years which corresponded to autumn suggests the presence of another factor apart from seasonal changes (7, 18-20). Since detailed socio-economic data could not be found in necropsy files of the cases, it is difficult to comment on this subject. In this study, the incidence of suicidal attempts might have increased because of elevated stress between the end of September and December.

According to research, rates of suicides varied among countries, and the highest rates were encountered in developed countries (7,21). A much greater number of males were victims of suicidal attempts. These rates were influenced by factors such as occupation, ethnicity, psychiatric diseases, substance abuse, personality disorders and family history (22).

In studies performed in Finland, a strong seasonal impact on the incidence of suicidal attempts and a highest risk of suicides during spring months were reported (23,24). An investigation performed in Italy revealed that the number of suicides reached its peak in February, and made a second peak in June and July. The highest number of suicides occurred during hours of 08.31 -12.30. At Nagpur University in India, (4.2 %) cases of homicide and (19. 5%) suicidal deaths were detected (2).

In the present study, during the months of Ramadan, the incidence of homicides declined greatly among women whereas the incidence of homicides in men increased. Even though, the number of homicides decreased during Ramadan, there was a considerable increase in all-cause mortalities detected during these months. The incidence of suicidal and murderous attempts is increasing in the whole world (2,3,8). Every year homicides and suicides are responsible for the death of nearly one million people. Besides, annually, 2.5 million people lose their lives because of accidents, burns, drowning in water, poisoning, falls from a height, and natural disasters (2).

In this study, although no significant differences could be found in the incidences of homicides and suicides between Ramadan and control months, the number and relative rates of murderous deaths decreased in females, whereas the rate of murderous deaths increased in males. This increase in the rate of murdered males suggests that they are involved in social life activities more predominantly than females, which might have increased the risk of murders of males.

There have been studies which indicate a significant association between traumatic events and alcohol consumption (25-28). In this study, although there was a remarkable decrease in toxic substance use during the months of Ramadan especially in Bursa, the incidence of traumatic deaths was higher in cases found to have increased blood levels of toxic substances on postmortem analyses, which is consistent with the literature.

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