AJEM-34392: Research Article

Comparison of EMS Cases in Different Types of Mass Gathering Events Held Between 2015-2018 in Turkey

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Aim: The aim of the study is to evaluate the Emergency Medical Services (EMS) cases in some mass gatherings held in Turkey between the years of 2015-2018 and to compare the PPR and TTHR rates of different types of MGs.
Methods: The research is a descriptive cross-sectional epidemiological study. The population of the study consists of 112 EMS records of the Commemoration Events of the Çanakkale Land Warfare (CEÇLW), Zeytinli Rock Festival (ZRF), Summer Deaflympics (DEAFLYMPICS) and European Youth Olympic Winter Festival (EYOF) organizations held in Turkey between the years of 2015-2018.
Results: the hours of 12: 00-17: 59 (34.0%, n = 161). 57.4% (n = 272) of the cases were due to medical 474 EMS cases were examined in the study. 49.5% (n = 235) of the cases were in DEAFLYMPICS and 57.6% (n = 273) of the cases were male. The mean age of the cases was 30.3 ± 16.5 (Min: 0, Max: 92). Most cases occurred between reasons. According to the triage codes, 57.7% (n = 153) of the cases were green, 32.3% (n = 153) were red and 15.8% (n = 75) were yellow. When the results of the cases were analyzed, 54.0% (n = 256) of the cases were transferred to hospital, 20.7% (n = 98) were on-site intervention and 14.1% were refusal of transfer.
Conclusion: As a result, differences in PPR and TTHR rates are observed in different types of MG.

Keywords: Ambulance, Emergency Medical Services, EMS, Mass Gathering, PPR, TTHR.
Short Title in English: Comparison EMS of Mass Gathering

Introduction

Although mass gatherings (MG) are common throughout the world, there is no universal definition yet(1–4). According to the World Health Organization (WHO), MGs are defined as the gathering of people in a planned or unplanned manner in an amount that exceeds the limits of emergency plan and the response resources of a society(5–13). The most common noncommunicable health problems seen in MGs are headache, abdominal complaints, abrasion/lacerations, orthopedic discomfort, eye injury, syncope/dizziness, burns, chest pain, heat-related injuries, respectively(14). Patient Presentation Rate (PPR) is seen in the range of 0.12 to 0.90 in MGs. Among the leading causes of mortality during MGs are stampede and heat related diseases(15). Alcohol and drug use are common in many festivals. Conditions requiring medical intervention are 10% more in such events.

Transport to Hospital Rate (TTHR) value for the study of Bledsoe et al. was 0.61, 0.54 for Lund et al., 0.22 for Luther et al., and 0.19 for Munn et al.(16). In another study, 15 MGs held in South Australia were analyzed, and PPR was found to be 0.48 (n = 146) while TTHR was found to be 0.04 in the MG activities where the total number of participants was 303,500(17). Minor problems (headache, neck pain, fluid retention, etc.) were among the most common health problems at 41.1% (n = 60)(17). This is followed by sprains, injuries and insect bites at 26.7% and major injuries (fractures and lacerations) at 13.7%(17). Almost 90% of the patient

admissions took place in the activities where alcohol sales were allowed(17). In the same study, while the average temperature of the activities was between 20º-25º, there were fewer patient applications in the activities above 25º than the others, contrary to the information in the literature(17).

This is the second scientific research on MG conducted in Turkey. It is important in terms of presenting measures such as PPR and TTHR for medical cases which occurred in different types of mass gatherings held in Turkey to the world literature for the first time. Within the scope of the study, 4 different types of mass gathering activities are compared with each other and with similar studies in the world.

The aim of the research is to evaluate the EMS cases in some mass gatherings held in Turkey between the years of 2015-2018 and to compare the PPR and TTHR rates of different types of MGs.

Materials and Methods:

The research is a descriptive cross-sectional epidemiological study. It is designed as a retrospective record research. Within the scope of the study, medical case records kept by 112 Ambulance Service on accidents and injuries, which occurred in some mass gathering events between 2015-2018, were evaluated.

Population of the Research

Health directors were interviewed about EMS planning and preparation works for Commemoration Events Çanakkale Land Battles (CEÇLW), Hearing Impared Summer Olimpics (DEAFLYMPICS) and European Youth Olympics Festival (EYOF) within the context of information about the population. Since no special preparation was made for Zeytinli Rock Festival (ZRF), no information was obtained (Table 1).

Characteristics of Selected Mass Gatherings

CEÇLW is held annually as a commemoration event in the Gallipoli peninsula of Çanakkale between April 24-25. In the CEÇLW, activities are organized at different points of the peninsula at the same time or in consecutive time periods. People of all ages come to the activities. An important part of the participants is 12-18 or 65+ years old. During the event, a massive physical exertion is made in some sections. Very Important Personel (VIP) and Very Very Important Personel (VVIP) people also attend the ceremonies. Therefore, a much different and comprehensive preparation is required than usual. Participants begin to move to Gallipoli on the morning of April 24. Therefore, health measures start on April 23 and take place on the field exactly on April 24 at 06:00. It occurs in the open ground with approximately 7-8 hours of sleep

and rest during the night connecting the 24th of April to the 25th April. Around 10,000 people from different age groups from Australia and New Zealand attend the events (Table 1). At the Australian and New Zealand Army Corps (ANZAC) ceremonies, the ANZAC soldiers who died in the First World War are commemorated by performing the Dawn Service on the morning of 25 April. After the Dawn Service, participants climb a pathway towards the Long Pine monument (Table 1). Çanakkale 112 Ambulance Service takes health measures with pedestrian National Medical Rescue Teams (NMRT) for about 2 km. The ceremonies end on April 25 at 20:00.

ZRF is an event that usually young people attend by the sea with tent accommodation. In this event, health services in the area are provided by private ambulance companies. However, in emergency cases, Balıkesir 112 Ambulance service intervenes and enables patients to be transferred to the nearest health facility. The events were organized as 3 days in 2014 and 5 days in 2018 (Table 1).

EYOF is an important sporting event held every two years with the participation of 50 European countries. EYOF events, in which athletes between the ages of 14-18 participate, are held in the form of summer and winter festivals(18). The EYOF, organised in Erzurum between 11-18 February 2017, was held with a total of 1311 participants and over 10 thousand audience, including 675 athletes from 34 different countries, 436 administrative and technical personnel, 120 VIP guests and 80 referee boards (Table 1) (19). In the EYOF held in Erzurum, alpine discipline, biathlon, cross-country skiing, snow skiing, ski jumping, curling, ice hockey, speed skating, figure skating sports were performed.

A total of 8 thousand people including 3 thousand athletes and technical committees and 5 thousand spectators from 97 countries participated in DEAFLYMPICS held between 18-30 July 2017 in Samsun (Table 1) (20). The Olympics were held in 8 different districts of Samsun. The European Youth Olympic Festival is an important sporting event held every two years with the participation of 50 European member countries. EYOF events, in which athletes between the ages of 14-18 participate, are held in the form of summer and winter festivals (18). 60 emergency ambulances, 1 helicopter ambulance, 4 NMRT teams were assigned for the festival. In addition, 16 health cabins were created in the Olympic areas where the Olympics would be played(21). International and Turkish Sign Language Training was provided to all healthcare professionals within the scope of the event(22). The staff who knew the sign language were assigned in the hospital emergency departments.

Table 1

Application of the Research

The data were obtained through the General Directorate of the Health Information Systems of the Ministry of Health of the Republic of Turkey. The data recorded in the General Directorate Emergency Health Automation System was converted to Excel format and sent to the researcher via external memory and e-mail. The data received in Excel format was given as 7 separate and different pages, respectively: (1) case detail, (2) application information, (3) medication information, (4) diagnostic information, (5) material information, (6) measurement information, (7) rejection information.

The data extracted by the experts were examined by the researcher and the data that were the subject of the study were transferred to the database created in SPSS 22.0 program.

Data Collection and Editing

For EMS cases in DEAFLYMPICS and EYOF MGs, all the records encoded as ODD55 and ODD25 were transferred to the database prepared in SPSS 22.0 program. The data of the cases in CEÇLW and ZRF were not created with a standard coding. Therefore, the data finding process was made according to the case address. The keywords of 'Eceabat, marina, mimosa cafe, health boat, lonepine, heliport, conkbayırı, Kireçtepe, 57th regiment walk, tent hospital, anzac/Anzac bay, simulation center, Vip, VIP, monument and camping area' were scanned for CEÇLW between April 24-25 and the data obtained were used. It was seen that there was no special record for the event in ZRF. For this reason, scanning the keywords of "Rock, Rack, Festival, Zeytinli, Concert, Tent, Camping Area, Rak, Altınkum Beach" constituted the data obtained.

The data in 7 different pages in Excel were combined in the database prepared in SPSS 22.0 program by using the search page (CTRL+F) with Case ID numbers.

Data Analysis

Frequency Analysis: Frequency distribution between dependent and independent variables was taken for the descriptive analysis of the study. Tables were usually created based on the type of activity for comparison. The mean, standard deviation (SD), median, minimum and maximum values of the descriptive statistics of some variables were calculated.

Rate Calculations: In the research, PPR and TTHR rates were calculated both for MG types and for total.

Patient Presentation Rate (PPR): It is the main criterion in the evaluation of health services in MGs. It is defined as the number of patients applying for health services among 1,000 participants of an event(23) (24).

Transportation to Hospital Rate (TTHR) (24)*:* It is the calculation of the rate of patients who are transferred to a hospital by an ambulance during a MG among 1000 participants. The number of patients and injured people transferred to the hospital/number of participants x 1.000

Research Permissions and Ethics

Permission was obtained from the Non-Interventional Research Ethics Committee of University of Bezmialem Vakif with the decision number 15/233, dated 15.08.2018. Permission was obtained from the Ministiry of Health with the letter number 75730711, dated 14.12.2017.

Results

474 cases in 4 different types of MGs were examined within the scope of the research. In the study, the cases with ambulance intervention were 49.5% (n = 235) in DEAFLYMPICS, 22.6% (n = 107) in CEÇLW, 15.2% (n = 107) in ZRF, 12.7% (n = 60) in EYOF. The mean age of the study population is 30.3 ± 16.5, (minimum 0, maximum 92). In the cases examined in the study, age ranges with the highest number of participants were 18-34 in the CEÇLW at 41.1% (n = 44); 18-34 in the DEAFLYMPICS at 60.4% (n = 142), 18-34 in the EYOF at 56.7% (n = 34), 18-34 in the ZRF at %73,6. 57.6% (n = 273) of the total cases were between the ages of 18-34. 57.6% (n = 273) of the total cases were between the ages of 18-34 and 23.6% (n = 112) were between the ages of 35-64. The age range of 13.3% (n=63) of the cases were 0-17 and 5.5% (n=26) were 65 and older.

Following the call, the mean time period before arrival to the case was 9.3 min. (SD=5.7, median=9.1) for ZRF, 1.6 min. for DEAFLYMPICS, 3.4 min. for EYOF and 8.3 min. for CEÇLW. In the research, it was seen that 34.0% (n=161) of the cases took place between the hours of 12:00 and 17:59, 28.3% (n=134) between 18:00 and 23:59, 26.6% (n=126) between 06:00 and 11:59, 11.2% (n=53) between 00:00 and 05:59. When the incidence hours of the cases were analyzed according to the activity types, the time period in which the cases were seen most frequently was between 06:00 - 11:59 at 39.3% (n = 42) in CEÇLW; 12:00 - 17:59 at 32.8% (n=77) in DEAFLYMPİCS; 12:00 - 17:59 at 61.7% (n=37) in EYOF; 18:00 - 23:59 at 44.4% (n=32).

When the cases were examined according to the incident locations, 76.6% (n = 82) of the cases in CEÇLW occurred in a field, 41.7% of the cases in DEAFLYMPICS occurred in a dormitory, 21.7% of the cases seen in EYOF (n = 13) occurred in a hotel, 86.1% (n = 62) of the cases seen in ZRF occurred on the street.

When the cases were examined according to the triage codes, 51.7% (n=254) of the cases were green, 32.3% (n=153) of the cases were red, 15.8% (n=75) of the cases were yellow and 0.2% of the cases were black. When the triage codes of the cases were analyzed according to activity types, 56.1% (n=60) of the cases in CEÇLW were code green, 25.2% (n=27) were code red and 18.7% (n=20) were code yellow. The triage codes of the cases in DEAFLYMPICS were 47.2% (n=111) green, while 36.6% (n=86) were red and 16.2% (n=38) were yellow. The triage codes of the cases in EYOF were 48.3% (n=29) green, 35.0% (n=21) red and 16,7% (n=38) yellow. When the triage codes of the cases in ZRF were examined, 62,5% of the cases were green code, 26,4% (n=19) were red code, 9,7% (n=7) were yellow code and 1.4% (n=1) were black code (Table 2).

Table 2

When the results of the cases were analyzed, 54.0% (n=256) of the cases were transferred to hospital, 20.7% (n=98) were on-site intervention, 14.1% were refusal of transfer, 3.6% (n=17) were transfer for medical examination and 0.8% (n=4) were transfer between hospitals.

PPR values in the study are 1.3 for CEÇLW (average of 2015-2018), 18.1 for DEAFLYMPICS, 7.1 for EYOF and 0.3 for ZRF. TTHR values are 0.7 for CEÇLW, 13.3 for DEAFLYMPICS, 5.1 for EYOF and 0.2 for ZRF (Figure 1).

Figure 1

Considering the distribution of the cases according to ICD10 diagnostic codes, the most common pre-diagnoses were successively symptoms, signs and abnormal symptoms (nausea and vomiting, dizziness) at 22.3% (n = 98), injury, poisoning and other consequences of some external causes at 19.2% (n=84), accidents at 14.4% (n=63), circulatory system diseases at 9.8% (n=43), musculoskeletal system and ligament tissue diseases at 9.6% (n=42), mental and behavioral diseases at 6.8 (n=30) and respiratory system diseases at 5.5% (n=24). The most common cases in CEÇLW were soft tissue trauma at 9.7% (n=7), hypotension at 6.9% (n=5), angina pectoris at 6.9% (n = 5) and multitrauma at 5.5% (n = 4). In DEAFLYMPICS, the most common cases were Soft Tissue Trauma at 18.3% (n = 43), nausea and vomiting at 6.4% (n = 15), lower extremity injuries at 5.1% (n = 12), pain at 5.1% (n=12). In EYOF, 28.3% of the cases were multitrauma, 28.3% of them were soft tissue trauma and 5% (n = 3) were upper extremity injuries. In ZRF, 20.8% (n=15) of the cases were mental and behavioral disorders due to alcohol use, 12.5% (n=9) were conversion, 4.2% (n=3) mental and behavioral disorders due to drug intake.

Discussion

474 cases in 4 different types of MGs were examined within the scope of the research. In the MGs examined during the research (2015-2018), the most cases are in DEAFOLIMPICS with 49.5% (n = 235). In the study, 54.0% (n = 256) of the cases were transferred to the hospital. When the cases were examined according to the triage codes, 51.7% (n=254) of the cases were green, 32.3% (n=153) of the cases were red, 15.8% (n=75) of the cases were yellow and 0.2% of the cases were black.

In a study on the Emergency Health Services (EHS) records of 79 MG events between 2009 and 2011, the mean age of the patients was 32.1 (SD: 16.8)(10). The mean age of the patients at the 2002 FIFA World Cup in Japan was 30 ± 17(25). The mean age of those receiving health care in University Games was 27 (between 14-70)(26). The mean age of the current study (30.3 ± 16.5) shows similarity with the information in the literature. 19% of the cases that occurred in Milan 2015 EXPO were under the age of 18 (14). In the research, 57.6% of the cases are between the ages of 18-34. This is because DEAFLYMPICS and EYOF sports games are the activities for young people. In addition, the music type of ZRF mostly appeals to people in this age group. Likewise, both Turkish and Australian citizens mainly bring young people to CEÇLW in order to create national feelings among them. For all these reasons, a large part of the population in MGs is also considered to be in the 18-34 age range.

It was observed that the cases were most frequently experienced between 12:00 and 16:00 in Swiss Wrestling and Alpine Games(27). In a 4-year analysis of Formula 1 Singapore Night Races, it was found that the most cases (66.6%) occurred between 17:00 and 22:00 during the MG(28). In the research, it was seen that approximately 80% of the cases in ZRF took place between the hours of 18:00 and 05:59. These hours are between the active start and end hours of the concert. When it is compared, the findings of the DEAFLYMPICS (32.8%) and EYOF (61.7%), which are the sport activities of this study, show similarities with the information in the literature.

Following the call, the mean time period before arrival to the case was 9.3 min (SD=5.7, median=9.1) for ZRF, 1.6 for DEAFLYMPICS, 3.4 for EYOF and 8.3 for CEÇLW. The time period of arrival was 8.3 min for CEÇLW and 9.3 min for ZRF. Sport events were in a better position than the other MG types because of the high standards of health services provided by the Olympic Committee. These periods being shorter than others are thought to be due to the presence of ready teams in each hall and considered to be related to the fact that sports competitions were held in fixed places.

During the 2015 EXPO in Milan, 1% of the patients transferred to the hospital were code red, 29% were code yellow, and 70% were code green(4). In the research, 32.3% of the cases were code red and 15.8% were code yellow. In EYOF and DEAFLYMPICS, which are sports events, cases with code red were 35.0% and 36.6%, while the cases with code yellow were 16.0% and 16.2%, respectively. 25.2% of the cases in CEÇLW, which is a commemoration event, were code red and 18.7% were code yellow (Table 2). MG types are similar among themselves in terms of triage codes. However, it differs with the work done in Milan. The reason for this is thought to be the staff's lack of knowledge or inadequacy of sensitivity in using the triage codes in Turkey. The fact that approximately 1/3 of the total cases were red code suggests that there were deficiencies in terms of applications and interventions. For example, in one case (Case 2), the preliminary diagnosis of the wrist and crush injury of the hand was entered as a code red. Another case (168. Case) diagnosed as an acute respiratory infection was entered as a code red. In this way, the red coded cases are abnormally high.

In the research, 54.0% of the cases were transferred to hospitals. 61.3% of the cases in DEAFLYMPICS, 33.6% of the cases in CEÇLW, 66.7% of the cases in EYOF, 50.0% of the cases in ZRF were transferred to hospitals. Mobile hospitals were established on the Gallipoli peninsula during CEÇLW. Therefore, it is natural that the number of the transfer to hospitals is lower than others.

It is stated in the literature that PPR values in many MGs were between 0.5 and 2.0(10). In 15 MGs in South Australia, PPR was 0.48 and TTHR was 0.04(17). PPR was found to be 2.1 in the research conducted on Nigeria University Games(26). In the research at Georgetown University, PPR value was found to be 0.39 for 184 MG activities between 2011-2016(29).

As a commemoration activity, the mean PPR value was 1.3 for CEÇLW. When the PPR values of the CEÇLW were examined by years, PRR values were estimated to be 0.3 for 2015, 1.9 for 2016 and 2017, and 3.3 for 2018. The PPR value was found to be 0.3 in ZRF. These results are similar to common PPR values in the literature. The PPR value was 0.39 for 184 MG activities examined by Georgetown University and held between 2011-2016, and it was 1.2 for 2002 FIFA World Cup in Japan.

For sports activities, the PPR value of DEAFLYMPICS was 18.1, while it was 7.1 in EYOF. It appears to be higher in terms of PRR value compared to both literature and the other MGs in the study (Figure 1).

The TTHR rate was found to be 0.7 in CEÇLW. In a study conducted by Ranse et al. on music festivals, TTHR was calculated to be 0.35(30). As a rock concert, the TTHR rate was calculated

to be 0.2 in ZRF. In VIM, the highest TTHR rate was found to be 0.58 and the lowest TTHR rate was 0.09. The mean TTHR was found to be 0.04 in 15 MG in South Australia.

It is difficult to compare transportation to hospital rates, as there are different studies in the literature(16) and the injured may have applied to emergency services or other polyclinics not only with ambulances but also with their own means.

Limitations

Firstly, since the research is a retrospective research, there may be deficiencies in the data due to the lack of records. Secondly, there might be deficiencies in the records of minor injuries and interventions in MG activities. Thirdly, the research data are taken from the Ministry of Health national database (EHAS). For this reason, deficiencies due to not transferring some information in written forms to the digital database are among the limitations of the research. Fourthly, the only data that were used within the scope of the research was from the Ministry of Health. Fifthly, the healthcare interventions of the medical teams of private healthcare institutions or teams/participants, and interventions in mobile hospitals are not covered by the research. Sixthly, the lack of knowledge about the importance of the data records of healthcare professionals who recorded the cases, and the non-standardized entry technique may be another limitation of the study.

Conclusion

474 emergency health care cases were examined in the study. It is seen that there are differences in PPR and TTR rates according to activity types in mass meetings. In the study, the majority of the cases are green-coded, while red-coded cases are rarely seen. PPR value varies according to the activity type. In sports organizations, cases are intervened faster. It is seen that more than half of the cases were transferred to the hospital. The records of 112 ambulance cases should be made with a special coding through the introduction of special criteria for some mass gatherings, especially in terms of duration and number of participants, by the Ministry of Health. For mass gatherings (festivals, memorial ceremonies, etc.) which are organised regularly, it is necessary to determine standardized processes at local and regional level and to support health services which would be provided on a regular basis. In order to distinguish emergency health services, especially for concerts and festivals, from ordinary life, a different coding must be used and recorded in the database. A legal infrastructure should be established for health services to be provided for MGs in Turkey.

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Table 1 The Distribution of the Participant Numbers of Some Mass Gatherings Held in Turkey Between 2015-2018 (Ankara 2019).

	2015	**2016**	**2017**	**2018**
CEÇLW (2*4=8 days)[1]	50.000	10.000	10.000	10.000
ZRF (5 days)[2]	100.000	150.000	-	-
DEAFLYMPICS[3] (13 days)	-	-	8.000	-
EYOF[4] (8 days)	-	-	13.000	-

[1] The data were taken from the authorities responsible for emergency health organization.

[2] The data were taken from biletix.com which sells tickets for events.

[3] The data were taken from the official site of the event. Access: 15 March 2019, http://www.deaflympics2017.org/tr/samsun-deaflympics-2017-sona-erdi-detay/282

[4] The data were taken from the official site of the event. Erişim: 15 March 2019, https://www.eyof2017erzurum.org/sayfa/detay/kapanis-basin-toplantisi-gerceklestirildi/253

CEÇLW: Commemoration Events Çanakkale Land Battles; DEAFLYYMPICS: Hearing Impared Summer Olimpics
EYOF: European Youth Olympics Festival; ZRF: Zeytinli Rock Festival

Table 2: The Distribution of 112 Ambulance Cases by Triage Codes in Some Mass Gatherings Held in Turkey Between 2015-2018 (EHAS, Ankara 2019).

	CEÇLW	**DEAFLYMPICS**	**EYOF**	**ZRF**	**Total**
	Number (%)	*Number (%)*	*Number (%)*	*Number (%)*	*Number (%)*
Code Red	27 (25,2)	86 (36,6)	21 (35,0)	19 (26,4)	153 (32,3)
Code Yellow	20 (18,7)	38 (16,2)	10 (16,7)	7 (9,7)	75 (15,8)
Code Green	60 (56,1)	111 (47,2)	29 (48,3)	45 (62,5)	245 (51,7)
Code Black	-	-	-	1 (1,4)	1 (0,2)
Total	107	235	60	72	474

CEÇLW: Commemoration Events Çanakkale Land Battles; **DEAFLYMPICS:** Hearing Impared Summer Olimpics
EYOF: European Youth Olympics Festival; **ZRF:** Zeytinli Rock Festival