

ORIGINAL ARTICLE

The Incidence of Sickness/trauma in Spectators of Professional Baseball at the Meiji Jingu Baseball Stadium

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Abstract. The Meiji Jingu Baseball Stadium attracts a large number of spectators in the Tokyo metropolitan area. To clarify the demand for medical care at a public ballpark, we analyzed following two types of medical records maintained at the stadium: (1) "Report of Aid": a record of patients visiting the first-aid station in 2003 season and (2) "Report of Accidents": a record of patients referred to clinics/hospitals between 1996 and 2003 season. (1) In 2003, approximately 1,582,000 spectators watched 67 professional baseball games (60 night games). Of the 247 spectators received medical care at the first-aid station (3.7 persons per game, 1/6,405 spectators), 128 (51.8%) had trauma and 109 (44.1%) had illness. The incidence of trauma was relatively higher before the start and near the end of the night games. The risk of becoming sick/wounded per spectator or the number of the sick/wounded per game differed depending on the participating sports teams. (2) Ninety-three spectators referred to clinics/hospitals during the 8-year period from 1996 to 2003, of which 57 were transferred by ambulance. Direct ball injury accounted for 65 (69.9%) cases of trauma, followed by stumbling/falls (18 cases, 19.4%). Twenty patients were diagnosed to have fractures at the clinics/hospitals. Intrinsic cardiopulmonary arrest occurred in one spectator. Trauma due to direct ball injury accounted for the largest number of wounded patients referred to clinics/hospitals. Treatment to patients at the first-aid station in the stadium may optimize the frequency of hospital visits. Records of medical care are effective to analyze the demand for medical preparedness. (*Keio J Med* 56 (3) : 85 – 91, September 2007)

Key words: mass gathering medicine, large-scale public facility, baseball stadium, medical facility, event planning

Introduction

Various types and levels of medical aid may be provided at large-scale public facilities that are visited by large and diverse crowds.¹ Therefore, some facilities have a first-aid station and encourage the staff to undergo training in cardiopulmonary resuscitation. However, standards for organization of the first-aid station and equipment / materials at public facilities have not yet been established to date, and are vaguely based on the subjective experience of administrators of facilities.² To resolve

this problem, we considered that it would be necessary to analyze the demand for medical care in individual public facilities by precisely comprehending the occurrence of sickness and injury at the concerned facility.

Large-scale athletic games are held at many cities around the world. Even though the players in the participating teams come in a perfect state of medical preparedness,³ adequate medical care for spectators still remains to be established. Recently, there has been an increasing awareness of the occurrence of medical emergencies at sports events in Japan, especially from the time that the

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Table 1 Sick/wounded persons visiting a first-aid station in 2003

		Number (percentage)	Trauma	Sickness	Others
Male		118 (53.4)	55	56	7
Female		103 (46.6)	60	42	1
Total		221 (100)	115	98	8
Disposition	Discharged to home	197 (89.1)	101	88	8
	Self-visit to clinics/hospitals	14 (6.3)	9	5	0
	Transfer by ambulance	10 (4.5)	5	5	0

Unit: Number of patients

Number of sick / wounded persons visited first-aid station was analyzed from "Report of Aid" in 2003. After receiving the first-aid, 24 (10.8%) of the spectators visited clinics / hospitals on the day of the game, and 10 (4.5%) of them were transferred as emergency patients.

Table 2 Symptoms/diagnosis of sickness at first-aid station in 2003

Symptom, Diagnosis	Cases
Gastrointestinal symptoms (Nausea, Abdominal pain, etc.)	29
Hypoglycemic seizures	11
Headache	11
Discomfort	10
Hypotension	9
Dehydration/heat related illness	7
Common cold	6
Pyrexia	5
Dizziness	5
Hyperventilation	4
Loss of consciousness	3
Menstrual pain	2
Others	8
Total	110

Unit: Number of patients (98 patients)
Symptoms / diagnosis of sickness was analyzed from "Report of Aid" in 2003. Diverse medical conditions were encountered.

Soccer World Cup was held in Japan in 2002.^{4,5}

Among the many athletic facilities located in the metropolitan area of Tokyo, the Meiji Jingu Baseball Stadium attracts large crowds (at least 2,000,000 annually, including 1,582,000 who watched professional baseball games in 2003), because a professional baseball club as a franchise often utilizes the stadium to host baseball matches. Further, the stadium is equipped with a first-aid station which maintains records of medical care provided to visiting spectators with sickness/trauma. The aim of this study was to analyze the demand for medical care during professional baseball matches held at the stadium, based on analysis of the records.

Subjects and Methods

The Meiji Jingu Baseball Stadium built in 1926 is one of the most famous ballparks in Japan. There is a first-aid station at the stadium and records of the recent first-aid practices at the stadium have been maintained in two

types of documents: "Report of Aid" written by nurses and "Report of Accidents" written by clerks. The former contains reports of information on patients visiting the first-aid station, including the gender, age, time of visit, type of disease, and site of injury. The latter contains reports of patients referred to clinics/hospitals.

An investigation of the sick/wounded persons who required medical care during the professional baseball games (March to November) was performed by examining both the records. The number and incidence of sickness and injury, the time of occurrence, the types of sickness and injury, and the sites and mechanisms of injury, disposition after the first-aid, and diagnosis of the patients who were transferred to clinics/hospitals were noted. As for the diagnosis of the patients referred to clinics/hospitals, it was reported to the stadium either by the patients themselves or by the clerks who visited the clinics/hospitals with the transferred patients.

The study period spanned the professional baseball season of 2003 (from March to November) for examination of the "Report of Aid", and 1996 to 2003 for that of the "Report of Accidents".

Statistical analyses were performed by the Chi-square test using the Mac Toukei-Kaiseki Ver. 1.5 (Esumi co. Ltd., Tokyo, Japan) program on a Macintosh computer. A significance level of $P < 0.05$ was set for the comparisons.

Results

1. Number of sick/wounded persons and disposition at the first-aid station

During the baseball season of 2003, there were 67 games (60 night games, 7 daylight games) hosted by professional baseball clubs, of which 61 were official games and 2 were called off due to rain. A total of 1,582,000 spectators watched the 59 official games (mean: 26,813 persons per game) during this season, and 247 spectators (mean: 3.7 persons per game, including all games), accounting for 0.015% of all spectators, received aid at the first-aid station of the stadium. After excluding 17 staff members of the stadium and 9 persons whose gender was

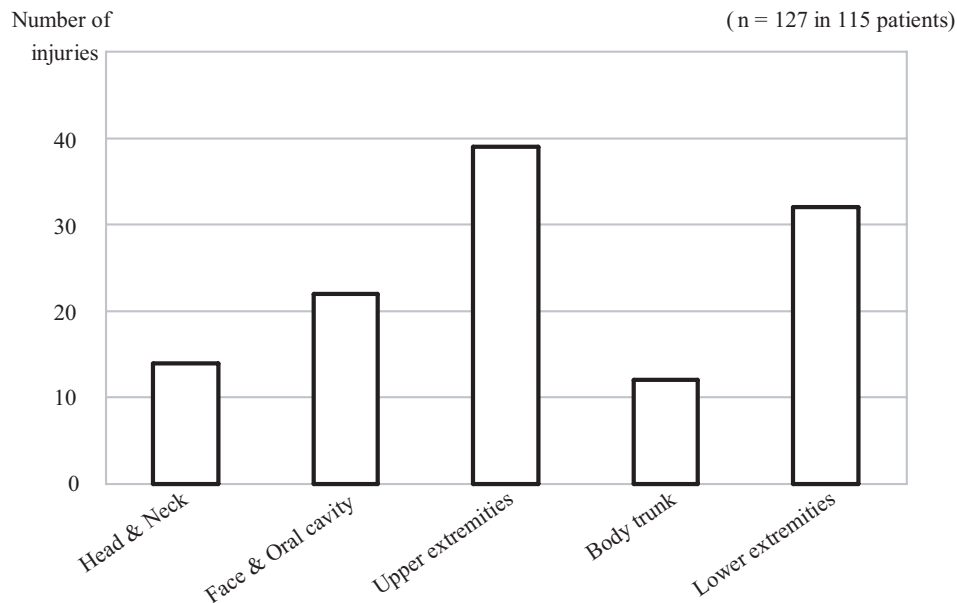


Fig. 1 Sites of trauma at a first-aid station in 2003

Sites of trauma were analyzed from “Report of Aid” in 2003. The incidence of upper and lower extremity injuries was high.

not recorded in the reports from this figure, there were 221 sick/wounded persons, consisting of 118 males (53.4%) and 103 females. In regard to the type of sickness/trauma, 46.6%, 47.5%, and 5.9% of the males were recorded as having suffered from trauma (including 2 cases of burns), sickness, and “others” (insect bite, toothache, etc.), respectively. The corresponding percentages among the women were 58.3% (including 4 cases of burns), 40.8%, and 0.9%, respectively. After provision of first-aid, 24 (10.8%) of the 221 patients were referred to clinics/hospitals, of which 10 (4.5%) were transported by ambulance (Table 1).

2. Types of sickness and trauma encountered at the first-aid station

Patients with acute sickness had diverse symptoms; e.g., gastrointestinal symptoms, abdominal pain, headache, hypoglycemia, mood disorders, hypotension, dehydration/heat stroke, and common cold (Table 2). In 127 sites of the 115 patients with trauma, trauma of the upper and lower extremities accounted for the highest percentage of cases (Figure 1). In the referred patients to clinics/hospitals with trauma, facial and oral cavity trauma accounted for the highest percentage of cases from 1996 to 2003. During this 8-year study period, direct trauma caused by balls accounted for 118 (76.6%) of the wounded patients, followed by that due to stumbling/falls (27 patients, 17.5%) (Figure 2).

3. Diagnoses made at the clinics/hospitals

In the patients referred during the period from 1996 to 2003, 20 patients were diagnosed to have fractures. Among the 20, 10 who sustained the fracture by direct ball attack and 5 in whom it was caused by stumbling/falls were transferred to the clinics/hospitals by ambulance, and 5 (including 4 who sustained the fracture by direct ball attack and 1 in whom it was caused by stumbling/falls) visited the clinics/hospitals on their own. Seven and 2 subjects among those who were injured by a direct ball attack were diagnosed to have eye injuries and crown fractures of the teeth, respectively (Table 3).

4. Time of occurrence of the sickness/trauma in the spectators visiting the stadium for the night games

The time of occurrence of sickness and trauma was analyzed for the 230 spectators of the 60 night games in 2003 who required first-aid. The incidence of trauma was the highest before the start of a game and near the end of the games, and the incidence of acute illness was the highest before the start of a game and during the second half of the game (Figure 3).

5. Incidence of sickness and trauma according to the participating teams

In 2003, Yakult Swallows, *i.e.*, the franchise baseball team and a member of the Central League, played 59 official games with 5 teams. The incidence of sickness/trauma was the highest during the game played by the

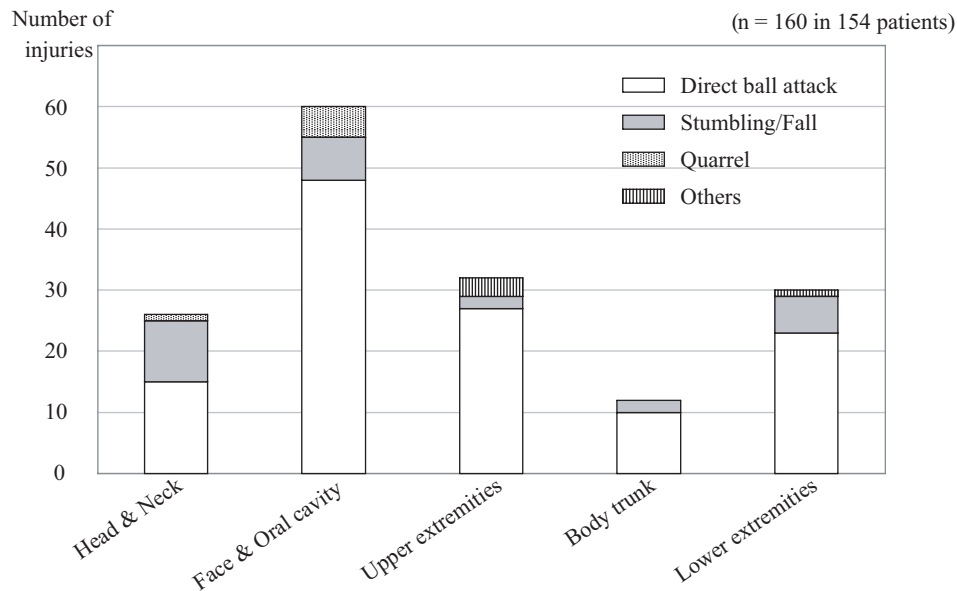


Fig. 2 Sites and causes of trauma in patients referred to clinics/hospitals from 1996 to 2003

Sites of trauma and causes of trauma were analyzed from “Report of Accidents” during the period 1996-2003. Most of trauma is by direct ball attacks. Trauma of the head and face are tended to be serious in many cases.

Table 3 Classification of trauma in referred patients from 1996 to 2003

	Direct ball attacks		Stumbling/falls	
	Ambulance	Self-visit	Ambulance	Self-visit
Blows	12	18	4	0
Fractures	10	4	5	1
Open wounds	10	3	5	4
Eye injuries	6	1	0	0
Crown fractures	0	2	0	0
Total	38	28	14	5

Unit: Number of patients

Definitive diagnosis made at clinics / hospitals and transportation to the clinics / hospitals were analyzed from “Report of Accidents” during the period 1996-2003.

victorious team of that season (Hanshin Tigers in 2003). The risk (incidence of visits to first-aid station) per spectator was 2.13 times as high as compared to that for the team with the lowest incidence of sickness/trauma in that season ($P < 0.01$), and the risk per game was 4.47 times as high as compared to that for the team with the lowest incidence of sickness/trauma ($P < 0.01$) (Table 4).

Discussion

While there have been several reports on the demand for the medical care at mass events, the majority have dealt with only a single event.^{1,6} Continuous observation

of the medical demand at the same events has been reported for the national football league games in the USA.⁷ Although baseball games are also popular, there has been no study until now for medical care at any stadium hosting baseball matches. One study has reported on the degree of sweating and water intake in baseball spectators in the summer.⁸ Another report reviewed first-aid at a stadium during a US Major League Baseball season in 1991, however, it contains no detailed data of the patients.⁹

The present study revealed that 3.7 sick/wounded persons per professional baseball game utilized the first-aid station at the stadium during the professional baseball season in 2003. This rate is not high, and represents only 0.015 % of all the spectators, *i.e.*, only 1 out of every 6,405 spectators, as compared with that reflected in the records of the previously mentioned national football league game season in the USA (0.04%),⁷ 2002 FIFA World Cup soccer games in Japan (0.12 %),¹⁰ and a rock festival in Japan (1.7 %).¹¹

Sick/wounded persons who utilized the services of the first-aid station had diverse symptoms or trauma, and the most frequent cause of trauma in those who attended the first-aid station was direct ball attacks, followed by stumbling/falls, quarrels, and burns due to hot foods/beverages. In particular, the incidence of trauma caused by direct hits of balls was the highest, which is considered to be characteristic of ballparks.¹² The incidence of trauma due to stumbling/falls was also high. It was speculated that the occurrence of these accidents could be in-

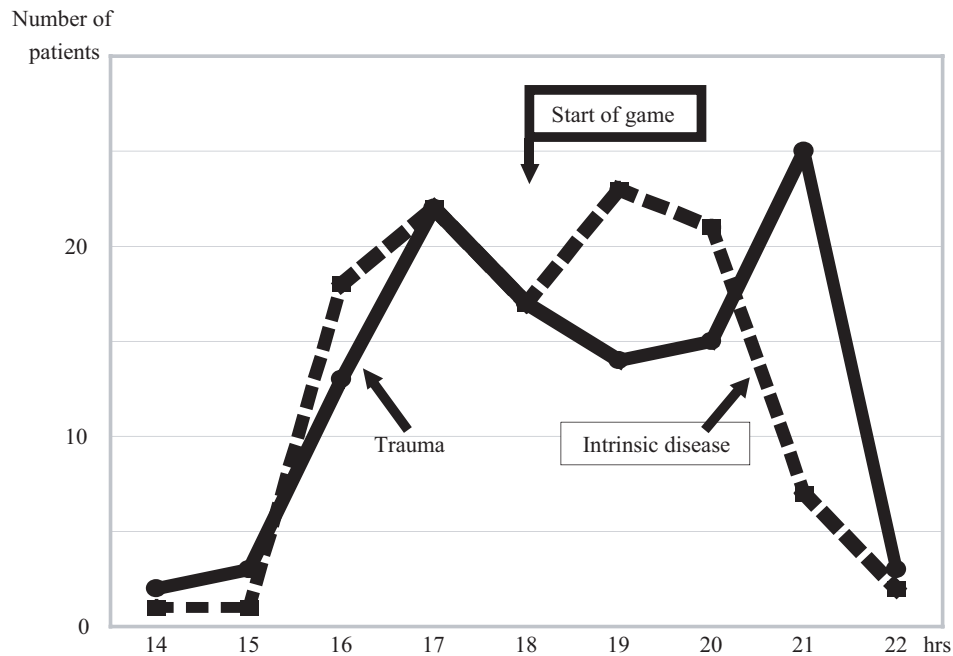


Fig. 3 Time of occurrence of sickness / trauma in the night games

The time zone of the occurrence of sickness / trauma in the night games was analyzed from “Report of Aid” in 2003. The number of night games was 60, 2 of them were called-off by rain.

fluenced by the inherent stadium structure (high slope and narrow pathways), overcrowding/stampede inside the stadium, and alcohol consumption.

At the Meiji Jingu ballpark, the first-aid station is on the ground floor next to the office. It is equipped with a bed, refrigerator, closet for drugs, TV, stretcher, wheelchair, and crutches, however, there is no arrangement yet for an automatic external defibrillator (AED) in 2003.¹³ However, rescue drills for sick/wounded persons have been carried out over the years about 3 - 4 times a year with the cooperation of the nearest fire station. During the games hosted by professional ball teams, one physician and one or two nurses contracted by the stadium are kept on standby at the first-aid station. Guards on duty, recruited from a security company, who find sick/wounded patients, communicate with the station via a wireless system. Depending on the situation, either the physician or the nurse is dispatched to attend to the sick/wounded, or alternatively, the sick/wounded are transferred to the first-aid station for medical care. As a rule, the stadium takes responsibility for the care of cases of trauma caused by inadequacy of facilities, and the franchisee ball team takes responsibility for the care of cases of trauma caused by balls.

Grange JT *et al.* reported that the availability of on-site physician-level medical care at large mass gatherings significantly reduced the number of patients requiring transport to hospitals.¹⁴ In fact, in the 2003 season, only

24 (10.8%) patients visited clinics/hospitals on the day of the game, and only 10 (4.5%) of these were transferred by ambulance after provision of first-aid. Thus, the availability of a physician on-site is important to reduce the impact on the local emergency medical system and the local medical facilities.

Analysis of the actual time of occurrence of the sickness/trauma revealed that the incidence of trauma was the highest before the start of a game and near the end of the game, while that of sickness was highest before the start of a game and during the second half of the game. Thus, before the start of a game, direct trauma caused by ball attacks during warm-up practice and sickness induced by excitement before the game may be contributing factors. During the second half of the game, alcohol consumption and excitement due to the match coming to an end probably induces sickness, and near the end of the game, trauma due to overcrowding and stampede may be involved. It should be borne in mind that sickness and trauma may be reported until all the spectators have left the stadium.

The incidence of sickness/trauma among the spectators may be influenced by the number of spectators, as shown by the varying incidence according to the participating teams. During the game played by Hanshin Tigers, which emerged as the victorious team in the 2003 season, an average of 7.6 spectators (a maximum of 18 spectators per game) suffered from sickness/trauma. The

Table 4 Number of the sick/wounded persons classified by the participating teams in 2003

Participating team	Number of games*	Number of spectators*	Number of spectators per game	Number of sick/wounded persons	Number of sick/wounded persons per game	Number of sick/wounded persons per 10,000 spectators	Relative risk level per game**	Relative risk level per 10,000 spectators**
Hanshin Tigers	12	482,000	40,167	99	7.6	2.05	4.47	2.13
Chunichi Dragons	10	154,000	15,400	19	1.9	1.23	1.12	1.28
Yomiuri Giants	14	493,000	35,214	75	5.0	1.52	2.94	1.58
Hiroshima Toyo Carp	12	208,000	17,333	20	1.7	0.96	1.00	1.00
Yokohama Bay Stars	11	190,000	17,273	26	2.4	1.36	1.41	1.42
Exhibition game	6	55,000	9,167	8	1.3	1.45	0.76	1.51
Total	65	1,582,000		247	3.7	1.56		

* Excluding the called-off games

** The risk level for the game relative to that for a competitor with the lowest incidence of sickness and injury is set as 1. Number of the sick / wounded persons classified by the participating teams was analyzed from "Report of Aid" in 2003.

risk (*i.e.* incidence of visits to the first-aid station) per spectator was 2.13 times as high as that for the participating team with the lowest incidence, and the risk per game was 4.47 times as high as that for the team with the lowest incidence. These results suggest that the extent of medical preparedness needed at the first-aid station in the stadium varies according to the participating teams.

The survey of "Report of Accidents" revealed that intrinsic cardiopulmonary arrest (CPA) occurred in one spectator during the 8-year study period. By-stander cardiopulmonary resuscitation (CPR) was not employed and there was no record of the initial heart rhythm. Thus, even ballparks should be equipped with an AED to rescue spectators who might suffer CPA.¹⁵ Recently, the Full Cast Stadium at Sendai (the home ground of a new ball club) was equipped with 12 AEDs.

In summary, the results of the present study show that there is a constant risk to even spectators at ballparks, although these data have been collected from only one stadium. Medical care is needed even for spectators of professional baseball games and the on-site first-aid station at the stadium may reduce the need for clinics/hospitals visits referral. It is considered that meticulous maintenance of records of the sick/wounded at public facilities would allow a reasonable analysis of the demand for medical preparedness at any particular facility, as well as planning of reasonable medical care posts at other similar facilities.

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