

## Patterns of Injuries and Illness Among Malaysian Athletes during the XVII Asian Games 2014

(Pola Kecederaan dan Masalah Kesihatan dalam Kalangan Atlet Malaysia di Kejohanan Sukan Asia 2014)

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### ABSTRACT

*Although more Malaysians are taking part in International Multisport Games, these athletes well-being at such events have not been fully explored. The purpose of this study was to examine the pattern of injury and illness among Malaysian athletes during the XVII Asian Games 2014. Clinical and socio-demographic information of athletes diagnosed with injury or illness during the centralised training camp and at the Games were recorded in a standardised report form. Throughout the study period, 83 injuries and 64 illnesses were recorded from 276 athletes. Muscle strains and tears were the most common injury followed by ligamentous injury and soft tissues contusion. The number of injuries was highest among badminton players followed by hockey and rugby. Significantly higher incidence of injuries was observed among men than women hockey players. Athletes in individual events had higher proportion of more severe injury than those in team events. Respiratory tract infection was the most frequent illness diagnosed among athletes. Most injuries and illnesses diagnosed among athletes were minor and did not result in time away from participation. The incidence of injuries and illnesses among Malaysian athletes at the XVII Asian Games were comparable with those reported by previous authors. Injury and illness rate were influenced by gender and sports. Fortunately, majority of injuries and illnesses were minor and did not prevent athletes from participation.*

**Keywords:** Epidemiology; multi-sports games; sports injuries

### ABSTRAK

*Walaupun ramai atlet Malaysia telah menyertai pelbagai kejohanan sukan pada peringkat antarabangsa, tahap kesihatan mereka dalam kejohanan masih belum diterokai. Tujuan penyelidikan ini dijalankan adalah untuk mengkaji pola kecederaan dan masalah kesihatan dalam kalangan atlet Malaysia pada Kejohanan Sukan Asia ke-XVII 2014. Maklumat klinikal serta sosio-demografik atlet yang mengalami kecederaan atau masalah kesihatan ketika di kem latihan dan pada kejohanan sukan direkodkan di dalam borang laporan kecederaan/masalah kesihatan. Sepanjang penyelidikan ini dijalankan sejumlah 83 kecederaan dan 64 masalah kesihatan telah direkodkan dalam kalangan 276 atlet Malaysia. Kecederaan otot adalah kecederaan yang paling kerap dilaporkan diikuti kecederaan ligamen dan kontusi tisu lembut. Jumlah kecederaan tertinggi dilaporkan dalam kalangan atlet badminton diikuti dengan pemain hoki dan ragbi. Kecederaaan juga dilaporkan secara signifikannya lebih tinggi dalam kalangan pemain hoki lelaki berbanding wanita. Kadar kecederaan yang teruk lebih tinggi dalam kalangan atlet acara inividu daripada atlet berpasukan. Sementara itu jangkitan salur pernafasan merupakan masalah kesihatan yang paling kerap didiagnosis dalam kalangan atlet. Majoriti kecederaan dan masalah kesihatan dialami atlet merupakan masalah ringan yang tidak mengecualikan atlet daripada bertanding mahupun berlatih. Insiden kecederaan dan masalah kesihatan dalam kalangan atlet Malaysia di kejohanan Sukan Asia ke-XVII sebanding dengan insiden yang dilaporkan oleh penyelidik terdahulu. Kadar kecederaan dan masalah kesihatan dipengaruhi oleh jantina serta jenis sukan. Majoriti kecederaan dan masalah kesihatan dialami adalah masalah ringan dan tidak mengecualikan atlet daripada penyertaan.*

**Kata kunci:** Epidemiologi; kecederaan sukan; kejohanan pelbagai sukan

### INTRODUCTION

While the benefits of sports on health has been widely proven and accepted, the unwanted side effects and the injuries are becoming more evident. Sports injuries are an increasing burden to both the athletes and the society (Ekstrand et al. 2011; Orchard et al. 2013). Therefore, developing strategies in injury and illness prevention are paramount in ensuring optimal athletes performance

especially during the critical time around games. In an effort to understand this issue the International Olympic Committee (IOC) with the local organising committees are actively focusing on injuries and illnesses surveillance during competitive events (Junge et al. 2008). Understanding the extent of this problem is an important first step in developing prevention plan (van Mechelen et al. 1992).

Currently there are only few studies that report the incidence of injuries and illnesses among Malaysian athletes. Most available literatures were cross-sectional studies conducted during single sport tournaments including rugby and badminton (A Hamid et al. 2014; Goh et al. 2013). Although Malaysia has been taking part in many multisport events including the South-East Asia Games, University Games, Olympic Games and Islamic Solidarity Games, information on the incidence of injury and illness among Malaysian athletes participating at these events is limited. At present there is only one study that explored the pattern of injuries and illnesses among Malaysian athletes (athletics, badminton, cycling, soccer, hockey, shooting and swimming) published in 1973 (Jegathesan 1973). Since 1973 more Malaysian athletes are taking part in various sports at many different levels. Also the number of women athletes entering these Games has increased. The changing patterns of participants combined with rules modifications of individual sports over the years may influence epidemiology of sports injuries and illnesses among Malaysian. Apart from providing important information on injury and illness pattern, such information is valuable for the long-term goal of prevention. Furthermore, this knowledge could also be useful for medical team planning and preparation at future events.

The main objective of this study was to examine the patterns of injuries and illnesses affected the Malaysian athletes at the XVII Asian Games 2014. Also, factors associated with injuries were explored. Findings from this study will be used for continuous improvement effort in providing better care for athletes' health and well-being at future multisport games.

## METHODS

### STUDY DESIGN

We performed an observational prospective study of injuries and illnesses sustained by Malaysian athletes taking part at the XVII Asian Games 2014.

### PARTICIPANTS

All athletes selected to represent Malaysia at the XVII Asian Games 2014 were eligible to take part in this study. Details of the study including objectives and procedures involved were distributed and presented at the Malaysian Contingent team briefing before the centralised training camp. Athletes' were assured of anonymity and all information gathered was treated with strict confidentiality. Participation was voluntary and written informed consent were obtained from all athletes.

### DATA COLLECTION

Using the convenience sampling approach, all injuries and illnesses reported to the Malaysian medical personnel (physiotherapists, staff nurses, medical assistants

and doctors) whether on-field (including training and competition) or at the contingent medical clinic were recorded in a standardised injury/illness report form. The injury report form was adapted from the International Olympic Committee (IOC) daily report of injury and illness form (Junge et al. 2008). Athlete accreditation number, date of birth and sports were recorded in the injury report form. Also, information on the injury or illness sustained including the date of injury, whether the injury occurred during competition or training, body part involved, injury type, provisional diagnosis and severity of injury were documented. All Malaysian contingent medical personnel for the 2014 Asian Games were trained through a half-day workshop on the use of the injury/illness report form by the principal investigator. Data collection started on the first day of the contingent centralised camp (9 - 14 September 2014) and ended on the final day of the XVII Asian Games (15 September - 4 October 2014).

### DEFINITION OF INJURY AND ILLNESS

Injuries and illness were defined as new (pre-existing or not fully recovered conditions were not recorded) or recurrent (athletes having successfully returned to full participation after previous condition) musculoskeletal complaints (including concussion) or medical illness diagnosed at training or competition regardless of the consequences of the athlete absence from competition or training (Engebretsen et al. 2013). In cases where athletes sustained multiple injuries or affected multiple body parts, only the most severe diagnosis was documented (Engebretsen et al. 2013).

### DATA ANALYSIS

Injuries sustained by athletes were broken down according to sport where appropriate. Categorical variables were presented as frequencies (numbers) and prevalence (%). Whereas continuous variables were expressed as mean  $\pm$  SD or median  $\pm$  IQR based on data distribution assessed using the Shapiro-Wilk test of normality. The incidence of injury and illness were calculated according to the formula  $i = n/e$ , where  $n$  is the number of injuries or illnesses during competition or training throughout the centralised camp and Asian Games and  $e$  was the number of exposed athletes (Engebretsen et al. 2013). Injuries and illnesses incidences were reported per 100 athletes and the incidence rate between two groups were expressed as rate ratios (RR) with 95% confidence intervals (CIs).

Injury severities were dichotomised into injury without time away from participation and injury resulting in time away from participation. The association between injury severity and gender, sport category (individual or team), type of sport (contact or non-contact sports), injury mechanism (contact vs non-contact injuries), injury circumstances (training or competition) and body region injured were assessed using chi-square test. Stepwise logistic regression analysis was conducted to identify

predictors of injury severity. Variables with  $p<0.25$  on univariate testing were included in the multivariate logistic regression model, as recommended by previous researchers (Bursac et al. 2008; Hosmer & Lemeshow 2000). All analyses conducted were two-tailed with significance level set at  $p<0.05$ .

#### ETHICAL APPROVAL

This study was approved by the Medical Ethics Committee University Malaya Medical Centre (MECID No: 20158-1546) and the National Sports Institute of Malaysia Research Committee (ISNRP: 33/2014).

#### RESULTS

A total of 276 athletes represented Malaysia competing in 24 of 26 sports at the XVII Asia Games 2014. Of these 167 (60.5%) were men and 109 (39.5%) women. The median age of Malaysian athletes took part at the Games was  $23.0 \pm 5.0$  (IQR) years. Incidence of injuries among the Malaysian athletes during the games was slightly higher compared with illness; 30.0 vs. 23.0 per 100 athletes ( $p=0.12$ ), respectively. Missing data of 8.4% ( $n=7$ ) was noted only in the estimation of return-to-play date variable.

#### INJURIES INCIDENCE AND DISTRIBUTIONS

Among the 276 Malaysian athletes participated at the games, 83 injuries were diagnosed representing an overall injury rate of 30.1 injuries per 100 athletes (Table 1). Seventy-nine (85%) athletes sustained at least one injury, 12 (13%) athletes were diagnosed with two injuries and another two sustained three injuries. Although, the number of injuries between team and individual athletes were comparable ( $n=41$ ; 49% vs.  $n=42$ ; 51%, respectively), athletes in individual events had higher proportion of more severe injury resulting in time away from sport activities (37.8% vs. 12.8%). Highest numbers of injuries were diagnosed among badminton players ( $n=18$ ) followed by hockey ( $n=16$ ) and rugby ( $n=9$ ). The injury rate was slightly higher in men 32.9 injuries per 100 athletes (95% CI 24.8 to 42.9) than women 25.7 (95% CI 17.1 to 37.1) the difference however was not statistically significant ( $p=0.28$ ). However, men hockey players had significantly ( $p<0.001$ ) higher incidence of injury (RR=15) compared with women (Table 2).

#### INJURY MECHANISMS AND CIRCUMSTANCES

More than half of the total injuries ( $n=47$ ; 57%) were sustained during training sessions. Furthermore, 65% of all

TABLE 1. Overall injuries diagnosed among Malaysian athletes at the ASIAN Games 2015  
by sport, severity, match and training sessions

Sport	Athletes (n)	Injuries / Illnesses						Training	All illness
		All	Same day RTP	Mild 1 – 7 days	Severe > 28 days	Match	Training		
Athletic	6	1 (1.2)	1 (1.8)	0 (0.0)	0 (0.0)	1 (4.0)	0 (0.0)	1 (1.6)	
Badminton	20	18 (21.7)	4 (7.0)	10 (62.5)	2 (3.5)	3 (12.0)	14 (29.8)	4 (6.3)	
Beach volleyball	4	1 (1.2)	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.1)	0 (0.0)	
Bowling	12	6 (7.2)	4 (7.0)	1 (1.8)	0 (0.0)	0 (0.0)	4 (8.5)	10 (15.6)	
Boxing	2	1 (1.2)	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Cricket	30	5 (6.0)	5 (8.8)	0 (0.0)	0 (0.0)	1 (4.0)	4 (8.5)	5 (7.8)	
Cycling	7	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (4.7)	
Diving	9	2 (2.4)	2 (3.5)	0 (0.0)	0 (0.0)	1 (4.0)	1 (2.1)	2 (3.1)	
Hockey	32	16 (19.3)	9 (15.8)	4 (7.0)	0 (0.0)	5 (20.0)	9 (19.1)	7 (10.9)	
Kabaddi	10	4 (4.8)	4 (7.0)	0 (0.0)	0 (0.0)	2 (8.0)	2 (4.3)	2 (3.1)	
Rugby	24	9 (10.8)	9 (15.8)	0 (0.0)	0 (0.0)	2 (8.0)	4 (8.5)	1 (1.6)	
Sailing	17	6 (7.2)	6 (10.5)	0 (0.0)	0 (0.0)	1 (4.0)	5 (10.6)	2 (3.1)	
Sepaktakraw	20	2 (2.4)	2 (3.5)	0 (0.0)	0 (0.0)	2 (8.0)	0 (0.0)	6 (9.4)	
Shooting	12	2 (2.4)	2 (3.5)	0 (0.0)	0 (0.0)	1 (4.0)	0 (0.0)	8 (12.5)	
Soccer	20	5 (6.0)	3 (5.3)	1 (1.8)	0 (0.0)	5 (20.0)	0 (0.0)	5 (7.8)	
Swimming	6	1 (1.2)	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Synchronized swimming	3	1 (1.2)	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.1)	4 (6.3)	
Table tennis	3	1 (1.2)	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.1)	1 (1.6)	
Taekwondo	3	1 (1.2)	1 (1.8)	0 (0.0)	0 (0.0)	1 (4.0)	0 (0.0)	1 (1.6)	
Wushu	8	1 (1.2)	0 (0.0)	0 (0.0)	1 (1.8)	0 (0.0)	1	0 (0.0)	
Total	248*	83	57**	16**	3**	25#	47#	64	

Values are numbers (percentages) of injuries or ill athletes

\*No injuries or illness were reported in 4 sports (archery, golf, gymnastics and weightlifting) (28 athletes)

\*\*Information on injury severity is not documented in 11 injuries

#Eleven injuries did not occur during either match or training sessions

TABLE 2. Overall injuries by gender and sports

Sports	Men		Women		<i>p</i>	RR	95% CI
	n	All injuries	n	All injuries			
Athletic	4	1	2	0	0.48	-	-0.44 – 0.94
Badminton	10	12	10	6	0.16	2	-0.23 – 1.43
Beach volleyball	4	1	0	0	-	-	-
Bowling	6	1	6	5	0.10	5	-0.13 – 1.47
Boxing	2	1	0	0	-	-	-
Cricket	15	3	15	2	0.65	1.5	-0.17 – 17.96
Diving	3	1	6	1	0.62	2.0	0.03 – 156.99
Hockey	16	15	16	1	0.0005	15.0	2.3 – 631.5
Kabaddi	10	4	0	0	-	-	-
Rugby	12	3	12	6	0.32	2.0	0.43 – 12.36
Sailing	10	4	7	2	0.70	1.4	0.20 – 15.52
Sepaktakraw	12	2	8	0	0.25	-	-0.12 – 0.45
Shooting	8	1	4	1	0.62	2.0	0.03 – 156.99
Soccer	20	5	0	0	-	-	-
Swimming	4	0	2	1	0.16	-	-0.19 – 1.19
Synchronized swimming	0	0	3	1	-	-	-
Table tennis	0	0	3	1	-	-	-
Taekwondo	2	1	1	0	0.48	-	-0.89 – 1.89
Wushu	4	0	4	1	0.32	-	-0.24 – 0.74
Total	142	55	99	27			

Values are numbers (percentages) of injured athletes

\*No injuries or illness were reported in 5 sports (archery, golf, gymnastics and weightlifting) (35 athletes)

injuries in the individual and 49% of team events occurred at training. Majority ( $n=63$ ; 76%) of injuries were classified as non-contact injuries and only 20 resulted from contact either with an object ( $n=12$ ; 15%) or contact with another person ( $n=8$ ; 10%).

#### SEVERITY, LOCATION AND TYPES OF INJURIES

Majority of injuries did not result in any time away from sports ( $n=57$ ; 68.7%). Nineteen injuries (22.9%) however did prevent athletes from competing or training. Among these, 16 injuries were classified as minor (1 - 7 days off sports) and three were moderate (8 - 28 days off) injuries. Most injuries that resulted in time away from participation occurred at training ( $n=15$ ) and only four sustained during competition. Throughout the Games, 13 knees, 12 lower back, nine thighs and seven ankle injuries were diagnosed (data not shown). The three most common injuries were muscle strain and tears ( $n=29$ ; 35%), ligamentous injuries ( $n=17$ ; 21%) and contusion/bruise ( $n=11$ ; 13%).

A significant relationship between injury severity and sport category was found ( $\chi^2 = 6.3$ ,  $p = 0.01$ ). Sport category, type of sport and injury mechanism met the criteria for inclusion in the multivariate model. The odds of athletes participating in individual sport sustaining injuries resulting in time away from participation (training and competition) was 4.1 times higher than athlete in team sports ( $p = 0.01$ ; (95%CI: 1.3 - 13.1). All other variables were eliminated by the stepwise procedure.

#### ILLNESSES INCIDENCE AND DISTRIBUTIONS

A total of 64 illnesses were reported, representing an incidence of 23.2 illnesses per 100 athletes. On average one in every five athletes suffered an illness. The incidence of illness was significantly higher in women than men athletes (30.3 vs. 18.6 illnesses per 100 athletes, RR=1.6 (95% CI 1.0 to 2.8),  $p=0.04$ ). Illnesses were reported from various sports including bowling, shooting, hockey, sepak takraw, soccer, cricket, badminton and synchronised swimming (Table 1). Illnesses affecting the respiratory tract ( $n=33$ ; 51%) were the condition most frequently diagnosed followed by skin ( $n=8$ ; 13%) and gastrointestinal conditions ( $n=3$ ; 5%). Majority of the illnesses ( $n=51$ ; 80%) did not result in absence from training or competition. Only seven illnesses were categorised as minor with an estimated time loss from participation not more than seven days.

#### DISCUSSION

To the best of our knowledge, this is the second study since 1973 that describe sports injuries and illness suffered by Malaysian athletes during an International Multisport Games. Such information would be useful for ideal planning of team medical coverage at any events. Throughout the study period, 30.1% and 23.2% of the 276 Malaysian athletes sustained at least one injury or illness, respectively. The rate of injury and illness noted in this study were lower compared to previous study (43.8% and 28.1%) (Jegathesan 1973). This could be attributed

to a smaller contingent size in the previous study ( $n=57$ ) (Jegathesan 1973). Therefore, a small change in number of injury and illness seen in previous study may directly influence prevalence rates to larger degree.

In contrast with previous report, the current study found that incidence of injuries was comparable between men and women. Jegathesan (1973) observed higher incidence of injury among women than men (Jegathesan 1973). It should be emphasise here that fewer women athletes took part in the 1973 Olympic Games ( $n=3$ ) than at the XVII Asian Games 2014 ( $n=109$ ). Our observation is consistent with more recent studies on injuries and illness at the summer Olympic Games 2008 and 2012 (Engebretsen et al. 2013; Junge et al. 2009).

When injuries were stratified according to type of sports, significantly higher injury rate was observed between men and women hockey players. Men hockey players were 15-times more likely to sustain an injury compared with women. This observation is in agreement with other studies. Previous studies reported between 1.7 and 4-fold higher incidence of injuries (all injuries and time-loss injuries) in men than women hockey players (Junge 2006; Murtaugh 2009; Sherker 2014). Moreover, Murtaugh (2009) reported men hockey players were more likely (OR=6.0) to sustained severe injuries leading to time-loss from participation then women. Higher injury rates among men in current study could be attributed to more number of matches played by men (6 games) compared with women (4 games) hockey teams. Additionally, differences in type of play, intensity and aggressiveness of play (men played for medal contention games) may influence the injury patterns between genders.

In contrary to previous reports however, majority (57%) of injury in the current study occurred at training. Injury surveillance studies among athletes at the Summer Olympic Games 2008 and 2012 reported 55% to 73% of injuries were sustained during competition. It should be reminded here that injuries incurred during warm-up before competition were analysed as injuries during competition in these studies (Alonso et al. 2010; Engebretsen et al. 2013). Considering that athletes spent more time preparing for competition than competing, it was not surprising to observed higher rates of injury during these sessions (Shariff & George 2009). Besides, training sessions may involve more injury-producing drills that athletes are working on to perfection for competition (Witvrouw et al. 2001). However, this issue needs further exploration as sustaining injury at such critical time could be counterproductive to the time and effort already put in by the athletes and support team.

It is comforting to know that majority (68.7%) of injuries were mild and did not prevent athletes from continuing participation in their events. Minimally severe injuries (no absence from competition or training) ranges from 65% to 75% of total injuries were also reported in previous studies that involved larger number of athletes (Engebretsen et al. 2013; Owoeye 2010). The relationship between injury severity and sports category must be

interpreted cautiously as the total number of mild to severe injuries observed in the current study was small (individual sports = 11; team sports = 5) (Palmer-Green & Elliott 2015).

Upper respiratory tract infection (URI) was the commonest illness diagnosed among the Malaysian team. This finding was in agreement with data from earlier studies (Alonso et al. 2010; Engebretsen et al. 2013; Hanstad et al. 2011; Mountjoy et al. 2010; Palmer-Green & Elliott 2015). Factors including over training induced 'immunosuppression', crowding at competition venues/athletes village, regular changes in temperature extremes (12°–28°C) e.g. moving from athlete accommodation to venues could contribute to such high prevalence of URI (Mountjoy et al. 2010; Palmer-Green & Elliott 2015). Consistent with previous report, incidence of illnesses was significantly higher among women than men (Alonso et al. 2010; Engebretsen et al. 2013; Hanstad et al. 2011; Mountjoy et al. 2010; Palmer-Green & Elliott 2015). In a prospective study on upper respiratory symptoms and oral-respiratory mucosal immunity among endurance athletes, it was noted that given the same training load, women demonstrated greater depressive effect on humoral and systemic immunity than men. The author further concluded that lower mucosal-immunity associated with training as the most likely reasons for higher URI among women (He et al. 2014).

This study has several limitations that require to be mentioned. First because of limited number of medical staff, priority of medical coverage was given for competition rather than training sessions, particularly to sports that have higher risk of injury such as combat and contact sports. Therefore, there is a possibility that minor injury occurred during training sessions may have been under-represented. Secondly, the time away from participation was based on the physician's estimate. Although a follow-up of the injured athletes might improve validity of these data, logically was impractical, as some athletes had returned home following injury (for further investigations and management) and upon completion of their events.

## CONCLUSION

The incidence of injuries and illnesses among Malaysian athletes at the XXVII Asian Games 2014 were 30.0 and 23.0 per 100 athletes, respectively. The rate of injury and illness were influenced by gender and type of sports. It is comforting to know that majority of injuries and illnesses were minor and did not result in time away from participation. Further exploration on cause of injuries and illnesses is important in instilling prevention initiatives and medical planning for future games.

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