Occurance of injury during ASEAN Paragames Cambodia 2023: a study in Indonesia para-athletics team

Incidencia de lesiones durante los Juegos Paralímpicos de la ASEAN Camboya 2023: un estudio en el equipo de paraatletismo de Indonesia

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Abstract

Introduction: Possible risk factors, such as gender, age, type of discipline, and category of impairment, are associated as indicators of higher incidence rates (IR) and injury characteristics in athletic athletes.
Objective: To provide deeper information about the incidence rate (IR) and injury characteristics in the Indonesian athletics team at the ASEAN Paragames Cambodia 2023.
Methodology: This research employs a retrospective study methodology in conjunction with an observational approach. Comprehensive athlete demographic data were obtained from the National Paralympic Committee Indonesia (NPC Indonesia). Injury-related data were obtained from a database by a medical team that provided treatment for their respective sports, using a recording system created by the medical team.
Results: 86.8 injuries per 1000 athlete days was the overall injury rate. The IR did not significantly differ between tracks (IR, 112.55) and field (IR, 61.22).
Discussion: Athletes using assistive devices have the potential to experience injuries to the lower limbs, although athletes with limb deficiency may face lower risk levels compared to athletes from other ambulation impairment categories. Athletes using wheelchairs who participate in throws have a high risk of experiencing injuries in the shoulder area.
Conclusions: Injuries in athletes with assistive devices occur more frequently in the thigh, and shoulder injuries in wheelchair athletes. The type of impairment an athlete has and the sport they play affect the frequency and location of biomechanical injuries.

Keywords

Athletic; injuries; incidence rate; Paragames.

Resumen

Introducción: Posibles factores de riesgo, como el género, la edad, el tipo de disciplina y la categoría de discapacidad, se asocian como indicadores de tasas de incidencia (TI) más altas y características de las lesiones en atletas.
Objetivo: Proporcionar información más detallada sobre la TI y las características de las lesiones en el equipo de atletismo de Indonesia en los Juegos Paralímpicos de la ASEAN Camboya 2023.
Metodología: Este estudio utiliza un enfoque observacional con un método de estudio retrospectivo. Los datos demográficos completos de los atletas se obtuvieron del Comité Paralímpico Nacional de Indonesia (CPN Indonesia). Los datos relacionados con las lesiones se obtuvieron de una base de datos por un equipo médico que brindó tratamiento en sus respectivos deportes, utilizando un sistema de registro creado por el equipo médico.
Resultados: La TI general fue de 86,8 lesiones por cada 1000 días-atleta. No se observaron diferencias significativas en la TI entre la pista (TI: 112,55) y el campo (TI: 61,22).
Discusión: Los atletas que utilizan dispositivos de asistencia tienen el potencial de sufrir lesiones en las extremidades inferiores, aunque los atletas con deficiencias en las extremidades pueden enfrentar niveles de riesgo menores en comparación con los atletas con otras categorías de discapacidad para la deambulación. Los deportistas que realizan deporte en silla de ruedas corren un elevado riesgo de padecer lesiones en la región del hombro.
Conclusiones: Las lesiones en atletas con dispositivos de asistencia ocurren con mayor frecuencia en el muslo, y en los atletas en silla de ruedas, en el hombro. La incidencia y el lugar de las lesiones biomecánicas difieren dependiendo del tipo de discapacidad del deportista y el deporte que practica.

Palabras clave

Atletismo; lesiones; tasa de incidencia; Parajuegos.

Introduction

Sports play a crucial role in maintaining physical fitness and building a strong physique. The interdependence of health and physical activity is widely recognized, as both are essential for individuals seeking a healthy and disease-resistant body (Salahudin & Rusdin, 2020). However, the pursuit of athletic excellence inevitably carries the risk of injury. Injury is defined as the result of external forces exerted on the body or specific body parts, exceeding the body's capacity to withstand and respond to such forces. Excessive force or energy applied to the body leads to injury, impairing the body's ability to cope and adapt (Zou et al., 2022).

The risk of sports injuries varies significantly among athletes, influenced by a multitude of factors including the type of sport, environmental conditions, and individual athlete characteristics and behaviors. These factors encompass age, gender, skill level, and the use of protective equipment (Anwar & Abdullah, 2021). Research has highlighted the prevalence of injuries in Paralympic sports. For instance, (Sakanashi et al., 2024) reported a 38.8% injury rate among 4,403 athletes from 163 countries at the Tokyo 2020 Paralympic Games. Similarly, Maria (2025) found an overall weekly injury prevalence of 34.6% and a weekly severity score of 48.6% during the Rio de Janeiro 2016 Summer Paralympic Games. Notably, 21% of these injuries were acute, 49% were gradual, and 30% had an unknown onset. Explanation byDerman et al. (2013), in their study of the London 2012 Paralympic Games, observed a 12.7% injury incidence rate over a 14-day study period, with rates of 14.8% during the pre-competition period and 12.1% during the competition period. The percentage of athletes experiencing injuries was 4.3% in the pre-competition phase and 10.9% during the competition phase.

Athletics stands out as a sport with a large and diverse athlete population participating in the ASEAN Para Games. The 2023 ASEAN Para Games in Cambodia featured 1,453 athletes competing in 14 sports, with athletics having one of the highest athlete representations. In accordance with the International Paralympic Committee (IPC) regulations, athletics events at the Para Games include track and field, encompassing various disability categories such as physical impairments, visual impairments, and intellectual disabilities.

In recent years, sports medicine and injury prevention research has focused heavily on injury surveillance in athletics (track and field)(Clarsen & Bahr, 2014; Edouard et al., 2014; Junge et al., 2008); Timpka et al., 2014; Yeung et al., 2009). This growing interest is a result of the realization that a thorough understanding of injury incidence and patterns is highly beneficial to the medical professionals and physiotherapists in charge of athlete care at major international competitions. Effective preventive measures can be developed and tracked over time by identifying risk factors linked to common injuries (Mechelen et al., 1992).

Both domestically and abroad, numerous studies have examined injury surveillance in sports at different levels of competition (Alonso et al., 2012; Alonso et al., 2010, Feddermann-Demont et al., 2014; Jacobsson et al., 2012; Yeung et al., 2009), with a growing focus on the benefits of injury prevention initiatives. For example, studies carried out during the International Association of Athletics Federations' World Athletics Championships in 2007, 2009, and 2011 revealed incidence proportions (IP) that varied from 97.0 to 153.4 injuries per 1000 registered athletes. The first extensive injury and illness surveillance study specifically targeting athletes participating in Paralympic summer sports was conducted during the London 2012 Paralympic Games (Derman et al., 2013; Schwellnus et al., 2013; Willick et al., 2013). The overall incidence rate (IR) for all sports at the London 2012 Paralympic Games was 12.7 injuries per 1000 athlete-days. Notably, according to Willick et al., (2013) track and field and athletics had the sixth-highest injury incidence rate.

Therefore, this study aims to provide in-depth information on the incidence rate (IR) and injury characteristics within the Indonesian athletics team at the ASEAN Para Games 2023. Additionally, we aim to assess whether potential risk factors discipline type (e.g., sprint versus endurance, track versus field), age, gender, and impairment category are linked to increased injury rates in this population.

Method

This study used a retrospective study design with an observational approach. Over the course of the seven days of the ASEAN Para Games 2023, medical records of para-athletic athletes from the Indonesian contingent were gathered and examined. The number of injuries per 1000 athlete-days, or the Incidence Rate (IR), was computed. The athlete-days calculation method described by Derman et al., (2013) was modified for this study. The number of injuries per 100 athletes (%) was used to compute the Incidence Proportion (IP), which represents the percentage of athletes who report injuries

Procedure

This extensive injury and illness surveillance study involved 57 athletes from the Indonesian delegation. Comprehensive athlete demographic data, including confidential information such as age, gender, and sport codes, were obtained from the National Paralympic Committee Indonesia (NPC Indonesia). Injury-related data were sourced from a single database maintained by the medical team, who provided treatment for their respective sports, using a standardized recording system.

The number of injuries per 1000 athlete-days was used to calculate the Incidence Rate (IR), which is explained in more detail below. The percentage of athletes who report injuries is known as the Incidence Proportion (IP), and it is computed as the number of injuries per 100 athletes (%). Injuries were defined for this study using the definition provided by Derman et al.: "a new injury or exacerbation of a pre-existing injury occurring during training and/or competition within the pre-competition and competition periods." According to the definition, acute traumatic injuries are "injuries resulting from a direct traumatic event." The definition of acute-on-chronic injuries was "acute injuries occurring in athletes with pre-existing chronic injury symptoms in the same body region." Finally, "injuries that develop gradually over days, weeks, or months and are not associated with a single triggering event" was the definition given to chronic overuse injuries" (Derman et al., 2013).

Instrument

The number of injuries per 1000 athlete days was used to compute the incidence rate, or IR. As previously mentioned, athletic injury data was gathered in addition to general study data. Injury data from the entire seven-day athletics competition at the ASEAN Para Games Cambodia was taken out for the analysis specific to athletics. Additionally, categories of "sprint" and "endurance" were established for wheelchair and ambulating athletes competing in track events based on previous research (Alonso et al., 2009). In particular, 800m, 1500m, and 5000m races were categorized as "endurance," whereas 100m, 200m, and 400m races were classified as "sprint". In light of (1) the comparatively small number of Paralympic athletes competing in long-distance events (5000m and marathon) and (2) the frequent participation of Paralympic athletes in multiple or all "endurance" events, particularly in wheelchair racing, beginning from 800m, the previously mentioned "middle-distance" and "long-distance" categories (Alonso et al., 2009) were combined into a single "endurance" category for this analysis.

Additional data on athlete classifications and competition types was gathered from the International Paralympic Committee (IPC) athlete database in order to aid in the creation of meaningful sport-specific injury reports pertaining to Incidence Rate (IR) and Incidence Proportion (IP) in athletics. This made it possible to compare track and field disciplines and map injuries by impairment category (using classification data).

Data analysis

The information was displayed as the total number of injuries sustained by each athlete. An athlete could report multiple injuries during the seven days of competition at the Para Games, and an athlete could also participate in multiple sporting disciplines. Standard descriptive statistical analyses were conducted, including totals, proportions, and incidences across the entire sample and for subgroups categorized by sport discipline, injury type, gender, and age. To identify significant differences in incidence data, incidence ratios were applied to compare data based on gender, age, and injury type.

Results

Overall Incidence of Injuries (Track and Field)

Using a retrospective cohort design, this study examined data gathered over the course of the seven-day ASEAN Para Games Cambodia 2023 competition. Medical records from the Indonesian medical team were reviewed. Over the total 7-day monitoring period, data from 57 athletics athletes from the National Paralympic Committee Indonesia, representing 476 athlete-days, were included in the analysis. The cohort consisted of 36 male athletes (68.5% of all athletes) and 21 female athletes (31.4%).

Proportion of Incidence (IP). Over the course of the seven days, 41 injury cases were reported (IP, 60.8). Of these, 35 athletes participated in field events with 15 injuries (IP, 42.86%), and 33 athletes participated in track events with 26 injuries (IP, 78.79%).

Incidence Rate (IR). The overall incidence rate (IR) for athletics during the study period was 86.8. No significant differences in IR were observed between track (IR, 112.55) and field (IR, 61.22) disciplines.

Injury IR in Track Disciplines

Track Disciplines' Injury IR by Impairment Category. In track athletics, 7 injuries were recorded among 13 athletes with limb deficiencies (IR, 76.92), 10 injuries among 10 ambulating athletes with visual impairments (IR, 178.57), 4 injuries among 5 ambulating athletes with intellectual impairments (IR, 114.29), and 2 injuries among 2 ambulating athletes with cerebral palsy (CP) (IR, 142.86). Amulating athletes with visual impairments and cerebral palsy (CP) exhibited significantly higher injury rates (IR, 178.57 and IR, 142.86, respectively) compared to athletics athletes with limb deficiencies (Table 1). Notably, wheelchair racing athletes reported the lowest injury incidence, with 0 injuries (IR, 0.00). The risk of injury in running events was higher for ambulating athletes than for those participating in wheelchair racing.

Injury IR in Track Disciplines by Gender. A total of 18 injuries were recorded among 22 male athletes (IR, 71.43), and 8 injuries among 11 female athletes (IR, 54.42), indicating a higher injury rate among male track athletes compared to female athletes (Table 1).

Table 1. Track event injury ip and ir by sex and impairment category at asean paragames cambodia 2023 during the competition period (7 days)

	Participating Athletes (n)	Athletes-day	Injuries (n)	IP (per 100 athletes)	IR (per 1000 athletes-day)
Total athletes	33	399	26	78.79%	112.55
		Sex			
Male	22	252	18	81.82%	71.43
Female	11	147	8	72.73%	54.42
		Ambulan track			
Limb deficiency	13	91	7	53.85%	76.92
Visual impairment	10	70	10	100.00%	178.57
Intelectual impairment	5	35	4	80.00%	114.29
Cerebral Palsy	2	14	2	100.00%	142.86
Wheelchair racing	3	21	0	0.00%	0.00

*IP= Incidence Proportion, IR= Incidence Rate

Injury IR in Field Disciplines

Injury IR by Impairment Category in Field Disciplines. Six injuries were sustained by 17 ambulating throwing athletes in field disciplines (IR, 35.29). When comparing impairment categories within ambulating throwing events, the incidence rate (IR) appeared significantly higher for athletes with intellectual impairments and cerebral palsy (CP) compared to the overall population. Out of these, five injuries were reported among eight athletes competing in seated throwing events (IR, 89.29), suggesting that the injury rate for seated throwing athletes was significantly higher than that of wheelchair racing athletes (IR, 0.00). In jumping events, 4 injuries were reported among 10 athletes (IR, 40.00).

Gender-specific Injury IR in Field Disciplines. The data revealed 9 injuries among 24 male athletes (IR, 53.57) and 6 injuries among 11 female athletes (IR, 77.92), suggesting no significant gender-related differences in injury incidence in field disciplines (Table 2).

Table 2. Field event injury ip and ir by sex and impairment category at asean paragames cambodia 2023 during the competition period (7 days)

	Participating Athletes (n)	Athletes-day	Injuries (n)	IP (per 100 athletes)	IR (per 1000 athletes-day) (95% CI)
Total athletes	35	245	15	42.86%	61.22
		Sex			
Male	24	168	9	37.50%	53.57
Female	11	77	6	54.55%	77.92
		Ambulant jumping			
Limb deficiency	6	42	1	16.67%	23.81
Visual impairment	2	14	1	50.00%	71.43
Intelectual impairment	2	14	2	100.00%	142.86
		Ambulant Throwing			
Limb deficiency	11	77	2	18.18%	25.97
Visual impairment	2	14	1	50.00%	71.43
Intelectual impairment	1	7	1	100.00%	142.86
Cerebral Palsy	1	7	1	100.00%	142.86
Short Stature	2	14	1	50.00%	71.43
Seated throwing	8	56	5	62.50%	89.29

*IP= Incidence Proportion, IR= Incidence Rate

Injury IR Anatomic Area in Ambulant Athletes

Injury IR by Anatomical Area. In ambulating athletics, a total of 38 (38.4%) injuries were recorded among track and field athletes, with the leg being the most frequently affected anatomical area. Specifically, 24 (24.2%) injuries involved the thigh, 15 (15.2%) injuries involved the ankle, 7 (7.1%) injuries involved the upper back, 6 (6.1%) injuries involved the knee, and 5 (5.1%) injuries involved the shoulder. The lowest injury incidence, 1 (1.0%), was observed in the forearm, hip, foot, and lower back regions. These findings indicate that leg injuries were the most prevalent among ambulating athletes, with 33 injuries occurring in the leg region in track events, and ankle and leg injuries being predominant in field events (Table 3).

Table 3. Injury rate in ambulant athletes by anatomical area at asean paragames cambodia 2023 during the competition period (7 days)

Anatomic area	Track	Field	Injuries , n (%)
Shoulder	3	2	5 (5.1)
Fore Arm	0	1	1 (1.0)
Hip	1	0	1 (1.0)
Knee	4	2	6 (6.1)
Ankle	10	5	15 (15.2)
Thigh	20	4	24 (24.2)
Leg	33	5	38 (38.4)
Foot	0	1	1 (1.0)
Upper back	4	3	7 (7.1)
Lower back	1	0	1 (1.0)
TOTAL	76	23	99 (100.0)

Injury IR Anatomic Area in Seated or Wheelchair Athletes

Injury IR by Anatomical Area. In wheelchair athletics, 3 (15.8%) injuries each occurred in the shoulder and thigh regions. Additionally, 2 (10.5%) injuries each occurred in the forearm, upper back, and lower back regions. The ankle experienced 5 (26.3%) injuries, while the leg and knee each had 1 (5.3%) injury. The risk of injury in running events was higher for ambulating athletes than for those participating in wheelchair events (Table 4).

Table 4. Injury rate in seated or wheelchair athletes by anatomical area at asean paragames cambodia 2023 during the competition period (7 days)

Anatomic area	Track	Field	Injuries, n (%)
Shoulder	0	3	3 (15.8)
Fore Arm	0	2	2 (10.5)
Knee	0	1	1 (5.3)
Ankle	0	5	5 (26.3)
Thigh	0	3	3 (15.8)
Leg	0	1	1 (5.3)
Upper back	0	2	2 (10.5)

Lower back	0	2	2 (10.5)
TOTAL	0	19	19 (100.0)

Discussion

This study represents the first investigation involving Indonesian national para-athletic athletes to determine the injury prevalence and detailed information regarding injury incidents and associated factors within track and field athletics at the Para Games. During the 7-day competition, the Incidence Rate (IR) was 86.8 per 1000 athlete-days. The IR for track events was similar to that of field events. Key findings of this study on injury factors and characteristics in Para Games athletics revealed that: (1) male athletes in track disciplines had a higher injury incidence ratio (IRR, 71.43) than female athletes; (2) ambulating athletes with visual impairments and cerebral palsy (CP) experienced higher IRs in track events (IRs of 178.57 and 142.86) compared to those with limb deficiencies; (3) wheelchair athletes in seated throwing events (field discipline) had a higher IR than those in wheelchair racing (track discipline) (IRs of 89.29 for seated throwing and 0.00 for wheelchair racing).

When comparing these findings with other research on athletics, it is important to highlight that injury patterns in physically able-bodied athletes show higher injury rates during competition than during training. Although able-bodied athletes tend to suffer more time-loss injuries (36% of all injuries across 13 international athletics championships) than the athletes in this study (Feddermann-Demont et al., 2014) , it is noteworthy that for athletes who can ambulate without difficulty, thigh injuries are the most commonly diagnosed (Alonso et al., 2012; Alonso et al., 2009; Alonso et al., 2010); Askling et al., 2014; Feddermann-Demont et al., 2014), which aligns with the current study's finding that the thigh was the most frequently injured anatomical location in ambulating athletes. Due to differing definitions of Incidence Rate (IR) and Injury Prevalence (IP) across studies, making direct comparisons between athletes with and without disabilities is challenging. Most previous studies on able-bodied athletes in international competitions used "injuries per 1000 registered athletes" to present IP data (Alonso et al., 2012; Alonso et al., 2009; Alonso et al., 2010). When comparing IP using "injuries per 1000 registered athletes" with "injuries per 100 athletes" as in this study, it appears that athletes with disabilities experience a higher injury incidence (18.4 injuries per 100 athletes in this study) compared to able-bodied athletes (ranging from 97.0 to 135.4 injuries per 1000 registered athletes in previous studies). However, it is crucial to note that previous studies on able-bodied athletes did not primarily focus on IR, making it difficult to compare injury rates across competitions of varying lengths.

A key takeaway from this study is that runners with limb deficiencies tend to experience fewer injuries during running events (IR, 76.92) compared to those with other types of impairments. The study also suggests that wheelchair or seated athletes are more prone to upper limb injuries in throwing events than those competing in wheelchair racing. This challenges previous beliefs that wheelchair racing athletes had the highest injury risk. Although more biomechanical research is needed to better understand the injury mechanisms, it is suggested that seated throwing athletes are more vulnerable to upper limb injuries due to the nature of the throwing motion, which is similar to that of other athletes who rely on their upper limbs for throwing (Kibler & Thomas, 2012). Additionally, because wheelchair and seated athletes do not primarily use their legs and core for generating force in explosive throws, the upper body may undergo greater stress during the movement. Given these findings, future shoulder injury prevention programs should focus on seated throwing athletes, emphasizing scapular stabilization, improving glenohumeral joint internal rotation, and promoting closed kinetic chain strengthening to balance muscle function.

This study is the largest and first prospective cohort research focused on injury incidence and risk factors in Paralympic athletics, specifically examining Indonesian national athletes. Given that athletics is the most significant and one of the most widely recognized sports at the Paralympic Games, gaining a deeper understanding of injury patterns among athletes is vital for preventing injuries in the sport. Additionally, this is the first study to report injury incidence rates in Paralympic athletics, considering athlete-days and allowing comparisons with other events across different sports and time periods. By developing a web-based injury surveillance tool, we were able to gather detailed injury data and information on athlete impairments, facilitating comparisons of injury incidence across various impairment categories.

The limitation of this study is that it only discusses Injuries to the Indonesian Para-Athletics Team During the 2023 ASEAN Paragames Cambodia. It is also important to note that these findings only account for injuries sustained during the Paralympic competition period, whereas many injuries in athletics occur outside of competition, as athletes often train individually and in decentralized locations. This limitation is similar to those found in other large-scale epidemiological studies in athletics (Edouard et al., 2014).

Conclusions

This study offers an in depth analysis of the frequency, characteristics, and factors related to injuries in Paralympic athletics competitions, which are the largest sport in the Para Games. Athletes who use assistive devices are particularly vulnerable to lower limb injuries, although those with limb deficiencies may have a lower risk compared to athletes with other mobility impairments. Among wheelchair athletes, those involved in throwing events face a higher risk of shoulder injuries. The main findings of this research provide valuable insights for physicians, therapists, coaches, and trainers, aiding in the development of injury prevention strategies aimed at protecting the health of Paralympic athletes. Additionally, it emphasizes that the occurrence and type of biomechanical injuries vary depending on the athlete's impairment and the specific sport they compete in.

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