INCIDENCE OF INJURIES AND ILLNESSES AMONG SABAHAN ATHLETES DURING SUKMA XIX 2018

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(Received 13 June 2019; accepted 24 July 2019; published online 1 January 2020)

To cite this article: *Aziz, M. A. & Mathew, M. G. (2020). Incidence of injuries and illnesses among Sabahan athletes during SUKMA XIX 2018. Malaysian Journal of Movement, Health & Exercise, 9(1), 89-101. https://doi.org/10.15282/mohe.v9i1.404*
Link to this article: *https://doi.org/10.15282/mohe.v9i1.404*

Abstract

This is an epidemiological study on injuries and illnesses among Sabah SUKMA athletes in 2018. This study was done retrospectively using a standardized data registry. Incidence of injuries and illnesses were 16.27 and 16.74 per 100 athletes, respectively. Combat sports showed the highest incidence of injuries (45%), mainly involving the head and neck region. Common injuries included muscle strains and ligament sprains. The concussion rate was 1.85 per 100 full contact athletes. Time loss percentage was 1.4%. There were no reports on any severe head injuries or severe concussions. This could be due to the strict implementation of protective gear during competitions. The concussion rate was lower compared to many other international studies. Muscle strains was seen more in high speed sprinting and kicking athletes. The most significant illness affecting Sabahan athletes was an isolated case of mumps. However, contact tracing was activated immediately and there were no reported Mumps outbreaks among Sabahan athletes.

Keywords: SUKMA; Sports injury; Combat sports

Introduction

Sports and exercise have many benefits, improve quality of life and reduce mortality (Penedo and Dahn, 2005). They are the main modalities in primary and secondary preventions for cardiovascular disease (Fletcher et al. 1996). Kujala (1996) and Drawer (2001) reported a high incidence of musculoskeletal disorders and long-term disability, especially among elite athletes at the end of their careers. The prevalence of sports injuries is worrying, as it is burdening the healthcare system, and causing disabilities among athletes (Ekstrand, Hagglund & Walden, 2011; Orchard, Seward & Orchard, 2013). Nevertheless, sports injuries are unpredictable despite multiple measures taken to create safe sports environment and optimum health and well-being of participating athletes.

Sports injury is defined as any musculoskeletal complaint incurred during competition and/or training in any sports event which received medical attention. An injury can be detrimental to athletes, as it will cause absence of play during a competition. Severity of injury in this study is classified into three categories according to its duration; minor injury (1-7 days), moderate injury (8-28 days) and serious injury (more than 28 days to 6 months) or long term (more than 6 months) (Timpka, 2014). In addition to injuries, medical related illnesses can create problems for athletes during the period of competition. Medical illness is defined as "any medical concern; physical or psychological complaints which are not related to an injury that incurred during training or competition" (Junge et al., 2008; Timpka, 2014). This includes all medical problems as well as psychiatric diseases. Sports injury can be divided into two categories: acute injury and overuse injury. Yang J et al. (2012) defined acute injury as "trauma resulting from a specific and identifiable event", while overuse injury is described as "repeated microtrauma without a single, identifiable event responsible for the injury".

SUKMA is a biennial Malaysian sports event. Sabahan athletes participated in 25 out of 29 sports disciplines. This study divided the disciplines into three categories; full contact sports, limited contact sports, and non-contact sports. The full contact sports are defined as "sports in which physical contact is required and allowed by the rules" (Laoruengthana et al. 2009). This includes Boxing, Taekwondo, Rugby, Muay Thai, Judo, Pencak Silat, and Karate. Limited contact sports are defined as "sports in which the rules are designed to prevent intentional or unintentional contact between players which, if it occurs, carries strong penalties, including removing players from the field" (Laoruengthana et al. 2009). This includes football, futsal, and hockey. Non-contact sports are defined as "a sport in which players are physically separated, and contact is nearly impossible" (Laoruengthana et al. 2009). This includes swimming, aquatic, badminton, cycling, lawn bowl, gymnastic, archery, athletic, sailing, squash, bowling, weightlifting, golf, petanque and sepak takraw.

Malaysian athletes have participated in major national and international sports events since the Olympics in 1956. However, there have been limited studies done on the incidence of sports injuries among Malaysian athletes participating in multisport events including the SUKMA Games, Southeast Asia Games, University Games, and Olympic Games (Hamid, Salleh, Jamalullail & Hussein, 2016). To the author's knowledge, there have been no studies on the incidence of sports injuries among Sabahan athletes. This study looks at probable injury prevention strategies and medical team preparation for future sports

events. The objective of this study is to describe the pattern of injuries and illnesses seen among Sabahan athletes during SUKMA 2018.

Methods and Materials

Study design

This is an observational retrospective study. Data were collected from 8th – 22nd September 2018 during SUKMA Games XIX 2018 among Sabahan athletes.

Participants

All Sabahan athletes who reported to the medical camp or on site from 8th – 22nd September 2018 with medical complains, musculoskeletal complains and concussion were included in the study pools. Officials who were treated for medical or musculoskeletal complains were excluded from the study.

Data collection

Data were collected using a convenience sampling approach. As required by respective sports associations, athletes in full contact sports/ combat sports had to undergo pre-participation evaluation in Sports Medicine Clinic, Queen Elizabeth Hospital, Sabah prior to the event. This was conducted from 1st May 2018 until 30th July 2018. Detailed demographic data were taken, and systemic examination and detailed musculoskeletal examination were performed by trained medical officers and sports physicians. All medical examinations were recorded in a standard pre- participation form, and those who were declared fit to participate or only had minor overuse injuries were allowed to participate in SUKMA events. During SUKMA events (8th – 22nd September 2018), a standardized injury/illness registry was used. All injuries and illnesses of Sabahan athletes attended were recorded by Sabah medical team personnel (doctors) during the event, (including pre match warm up and competition) or at the contingent's medical camp. The demographic data which included the athlete's name, date of birth, identification number, race, and sports were recorded in the form provided. Injuries were identified as either acute injury during the event or overuse injury which occurred during training and were recorded in the registry. If the athletes had two or more injuries, the most serious injury was recorded in this study. The data registry includes information regarding the injured body parts, type of injury, mechanism of injury, provisional diagnosis and severity of injury. All athletes were examined and promptly given treatment, with a subsequent follow-up at the sports medicine clinic at Queen Elizabeth Hospital, Sabah, after the games.

Data analysis

The incidence of injuries and illnesses were calculated using formula $i = n/e$, where n is the number of injuries or illnesses attended by medical personnel from 8th – 22nd September 2018 (SUKMA 2018) and e is the number of Sabah athlete participated in the event by using excel and SPSS 22nd Version. Incidences were reported as per 100 athletes, and the

incidence rate between two groups were expressed as Rate Ratio (RR) with 95% confidence intervals (Cl).

Results

A total of 430 athletes represented Sabah at the SUKMA Games XIX 2018, competing in 25 sports disciplines. A total of 239 athletes were males (55.5%) and 191 were females (44.5%).

Injury incidence and distribution

A total of 70 injuries were recorded during the event, representing an overall injury incidence of 16.27 per 100 athletes. Eight of the athletes sustained two or more injuries affecting different body parts, while the rest of the injured athletes sustained a single injury. Male athletes reported a lower incidence of injury (14.6 per 100 athletes) than female athletes (18.3 per 100 athletes). Combat sports showed a higher percentage of injury among Sabahan athletes; Muay Thai (n=10,14.2%), Pencak Silat (n=9, 13%), Boxing (n=7, 10%), Karate (n=5, 7.1%), and Taekwondo (n=1, 14%), contributing to 45% of total injuries. Full contact sports showed the highest percentage of reported injuries (n= 35, 50%), compared to limited contact sports (n=17, 24%) and non-contact sports (n=18, 26%). Male athletes have higher percentage of injury in contact sports (n=20, 57%) and in limited contact sports (n=10, 58%) whereas female athletes had a higher percentage of injuries in non-contact sports (n=13, 72%). There were no reports of injury in weightlifting, Judo, golf, squash, sailing and diving.

Injury mechanism and circumstances

Most of the injuries reported were acute (*n*=58, 82.85%), while others were overuse injuries (*n*=12, 17.15%). Acute injuries were dominated by Muay Thai (n=9), silat (n=8), and boxing athletes (n=7) whereas overuse injuries were seen most commonly in football (n=4), hockey (n=3), and karate (n=3). The most common types of injuries were muscle strains (*n*=21, 30%) and ligament injuries (*n*=18, 27.14%).

Based on body region in combat sports, head injuries had the highest percentages of all injuries (*n*=7, 21.8%) followed by lumbar region injuries (*n*=5, 15.6%). The concussion rate per 100 full contact sports athletes was 1.85, and it is reassuring to know that no serious head injuries were reported. Based on type of injuries in combat sports, muscle strains (*n*=15, 46.8%) had the highest recorded rate of injuries involving the lumbar, thigh, leg and shoulder regions.

In contact sports, lower limb injuries (n=16, 45.7%) were more common compared to head and neck (n=12, 34.3%) and upper limb injuries (n=7, 20%). A high number of muscle strains (n=9) were reported around thigh and leg regions. Similarly, in limited contact sports, lower limb injuries (n=15, 88%) were the most commonly reported injuries, along with ankle sprains (n=5).

Whereas in non-contact sports, upper limb injuries dominated as compared to other body parts. Muscle strains (n=6) and ligament sprains (n=4) were also commonly reported.

Table 1: Descriptive analysis of injuries

Sports	Total Athlete Registered	Injured	Same Day RTP	Severe	Match	Training	All Illness
Archery	16	1 (1.4)	1 (1.4)	-	1 (1.7)	-	8 (11.2)
Athletic	47	2 (2.8)	2 (2.8)	-	-	2 (16.6)	-
Badminton	16	4 (5.6)	4 (5.6)	-	4 (6.8)	-	4 (5.6)
Bowling	15	2 (2.8)	2 (2.8)	-	1 (1.7)	1 (8.3)	1 (1.4)
Boxing	9	7 (9.8)	7 (9.8)	-	7 (11.9)	-	2 (2.8)
Cycling	21	2 (2.8)	2 (2.8)	-	1 (1.7)	1 (8.3)	5 (7)
Futsal	32	4 (5.6)	4 (5.6)	-	4 (6.8)	-	12 (16.8)
Gymnastic	6	1 (1.4)	1 (1.4)	-	-	1 (8.3)	-
Hockey	36	7 (9.8)	7 (9.8)	-	4 (6.8)	3 (24.9)	-
Karate	21	5 (7)	5 (7)	-	3 (5.1)	2 (8.3)	-
Lawn Bowl	14	1 (1.4)	1 (1.4)	-	1 (1.7)	-	7 (9.8)
Rugby	24	2 (2.8)	2 (2.8)	-	1 (1.7)	1 (8.3)	2 (2.8)
Silat	29	9 (12.6)	9 (12.6)	-	9 (15.3)	-	10 (14)
Swimming	15	2 (2.8)	2 (2.8)	-	2 (3.4)	-	-
Taekwondo	4	1 (1.4)	1 (1.4)	-	1 (1.7)	-	-
Takraw	30	3 (4.2)	2 (2.8)	1 (100)	3 (5.1)	-	5 (7)
Muay Thai	15	10 (14)	10 (14)	-	9 (15.3)	1 (8.3)	11 (15.4)
Football	20	7 (9.8)	7 (9.8)	-	7 (11.9)	-	2 (2.8)
Akuatik Terjun	5	-	-	-	-	-	-
Perahu Layar	11	-	-	-	-	-	-
Squash	8	-	-	-	-	-	1 (1.4)
Weight Lifting	9	-	-	-	-	-	-
Golf	7	-	-	-	-	-	-
Judo	6	-	-	-	-	-	-
Petangue	14	-	-	-	-	-	1 (1.4)
Total	430	70	69	1	58	12	71

*Values are number (percentage) of injured or ill athletes

*No injuries or illness reported in Judo, Golf, Weight lifting, Sailing, Akuatik Terjun

*RTP is return to play

Injury severity

1) Medical Illness

The rate of illnesses among Sabahan athletes during SUKMA 2018 was 16.74 per 100 athletes, of which 71 medical diagnoses were made. Female athletes (18.6 per 100 athletes) had a higher incidence of illness as compared to male athletes (14.6 per 100 athletes). The respiratory system was the most common system involved, all related to infections (*n*=38, 53.5%) and there were no documented hyperactive airways disease. Upper respiratory tract

infections were commonly seen among Pencak Silat (n=8,21%), archery (n=7,18.4%) and Muay Thai athletes (n=5, 13.1%).

There was a case of suspected mumps infection in one of the futsal players, leading to quarantine of the Sabah futsal team including officials and a bar from playing in the tournament. This led to the public health surveillance team activation, and there were no reports on Mumps outbreak among athletes.

Table 2: The rate of illnesses among Sabahan athletes during SUKMA 2018

Sport	Frequency men	Injured Men	Frequency Female	Injured Female	P value (Fisher exact)	Risk Ratio	95% CI
Archery	8	0	8	1	1.0	-	0.88- 1.48
Athletic	27	0	20	2	0.176	-	0.96 – 1.28
Badminton	8	1	8	4	0.569	0.23	0.43 – 2.56
Bowling	7	1	8	1	1.0	1.16	0.087– 15.075
Boxing	8	1	1	1	1.0	-	0.50 – 1.11
Cycling	13	-	8	2	0.133	-	0.89 – 1.98
Futsal	16	-	16	4	0.10	-	1.0 – 1.76
Gymnastic	1	1	1	1	-	-	-
Hockey	18	4	18	3	1.0	1.42	0.347– 5.127
Karate	11	4	10	1	0.311	5.14	0.484– 27.331
Lawn Bowl	7	-	7	1	1.0	1.16	0.86 – 1.57
Rugby	12	1	12	1	1.0	1	0.070- 14.208
Silat	17	3	12	6	0.1	0.214	0.109– 1.140
Swimming	3	-	12	2	1.0	-	0.93 – 1.54
Taekwondo	1	-	3	1	1.0	-	0.67 – 3.3
Takraw	15	2	15	1	1.0	2.15	0.2 – 19.7
Muay Thai	10	5	5	-	0.1	-	0.26 – 0.93
Football	20	7	20	7	-	-	-

*Values are number (percentage) of injured or ill athletes

*No injuries or illness reported in Judo, Golf, Weight lifting, Sailing, Diving, Squash, Petangue

Discussion

To the author's knowledge, there have been few and limited studies regarding the incidence of sports injuries among Malaysian athletes in multisport events, whether at the national or international level. This could be the first study to describe the pattern of injuries in Sabah athlete in a national sports event. The incidence of injuries and illnesses in Sabahan athletes is smaller as compared to the incidence among Malaysian athletes in the Asian Games in 2014 (30.1 per 100 athletes) (Hamid et al. 2016). However, the incidence rate is higher compared to the studies done among international athletes participating in multisport events (Soligard et al. 2017; Junge et al. 2009; Engebretsen et al. 2013; Engebretsen et al. 2010; Palmer-Green & Elliott, 2014). Van Beijsterveldt et al. (2015) reported a higher incidence of injuries in professional athletes as compared to amateur athletes during competition. Based on this study, it is probable that lower fitness level and lower intensity of training could be the predisposing factors of injuries affecting amateur Sabahan athletes. This study also noted that the incidence of injuries in female athletes was higher compared to male athletes, which coincides with studies on the London

Olympics 2012 (Engebretsen et al. 2013), Rio Olympics 2016 (Soligard et al. 2017), Korean team in Rio Olympics 2016 (Yoon et al. 2018), Malaysian athletes in the Asian Games in 2014 (Hamid et al. 2016), and Malaysian Olympic athletes in 1972 (Jegathesan, 1973).

Combat sports showed a high incidence of injury. This number of injuries reported in combat sports were higher compared to other studies done for Malaysian athletes (*n*=3, 3.6%) (Hamid et al. 2016), Thailand athletes (*n*=146, 29.43%) (Laoruengthana et al. 2009) and Korean team (*n*=67, 21.73%) (Yoon et al. 2018). Most of the injuries occurred in combat sports were acute injuries. Combat sports are well known for a high incidence of injury due to the rules of the games which allow full physical contact amongst players during competition (Laoruengthana et al. 2009). The high impact contact between opponents is the best explanation for the high risk of injuries. We noticed that the head and back are more prone to injuries in combat sports, results which are similar to other studies, potentially resulting in serious complications such as cerebral concussion (Ngai, Lewy & Hsu, 2008; Burke, 2003; Pieter & Zemper, 1998). *Muay Thai* reported a highest percentage of head injury compared to other combat sports. Muay Thai allows its players to target the bare head, despite having no protective gear, which makes this sport high risk for injuries (Motamedi et al. 2010).

The incidence rate of concussion in this study is lower as compared to the concussion rate of the Olympics: Beijing Games (12 concussions, 1.09 per 1000 athletes) (Junge, 2009); London Games 2012 (6 concussions, 0.57 per 1000 athletes) (Engebretsen, 2013); and Vancouver Winter Olympic Games 2010 (7.8 concussions per 1000 participating athletes) (Engebretsen, 2010). However, there were no reports of severe concussions or severe head injuries. The strict implementation of rules required athletes to wear protective gear when participating in combat tournaments may have prevented severe concussions and severe head injuries. However, protective head gear and mouth guard show no evidence in reducing risk of concussions in some studies. Nevertheless, it should be recommended as it can reduce the risk of skull fractures and maxillofacial injuries (Graham et al. 2014). Robust evidence shows increased risk of post traumatic encephalopathy in athlete who had frequent head trauma (concussion) and in athletes that participate in full contact level over long periods, which may present as anxiety, difficulty focusing and early Alzheimers (Rimel et al., 1981; Lystad & Reidar, 2015). This is due to degeneration of brain structure resulting from repetitive trauma involving area of hippocampus, thalamus and basal ganglia and affecting cognitive function of the brain (Lystad & Reidar, 2015). This highlights the importance of educational programs on concussions which should be delivered repeatedly and in efficient manner not only to athletes, but to coaches and parents as well. Effective concussion education should include importance of reporting concussion symptom, as well as improving attitudes and beliefs about concussions among athlete, coaches and parents (Graham et al. 2014).

This study found a high percentage of injuries in full contact sports. Male athletes sustained more injuries in contact sports possibly due to higher intensity of contact as compared to female athlete during competition (Inklaar h. 1994). Sabahan athletes reported high number of lower limb injuries in contact sports (n=16, 45%) which is a similar finding to Lee AC & Lee ZC. (2018) (n=137,66.5%). However, the most common body parts

reported were thigh (n=5), and leg (n=4) due to muscle strains. This study shows a higher number of muscle strains (n=15, 42.8%) compared to Perak athletes (n=39, 16.9%) (Lee, A. C., & Lee, Z. C. 2018). However, the huge difference in rates could be attributed to the small sample sizes of this study. Contact sports contributed to high muscle strains due to nature of the sports that requires high velocity and intensity either in sprinting or kicking (Kerr Z. et al. 2017). Hamstring injuries (n=8) were seen in sports which involved high speed sprinting such as in sprinters, footballers and rugby athletes, whereas hamstrings injuries while kicking are prevalent in Muay Thai and Pencak Silat athletes. Muscle strains occur during strong muscle eccentric contraction (Garrett, 1990). Proper warm up and stretching along with other methods such as strength training, plyometric and proprioception training can be used as strategies to reduce the number of strain injuries. Lumbar strain in combat is due to excessive twisting motion required for the kicking performed in combat sports (Harvey & Tanner, 1991). Other factors that might contribute to this injury includes poor strength of core musculature, and tight hip/lumbar muscles (Harvey & Tanner, 1991). Although most common back injuries are mechanical, a proper clinical assessment is essential, as these athletes have increased risk of spine pathology such prolapsed intervertebral discs, nerve root impingement, and sacral stress fractures that may require early surgical intervention (Baker & Patel, 2005).

In this study, the most common injuries reported in non-contact sports were muscle strains (n=6) and ligament strains (n=4); however, the rate is lower compared to contact sports injuries. This finding of high strains and sprains among non-contact sports athletes are similar to one study done among Perak SUKMA athletes (Lee, A. C. et al. 2018). However, upper limb injuries were the most reported injuries in our non-contact sport contrary from the findings by Lee et al. 2017. Shoulder injuries are the most common reported injuries among swimming and cycling athletes. The cycling athletes had histories of previous shoulder dislocations and clavicular fractures attributed to trauma in previous tournaments, reporting to medical camp for shoulder discomfort. The most common causes of shoulder injuries in cyclist are clavicular fracture and rotator cuff injuries due attributed to trauma during cycling events (Goldstein, Yariv et al. 2016). Although the injuries around the shoulder are often not severe, they can compromise the performance of the athlete during a tournament. Thus, Goldstein, Yariv et al. (2016) recommended protective shoulder gear for cyclers specific to apex of the shoulder to reduce the incidence of clavicular injury.

This study showed the lowest percentage of time away of injury (*n*=1,1.4%) as compared to Malaysian athletes in Asian Games (*n*=19, 22.9%) (Hamid et al. 2016), Korean team in the Rio Olympics 2016 (12%) (Yoon et al. 2018), Beijing 2008 (49.6%) (Junge et al. 2009), Vancouver 2010 (32%) (Engebretsen et al. 2010), London 2012 (35%) (Engebretsen et al. 2013), and Rio 2016 (40%) (Soligard et al. 2017). One possible explanation is elite athletes compete more vigorously compared to amateurs, which subsequently results in higher rate of moderate to severe injuries in elite athletes.

Illness

Upper respiratory infection (URI), as in other studies, was the commonest illness diagnosed among Sabahan athletes (Junge et al. 2009; Engebretsen et al. 2010; Engebretsen et al. 2013; Hamid et al. 2016, Yoon et al. 2018). Robust studies have shown

that athletes are predisposed to infection during sports events due to impaired function of immune response during intense training as well as higher risk of transmitting the infection due to overcrowding during the event (Nieman, 1994; Palmer-Green & Elliot, 2014).

The spread of communicable disease is a major concern in sporting events. One of these includes the suspected case of mumps encountered by one of the Sabahan athletes. A multidisciplinary team were activated during the event involving pediatricians and public health department. The nasal swab Polymerase Chain Reaction (PCR) for mumps was positive and athletes with Mumps contact were quarantine throughout the event. However, further assessment done by public health reported no mumps outbreak in among Sabahan athletes. Mumps is a viral infection causing inflammation to the glands most commonly parotid glands. Mumps spreads easily via air droplets and can cause dreadful complications; meningitis, encephalitis and death. Mumps can cause an infectious disease outbreak that will affect not only athletes but also coaching and supporting staffs. Sports provide an excellent opportunity for the transmission of communicable diseases to athletes, athlete staffs and social contacts. Modes of transmission in athletic settings include person-to-person contact, common-source exposures and airborne/droplet spread. One example of communicable disease occurring in major sports events was the measles threat during the Vancouver Olympic Winter Games 2010 (Khan et al. 2010) and the H1N1 threat during the Singapore Asian Youth Games 2009 (Abu Bakar et al. 2012). A proper multidisciplinary approach should be considered to prevent outbreaks, including improved surveillance and preventive measure of infectious disease transmission, public awareness, as well as access to public healthcare setting for a fast response to an epidemic (Abu Bakar et al. 2012).

This study produced a knowledge on incidence of injuries and illnesses among Sabahan athletes which is beneficial for improvement of injury surveillance and future planning. However, few limitations of this study should be stated. Many of the athlete did not came for clinic follow post event due to geographical difficulties and logistic reasons. Thus, injury outcomes as well as time lost due to injuries could not be assessed properly. There could be under reported injuries resulting in small sample size. Furthermore, due to a small number of medical team members, there was no medical team stand by during the pre-match warm up sessions. Thus, there were difficulties determining the relative injury risk among each disciplines of sports due to small sample size and unequal athlete distribution.

Conclusion

The incidence of injury in this study is higher than among international elite athletes. Overall risks of injury and illness are higher in females as compared to males. This study demonstrates that there is a high injury rate in combat sports (45%). Full contact sports showed a higher percentage of injuries as compared to limited contact sports and non-contact sports. The majority of injuries was mild and did not result in time lost due to the use of protective gear. There were no reports of severe head injuries and severe concussion. The main highlight in this study is the incidence of mumps resulting in the quarantine of the futsal team. However, further assessment by public health authorities found no mumps

outbreak among the athletes. There is a need to conduct further studies into the incidence of injuries in major sports events.

Conflict of Interest

The authors declare that there is no conflict of interest.

Acknowledgement

We would like to thank Dr Yau May Yann, Dr Muhammad Yusri Bin Yunus, Dr Dayyinah Binti Radzi – Sports Medicine Unit, Queen Elizabeth Hospital, Sabah, and Puan Nadirah Binti Sulaiman – Clinical Research Center, Queen Elizabeth Hospital, Sabah for contributing in this study.

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