

Differences in heat stroke prevention between Japan and Southeast Asia

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Acknowledgments

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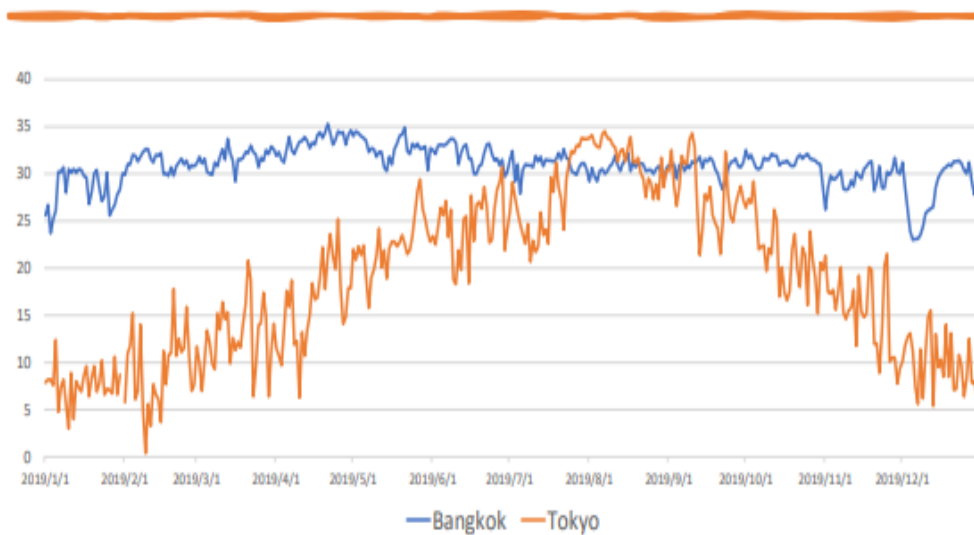
Background

- Recent reviews have highlighted global warming and health impacts in tropical areas.
- Global warming will increase heat illness at home, work and sports.

Characteristics of Japan

- Japan has a temperate humid climate with four distinct seasons.
- The temperature range throughout the year is wide, and temperatures can exceed 35 °C in the summer.
- Japan was the world's most aged population in 2017 (27.7% were ≥65 years old).

Highest temperature of Bangkok and Tokyo in 2019



The difference between Bangkok and Tokyo

- The both highest temperature of August exceeds 30°C and it is very hot.
- There is greatly a difference of the temperature of winter.

Heat stroke in Japan

- In Japan, more than 50,000 heat illness patients are transported to hospital by ambulance from May to September every year.
- A total of 95,137 patients were transported to hospitals for heat stroke, and 160 ultimately died in 2018.
- It has been reported that the majority of severe heatstroke cases were in elderly subjects affected during daily activities.

Definitions about heat stroke

- Because definitions of Heatstroke, heat illness, heat exhaustion and Heat related illness are not unified, we confuse and use them.
- In this report, we define them according to the general article of Bouchama A from N Engl J Med.

Bouchama A, Knochel JP. Heat stroke. N Engl J Med. 2002;346(25):1978-88.

Heat stroke

Severe illness characterized by a core temperature $>40^{\circ}\text{C}$ and central nervous system abnormalities such as delirium, convulsions, or coma resulting from exposure to environmental heat (classic heat stroke) or strenuous physical exercise (exertional heat stroke)

Bouchama A, Knochel JP. Heat stroke. *N Engl J Med.* 2002;346(25):1978-88.

Active Cooling

- Active cooling is essential for the treatment of heat stroke (Severe; deep body temperature $\geq 40^{\circ}\text{C}$ and Glasgow coma scale ≤ 8) .
- In multivariate analysis, Rehydration-only therapy had a 3.29-fold higher risk of in-hospital mortality than Active cooling.

Kanda J, Nakahara S, Nakamura S, et al. Association between active cooling and lower mortality among patients with heat stroke and heat exhaustion. *PLoS One.* 2021; 16 (11): e0259441.

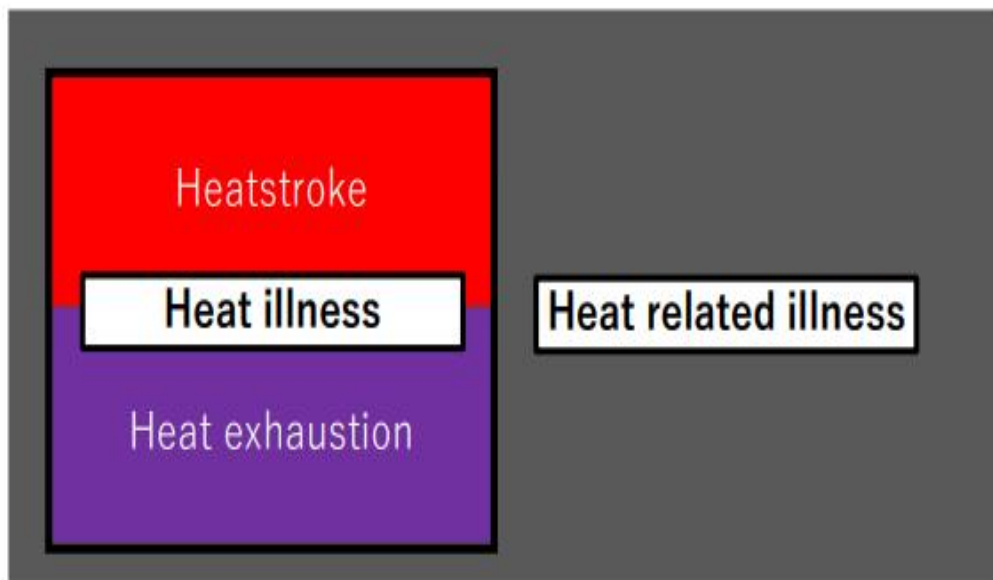
Heat illness

- **All illness** from exposure to high environmental heat or strenuous physical exercise
- Heatstroke(Severe) + Heat exhaustion(Mild to moderate)

Heat related illness

- Illness from exposure to high environmental heat or strenuous physical exercise but **not to have a diagnosis of heat illness**
- The border with heat illness is indistinct.
- In the heat environment Heat related illness may increase before Heat illness increases.

Physical disability due to heat environment



Examples of Heat related illness

- In the previous research, the onset of the following disease increases by a rise in temperature.
 - Psychiatric disorders
 - Heart conduction disorders
 - Cerebrovascular disorder
 - Kidney disease

Worries about Heat related illness

- Because heat stroke has not been diagnosed, is there a risk that Active Cooling is not being performed on patients who need it?

Limitations of the previous research

- They do not examine a climate and a disease outbreak directly.
- They do not consider a local difference.
- The definition of heat illness and heat related illness is not clear.

The relation between heat related illness and climate: multi-country study

- We plan to determine disease included in heat related illness by revealing relations of climate (especially temperature and humidity) and onset of every disease.
- If the details of Heat related illness are determined, we can prevent heat illness and heat related illness more effectively.

Subject

- All patients of emergency visit in cooperation institutions between 1st January and 31 December 2019.
- I'm assuming a total of 400,000 people (currently collecting data)

Cooperative institutions (4countries 10 institutions)

- Teikyo University (Tokyo, Japan)
- Khon Kaen hospital (Thailand)
- Mahidol University (Thailand)
- Mahosot hospital (Laos)
- Hanoi medical university (Vietnam)
- Aizawa hospital(Cool area of Japan)
- Asahi general hospital (Cool area of Japan)
- Ageo Central General Hospital(Hot area of Japan)
- Northern Okinwa Medical Center (Hot area of Japan)

Methods

- Each institution will send the following patient information to us.
 - ① Date
 - ②Age
 - ③Sex
 - ④Disease name (ICD-10)
- We will obtain weather information of each area through Japan Meteorological Business Support Center.
- We will match patient information with weather information and examine a relationship.

Intermediate analysis

- We performed an interim analysis using the data we have now collected.
- We calculated the correlation between WBGT and the number of heat stroke visits for each day at each hospital.

Correlation coefficient between the number of heat stroke cases and temperature (interim analysis)

	Total	Heat stroke	Correlation coefficient	p
Japan				
Asahi General Hospital	30,179	131(0.43%)	0.420	<0.001
Aizawa Hospital	29,336	79(0.27%)	0.412	<0.001
Ageo Central General Hospital	4,104	23(0.56%)	0.340	<0.001
Teikyo University	2,197	27(1.22%)	0.183	<0.001
Southeast Asia				
Koan Kaen Hospital	114,561	28(0.024%)	0.095	0.07
Hanoi Medical University	22,361	5(0.024%)	0.252	<0.001

Summary of Interim analysis

- In Japan, heat stroke patients accounted for about 0.5-1.0% of all patients and were correlated with WBGT.
- In Southeast Asia, heat stroke patients accounted for only about 0.02% of all patients, and some facilities did not correlate with WBGT.

Consideration

- In the case of heat-related illness, which is a complication of heat stroke, treatment of both heat stroke and other illnesses will be necessary, but it is necessary to examine whether treatment of other illnesses in Japan and heat stroke in Southeast Asia is lagging behind.
- In this study, Heat related illnesses will be identified by examining which diseases are increasing in number with increasing WBGT.

Especially in sports

- In sports, people who are healthy by nature are prone to heat stroke, so this is not a situation where other diseases should be considered.
- Active cooling and fluid intake, which is the initial treatment for heat stroke, should be given as soon as possible.
- I will report on my visit to the Khon Kaen Marathon in January 2020.





Report

- Active Cooling (Cold water immersion) is being implemented.
- There was a noticeable number of cases of massage without cooling, and several of these cases were severe.

Consideration

- Although we cannot deny the possibility of orthopedic injuries, we believe that many of these cases are due to cramps as a symptom of heat stroke.
- As in the emergency room, it is likely that there are injured people in sports who are not recognized as having heat stroke.
- It is important to reduce the number of cases of serious illness due to lack of prompt active cooling and hydration.

Objection

- In Southeast Asia, people have a well-established lifestyle against the heat, and heat stroke is less common.
- If this opinion is correct, then Japan needs to learn a lot from Southeast Asia.
- In any case, it would be beneficial for Southeast Asia and Japan to work together to promote measures against heat stroke.

Conclusion

- If heat stroke is missed, there is a risk of delay in active cooling, so it is important to be proactive in the differential diagnosis.
- Especially in sports, it is important to take measures against heat stroke because many people are healthy by nature.