COMMENTARY

Landslide at Father's Organic Farm: DVI and the Health Indicators During Monsoons

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ABSTRACT

Landslides are one of the most destructive disasters in Malaysia, which frequently occurs during the southwest and northeast monsoons that bring heavy rain. In this commentary, we describe for the first-time disaster victim identification (DVI) protocols for the identification of landslide victims that occurred on an agricultural facility known as Father's Organic Farm and its adjacent campsite that claimed the lives of 31 campers. Since time immemorial, floods, landslides and water surges brought on by the two monsoons in Malaysia have destroyed properties and infrastructure, besides causing the subsequent rise of diseases (e.g., leptospirosis) that threaten human lives. Therefore, appropriate mitigation strategies at hill slopes and rivers near tourism sites and populated areas (e.g., installation of soil sensors and implementation of an early-warning system with appropriate evacuation plans) included in this commentary should be considered by policymakers and related agencies as extreme weather events may impact on the health and safety of residents and travellers.

Keywords: Disaster; DNA; Profiling; Ecotourism; Safety.

INTRODUCTION

Landslides are a complex natural disaster influenced by geological, hydrological, geomorphological and anthropogenic factors, but the well-known culprits are mainly deforestation and urbanisation (1-2). They are one of the most destructive disasters in Malaysia, which frequently occurs during the southwest and northeast monsoons that bring heavy rain from May to September, and from November to March, respectively (3). From 1993 to 2011 alone, there were 28 major landslides reported in the country with the loss of more than 100 lives; refer Table I for details.

The latest deadly landslide in Peninsular Malaysia occurred on December 16, 2022, on a hill slope in Batang Kali, Selangor, that caused around 450,000 cubic meters of earth to come crashing down on an agricultural facility known as Father's Organic Farm and its adjacent campsite (4). The incident claimed the lives of 31 campers (13 males and 18 females), including teachers, parents and children of a primary school in Kuala Lumpur. Many landslide tragedies in Selangor have occurred in residential areas located near and on hill slopes due to lack of drainage and stormwater planning. They include the collapse of one of three 12-storey Highland Towers apartment blocks in December 11, 1993 (48 deaths), the Taman Hillview landslide in November 20, 2002 (eight deaths), and the landslide that hit Madrasah Al-Taqwa, Hulu Langat, on May 21, 2011 (16 deaths, including 13 children) (3). However, the Father's Organic Farm, which is known for its ecotourism activities like camping, fishing and trekking, is not located near a critical slope that required regular monitoring by the authorities (5).

The search and rescue operations and victim identifications

The search and rescue (SAR) operations and victim identifications were conducted based on disaster

Table I : The fatal landslides in Malaysia between 1993 and 2019[3]

No	Year	Location	Consequences
1	1993	Highland Tower, Ulu Klang, Selangor	48 were killed and 2 were injured
2	1995	Kuala Lumpur – Karak Highway	20 were killed and 22 were injured
3	1996	Pos Dipang, Kampar, Perak	44 people were killed
4	2002	Taman Hillview, Ampang, Selangor	8 people were killed and 5 were injured
5	2004	Taman Melati, Gombak, Selangor	1 deaths
6	2006	Taman Zooview, Ampang, Selangor	4 were killed
7	2008	Taman Bukit Mewah, Ampang, Selangor	4 were killed
8	2008	Ulu Kelang, Selangor	4 were killed and 15 were injured
9	2008	Kuala Kubu Bharu, Batang Kali, Selangor	2 were killed
10	2008	Bukit Ceylon, Kuala Lumpur	1 death
11	2008	Pantai Dalam, Kuala Lumpur	1 death and 4 were injured
12	2011	Pekan Batu 14 Hulu Langat, Selangor	16 were killed
13	2017	Tanjung Bungah, Penang Island	11 construction workers were killed
14	2018	Jalan Bukit Kukus, Georgetown, Penang Island	9 workers were killed

Figure 1 : The incident area was separated into four sectors (i.e., sector A, B, C and D) for SAR operations.

victim identification (DVI) protocols proposed by The International Criminal Police Organizing (Interpol), which include scene examination as well as collection and reconciliation of post-mortem and ante-mortem data from victims and their relatives (6-7). The incident area was separated into four sectors (i.e., sector A, B, C and D) for SAR operations (Figure 1). The operations were carried out by various agencies, including the Fire and Rescue Department, Royal Malaysia Police, Malaysia Civil Defence Force and army personnel soon after the incident and ended on December 25 after the discovery of the last victim's body.

Overall, 31 were found death while 61 other campers at the site managed to escape with their lives. Autopsy procedures for the 31 remains were all performed at The Department of Forensic Medicine, Sungai Buluh Hospital, Selangor. The identities of victims were determined by their next of kin (i.e., visual identification of dead bodies in the morgue) or via post-mortem and ante-mortem data (fingerprints, dental records or DNA profiles). Several dead bodies were not able to be identified either via visual recognition, fingerprints or dental records as they were decomposed, fragmented or due to inavailability of ante-mortem records for comparison. For this specific reason, all 31 remains were subjected to DNA profiling using either their blood or bone (sternum) samples for confirmation and comparison was made with DNA profiles of their family members (Table II). Genetic materials from family members were sourced either from their blood or buccal swab samples. DNA from blood and buccal swab samples were then profiled using GlobalFiler™

Table II : Details of dead victims and identification methods

	Gender	Ethnicity	Recognition method			
			Visual	Fingerprint	DNA profiling	Dental record
Victim #1	Female	Chinese	√	√	√	
Victim #2	Male	Chinese		√	√	
Victim #3	Male	Chinese	√		√	
Victim #4	Female	Chinese	√	√	√	
Victim #5	Male	Chinese	√		√	√
Victim #6	Female	Chinese		√	√	
Victim #7	Female	Chinese		√	√	
Victim #8	Female	Chinese		√	√	
Victim #9	Male	Chinese		√	√	
Victim#10	Female	Chinese	√		√	
Victim #11	Female	Malay		√	√	
Victim #12	Female	Chinese	√		√	√
Victim #13	Female	Chinese		√	√	
Victim #14	Male	Chinese		√	√	
Victim #15	Female	Chinese		√	√	
Victim #16	Female	Chinese		√	√	
Victim #17	Male	Chinese	√		√	
Victim #18	Female	Chinese		√	√	
Victim #19	Male	Chinese		√	√	
Victim#20	Male	Chinese	√		√	
Victim #21	Female	Chinese	√	√	√	
Victim #22	Male	Chinese	√		√	
Victim #23	Female	Chinese		√	√	
Victim #24	Female	Chinese	√		√	
Victim #25	Female	Chinese	√		√	√
Victim #26	Male	Chinese		√	√	√
Victim #27	Male	Chinese			√	√
Victim #28	Female	Chinese			√	√
Victim #29	Female	Chinese		√	√	√
Victim #30	Male	Chinese		√	√	√
Victim #31	Male	Chinese	√		√	√

Data were obtained with permission from the DNA Databank Division (D13), Criminal Investigation Department, Royal Malaysia Police.

PCR Express Amplification Kit while DNA from bone samples were typed using GlobalFiler™ PCR Amplification Kit (Applied Biosystems, Foster City, CA) as previously described in Hakim et al. (8) at the Chemistry Department's Forensic DNA Division, Petaling Jaya, Selangor. Data collection methods were carried out in accordance with Malaysian DNA Identification Act 2009 (Act 699) and DNA Identification Regulations Act 2012 and were approved by DNA Databank Division (D13), Criminal Investigation Department, Royal Malaysia Police.

DISCUSSION

The landslide at Father's Organic Farm has again highlighted the health and safety risks that people in this country face during the monsoon. The tragedy and many others before it are a grim reminder to pay heed to safety and disaster preparations. Since time immemorial, floods, landslides and water surges brought on by the two monsoons in Malaysia have destroyed properties and infrastructure, besides causing the subsequent rise of diseases (e.g., leptospirosis) that threaten human lives (9). The greatest lesson may be learnt from the major floods that occurred from December 2014 to January 2015 during the northeast monsoon, which claimed 24 lives and displaced more than 200,000 people, besides incurring RM1 billion worth of economic losses (10). With an annual rainfall of up to 4,500 mm, water surges are also a frequent monsoon phenomenon in Malaysia, although they are rarely reported because they occur in the interior with few casualties. Heavy rain in hill areas experiencing deforestation, soil destabilisation and loss of water retention capability will result in massive volumes of water flowing from upstream that may wash away or flood human settlements downstream. The most recent case occurred in Gunung Jerai, Kedah, on August 18, 2021, in which six people lost their lives and many houses and chalets in several villages were completely destroyed (11). The Fire and Rescue Department has identified more than 180 water-surge prone areas in the country during the northeast monsoon, and there are many more areas at risk during the southwest monsoon (12).

It is thus imperative to have a reliable DVI protocols for identification of victim of mass disaster, as described here. Visual recognition is the first level of identification, but this method not usually reliably used for identification of decomposed, fragmented, skeletonized and mixing of human remains (13). Thus, the other methods of identification (fingerprint, dental record and DNA profiling) should be included, but they are all depend on the availability of ante-mortem and post-mortem data for comparison purposes (Table 2). As with visual recognition, fingerprint cannot be obtained from the deceased in certain cases due to injury or decomposition, and in Malaysia, fingerprint record not available for Malaysians under 12 years old. Then, DNA profiling is the only option left for DVI because ante-mortem dental records of high quality are usually limited or simply not available, as we observed in Batang Kali landslide incidence (Table 2) and other disasters (14). In Malaysia, DNA profiling services for civil and crime cases are provided by accredited laboratory at the DNA Databank Division (D13), Royal Malaysia Police and Chemistry Department. Their facilities are located throughout the country and accessibility and quality of DNA services are thus not an issue in Malaysia. The DNA Databank Division (D13) is responsible to keep DNA records in Forensic DNA Data Bank of Malaysia as stipulated under subsection 3 (3) of Act 699 for the purposes of forensic identifications (8). Section 4(2) of the Act 699 also allows for DNA profile and any related information to be kept in the database and used for DVI and missing person identification (15).

Here, we can clearly see that the DVI protocols used for the identification of landslide victims that occurred at Father's Organic Farm can be established and widely adopted by enforcement agencies for any natural or accidental disasters in Malaysia. This is because the adopted DVI protocols are very systematic and involved four identification methods that complimentary to each other. However, effort needs to be put into producing an increasing number of competent DVI specialists (forensic DNA, odontologist, pathologist and fingerprint experts). Sufficient resources should also be allocated to conduct regular training for DVI personnel as part of their continuing professional development to gain knowledge and skills related to victim identification and mass disaster management.

Overall, floods, water surges and landslides associated with two monsoons in Malaysia have significantly negative impact on the country. They have brought much grief and suffering to Malaysians and, therefore, appropriate prevention and mitigation measures are needed. As monsoon-related disasters may be mostly attributed to human influence, such programs should be geared towards changing society perception towards of the environment. Malaysians need to be constantly reminded to take care of their surroundings and implement safety measures to prevent tragedies. On the part of the authorities, there needs to be clear guidelines and legislation for managing hill slope activities. The dispute and confusion over campsite licensing that came to light after the landslide at Father's Organic Farm indicates a blame-game that reflects poorly on the authorities and industry stakeholders. Finally, monitoring of hill slopes and rivers near tourism sites and populated areas must be beefed up with the installation of soil sensors

and implementation of an early-warning system with evacuation plans. Remedial works should also be carried out at potential sites that have been over-developed.

CONCLUSION

This commentary provides for the first time the DVI process in Malaysia. The DVI protocols described here can be adopted for future identification of mass casualty incidents. Appropriate mitigation strategies included here should also be considered by policymakers and related agencies, as extreme weather events may impact on the health and safety of residents and travelers.

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