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Original Article

Clinical characteristics of 1653 injured motorcyclists and factors that predict mortality from motorcycle crashes in Malaysia

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ABSTRACT

Purpose: Amongst the ASEAN countries, Malaysia has the highest road fatality risk (>15 fatalities per 100 000 population) with 50% of these fatalities involving motorcyclist. This contributes greatly to ward admissions and poses a significant burden to the general surgery services. From mild rib fractures to severe intra-abdominal exsanguinations, the spectrum of cases managed by surgeons resulting from motorcycle accidents is extensive. The objective of this study is to report the clinical characteristics and identify predictors of death in motorcycle traumatic injuries from a Malaysian trauma surgery centre.
Methods: This is a prospective cross-sectional study of all injured motorcyclists and pillion riders that were admitted to Hospital Sultanah Aminah and treated by the trauma surgery team from May 2011 to February 2015. Only injured motorcyclists and pillion riders were included in this study. Patient demography and predictors leading to mortality were identified. Significant predictors on univariate analysis were further analysed with multivariate analysis.
Results: We included 1653 patients with a mean age of (35 ± 16.17) years that were treated for traumatic injuries due to motorcycle accidents. The mortality rate was 8.6% (142) with equal amount of motorcycle riders (788) and pillion riders (865) that were injured. Amongst the injured were male predominant (1 537) and majority of ethnic groups were the Malays (897) and Chinese (350). Severity of injury was reflected with a mean Revised Trauma Score (RTS) of 7.31 ± 1.29, New Injury Severity Score (NISS) of 19.84 ± 13.84 and Trauma and Injury Severity Score (TRISS) of 0.91 ± 0.15. Univariate and multivariate analysis revealed that age≥35, lower GCS, head injuries, chest injuries, liver injuries, and small bowel injuries were significant predictors of motorcycle trauma related deaths with $p < 0.05$. Higher trauma severity represented by NISS, RTS and TRISS scores was also significant for death with $p < 0.05$.
Conclusion: Age, lower GCS, presence of head, chest, liver, small bowel injuries and higher severity on NISS, RTS and TRISS scores are predictive of death in patients involved with motorcycle accidents. This information is important for prognostic mortality risk prevention and counselling.

Introduction

Motorcycles are an important mode of transportation for the majority of Malaysians. There are currently more than 12 million registered motorcycles, which are 45.8% of the total registered vehicles in Malaysia. Traumatic injuries sustained by motorcyclist are the number one cause of death in all vehicular accidents with 135 181 accidents in 2016.[1] The outcome of these deaths led to an estimated loss of RM 8.58 billion which places a significant financial loss to the local economy.[2] Amongst the ASEAN countries, Malaysia is amongst the middle-income nations to have a high case fatality rate of >15 fatalities per 100 000 population.[3]

Motorcyclists are more exposed to death and are 37 times more likely to die with eight times more prone to injury in comparison to

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car passenger occupants.[4] The main leading causes of death in motorcycle related accidents reported in developed and developing countries are due to head injuries followed by chest and abdominal injuries.[5,6] Therefore, it is mandatory to wear a protective helmet in Malaysia while riding a motorcycle that reduces the risk of severe head injury by 70%.[7]

Hospital Sultanah Aminah is a tertiary hospital with a specialized trauma surgical unit to attend for all trauma cases. It is located in the southern state of Johor which has the second highest recorded motorised-vehicle related deaths in Malaysia with 1135 deaths in 2016.[1] Trauma care is initiated and led by trauma surgeons together with a team of general surgeons. Trauma surgery is one of the common surgical emergencies, which leads to admissions to the general surgery wards. From trivial rib fractures to exsanguinating intra-abdominal injuries, the spectrum of injuries sustained from motorcycle accidents is extensive. In view of the large number of deaths involving motorcyclist in Malaysia, this study is undertaken to determine the risk factors and identify predictors of death amongst motorcycle related death. This data may facilitate mortality risk counselling to patients sustaining injuries from motorcycle accidents. The aim of this study is to identify risk factors for prognostication of injury severity and recommend possible preventive measures from our local Malaysian trauma epidemiology.

Due to the large numbers of motorcyclist injured and high case fatalities, the primary objective is to identify the demography and patterns of injury involving motorcycle riders and its pillion riders. In addition, parameter of interest is analyzed to determine the risk factors and predictors which may contribute to death in this cohort of motorcyclist and its pillion riders. Demography, trauma trends and risk factors are important for risk prognostification during initial triaging and death counselling to patients' relatives during the course of treatment.

Methods

This is a cross-sectional study looking on the prospective trauma surgery registry of all trauma patients involving motorcyclists and its pillion riders that were managed in Hospital Sultanah Aminah (HSA) trauma surgery unit. We included all adult patients that were motorcycle riders or pillion with traumatic injuries treated by our trauma surgery team. Patients with concomitant head injuries and bony fractures were co-managed by the neurosurgery and orthopaedic teams respectively. Hence, patients with isolated brain injuries and/or pure orthopaedic trauma who were solely managed by the respective teams (neurosurgery, orthopaedic) were not captured in our sample population. From the prospective trauma surgery database, demography (age, gender, ethnicity), mechanism of injury (blunt, penetrating, blast), physiological parameters on arrival to emergency department (systolic blood pressure, respiratory rate, heart rate, temperature), Glasgow Coma Scale (GCS), Revised Trauma Score (RTS), New Injury Severity Score (NISS), Trauma and Injury Severity Score (TRISS), survivor and deaths were recorded and analysed.

The following were the inclusion criteria:

I. All patients that were motorcycle riders or pillion riders that sustained injuries due to trauma and were managed by the trauma surgery unit.
II. Intra-departmental referrals within the hospital due to post-traumatic motorcyclist's and pillion rider's injuries.
III. Referrals from surrounding district hospitals (government or privately owned) and clinics for management of traumatic injuries sustained by motorcyclists or pillion riders.

The exclusion criteria include

I. Complications sustained after initial definitive treatment in the primary attending centre for injuries sustained due to motorcycle accidents. (example: post traumatic liver injury which developed biloma post treatment in the primary attending centre)
II. Patients with injuries resulting from pathological conditions which were already diagnosed prior trauma. (example: pathological fractures from underlying parathyroid diseases)

Statistical analysis

Data was analysed using SPSS (Statistical Package for the Social Sciences) version 16. Descriptive data were expressed as mean ± standard deviation for continuous variables and percentage for categorical variables. Univariate analysis was done with *t*-test and Chi-square or Fisher's exact test. Multivariate analysis was performed with binary logistic regression to identify significant predictors of death. A value of $p < 0.05$ is considered statistically significant.

The study was registered with the National Malaysia Research Register and conducted in compliance with ethical principles outlined in the Declaration of Helsinki and Malaysian Good Clinical Practice Guideline. As patient data was collected anonymously, declared consent was not required.

Results

Demography

From May 2011 to February 2015, 1653 patients who were treated by the trauma surgery team for traumatic injuries related to motorcycle accidents were included. The victims were predominantly 93% males (1537) and 7% females (116) with a mean age of (35 ± 16) years. Local demographic data revealed that the Malay race was the majority with 54.3% (897) followed by the Chinese 21.2% (350) and Indians 20.9% (345). There were an almost equal number of motorcycle riders (47.7%, 788) and its pillion riders (52.3%, 865) with the majority wearing helmet when attended on scene. Recorded anatomic locations of isolated and concomitant injuries were head (380), cardiac (6), thoracic (685), liver (148), spleen (154), small bowel (50), large bowel (16) and bony fractures (633). Mean physiologic measures on initial assessment were systolic blood pressure (SBP) of 125 mmHg ± 25 mmHg, respiratory rate (RR) of (20 ± 3) breaths per minute, heart rate (HR) 93 ± 34 beats per minute, temperature of 37°C ± 0.3°C and GCS of 13 ± 2. Trauma severities were measured with a mean RTS of 7.33 ± 1.3, TRISS of 0.91 ± 0.1 and mean NISS of 19.84 ± 13.8 as seen in Table 1.

Mortality trend

Mortality rate for motorcyclists and pillion riders were 8.6% with 142 non-survivors. The major cause of death was central nervous system (CNS) related injury with 48 deaths (33.8%), followed by 42 deaths due to sepsis (29.8%), 29 deaths due to exsanguination (20.4%), 9 deaths due to multi-organ failure (6.3%) and 14 deaths due to multi-factorial complex causes (9.9%).

Physiological parameters

The physiological parameters on presentation amongst the 1511 survivors (93.4%) and 142 non-survivors (8.6%) were analysed. Physiological parameters analysed were age, systolic blood

Table 1
Patient demographics and comparison between survivors and non-survivors [*n* (%)].

Variable	All cases	Survivor	Non-survivor
	(*n* = 1653)	(*n* = 1511)	(*n* = 142)
Gender			
Male	1537 (93)	1406 (93)	131 (92.3)
Female	116 (7)	105 (7)	11 (7.7)
Age group (years)			
<35	1001 (60.6)	925 (61.2)	76 (53.5)
>35	652 (39.4)	586 (38.8)	66 (46.4)
Motorcyclist characteristics			
Helmet	1544 (93.4)	1417 (93.8)	127 (89.4)
No Helmet	109 (6.6)	94 (6.2)	15 (10.6)
Rider	788 (47.7)	692 (45.8)	96 (67.6)
Pillion	865 (52.3)	819 (54.2)	46 (32.4)
Race			
Malay	897 (54.3)	814 (53.9)	83 (58.5)
Chinese	350 (21.2)	327 (21.6)	23 (16.2)
Indian	345 (20.9)	315 (20.8)	30 (21.1)
Others	61 (3.7)	55 (3.6)	6 (4.2)
Physiologic parameters			
Age≥35 years	35.16 ± 16.8	37.47 ± 18.67	34.95 ± 15.92
SBP	125.91 ± 25.4	126.29 ± 24.12	121.9 ± 36.5
RR	20.28 ± 3.6	20.16 ± 3.52	21.6 ± 4.49
HR	93.45 ± 33.7	92.61 ± 33.88	102.32 ± 31.08
Temperature (℃)	36.96 ± 0.26	36.69 ± 0.25	36.86 ± 0.34
GCS score	13.06 ± 3.2	13.31 ± 2.96	10.36 ± 4.19
Injured organ category			
Head	380 (22.98)	299 (17.79)	81 (57.04)
Heart	6 (0.36)	4 (0.26)	2 (1.41)
Lung	685 (41.44)	590 (39.05)	95 (66.9)
Liver	148 (8.95)	116 (7.68)	32 (22.54)
Spleen	154 (9.32)	140 (9.27)	14 (9.86)
Small bowel	50 (3.02)	41 (2.71)	9 (6.34)
Large bowel	16 (0.97)	14 (0.93)	2 (1.41)
Extremity	633 (38.29)	594 (39.31)	39 (27.46)
Injured organ category with AIS grade≥3			
Head	337 (20.39)	258 (17.07)	79 (55.64)
Heart	6 (0.36)	4 (0.26)	2 (1.41)
Lung	676 (40.89)	581 (38.45)	95 (66.9)
Liver	93 (5.63)	69 (4.57)	24 (16.9)
Spleen	115 (6.96)	105 (6.95)	10 (7.04)
Small bowel	49 (2.96)	40 (2.65)	9 (6.34)
Large bowel	16 (0.97)	14 (0.93)	2 (1.41)
Extremity	462 (27.95)	427 (28.26)	35 (24.65)
Trauma score			
RTS	7.33 ± 1.3	7.45 ± 1.19	6.01 ± 1.52
TRISS	0.91 ± 0.2	0.93 ± 0.12	0.76 ± 0.26
NISS	19.84 ± 13.8	18.02 ± 12.35	39.19 ± 13.08

AIS: Abbreviated Injury Scale.

pressure (SBP), respiratory rate (RR), heart rate (HR), core body temperature and GCS. Independent *t*-test revealed that older age≥35 years, lower SBP, higher RR, higher HR, lower core body temperature and lower GCS were significant physiological parameters to predict motorcycle traumatic deaths (Table 2).

Anatomical injury parameters

Anatomical divisions of injuries into head, heart, lung, liver, spleen, small bowel, large bowel and extremity were analysed.

Table 2
The association between physiological parameters of injuries and mortalities.

Variable	Survivor (*n* = 1511)	Non-survivors (*n* = 142)	*p* value
	mean (SD)	mean (SD)	
Age	37.47 ± 18.67	34.95 ± 15.92	0.001
SBP	126.29 ± 24.12	121.9 ± 36.5	<0.001
RR	20.16 ± 3.52	21.6 ± 4.49	<0.001
HR	92.61 ± 33.88	102.32 ± 31.08	<0.001
Temperature	36.69 ± 0.25	36.86 ± 0.34	0.002
GCS score	13.31 ± 2.96	10.36 ± 4.19	<0.001

Univariate analysis comparing anatomical division of injuries sustained by survivors and non-survivors revealed that patients that sustained head, lung, liver and small bowel injuries had higher risk of death (Table 3).

Anatomical division with grade 3 injury and above

Anatomical division of injuries coupled with higher grade of injury (grade 3 and above) were analyzed. Similarly, the anatomical divisions were divided into 9 regions which were head, heart, lung, liver, spleen, small bowel, large bowel and extremity sustaining grade 3 injuries and higher. Univariate analysis comparing anatomical division of injuries sustained by survivors and non-survivors revealed that patients that sustained head, lung, liver and small bowel injuries were more prone to death (Table 4).

NISS, RTS, TRISS scores

Our database of motorcycle traumatic injuries had a mean RTS of 7.33 ± 1.3, TRISS of 0.91 ± 0.2 and mean NISS of 19.84 ± 13.8. Independent *t*-test revealed that the non-survivor group had lower mean scores (RTS, TRISS) and higher NISS score in comparison to the survivor group. This reflects the severity of injuries in non-survivor group (Table 5).

Multivariate analysis of the predictors for death from motorcycle related traumatic deaths

From the initial results univariate analysis, significant predictors of motorcycle related deaths with p value of <0.05 were further analysed. Multivariate analysis using binary logistic regression with enter method was performed. This is to ascertain the association of the identified predictors of motorcycle related deaths.

Results of multivariate analysis revealed that physiological parameters of age>35 and lower GCS were significant predictors of death. Anatomical injuries which had significant association with death was the presence of head, lung, liver and.

Higher severity of injuries sustained portrayed by the RTS, TRISS and NISS scores, which were significant predictors of motorcycle related deaths as seen in Table 6.

Discussion

In Malaysia, the case fatalities per 100 000 population is the highest among ASEAN countries. Local data report that the fatalities were mainly from the West Coast of peninsular Malaysia and its rural roads (61%).[2] A study by Ankarath et al. on 1239 motorcycle crash victims in Leeds, United Kingdom reported 74 deaths with a mortality rate of 5.9%.[8] Whereas a study on 360 motorcycle accidents in India reported a mortality rate of 6.7%.[9] Singapore reported a mortality rate of only 0.4% out of 1016 reported motorcycle

Table 3
The association between anatomical division of injuries and mortality.

Anatomical division	Non-survivor (*n* = 1511)	Odds ratio (*95% CI*)	*p* value
	Total (%)		
Head	81 (57.04)	5.383 (3.772–7.68)	<0.001
Heart	2 (1.41)	5.382 (0.977–29.64)	0.087
Lung	95 (66.90)	3.155 (02.19–4.54)	<0.001
Liver	32 (22.54)	3.498 (2.26–5.42)	<0.001
Spleen	14 (9.86)	1.071 (0.601–1.91)	0.816
Small bowel	9 (6.34)	2.426 (1.15–5.1)	0.016
Large bowel	2 (1.410)	1.528 (0.344–6.789)	0.406
Extremity	39 (27.46)	0.585 (0.39–0.85)	0.003

Table 4
The association between anatomical division with AIS injury grade 3 and above and mortality.

Body regions	Non-survivor (n = 142)	Odds ratio (*95% CI*)	p value
	Total (%)		
Head AIS 3	79 (55.64)	6.09 (4.26–8.70)	<0.001
Heart AIS 3	2 (1.41)	5.382 (0.98–29.64)	0.087
Lung AIS 3	95 (66.90)	3.235 (2.25–4.66)	<0.001
Liver AIS 3	24 (16.90)	4.251 (2.58–7.02)	<0.001
Spleen AIS 3	10 (7.04)	1.014 (0.52–1.99)	0.536
Small bowel AIS 3	9 (6.34)	2.489 (1.19–5.24)	0.021
Large bowel AIS 3	2 (1.41)	1.528 (0.34–6.79)	0.406
Extremity AIS 3	35 (24.65)	0.831 (0.56–1.24)	0.208

AIS 3: Abbreviated Injury Scale grade 3 and above.

Table 5
Comparison between the injury severity score among subjects.

Scores	Survivor (n = 1511)	Non-survivors (n = 142)	p value
	mean (SD)	mean (SD)	
RTS	7.45 ± 1.19	6.01 ± 1.52	<0.001
TRISS	0.93 ± 0.12	0.76 ± 0.26	<0.001
NISS	18.02 ± 12.35	39.19 ± 13.08	<0.001

Table 6
Multivariate analysis of predictors of mortality from motorcycle accidents.

Predictors of mortality	Odd's ratio	*95% CI* for Exp (B)	p value
Age>35 years	2.064	1.379 to 3.089	<0.001
Systolic BP	0.994	0.987 to 1.001	0.091
RR	1.041	0.995 to 1.088	0.08
HR	1.002	0.998 to 1.006	0.359
Temperature	0.494	0.241 to 1.011	0.054
GCS score	0.881	0.833 to 0.932	<0.001
Head injury	4.146	2.590 to 6.638	<0.001
Lung injury	2.254	1.496 to 3.395	<0.001
Liver injury	6.660	3.656 to 12.133	<0.001
Small bowel injury	3.268	1.384 to 7.712	0.007
NISS	1.102	1.083 to 1.121	<0.001
RTS	0.521	0.429 to 0.634	<0.001
TRISS	5.509	1.405 to 21.593	0.014
Helmet	1.575	0.828 to 2.995	0.166

accidents as reported by Tham et al.[7] The report shows a lower mortality rate amongst developed nations as shown by the United Kingdom and Singapore. Our data reported a mortality rate of 8.6% with 142 deaths. The possible reason for a higher mortality rate is due to a lack of road safety education and prevention enforcement as 35% of motorcyclists were found not to possess a proper licence.[2]

Motorcyclist has a higher possibility of being severely injured as they do not have an outer steel frame to absorb the forces on impact as compared to car occupants. The motorcyclist bluntly receives the force and impact of the crash. The common mechanism of injury is by frontal impact or ejection that occurs due to the abrupt stop of the motorcycle upon impact. The forward motion of both motorcyclist and pillion rider may lead to multiple injuries which may result from the impact to the tarmac or motorcycles parts. Most injuries involving a motorcyclist include head injuries, thoracic and abdominal injuries. Other mechanisms of injury are via lateral impact or ejection which commonly results in long bone fractures as the rider attempts to break the fall via the impacted site. The third mechanism is due to the attempt of the rider to slow the motorcycle down from imminent impact by turning it sideways 90° and falling to the ground. The lower limbs are commonly injured in this mechanism of accident.[10]

Age

Older age individuals have a two-fold mortality rate in comparison to the younger age group of motorcycle accident victims. A report by Talving et al. which studied on the physiological effects of age on the severity of motorcycle related accidents observed that older patients tend to have a higher injury severity score of >25. Those included in this study were severely injured which were older than 55 years old and the leading cause of fatalities was head injuries.[9] Comparing to our results, the age group, which were older than 35 years old, was a significant predictor of deaths. Leading contributory factors were due to CNS injuries. The differences in age groups difference from our study in comparison to Talving et al. were because motorcycles are an important means of affordable transportation in Malaysia. This represents the working class citizens which account for nearly 50% of registered vehicles in Malaysia which uses motorcycles for their daily means for transportation to work. Therefore, it is shown from our analysis that the working-class citizens aged more than 35 years were significant for deaths due to the large numbers using motorcycles in Malaysia as a means of primary transportation.[1]

GCS

Assessment of GCS on arrival is an important tool in predicting mortality in traumatic patients.[11] The presence of traumatic brain injury reflected by a low GCS on examination has a higher accuracy in predicting traumatic deaths.[12] It is a well-known predictor and amongst the variables used to predict death in the physiologic trauma score. This research concluded similar findings, i.e. a lower GCS is a significant predictor of death in motorcycle related deaths. A lower GCS on arrival would inevitably represent the severity of the head injuries sustained. Unlike injuries which lead to death due to exsanguination, head injuries have a lower time threshold for intervention and immediate action is often needed to reverse this hypoxic insults.[13]

Anatomical parameters

In our population of traumatic motorcycle injuries, the anatomical involvement of head, lung, liver and small bowel injuries were significant predictors of mortality. Analysis of head injuries for a significant predictor of deaths correlates with the physiologic variable of a lower GCS as a predictor of death. Although more than 90% of our population were found to wear helmets during initial assessment, this did not deter head injuries to come out as a significant death predictor. This generally is a reflection of the population that lacks safety measures and proper equipment, which may lead to this result. It is reported that at least 35% of Malaysian motorcyclists did not present with proper licence that reflects poor education and enforcement in safety measures.[1]

Apart from wearing a helmet, the other parts of the body are not protected during the usage of a motorcycle by its user and pillion rider.[10] This makes the thorax and abdomen vulnerable to injury in an unrestrained and unprotected environment.[8] From our analysis, we have found an increased risk of death in patients with injuries to the thorax, liver and small bowel injuries.

The identification of these anatomical parameters may be used for more accurate triaging of patients upon presentation to the casualty. Furthermore, the identification of these injuries gives a more alerted sense of urgency to act fast upon presentation.

NISS, RTS and TRISS scores

Trauma scores are broadly compared as an anatomical NISS or physiological RTS and TRISS by its scoring component.[14] A study conducted in Turkey by Reyhan et al. concluded that the NISS, RTS and TRISS scores were able to predict mortality and morbidity in trauma patients.[15]

Clinical application

The study identified significant predictors of motorcycle trauma mortality in a developing country of urban population that relies heavily on motorcycle as a means of transportation.

Identified predictors of deaths in motorcycle related trauma were age>35, low GCS, head injuries, thoracic injuries, liver injuries, small bowel injuries and higher severity of injury represented by RTS, NISS and TRISS scores.

The presence of these predictors may be utilized by attending emergency medical physicians to triage patients and heightened the level of alertness in such cases.

In addition, this data is applied to mortality counselling to patients and immediate family members in an event of patient exsanguinations and deaths.

Limitation

There are few limitations with this study. Firstly, the results produced are from a single centre experience and data from other centres may lead to a difference in results. However, our centre is the only centre in Malaysia with an attached trauma surgery subspeciality treating the majority of traumas within the southern peninsular Malaysia with no other data within the nation for comparison. In addition, the large numbers treated by our centre led us to believe that our result represents closely to the clinical situation faced elsewhere in other general surgery units in Malaysia.

The second limitation faced, was to maintain consistency and accuracy of the collected data into our trauma registry. Our centre still heavily relies on hand written entry of the patients clerking and general progress notes for documentation liable to missing data. Therefore, all measures were made to prevent data entry error or data missing during the interpretation and transferring the data into our computerised trauma registry. If a discrepancy arises, it is discussed first with the trauma coordinators, trauma surgeons and attending physician prior data entry.

Recommendation for future study

Although our centre is the only centre in Malaysia with a trauma surgery team complemented with a trauma surgery database, it is likely that with a larger study comprising of other centres managing traumatic motorcycle victims may improve our overall result. Furthermore, the additional numbers are required in the development of an original Malaysian trauma score for traumatic motorcycle accidents for prognostication in our local setting.

Conclusion

Age, lower GCS, the presence of head injuries, thoracic injuries, liver injuries, small bowel injuries and a higher severity of injury represented by RTS, NISS and TRISS scores is predictive of death in motorcyclist and pillion riders. Mortality resulted from motorcycle accident is high in our country and the region. Primary prevention with enforcement of road traffic rules on motorcyclist and road safety measure shall be the key to reduce the mortality rate. These identified predictors are used to triage accurately motorcycle related trauma victims and its immediate mortality risk counselling to patients and immediate family members.

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Ethics statement

Ethical approval was granted by Ministry of Health Malaysia Medical Research Ethics Committee.

Conflicts of interest

All the authors have declared no competing conflicts of interest.

Authors' contributions

Henry Tan Chor Lip was involved in planning, conducting, and reporting of the work described in the article. Tan, Yuzaidi, Affirul, Azlin, Rizal and Tn Nur were involved in the drafting of this manuscript.

Consent for publication

Study was done retrospectively. Subjects recruited were made anonymous. Informed consent was waived by the Malaysia Research Ethic Committee.

Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cjtee.2018.11.001.

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