MORTALITY PATTERNS IN THE EMERGENCY AND TRAUMA DEPARTMENT, HOSPITAL TUANKU FAUZIAH, PERLIS: A THREE-YEAR RETROSPECTIVE ANALYSIS

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ABSTRACT

Mortality data reflects the level of care of an institution. Inadequately trained personnel and lack of infrastructure may contribute to preventable deaths of hospital mortality whereas brought-in-dead (BID) cases are strongly related to pre-hospital factors.

A retrospective analyses on the profiles of mortality cases recorded in ETD, Hospital Tuanku Fauziah (HTF) from 1 January 2014 until 31 December 2016 was conducted. Relevant data were extracted from death registers and emergency record cards.

A total of 301 mortality cases were recorded in ETD HTF from the year 2014 till 2016. Seven cases were excluded due to incomplete relevant clinical data hence, 294 cases were analysed. Of these, majority, 59.5% (n=175) were death-in-department (DID) cases. The yearly incidence of BID cases demonstrated a decreasing trend throughout the study period. Majority of the BID cases were among the elderly, aged more than 70 years old (n=34, 28.6%). The commonest organ system afflicted was the cardiovascular system. There was a significant association between different age group and the nature of the mortality cases in ETD (p=0.0026). Our study also found that the elderly were more prone to be brought in dead upon arrival to ETD.

This study served as a baseline audit on the local mortality cases and a platform to target effective intervention at primary care setting. Hence, reappraisal of the healthcare system is warranted to provide dependable and excellent standard of care to the public.

Keywords: hospital mortality, emergency department.

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Conflict Of Interest
The authors declare that there was no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted

work and no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgement

The authors would like to thank the Director General of Health Malaysia for his permission to publish this article. The authors would also like to extend their gratitude to Madam Ooi Kim Hong from Clinical Research Centre, Hospital Tuanku Fauziah, Kangar, Perlis for her assistance in updating research data into statistical software for further analysis.

INTRODUCTION

Management outcomes of patients presented to the emergency and trauma department (ETD) provides an insight to the level of care of an institution. It is a known performance indicator of the quality of care provided by its primary provider[1]s.[1]

Inadequately trained personnel and lack of facilities and infrastructure may contribute to the occurrences of possible preventable deaths in hospital mortality cases. Brought-in-dead (BID) cases on the other hand are strongly related to pre-hospital factors such as the distance to the hospital, severity of the clinical condition or the nature of injury[2].[2]

Emergency medical service (EMS) in developing Asian region, such as Malaysia is still in its infancy[33]as evidenced by the paucity of baseline local epidemiological EMS data[4].[4] Literatures on BID cases are limited as they are deemed unforeseeable. However, the quality and standard emergency care for the public may be achieved through the improvement in health promotion strategies in instilling the health-seeking behaviour among public.

BID cases strongly relates to pre-hospital care. Pre-hospital care services include the role of primary responder services to the scene of emergency, emergency and inter-facility patient transportation services including land, water and air ambulance services, Medical Emergency Coordinating Centre (MECC) and 999 Emergency Call Management System, major medical incident and disaster management and major event medical coverage.

Death-in-department (DID) cases are more complicated as multiple factors may play a role including the severity of the illness or insult, the clinical competency of the managing team, medications and the facilities provided by the institution [5,6].

This study aimed to determine the profile of local mortality cases in the Emergency and Trauma Department of Hospital Tuanku Fauziah, Perlis over a 3-year study period from 1 January 2014 till 31 December 2016. The findings of this study may provide foundational data for future improvement strategies in efforts to revise current emergency practice.

METHODS

A retrospective study was carried out on the profiles of all mortality records including maternal, perinatal and paediatrics cases in the Emergency and Trauma Department (ETD) of Hospital Tuanku Fauziah (HTF), Perlis from 1 January 2014 to 31 December 2016. Separate data sheet was used for data collection.

Trained abstractors were tasked to extract the demographic data and causes of death from the death registers, death certificates and case review cards. Mortality records with missing *'relevant data'* were excluded. 'Relevant data' includes the cause of death and details of the presenting illness.

Multi-way frequency tables and graphs were used for descriptive statistics. Pearson chi-square test of independence and Pearson chi-square test for trend were used to find statistical significance between two or more categorical data. Mean and standard deviation were used to describe normally distributed data whereas median and interquartile range was used to describe skewed data.

The conduct of the study has been approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia on April 4th 2017 with the registration identification NMRR-17-585-35096.

Results

There were a total of 301 mortality cases reported in Emergency and Trauma Department (ETD) of Hospital Tuanku Fauziah (HTF), Kangar, Perlis from 1 January 2014 until 31 December 2016 (Figure 1). Seven cases were excluded due to incomplete relevant data, hence 294 cases were further analysed.

Male was the predominant gender, *n*=186 (63.3%). The mean age for the mortality cases reported for the year 2014, 2015 and 2016 were 56.8 (SD=20.8) years old, 58.2 (SD=22.5) years old and 58.5 (SD=22.8) years old, respectively.

The mean age of patients presented during the morning shift was 59.5 (SD=19.93) years old, evening shift was 60.3 (SD=20.40) years old and night shift was 55.8 (SD=22.65) years old.

There was no difference between the distance from the hospital and the consequence of BID or DID cases (*U*=8622.5, *p*=0.652). The median distance of BID cases from the hospital was 12.00 km (IQR=14.800) and the median distance among the DID cases was 12.10 km (IQR=12.000).

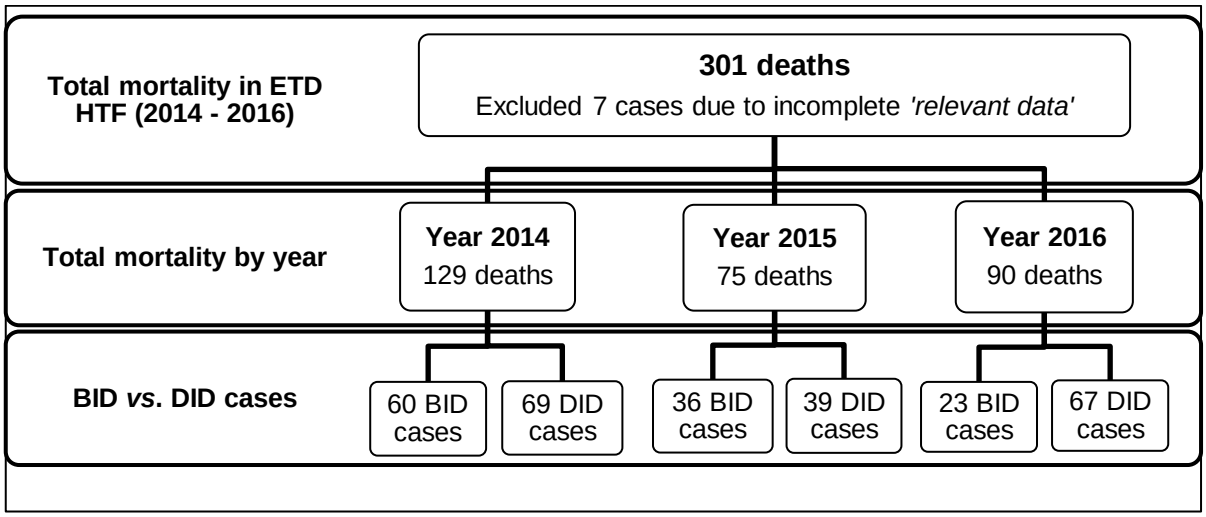

Fig.1 Distribution of mortality cases in Emergency and Trauma Department, Hospital Tuanku Fauziah, Perlis for the year 2014 to 2016.

There was a significant trend observed in the prevalence of the mortality cases observed in Emergency and Trauma Department of Hospital Tuanku Fauziah, Perlis during the study period as observed in Table 1, χ^2 (*df* = 1, *n* = 294) = 8.706, *p* = 0.003.

Mortality (n, %) / Year	2014 (n, %)	2015 (n, %)	2016 (n, %)	*p*-value*
BID (n=119, 40.5%)	60 (46.5%)	36 (48.0%)	23 (25.6%)	0.003
DID (n=175, 59.5%)	69 (53.5%)	39 (52.0%)	67 (74.4%)	

*Pearson chi-square test for trend

Table 1 Prevalence of mortality in Emergency and Trauma Department from the year 2014 – 2016, Hospital Tuanku Fauziah, Kangar, Perlis

There was an increasing trend of BID cases with increasing age group as observed in Figure 2.

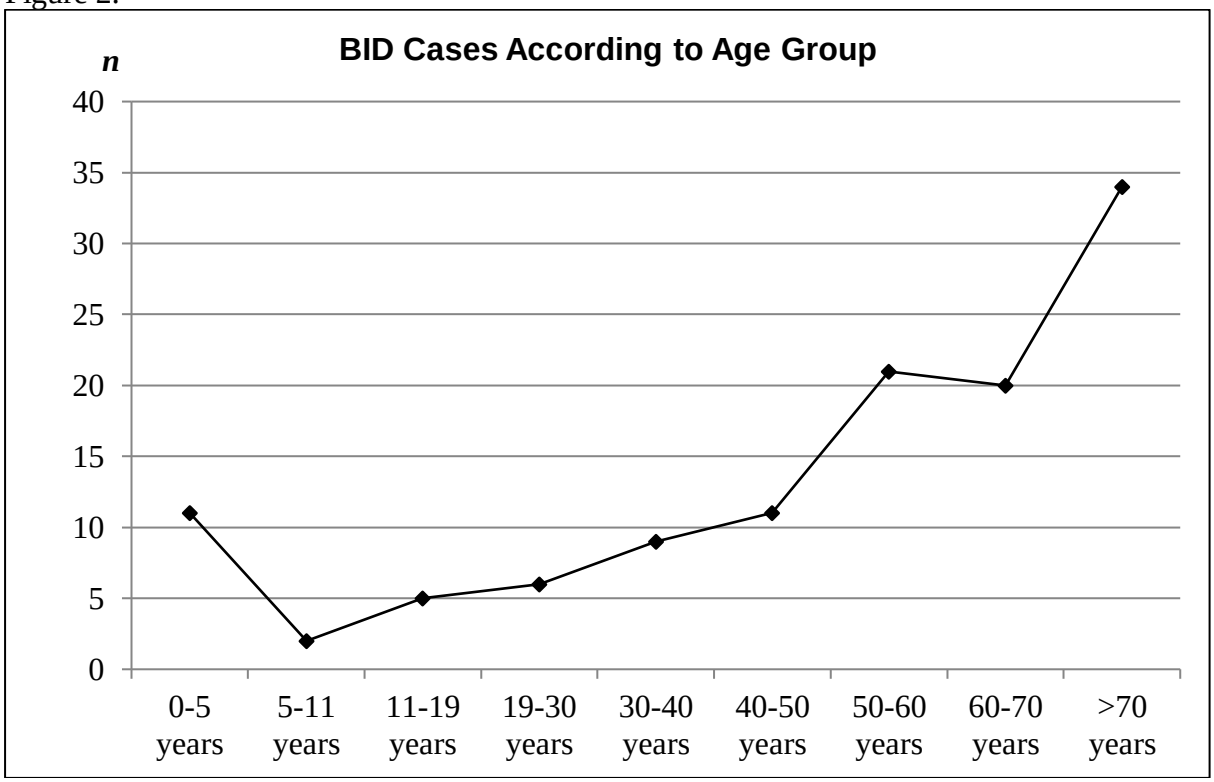

Fig.2 Graph showing an increasing trend of BID cases associated with increasing age over the study period.

There was also a significant association between the different age group and the type of mortality cases (BID *vs.* DID), (p=0.0026; Fisher's exact test). DID cases were noted to be increasing with increasing age.

Table 2 illustrated the organ system affected among the DID cases. Majority of the BID cases were among the elderly and most of the cardiac-related cause of death was among those aged more than 70 years old.

Organ system	2014 *n* (%)	2015 *n* (%)	2016 *n* (%)
Cardiovascular	37 (28.7)	21 (28.0)	25 (27.8)
Respiratory	3 (2.3)	0 (0.0)	4 (4.4)
Gastrointestinal	3 (2.3)	1 (1.3)	9 (10.0)
Renal	2 (1.6)	2 (2.7)	5 (5.6)
Endocrine	2 (1.6)	0 (0.0)	0 (0.0)
Trauma	11 (8.5)	8 (10.7)	12 (13.3)
BID	60 (46.5)	36 (48.0)	23 (25.6)
Others	11 (8.5)	5 (6.7)	12 (13.3)

Table 2 Distribution of the cause of death according to organ system

There are generally three working shifts for the medical officers in the Emergency and Trauma Department, Hospital Tuanku Fauziah, Kangar, Perlis. Morning shift begins from 8 am till 3 pm; evening shift starts from 3 pm till 10 pm whereas night shift begins from 10 pm till 8 am the next day. We found that the prevalence of BID cases were not significantly associated with the different ETD shifts, χ^2 (*df*=1, *n*=267) = 2.103, *p*=0.717.

However, there was a significant association between the different age group and the cause of death (*p*<0.001; Fisher's exact test). Different age group was significantly associated with the prevalence of trauma-related mortality cases (*p*=0.014; Fisher's exact test). Trauma-related cause of death was not significantly associated neither with the type of mortality, $\chi 2$ (df=1, n=294) =.51, *p*=0.822, nor presentation at different time of the day, $\chi 2$ (df=2, n=267) =.962, *p*=0.618.

Trauma cases with motor vehicle accident being the major mechanism of injury, were less as compared to non-trauma cases among overall mortality cases reported in ETD HTF, *n*=55 (18.7%) *vs.* *n*=239 (81.3%).

Results of the multiple linear regression indicated that there was no collective significant effect between the different age group, sex, race, shift, trauma cases and nature of death (BID *vs.* DID) (*p*>.05).

Discussion

Emergency medicine and trauma services offer clinical care to a wide range of acute medical illness or injury hence, demanding a high value of caring, teamwork and professionalism among the emergency physicians, medical officers, assistant medical officers, staff nurses and other healthcare personnel. The management involves both the pre-hospital and hospital-based medical care.

Critical management interphases from the pre-hospital care to the triage service and sorting out to the level of care deemed necessary according to the three dedicated management zone; critical (red) zone, semi-critical (yellow) zone and non-critical (green) zone.

In the analysis of the 3-year retrospective study, there were 301 mortality cases recorded in Emergency and Trauma Department (ETD) of Hospital Tuanku Fauziah (HTF). Kangar, Perlis. This was a relatively small number as compared to other hospitals in Malaysia attributed by the smaller population size in Perlis.

Male was the predominant gender recorded in the overall mortality cases in ETD HTF, *n*=186 (63.3%). A study by Christensen et al. (2016) also found that male constituted the majority from their total 1-1-2 patients[7]. The finding is most likely to be influenced by the fact that males generally hold job positions that have a higher risk of accidents and that cardiac diseases which can present with acute symptoms are more common among males.

The yearly mean age of the mortality cases reported between the year 2014 till 2016 was between 56 to 58 years old. The finding is comparable to a study conducted in Hospital Universiti Sains Malaysia, Kubang Kerian, Kelantan which found that majority of their red-tagged patients over a two-year study period comprised of men in their 60s[8].[8] This signifies the improved longevity among our adult population.

The commonest organ system affected in hospital mortality cases was the cardiovascular system, *n*=83 (28.2%) followed by trauma-related cases, *n*=31 (10.5%). This was in keeping with the modern-day diseases of which, among others include obesity, malignancy and suicide[9].[9] Nowadays, cardiovascular diseases and hypertension are gradually becoming more prevalent in young adults in Malaysia[10, 11].[10,11]

Apart from that, a study by Gunnarsdottir & Rafnsson (2005) also found that patient who have had previous visits to ED for the same illness have higher mortality rate in Emergency Department compared to the general population[12].[12] Hence, presence of patients with multiple visits to the casualty should alarm the managing clinicians of possible sinister diagnoses.

A retrospective study on 140 acute hospitals in England found that fewer deaths following hospital admission over the weekends as compared to the weekdays[1313] This is in agreement by a study by Walker et. Al (2017)[1414] while contrasted a study by Lee & Vaithilingam (2012) in Hospital Taiping, Perak which found that the risk of mortality is significantly higher on weekends or after hours[15].[15] However, our study did not find any statistical significance between the frequency of deaths to the different timing of the day.

BID cases were noted to increase with increasing age, particularly in those over the age of 70 years old which is in agreement with another study by Orish et al (2014) which observed the high prevalence of BID cases among the elderly in a secondary referral hospital in western Ghana catering 22 districts[2].[2] This may be partly explained by the progressive nature of age bearing on the development of chronic illnesses and physical limitation. They are also at greater risk of developing hypertension, diabetes, atherosclerosis and coronary artery diseases[10].[10]

There was a significant association between the different age group and trauma cases (p=0.013; Fisher's exact test). Geriatric trauma cases were found to be less prevalent as the elderly are less mobile as compared to the younger generation.

CONCLUSION

Our study found that the elderly was more prone to be brought in dead upon arrival to ETD, thus in need of public health measures to address the pre-hospital geriatric need. Apart from reappraising hospital quality and standard of care, there might be a need to increase health promotion strategies to instil health seeking behaviour, particularly among the elderly population.

The study highlighted the pattern of distribution of mortality cases in the local Emergency and Trauma Department setting. The high frequency of BID cases rendered poor understanding on the actual cause of death which further complicates proper planning of future measures. Hence it is vital to employ quality indicators such as ambulance response time and coverage percentage in Emergency Department at any medical facilities to enhance quality care and better clinical management[3,8,16].

Emergency and Trauma Department should also participate in quality improvement initiatives to sustain low-cost, self-funded model of continuous quality care, performance and achievements in all dimensions of its service and operations.

Quality emergency medical service (EMS) requires implementation of performance monitoring using appropriate and relevant measures such as the key performance indicators, which in Malaysia, is still lacking.

LIMITATION

The study has the limitations of a retrospective study, hence making the analysis of the cause and effect of the variables studied challenging.

There is a need for further extensive research looking at pre-hospital factors that may affect BID cases in the effort to improve emergency medical service particularly at pre-hospital setting.

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