STUDY OF CIRCUMSTANCES SURROUNDING DEATH IN HOSPITALIZED PAEDIATRIC PATIENTS IN HOSPITAL UNIVERSITI SAINS MALAYSIA

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURE

LIST OF APPENDICES

LIST OF ABBREVIATIONS

Cardio	Cardiology
CI	Confidence interval
GIT	Gastrointestinal tract
HDU	High Dependent Unit
HRPZ II	Hospital Raja Perempuan Zainab II
HUSM	Hospital Universiti Sains Malaysia
ICU	Intensive Care Unit
LOC	Loss of consciousness
MLR	Multiple Logistic Regression
OR	Odds ratio
PICU	Pediatric Intensive Care Unit
Respi	Respiratory system
SLR	Simple Logistic Regression
SOB	Shortness of breath
2 S	2 Selatan (Pediatric Surgical Ward)
6 S	6 Selatan Ward (General Pediatric Ward)
6 U	6 Utara Ward (Pediatric Oncology Ward)

ABSTRAK

Pengenalan

Kematian di kalangan kanak-kanak dikenal pasti sebagai penentu kepada pembangunan kesihatan dan juga penyumbang kepada kemajuan negara. Penyebab utama kematian di kalangan anak-anak kurang daripada 12 bulan adalah penyakit kongenital, masalah kromosom, dan pramatang manakala di kalangan kanak-kanak, penyebab utama kematian adalah kecederaan. Kematian kanak-kanak di hospital adalah berbeza berbanding umur dan gejala klinikal. Pesakit kronik umumnya dimasukkan ke wad dengan jangkamasa yang lebih lama. Kebanyakan kajian mendapati pelbagai faktor berkait rapat dengan kematian kanak-kanak di hospital termasuklah masa dan hari kemasukan ke wad. Kualiti penjagaan pesakit di hospital didapati kurang memuaskan sekiranya pesakit dimasukkan pada hujung minggu ataupun diluar waktu kerja.

Objektif

Bertujuan mengkaji faktor-faktor berkaitan penyebab kematian di kalangan kanak-kanak di Hospital Universiti Sains Malaysia (HUSM).

Kaedah Kajian

Kajian ini merupakan kajian '*case control*' yang menggunakan data selama 5 tahun daripada Januari 2009 hingga Disember 2013. Maklumat didapati melalui unit rekod perubatan HUSM. Statistik gambaran diterangkan sebagai pecahan dan dianalisis menggunakan *Chi square* dan *Fisher Exact test*. Analisis faktor yang terlibat dalam kematian kanak-kanak menggunakan model *Multiple Logistic Regression.*

Keputusan

Kajian ini menunjukkan, daripada 279 data, 139 merupakan kes yang melibatkan kematian, manakala 140 selebihnya adalah kes pesakit yang berjaya didiscajkan ataupun hidup. Kumpulan pesakit berumur 1 hingga 14 tahun adalah kumpulan majoriti, dan kebanyakan pesakit adalah Melayu (97%) diikuti oleh etnik Cina (2.5%) dan kumpulan etnik yang lain (Siam) iaitu sebanyak 0.7%. Punca utama kemasukkan wad adalah masalah pernafasan (30.5%), dituruti oleh gejala demam (28.3%), gejala usus dan pencernaan (14%), dan juga kes trauma dan saraf (13%) (p value, 0.006). Di kalangan kes kematian, 88% pesakit menerima rawatan dalam masa 4 jam daripada waktu dilihat oleh pegawai perubatan dan 11% menerima rawatan antara 4 hingga 8 jam. Di dalam kebanyakan kes kematian, 75% daripadanya meninggal dunia pada luar waktu kerja dan selebihnya pada waktu bekerja. Pesakit yang tidak mempunyai latar belakang penyakit kronik dilihat kurang berisiko bagi kematian berbanding pesakit kronik yang mempunyai 3 kali ganda risiko (OR 2.9, 95% CI 1.43, 6.04, p value 0.003). Kebanyakan pesakit yang dimasukkan ke hospital, telah dirawat oleh doktor pakar (77.4%). Pesakit yang menerima rawatan awal dilihat dapat mengurangkan risiko kematian (OR 0.9, 95% CI 0.04, 0.97, p value 0.048).

Kesimpulan

Kajian kematian di Hospital Universiti Sains Malaysia (HUSM) ini adalah standing dengan kajian sebelum ini. Mengenal pasti risiko kematian di kalangan kanak-kanak adalah penting untuk memperbaiki mutu rawatan yang diterima oleh pesakit.

ABSTRACT

Introduction

Childhood mortality is generally recognized as the indicator to monitor child health and wellbeing in a population and it is an overall assessment of country development. The leading causes of death in infants are related to congenital anomalies, chromosomal abnormalities, and prematurity whereas unintentional injuries are the main cause of death in children and adolescent. Children who die in hospital widely differ in age range and clinical presentations. Cases with complex chronic conditions are expected to have a longer hospital stay and requiring interventions in comparison with cases that present acutely. Many studies indicate that mortality is related to several factors, such as time, day, and the source of admission. Poor quality of care is shown to deteriorate at weekends as compared to weekdays.

Objectives

To describe the circumstances surrounding deaths of hospitalized children in Universiti Sains Malaysia Hospital (HUSM) which includes the demographic and clinical characteristic of children who died in HUSM and to determine the factors associated with the mortality.

Methodology

This study is a case control study conducted using data from 5 year period (from January 2009 till December 2013). The information was obtained from medical records. For descriptive statistics the categorical variables are expressed as proportions. The differences between groups were evaluated using Chi square and Fisher Exact test for categorical data. Statistical analyses conducted using Multiple Logistic Regression to assess the association of independent effects towards outcome (pediatric mortality).

Results

A total of 279 cases were enrolled in this study with 139 cases belongs to 'cases' group and 140 cases were grouped as 'control'. Children (aged 1 year to 14 years old) are the predominant group. Majority of patients were Malays (96.8%), followed by Chinese (2.5%) and other ethnic group (Siamese) (0.7%). In general, the common symptom was respiratory illness (30.5%), followed by fever (28.3%), gastrointestinal symptoms (14%), trauma cases (14%) and neurological cases (13%) (p value 0.006). Among the cases with mortality, 88% received treatment urgently (within 4 hours), and 11% of them received their first treatment after 4 to 8 hours. Majority of the cases happened during off hour period (75%) and the remaining of them died during working hours. Those patients who were admitted without any co morbidities were less likely to associate with pediatric mortality and children with co morbidities are 3 times higher risk of death (OR 2.9, 95% CI 1.43, 6.04, p value 0.003). Majority of the patients admitted to HUSM were reviewed by the specialist (77.4%). Early treatment administration has shown to reduce the risk of mortality (OR 0.9, 95% CI 0.04, 0.97, p value 0.048).

Conclusion

The study found that some of the results were comparable with other previous studies. It is very crucial to identify the factors associate with the risk of pediatric mortality thus in order to improve the care and management of pediatric patients.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND AND LITERATURE REVIEW

Childhood mortality is generally recognized as the indicator to monitor child health and wellbeing in a population and it is an overall assessment of a country's development which was outlined by United Nation under the Millennium Developmental Goal (MDG) 4, from 2000 till 2015. Approximately 6.3 million infant and children under 5 of age die each year (UNICEF, 2013).

There are various factors that contribute to the childhood mortality. These include socioeconomic status, basic social facilities and services. In Malaysia under 5 mortality rates has declined from 57 per 1000 live birth in 1970 to 8.17 deaths per 1000 live birth in 2015. (Swee Lan W, 2003)

The leading causes of death in infants are related to congenital anomalies, chromosomal abnormalities, and problems related to small gestational age and prematurity. Among children and adolescent, unintentional injuries are the leading cause of death which account nearly a third of death (UNICEF, 2013).

A death of a child which is either due to expected cause or acute events causes an intensely painful experience and become a tragedy for the parents and relatives, and it is a loss to the community (Pamela S, 2005).

Children who die in hospital widely differ in age range and clinical presentations. Cases with complex chronic conditions are expected to have a longer hospital stay and requiring interventions in comparison with cases with acute presentation (Feudtner, 2002).

Many studies that had been performed indicate that the mortality is related to several factors, such as time, day, and source of admission. Several studies highlighted contributory factors leading to childhood mortality related to the poor quality of care that is shown to deteriorate at weekends as compared to weekdays. This is attributed by many factors such as; lack of patient's monitoring, poor medication prescription, and poor patient outcome. These short falls are likely due to reduce level of staffing, lack of supervision and expertise (Gathara et al, 2013).

With regards to treatment services, delay in treatment administration significantly increases hospital mortality (Patricia, 2014) particularly in antibiotics institution in septic patients.

In Universiti Sains Malaysia Hospital (HUSM), the pediatric unit comprises of General Paediatric Ward (6 Selatan), Pediatric Oncology Ward (6 Utara), and Neonatal Unit (Nilam 1, Nilam 2, and 1 Timur Belakang). Surgical cases in pediatrics are nursed in 2 Selatan Ward. The age range for pediatric care in this hospital is ranged from birth till 12 years old. However, children aged more than 12 years with chronic medical problems or comorbidities who were under pediatric team follow up and reviewed were admitted to pediatric ward as we are more familiar with these patients rather than adult medical team.

The highest level of treatment in highly acute and intensive care available for neonate in Neonatal Intensive Care Unit (Nilam 1 and 2). For general pediatric cases, the patients who

require intensive care and treatment are nursed either in High Dependent Unit (HDU, 6 Utara) or transferred to general ICU. Therefore the study emphasizes on the importance of establishment of Pediatric Intensive Care Unit in HUSM.

There is lack of information regarding the actual practices in dealing with dying hospitalized children in Malaysia. The available local studies were done looking at the demographic and clinical characteristics of dying hospitalized pediatric patients in Malaysia without further analysis on the possible factors that may contribute to mortality among this group. Another study published in Singapore Journal in 2014 studied on clinical characteristics and mortality risk prediction in Malaysia Borneo. The main focus of the study was mainly emphasized on Mortality Risk Prediction Scoring system in Pediatric Intensive Care Unit (PICU) but not looking at the associated factors of mortality.

The present study was therefore undertaken to describe the circumstances surrounding dying pediatric patient particularly in pediatric unit in HUSM and determine the factors associated with dying hospitalized children and ultimately to improve identification of children at risk of mortality in our setting, and improve the care and management of the pediatric patient.

CHAPTER TWO

OBJECTIVES AND HYPOTHESIS

2.1 Objectives

General objectives

To describe the circumstances surrounding deaths of hospitalized children in HUSM

Specific objectives

1. To describe the demographic and clinical characteristic of children who died in Hospital USM
2. To determine the factors associated with pediatric mortality (time of death, diagnosis at death, highest level of care, age, gender and race, clinical condition at presentation and time of carried out order)

2.2 Hypothesis

There are significant associations between time of death, diagnosis at death, highest level of care, length of hospital stay, time interval of death from last review by specialist, patient age, gender and race, clinical condition at presentation and time of carried out order with pediatric mortality in HUSM from 2009-2013.

CHAPTER THREE

METHODOLOGY

3.1 Study design

This is a retrospective case control study which identified admission from 1st January 2009 to 31st December 2013 (5 years period) via patient registry database of HUSM.

The study conducted to compare the demographic, patient clinical conditions and treatment characteristic of cases of pediatric mortality in HUSM to children surviving during the same period of time.

3.2 Study area and patients

This study was done in Hospital Universiti Sains Malaysia encompassing the pediatric patients' populations who were admitted in 2009 till 2013. All mortality cases among pediatrics patients in General Pediatric Ward; 6 S, Oncology Ward; 6U, Pediatric High Dependency Unit and General ICU, Pediatric Surgical Ward; 2S were included in the study and are classified as 'cases' group. The non survivors that were included in study were either suffering from acute or underlying pre morbid chronic illness.

The exclusion criteria for cases are the neonates, patients who were 'brought in dead' in casualty or those patients who were not yet admitted to ward ie; failed resuscitation at Emergency Department.

On the other hand, the control group consists of pediatric patients who had survived and were admitted to 6S, 6U, HDU, general ICU and 2S from January 2009 till December 2013 and

they were selected randomly by using systematic random sampling- using random number in every 5th person based on sequence of admission. However, the 'control group' were not matched based on severity of clinical manifestation and time of admission.

The information was obtained from medical records unit. The name and registration number were gathered from respective ward, and the case notes of patient were retrieved from the hospital's record office. Each cases or record were systematically given a code number.

3.3 Ethical approval

Ethical approval was obtained for this study from Human Research Ethical Committee of USM. No ethical issues identified in the study.

The case records were extracted from the medical records which contain the name, identification data and address, but the data were kept as codes. For data protection, all information obtained was kept confidential unless required by the authorities and anonymity was maintained at all times.

Permission from the Hospital Director was also obtained in order for using the information from the medical records of the patients involved.

3.4 Sample size

Sample size was calculated using Power and sample size calculation software (version 3.0, January 2009). From the calculation based on type 1 error of 0.05 and power (1-B) of 0.8, the estimated sample size is 377 (KG Lee, 2012). However, the cases group estimated is smaller than the calculated one (approximately 150 deaths in pediatric patients over 5 years in HUSM).

Therefore 150 cases were planned for study for each group. The study of 'cases' and 'controls' are based on 1:1 ratio used as subjects. However, during data collection we were only able to retrieve 139 case notes for the deceased cases, therefore for matched sample, 140 files were enrolled for control group.

3.5 Statistical analysis

The statistical analysis was performed using Software SPSS version 22.

For descriptive statistic the categorical variables are expressed as proportions. The differences between groups were evaluated using Chi square and Fisher Exact tests for categorical data.

Statistical analyses conducted using Binary Logistic Regression analysis to assess the independent effects (demographic profiles, clinical presentation, and diagnosis) to the mortality. Multiple Logistic regression analysis was used in order to estimate the associated factors affecting pediatric mortality in HUSM. The predictors of interests are co morbidities, diagnosis, and time of first received treatment.

The study outcome was dichotomous binary categorical variable. In order to achieve final model, all the 6 steps in Multiple Logistic Regression (MLR) were run as follows

1. Data exploration and cleaning
2. Univariate analysis (Simple Logistic Regression)
3. Variable selection (Multiple Logistic Regression): preliminary main effects model
4. Checking multicollinearity and interaction: preliminary final model
5. Checking assumptions: final model
6. Interpretation and presentation

Results were presented as OR (odd ratio) and concluded as associations.

3.6 Outcomes measures

The outcomes are the ‘deceased’ and ‘survived’ patients. The demographic data and clinical characteristics together with the level of treatment received were identified in both groups.

In this study, factors associated with pediatric mortality (gender, symptoms, co morbidities, time of first received treatment) were recognized.

3.7 Variable definitions

Age group

- ☐ Infant: 1 month to 1year old
- ☐ Children: 1-14 years old
- ☐ Young adult: 14-18 years old

Time of death

- ☐ Off hour: starts at 5.00PM till 8.00 AM on Sunday till Thursday and the weekends (Friday till 7.59 AM on Sunday)
- ☐ Working hours: every Sunday till Thursday 8.00AM till 5.00PM

Types of admission

- ☐ Elective
- ☐ Emergency

Chronicity

- ☐ Acute
- ☐ Chronic/ patient with underlying comorbidities

Clinical condition at presentation

- ☐ Fever
- ☐ Respiratory distress: breathlessness, increase respiratory effort
- ☐ Fitting and reduced level of consciousness
- ☐ Diarrhea and vomiting
- ☐ Trauma

Time of carried out order (oxygen, antibiotic, blood transfusion)

- ☐ Less than 4 hours
- ☐ 4 to 8 hours
- ☐ More than 8 hours

Length of hospital stay

- ☐ Less than 1 day
- ☐ 1 to 7 days
- ☐ More than 7 days

Highest level of care

- ☐ Medical officer
- ☐ Specialist

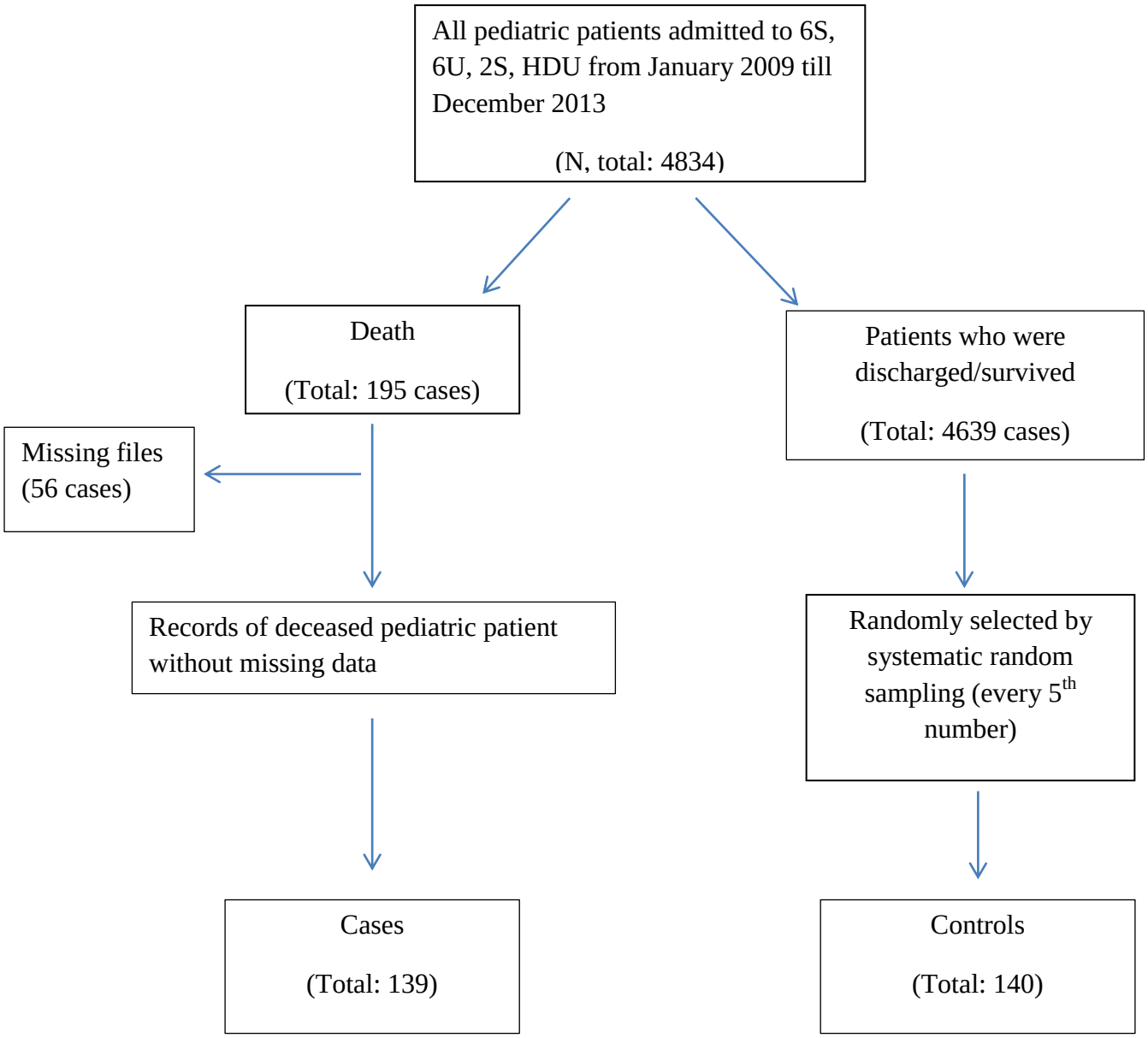
Diagnosis categories at death or discharge

- ☐ Disease of Respiratory illness
- ☐ Disease of Cardiovascular illness
- ☐ Disease of central nervous system (CNS) or neurological disorder
- ☐ Infectious diseases
- ☐ Metabolic/poisoning
- ☐ Hematology/Oncology cases
- ☐ Injury/trauma

Time interval of death from last review by specialist

- ☐ Never seen by specialist
- ☐ Less than 12 hours
- ☐ 12 to 24 hours
- ☐ More than 24 hours

Figure 1: Flow Chart of 'Case' and 'Control' Selection



CHAPTER 4

RESULTS

In this study period (January 2009 till December 2013) there were a total of 4834 pediatric cases admitted to pediatric wards in HUSM namely to 6 Selatan (6S), 6 Utara (6 U), 6U High Dependent Units (6U HDU), and 2 Selatan (2S). All children age 28 days to 18 years old who were admitted in year 2009 to 2013 to the aforementioned wards were included.

Out of these 4834 admissions, there were a total of 195 'death' cases (4%). From 195 cases only 139 cases were enrolled in this study as the other 'death' cases files were unable to be obtained. These data was gathered from the registration record office.

The cases are the pediatric patients who died in pediatric wards and those non survivors that suffered from either acute or underlying chronic diseases. The exclusion criteria for cases were the neonates, the patients who were 'brought in dead' in casualty, and who were not yet admitted to ward i.e.; failed resuscitation at Emergency Department.

The control groups were randomly selected among pediatric patients who 'survived', admitted to 6S, 6U, HDU, general ICU and 2S from January 2009 till December 2013. Random selection was done using systematic random sampling of every 5^{th} patients based on sequence of admission. The severity of clinical conditions was not specifically matched.

The admissions were classified into elective and emergency admission. The presenting symptoms were further divided into common symptoms presented during admissions namely

fever, respiratory complaints (cough, shortness of breath, noisy breathing), neurological symptoms (seizure, loss of consciousness, weakness), vomiting, abdominal pain, and trauma/injury.

The cause of death and diagnosis at discharge were reviewed and classified according to International Statistical Classification of Disease and related health problem (ICD 10).

With regards to the treatment and care received during admissions, both ‘cases’ and ‘control’ groups were reviewed and time of carried out order and level of care (Medical officer, or specialist) were identified.

Further analysis were done in ‘cases’ groups related to time of death which could be either during working hours or off hour, and the last interval time seen by the specialist in order to look for their contribution to the mortality.

4.1 Demographic profiles and clinical characteristics of pediatric patients admitted to HUSM

Table 1 Demographic data of patients admitted to HUSM in January 2009 to December 2013

Variables	**Number (n) (Total : 279)**	**Percentage (%)**
Year of admission		
2009	46	16.5
2010	53	19.0
2011	61	19.7
2012	55	19.7
2013	64	22.9
Age group		
Infant: 1 month to 12 months	105	37.6
Children: 1-14 years old	169	60.6
Young adult: 14-18 years old	5	1.8
Gender		
Male	143	51.3
Female	136	48.7
District		
Bachok	34	12.2
Gua Musang	6	2.2
Jeli	3	1.1
Kota Bharu	120	43.0
Ketereh	2	0.7
Kuala Krai	3	1.1
Machang	14	5.0
Pasir Mas	15	5.4
Pasir Puteh	16	5.7
Rantau Panjang	1	0.4
Tanah Merah	10	3.6
Tumpat	11	3.9
Johor	2	0.7
Kedah	1	0.4
Kuala Lumpur	1	0.4
Pahang	1	0.4
Perak	1	0.4
Selangor	1	0.4
Terengganu	37	13.3
Race		
Malay	270	96.8
Chinese	7	2.5
Others (Siamese)	2	0.7

Table 2. Clinical characteristics and admission profiles of pediatric patients admitted to HUSM in January 2009 to December 2013

Variables	**Number (N) (Total: 279)**	**Percentage (%)**
Admission		
Elective	35	12.5
Emergency	244	87.4
Chronicity		
Acute	134	48.0
Co morbidities	145	52.0
Presenting symptoms		
Fever	79	28.3
Respiratory symptoms (cough, SOB, runny nose)	85	30.5
Gastrointestinal symptoms (vomit, abdominal pain/distension, poor feed)	40	14.3
Neurology symptoms (fit, LOC)	36	12.9
Trauma	39	14.0
Length of hospital stay		
Less than 1 day	41	14.7
1 day to 7 days	144	51.6
More than 7 days	94	33.7
Diagnosis/ Cause of death(ICD)		
Disease of nephrology	12	4.3
GIT/metabolic/poisoning	30	10.8
Disease of neurological	30	10.8
Disease of cardiology	28	10.0
Infectious disease	34	12.2
Traumatology	39	14.0
Disease of respiratory	49	17.6
Hematology/oncology	57	20.4
Level of care		
Medical officer	64	22.9
Specialist	215	77.1
Time of carried out order		
Less than 4 hours	225	80.6
4 to 8 hours	46	16.5
More than 8 hours	8	2.9

Table 3: Demographic and clinical characteristic profile of 'cases' and 'control' group

Variables	Case (N, %)	Control (N, %)	N (total)	*P* value
1. Year of admission				
2009	19 (41)	27 (59)	46	0.712[a]
2010	26 (49)	27 (51)	53	
2011	33 (54)	28 (46)	61	
2012	27 (49)	28 (51)	55	
2013	34 (53)	30 (47)	64	
2. Age group				
Infant: 1 month to 12 months	39 (37)	66 (63)	105	0.004[b]
Children: 1-14 years old	97 (57)	72 (43)	169	
Young adult: 14-18 years old	3 (60)	2 (40)	5	
3. Gender				
Male	62 (43)	81 (57)	143	0.027[a]
Female	77 (57)	59 (43)	136	
4. Race				
Malay	135 (50)	135 (50)	270	0.194[b]
Chinese	2 (28)	5(72)	7	
Others	2 (100)	-	2	
5. Chronicity				
Acute	40 (29.8)	94 (70.2)	134	<0.001[a]
Co morbidities	99 (68.2)	46 (31.8)	145	
6. Presenting symptoms				<0.001[a]
Fever	48 (64.5)	28 (35.4)	79	
Respiratory symptoms (cough, SOB, runny nose)	37 (43.5)	48 (56.5)	85	
Gastrointestinal symptoms (vomit, abdominal pain/distension, poor feed)	17 (42.5)	23 (57.5)	40	
Neurology symptoms (fit, LOC)	23 (58.3)	15 (41.7)	36	
Trauma	14 (33.3)	26 (66.7)	39	
7. Length of hospital stay				
Less than 1 day	19 (46)	22 (54)	41	<0.001[a]
1 day to 7 days	48 (33)	96 (67)	144	
More than 7 days	72 (76)	22 (24)	94	
8. Types of admission				
Elective	11 (31.4)	24 (68.6)	35	0.029[a]
Emergency	128 (52.4)	116(47.6)	244	

9. Diagnosis/ Cause of death (ICD)				<0.001[a]
Disease of nephrology	4(33.3)	8 (66.7)	12	
GIT/metabolic/poisoning	10 (33.3)	20 (66.7)	30	
Disease of neurology	18 (60.0)	12 (40.0)	30	
Disease of cardiology	20 (71.4)	8 (28.6)	28	
Infectious disease	23 (67.6)	11 (32.4)	34	
Traumatology	12 (30.8)	27 (69.2)	39	
Disease of respiratory	4 (8.2)	45 (91.8)	49	
Hematology/oncology	48 (84.2)	9 (15.8)	57	
10. Level of care				
Medical officer	17 (27.0)	46 (73.0)	53	<0.001[a]
Specialist	122 (56.5)	94 (43.5)	216	
11. Time of treatment administered				
Less than 4 hours	123 (54.6)	102 (45.4)	225	0.002[b]
4to 8 hours	15 (48.3)	31 (51.7)	46	
more than 8 hours	1 (12.2)	7 (87.8)	8	

Abbreviation:
SOB: shortness of breath, LOC: loss of consciousness, respi: respiratory, GIT: gastrointestinal tract, ICD: International Statistical and Classification of Diseases
[a] Chi square test
[b] Fisher Exact test

4.1 Demographic profiles of overall patients admitted to HUSM

The data of each 'cases' and 'controls' groups was identified from the admissions records in 2009 to 2013. Cases were selected from each year with relatively similar ratio. Male gender has slightly higher proportion (1.1:1) to female.

Majority of patients were Malays (96.8%), followed by Chinese (2.5%) and other ethnic group (Siamese) (0.7%). As most of the Kelantan populations are Malay, this ethnic group is the main customer seeking treatment in this hospital. The patients were from all over Kelantan and a number of them (44 cases, 15.7%) were from other states in Malaysia. Thirty seven cases were from Terengganu, the neighboring state.

Children aged one to fourteen years old were the predominant age group. The age group classification was based on previous similar study done in North Carolina (Michael C, 2014).

4.2 Clinical characteristics and admission profiles of patients admitted to HUSM during study period

Majority of the patients were admitted within 1 to 7 days (51.6%), and a number of them had a longer hospital stay (more than 1 week admissions, 33.7%). Elective admission constituted 12.5% of the admission and 87.5% were admitted acutely to hospital.

Overall the main presenting symptoms were respiratory symptoms followed by fever, trauma, and gastrointestinal symptoms. Hundred and forty five (52.4%) of the patients admitted had underlying chronic medical illness. Among of patients admitted during study period, 77.1% were reviewed by the specialist. In both 'survived' and 'died' group, treatments were instituted within 4 hours of being attended by the medical personnels (80.6%) and 16.5% between 4 to 8 hours.

4.3 Demographic profiles of 'cases' and 'control'

A total of 279 data was enrolled in this study with 139 data belongs to 'cases' group and 140 cases were grouped as 'control'. Among the cases group, almost 23% data obtained in 2013, followed by 2011 with 22%, for year 2010 and 2012 with 19% each. The lowest proportion was in 2009. Since the folders were relatively older and inactive compared to the other years, most folders were unable to be retrieved from record unit.

There was statistically significant difference (p value 0.004) regarding the age of 'non survivor' and those who 'survived'. Children (aged 1 year to 14 years old) dominated the 'died' category (60.6%) followed by the infants (51.3%). Adolescent's death contributed 1.8% to the total who died.

4.4 Clinical characteristics and admissions profiles of 'cases' and 'control' group

Of a total of 279 cases, 87.4% were emergency cases, and among these, 128 cases died and the rest were discharged well after being admitted acutely (p value 0.029). The main reason for admission was respiratory illness that presented with cough, runny nose, and shortness of breath (30.5%), followed by fever (28.3%), gastrointestinal symptoms (vomiting, abdominal pain, distension) and trauma cases with 14% each and neurological symptoms (seizure, loss of consciousness) with 13% (p value 0.006).

Treatment received within 4 hours of being reviewed in majority of cases in both 'survived' and 'non survived' group (total 80.6%), and 16.5% of them being treated within 4 to 8 hours (p value 0.002). Two hundred and fifteen (77.1%) of patients admitted were reviewed by the specialists and remaining (22.9%) reviewed by the medical officer (p value <0.001) before their death.

Time of treatment administrations and main presenting symptoms classifications were based on similar comparable study done in Malawi (Gathara et al, 2013).

Children who were admitted within this time period mostly stayed in hospital for 1 to 7 days (51.6%). Some of them had a longer hospital stay (more than 7 days), 33.7%, and only 14.7% were admitted less than 24 hours (p value <0.001).

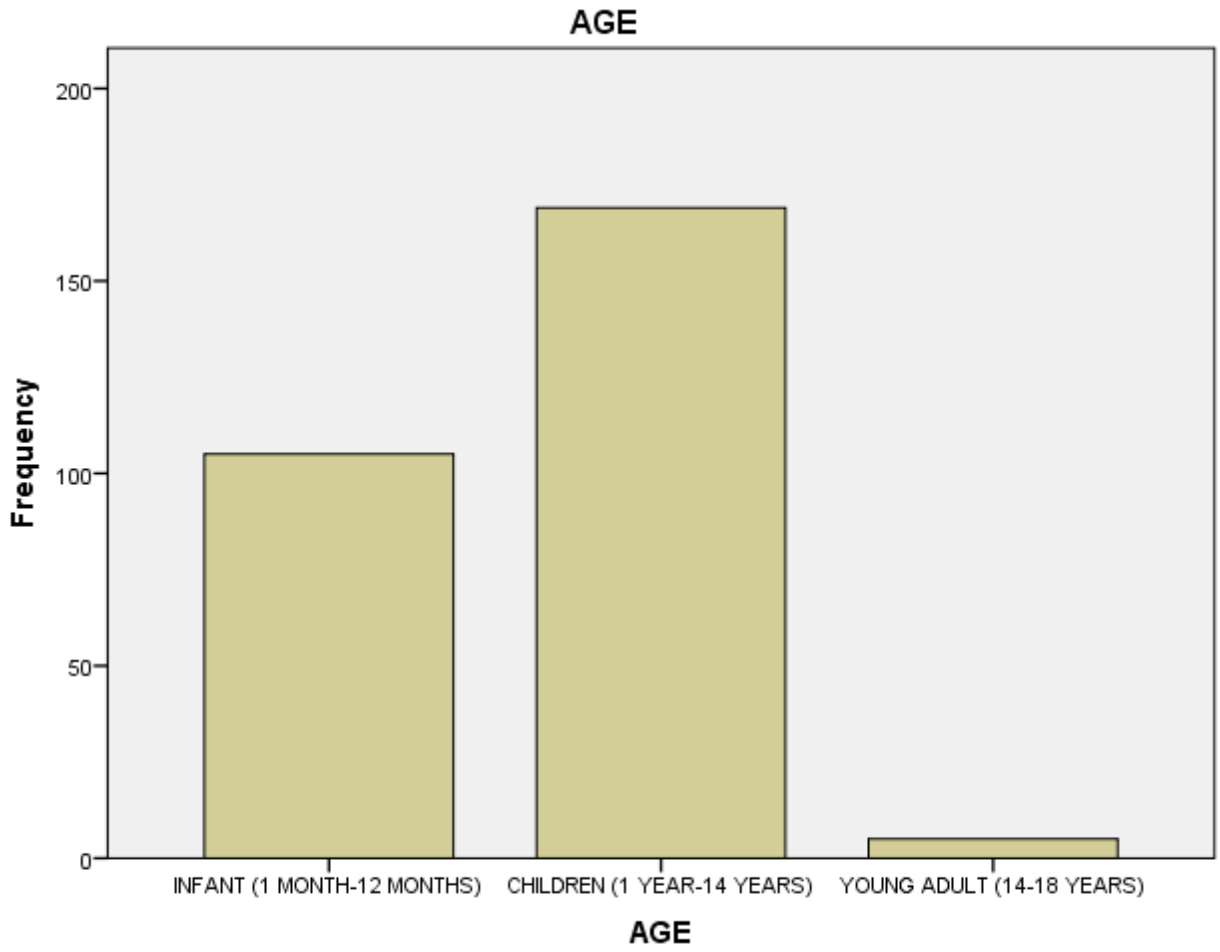


Figure 2: Age group distributions for pediatric patients admitted in 2009 to 2013

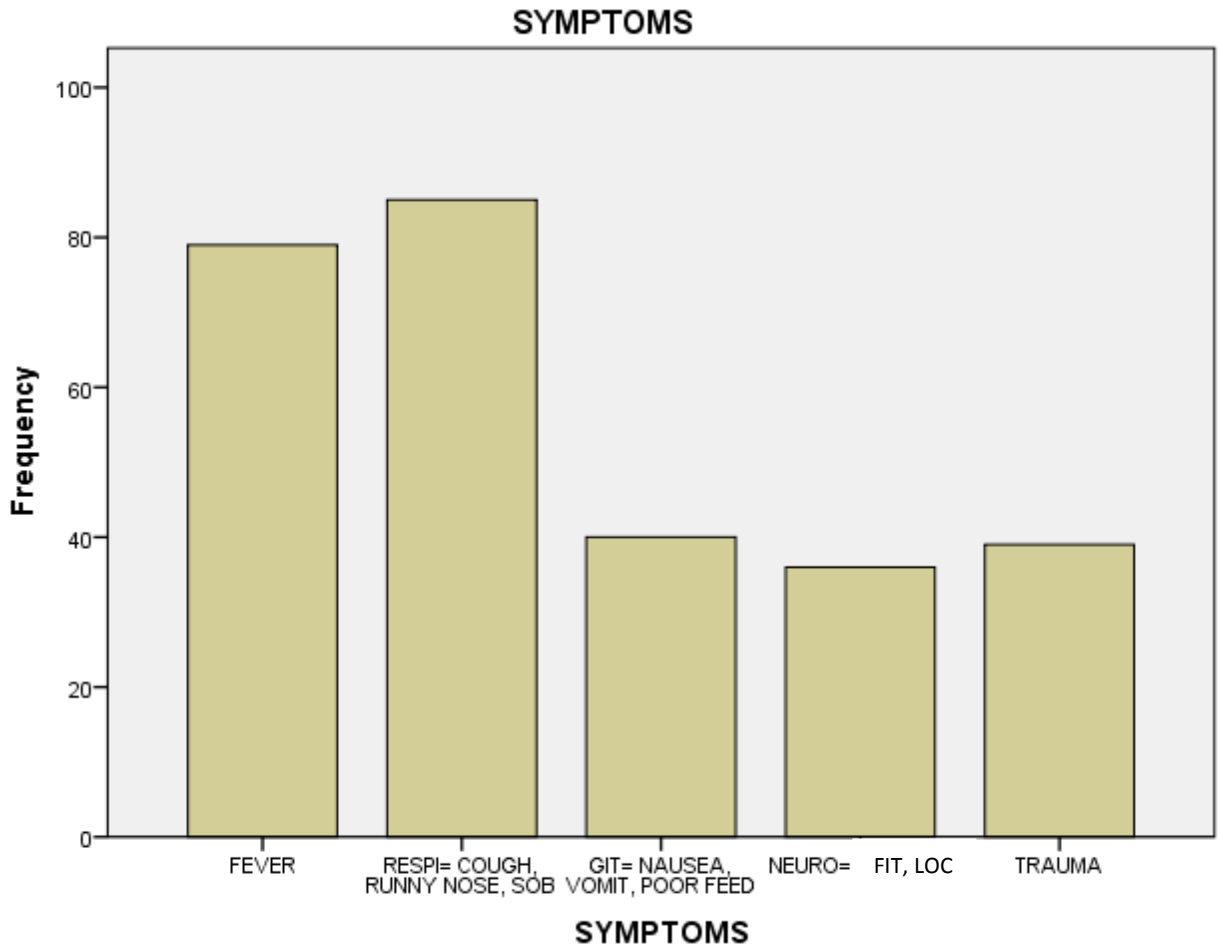
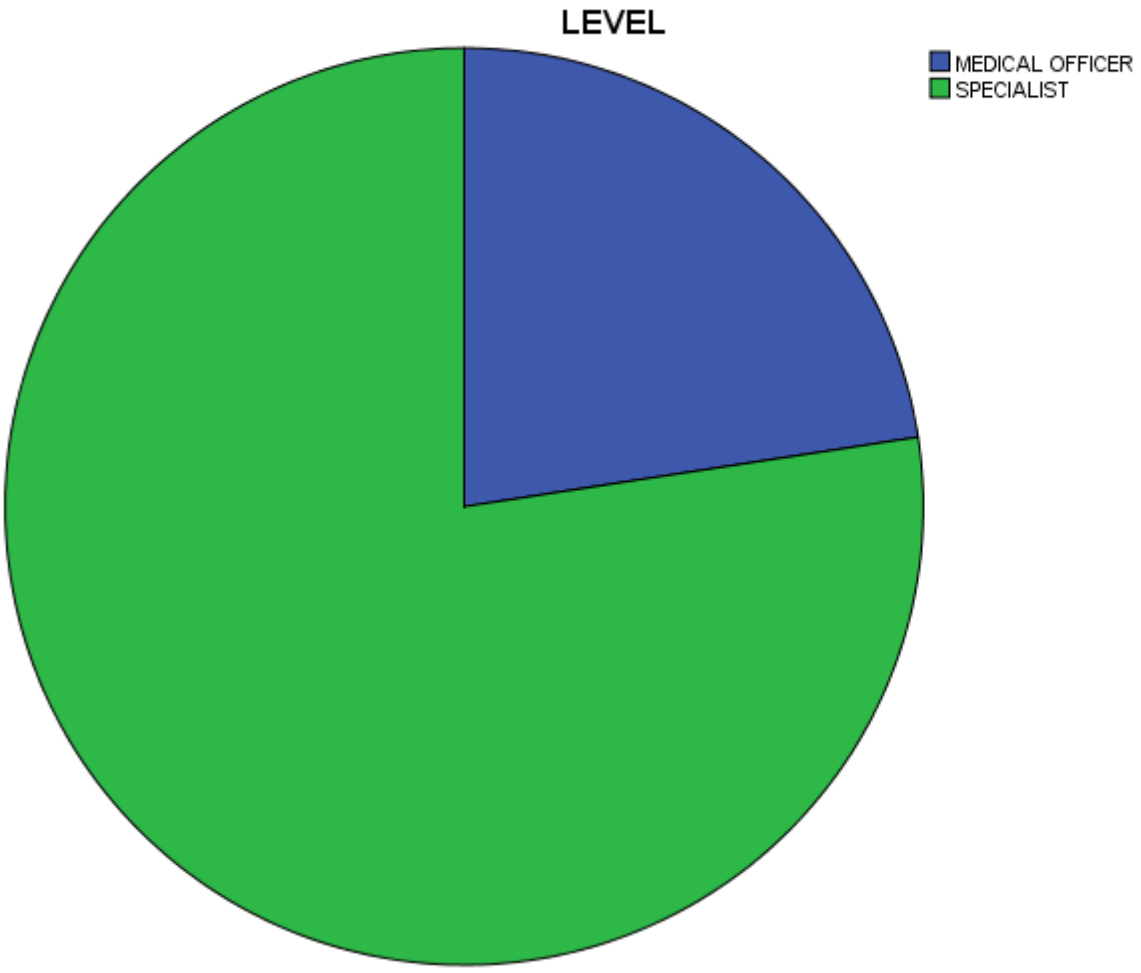


Figure 3: The main presenting symptoms for admission of pediatric patients in HUSM in 2009 to 2013



Medical officer: 64 (22.9%)
Specialist: 215 (77.1%)

Figure 4: The level of care received in the children admitted to HUSM in 2009 to 2013

Table 4: Clinical characteristics of ‘cases’ group

Characteristics	**N**	**%**
Chronicity		
Acute	40	28.8
Chronic (comorbidities)	99	72.2
Symptoms		
Fever	48	34.5
Respiratory symptoms	37	26.6
GIT symptoms	17	12.2
Neurological symptoms	23	16.5
Trauma	14	10.1
Level of care		
Medical officer	17	12.2
Specialist	122	87.8
Time of treatment given after being reviewed		
Less than 4 hours	122	87.8
Four to 8 hours	15	10.8
More than 8 hours	2	1.4
Cause of death		
Disease of nephrology	4	2.9
GIT/metabolic/poisoning	10	7.2
Disease of neurology	18	12.9
Disease of cardiology	20	14.4
Infectious disease	23	16.5
Traumatology	12	8.6
Disease of respiratory	4	2.9
Hematology-oncology	48	34.5
Time of death		
Working hours (8am-5pm)	35	25.2
Off hours	104	74.8
Interval time from last seen by specialist		
Never seen by specialist	17	12.2
Less than 12 hours	50	36.0
12 to 24 hours	36	25.9
More than 24 hours	36	25.9

4.5 Clinical characteristics of 'cases'

Of the 139 deaths included as 'cases', the majority was girl (56.1%) and the predominant age group was children group (69.8%). Almost 72% of the cases had underlying chronic medical illness. The main presenting symptoms that brought the children to medical attention were fever (35%) followed by respiratory complaints (27%) and neurological symptoms (16.5%).

Among all death, the majority (70%) were reviewed by the consultants during the course of hospitalization, probably due to critical presentation that required higher expertise. However 12% of these children were not seen by the specialists or consultant throughout the admission.

Of the death cases, 88% received treatment urgently within 4 hours after being reviewed by the medical personnel's and 11% of them received treatment after 4 to 8 hours. In majority of the cases, children died during 'off hour' (5.00pm till 8.00am, and during weekends and public holidays) (75%) and the rest of them died during working hours. The main cause of death were related to oncology cases (35%), followed by infectious diseases (16.5%), cardiology cases (14.4), and traumatology (8.6%).

The time interval of death from last seen by specialist was reviewed; and among these, 36% were last seen less than 12 hours from the time of death, followed by 26% each were seen within 12 to 24 hours group. Another 26% of cases were seen by specialist more than 24 hours before the patients died. 12% were not even seen by specialist during the hospital stay.