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Trend Analysis of Medically Certified Death in Malaysia, 1995 - 2010

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Abstract. This study aims to examine the trend of death certification in Malaysia from 1995 to 2010. In addition, this study also investigates the ecological association between the number of registered medical officer and death certification. Death record was retrieved from the National Registration Department (NRD), Malaysia and record for the number of registered medical officer was retrieved from the Health Informatics Centre (HIC), Ministry of Health (MOH), Malaysia. The trend analysis indicated that the medically certified death was increasing over time compared to the static trend in non-medically certified deaths. In ecological trend, the increased number of medically certified death is also associated with the increased number of registered medical officer in the country. Although there is a positive trend of death certification in Malaysia, there are still a large number of non-medically certified deaths.

Keywords. Medically certified death; death trend; death certification; Malaysia.

Introduction

The death certificate is a permanent record of the fact of death. It records personal information on the deceased and circumstances surrounding the death. The death certificate is the source for state and national mortality statistics, and it can provide important information especially when the death is medically certified. Formulation of public health policies and implementation is heavily dependent on accurate, reliable and timely statistics on births and deaths, with the medical causes of death. Reliable figures on death and causes of death can be used for policy making and planning, resource allocation in health sectors, evaluation and continuous monitoring of the impact of health interventions, health programs and the country's development status[16].

The quality of death registration is a main problem in many countries especially in developing ones. At the end of 2003, there were 115 countries reporting deaths from their vital registration systems to the World Health Organization (WHO). However, only 23 countries, mostly developed, have high quality death registration data (more than 90% complete, with ill-defined causes accounting for less than 10% of total deaths). Seventy five countries have no information available on causes of death after 1990, and more than 90% of these are from Africa[9].

The underlying cause of death in most developed countries is certified by a medical practitioner, which is not the case in developing countries. Less than 30% of medically certified information on deaths is available from the estimated of 50.5

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million deaths that occur each year worldwide[12]. Part of this under reporting may also be due to the laws and public sanctions which have influenced the under reporting of sensitive causes of death such as suicide and HIV/AIDS[9]. In developed countries, the cause of death is always certified by a medical practitioner, in contrast to the situation in a developing country where a significant proportion of deaths may occur without medical attention, and they may be registered without a medical opinion about the cause of death. In India, for example, over three-quarters of the 9.5 million deaths occur at home, and less than half of the majority had a medically certified cause of death[6].

As of 2008, the crude death rate for Malaysia was about 4.7 per 1,000 populations per year according to Department of Statistics, Malaysia (DOSM). The crude death rate increased to 4.8 per 1,000 populations in 2009, and 4.9 per 1,000 populations in 2010[3]. According to DOSM, "Certified death refers to certifications made by registered medical practitioners, coroners or magistrates carrying out inquests or investigations on a particular death". Registered medical practitioners refer to medical practitioners as defined in the Medical Act 1971[10]. The persons qualified to give information concerning a death is clarified in the Act 152 under Registration of Births and Deaths (Special Provisions) Act 1975[17]. However, due to constraints in access to medical officers or coroners in some circumstances, informants such as policemen, medical assistants or other individuals take over this responsibility in certifying or providing information on the causes of death.

DOSM reports annually a detailing statistics on causes of death among medically certified and non-medically certified death. However they do not report the trend of these statistics. Trending is important to visualize the pattern over the years on the extent of improvement in our reporting system. Apart from emphasizing on the trending of death certification, extensions have been made to determine if there is any correlation between number of medical officers registered in a year and the proportion of medically certified deaths. In addition, trending will also determine if time of death is associated with death certification.

1. Methods

Two cross-sectional data sets from the years 1995 to 2010 were used in this study. These data sets were of death records from the National Registration Department (NRD) and records of registered medical officers from the Health Informatics Centre (HIC), a resource centre for health information management in Ministry of Health (MOH). HIC provides policy and strategic framework for all biomedical or health care informatics management in Malaysia.

The first part of the study used death records to determine the trend of death certification among medically certified and non-medically certified deaths in Malaysia. Medically certified deaths in this study refer to death certifications made by registered medical practitioners with Malaysian Medical Register as clarified in Medical Act 1971[10], which involves medical officers, district health officers and coroners. Non-medically certified deaths were defined as certifications made by persons other than the

above, including by policemen, medical assistants and other informants. This study used secondary data and therefore did not involve any sample size planning or sampling techniques. Numbers and percentages were reported to identify deaths and death certification trends for fifteen years. Non-parametric test of trend was analyzed using The Mann-Kendall trend test[8] to analyze and assess the significance of the trend in the de-seasonalized time series of total number of medically certified and non-medically certified deaths.

The second part of the study is an ecological study which used records of registered medical officers to determine its association with medically certified death records. Association between categorical variables of types of death certification and time intervals was also carried out.

2. Results

In 1995, the total number and percentage of non-medically certified deaths was 55% (51,567/94,014), which was higher when compared to medically certified deaths of 45% (42,447/94,014). Until the year 2002, these statistics remained the same, albeit with little differences. From 2003 onwards, the percentages and the numbers of certified deaths gradually began increasing (Figure 1) with 57% (75,456/131,670) of certified deaths being recorded in 2010.

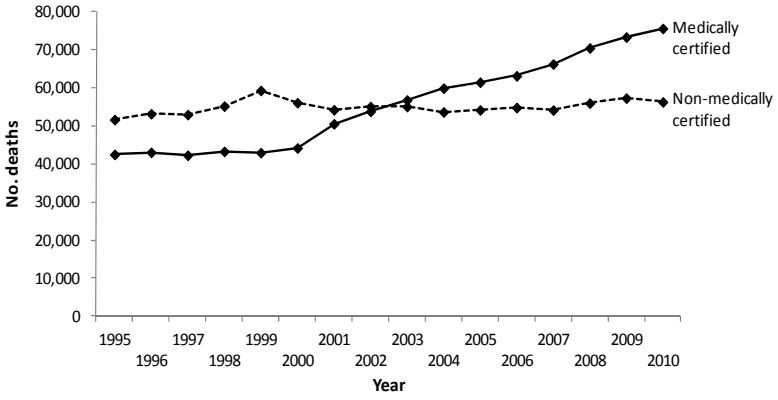

Figure 1. Number and percentage of deaths by type of certification in Malaysia, 1995-2010

Over a period of sixteen years from 1995 to 2010, the Mann-Kendall test showed a significant upward trend ($p<0.001$) in the de-seasonalized data series of medically certified deaths, but a non-significant ($p=0.062$) trend in the number of non-medically certified deaths (Table 1).

Table 1. Mann-Kendall test of trend for deaths certified from 1995-2010

	Mann-Kendall test			
	S	**Z**	***p*-value**	**Trend***
Medically certified	112	5.042	<0.001	↑
Non-medically certified	41	1.864	0.062	NT

* ↑=*upward trend*; NT=*no trend*

S=Mann-Kendall test statistic; *Z = Z-statistic*

The increasing trend of medically certified deaths was consistent with the increasing number of medical officers in the population (Figure 2). There was a high ecological association between medically certified deaths and the number of registered medical officers.

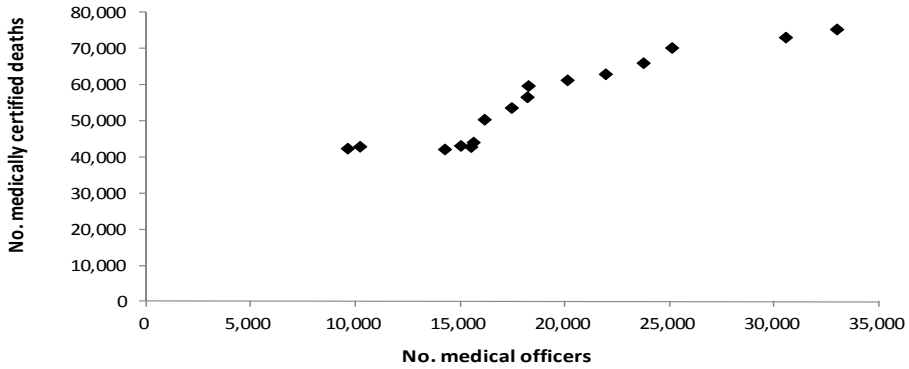

Figure 2. Scatter plot between number of death certification by certified officer and number of registered medical officer in Malaysia, 1995 - 2010

On average, there were four recorded deaths certified per medical officer in 1995, as shown in Figure 3. This decreased to three in 1997, and declined further to one medical officer certifying only two deaths in 2009 and 2010.

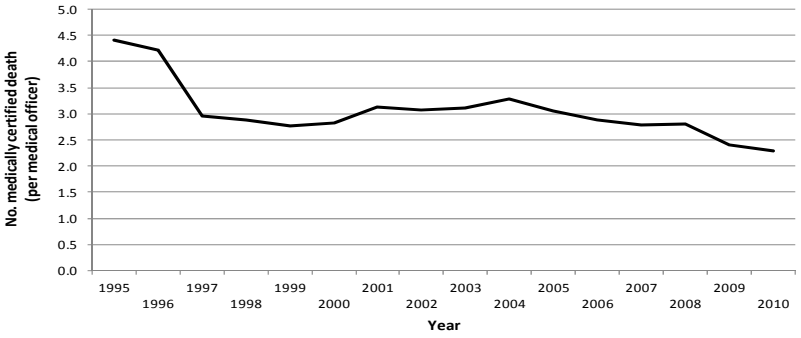

Figure 3. Number of medically certified death per medical officer in Malaysia, 1995 - 2010

The proportion of medically certified death is comparable with the non-medically certified death for each 6-hour time interval, irrespective of time of death. The result is as shown in Table 2.

Table 2. Number and percentage of death certification by time interval in Malaysia, 1995-2010

Time	Death certification	
	Medically certified, *n* (%)	**Non-medically certified, *n* (%)**
12 a.m. – 6 a.m.	196,623 (22.6)	174,876 (20.2)
6 a.m. – 12 p.m.	220,894 (25.4)	218,846 (25.3)
12 p.m. – 6 p.m.	232,520 (26.7)	248,838 (28.8)
6 p.m. – 12 a.m.	220,056 (25.3)	222,589 (25.7)

* Values are number with information available (%).

3. Discussions

From 1995 to 2010, medically certified deaths ranged from between 45% to 57%. This was comparable with other developing countries such as Sri Lanka, where in 2006 around 50% of deaths were medically certified[4]. In Philippines, all deaths in principle are medically certified, and the proportion of ill-defined deaths only around 5%, however, in year 2005, only about 35% of deaths are certified by the attending physician[5]. Among the total of 0.4 million reported deaths in Thailand in 2004, 65% took place outside hospitals. In these cases, the cause of death was mostly ascertained by a non-medically trained person who would not have been familiar with the concept of the underlying cause leading to the death[18].

Death certification without an accurate estimation on the causes of death will lead to errors and uncertainty in terms of validity and reliability regarding the cause of death, irrespective of whether it is a medically certified or non-medically certified case. In healthcare facilities, medical officers may certify deaths based on medical records, which comprises of details on the status of the patient, treatment and other relevant clinical information. Clinical records together with pathological autopsy may lead to an accurate medical certification of the cause of death. Completeness, reliability and coherent medical history are crucial in determining the cause of death. In Thailand, hospital based mortality was mainly based on medical record reviews even it was known that there were cases which were based on the physicians observation[14]. This study also proved that 51% of original death certification contained certification errors inclusive of listing and sequence of causes of death and inconsistencies in the underlying causes. Another study assessing the utility of the national mortality registry in research via use of linkage concluded that approximately 30% had death records with an 'unspecified' cause of death among those who died due to progressive heart failure and arrhythmias based on medical records[21].

Errors in death certification on causes of death may also be due to common errors in the procedure of registering a death and obtaining a death certification.

Currently, the practice of registering a death is via an application using the Death Registration Form together with supporting documents inclusive of medical certification of cause of death[11]. Throughout the procedures, there are chances of errors due to abbreviation, handwriting, inaccurate and incompleteness of information since the procedure is still in manually written form at the first stage of registration process. Incompleteness of information in death certificate and registration form is the limitation of the death registration procedure.

On the other hand, verbal autopsy for death certification might be another issue on the unreliability of the causes of death. It is a procedure of questioning or interviewing the close relatives of a death person for information that could be used to identify the cause of death. For example, in a death that occurred at home without the presence of a medical officer will depend solely on the information from relatives or individual determination of the cause of death. Generally, the information from relatives might over diagnose or under diagnose important causes of death. A validation study of verbal autopsy by Wrangkana in 2010 resulted in over diagnosing of several causes including diabetes, liver cancer and tuberculosis in Thailand. The same study also resulted with under reporting in deaths of human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), liver disease, genitourinary (essential renal) and digestive system disorders[15].

In developed countries such as Australia, as part of the registration process, the death must be certified by either a doctor using the medical certificate with cause of death, or by a coroner. Approximately 85% to 90% of deaths each year are certified by a doctor. The remainder is reported by a coroner[2]. The advantage is when the death was medically certified; it increased attention to the correct identification of the cause of death and its underlying factor, resulting in an improvement in data quality. In England and Wales, there were approximately 78% deaths certified by doctors from 2005 to 2008 with roughly 500,000 certified and registered deaths a year[13].

Our study found that the number of medically certified deaths in Malaysia has improved over time. However, non-medically certified death still contributes to a large proportion of total deaths reported. When deaths are not medically certified, critical information about the cause of death is usually missing, resulting in poor quality data[19]. Inaccuracies in information undermine the quality of the data derived from death certificates. The average number of medically certified death per medical officer is relatively constant from year 1997 to 2010. It is around two to three medically certified death per medical officer each year.

The government's effort to reduce the shortage of medical doctors in the country, particularly in the public sector, has shown a positive effect on the amount of the medically certified deaths. The ratio of medical officer to population is 1:859 in 2010; is set to rise to 1:600 by 2015 and 1:400 by 2020[7]. This rise in the number of the medical practitioners should result in a rise of the number of medically certified deaths in the future. This is because as a general rule, the higher the proportion of deaths that is medically certified, the more reliable the resulting cause-of-death statistics.

Apart from that, we found that there is no significant association between patterns of medical certification and time of death. This indicates that time of death is

not a major factor that contribute to the high number of non-medically certified deaths. Therefore further investigation needs to be done regarding methods of improving medically certified deaths. In this paper, we have only studied available data from death registration records, which explains the limitation of this study.

4. Recommendations

The death certificate is a vital resource on disease incidence, prevalence and mortality. It should therefore be as accurate and complete as possible. Families of the deceased may face difficulties to collect benefits and insurance as a consequence of an inaccurate death certificate. For example, if the death certificate lists septic shock and cardiac arrest as the cause of death for a policyholder who was involved in a motor vehicle accident, the beneficiary may encounter denial of claim for an insurance policy that pays only upon accidental death. In every claim for death benefits, a certified copy of the death certificate must be provided as part of the claim procedure to verify the date and cause of death.

The quality of death records could be improved if the information on the cause of death is supplied by either a medical practitioner or a coroner, or by having a medical death registry. More efforts are needed to make the death reporting system more responsive to the country's needs, basically in view of the death registration with the cause of death being medically certified, in order to count every death. Since the information on the death certificate is crucial, it is also important that all medical practitioners concerned with the registration of deaths strive not only for complete registration, but also for accuracy and promptness in reporting these events.

National governments should give high priority to policies that will improve civil registration systems so that the public will enjoy the advantage of strengthening health sector performance. However, such improvements cannot be achieved overnight and need investment not only in administrative systems, but also in facilitating public awareness and participation.

Thus, a developing country must invest in a good system to capture the salient variables. Faudzi et al.'s study[1] identified a mechanism to improve the system with existing resources; namely to engage Medical Assistants specially trained on certifying deaths based on the ICD classification. This was a pilot study covering one state, and if put into practice nationally, could be enough to significantly increase the numbers of medically certified deaths.

In many developing countries, where civil registration and vital statistical collection systems are weak, mortality statistics are only available periodically and that too without covering the whole population. Recently the World Health Organization (WHO), working with the University of Queensland, Australia developed a package of materials, referred to as the "World Health Organization (WHO) guidance tool", to provide guidance for a standards-based review of country practices in civil registration and vital statistics[21]. This is aimed towards helping responsible authorities obtain a clear and comprehensive understanding of the current approaches of their civil registration and vital statistics systems', and help to generate the evidence based for

corrective action, focusing on births, deaths and cause-of-death. The deployment of this package should be undertaken by all developing countries in their bid to improve their statistical systems.

5. Conclusion

There is a positive trend in death certification in Malaysia with the increasing number of medically certified deaths. However, the numbers of non-medically certified deaths are still large compared to other developed countries. The increasing number of registered medical officers does improve the number and proportion of medically certified deaths. However, the number of certified deaths per medical officer has decreased compared to previous years.

Improving the accuracy of existing vital statistical systems is crucial towards establishing morbidity and mortality patterns for a nation and providing the fundamental base for national healthcare and economic planning. It is hoped that this study helps to create awareness towards the importance of cause-of-death certification and provides an impetus to stakeholders and policy makers to enable constructive action to be taken.

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