

# A study of ill-defined causes of death in Bahrain

## *Determinants and health policy issues*

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### ABSTRACT

**الأهداف:** البحث عن السبب الحقيقي للوفاة في شهادات الوفاة غير معروفة الأسباب في عام 2006م وتقييم مدى اكتمال شهادات الوفاة وتحديد العوامل التي تؤثر على النسبة المرتفعة للوفاة الغير معروفة السبب في البحرين.

**الطريقة:** أجريت دراسة استرجاعية على جميع شهادات الوفاة التي كان سبب الوفاة المسجل بها غير معروف طبقاً للتصنيف العالمي للأمراض R0-R99 خلال الفترة من يناير 2006م إلى ديسمبر 2006م في البحرين.

**النتائج:** من خلال مراجعة شهادات الوفاة غير معروفة السبب في عام 2006م كانت نسبة البحرينيين 76.7%، وبلغت نسبة الذكور 70.6%، تراوحت أعمار نسبة 37% أكثر من 70 عام، وحدثت الوفاة في المنزل في 62.7%. وتبين أن معظم الأسباب الكامنة المسجلة وراء الوفيات في 92% في جميع شهادات الوفاة المدرجة تم إحضارها إلى المستشفى متوفاة بسبب هبوط حاد في الدورة الدموية، ومن بينهم توفي 86% في المنزل، وتم اعتماد 60% من شهادات الوفاة من قبل أطباء مركز السلمانية الطبي، وتم توقيع الشهادات الباقية من قبل الأطباء الشرعيين، كانت أكثر من نصف الشهادات معتمدة من أطباء يحملون مؤهل بكالوريوس طب و جراحة فقط. من بين الشهادات المراجعة في مركز السلمانية (SMC)، بلغت نسبة شهادات الوفاة التي تم تعديلها في مركز السلمانية الطبي 60%، و اعتمدت 47.4% من أطباء قسم الطوارئ والحوادث، و 31.5% من قسم الطب، و 21.1% من قسم الجراحة.

**خاتمة:** يجب إعادة تقييم شهادات الوفاة في البحرين مع جميع المسؤولين لتحسين جودة شهادة الوفاة. كما يجب أن تشدد السياسة المراجعة على رفع مستوى وعي الأطباء للعوامل المؤثرة عليها.

**Objectives:** To find the actual cause of death in death certificates that had “ill-defined” causes in 2006, evaluate the correctness of the completion of those certificates, and recommend ways to decrease the proportion of “ill-defined” causes of death in Bahrain.

**Methods:** This was a retrospective review of all death certificates that had “ill-defined” as a cause of death (International Classification of Diseases-10 codes R0-R99) from January through December 2006 in Bahrain.

**Results:** Of the decedents with “ill-defined causes” of death in 2006, 76.7% were Bahraini, 70.6% males, 37% older than 70 years, and 62.7% died in their homes. The underlying causes of death of 92% were recorded as “brought dead” and “cardiopulmonary failure.” Of those whose place of death was recorded as “brought dead”, 86% had died in their homes. Sixty percent of the death certificates were signed by Salmaniya Medical Complex (SMC) physicians and the remaining by forensic doctors and over half by senior residents. Of the death certificates retrieved at SMC, 60% were corrected, 47.4% of which were certified by doctors from the accident and emergency department, 31.5% from medical, and 21.1% from surgical departments.

**Conclusion:** Death certification in Bahrain should be reevaluated by all stakeholders to improve the quality of mortality data. The revised policy should stress upon increasing the awareness of the physicians on the implications of inaccurate death certification.

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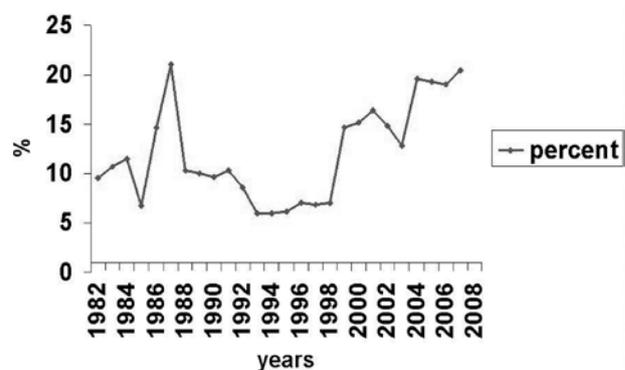
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Mortality statistics are one of the most important health indicators for countries and the most widely used data by health policy makers. They are valuable to policy makers in the development of public health programs, allocation of health care resources, and identification of priority areas for future research. The accuracy of the mortality statistics depends on the completeness and correctness of the death certificate; mostly the underlying cause of death. Recent studies have reported many inaccuracies in death certificates worldwide, and their reliability has come under increasing criticism in medical journals and among health officials.<sup>1</sup> Editorials have drawn attention to the lack of information on causes of death in many developing countries and the urgent need for the World Health Organization (WHO) and other international health agencies to take a lead in readdressing this situation.<sup>2</sup> In 2003, the WHO Director General stated that strengthening of the vital statistics registration system is one of his priorities.<sup>3</sup> Despite many efforts to increase the quality of vital statistics including the development of the International Classification of Diseases (ICD), death registration remains inadequate in several countries.<sup>1</sup> Factors contributing to its deficiency include incomplete coverage, late registration, missing data, and errors in the reporting or classification of the underlying cause of death.<sup>3</sup> Although, autopsy findings are believed to increase the reliability of mortality data, they are not routinely performed by all countries.<sup>4</sup> When comparing the rank of "ill-defined" causes of death in Bahrain with that of the world, it is between the developed and the less developed regions. They usually rank as the second cause of death after diseases of the circulatory system; however, the latest available data from the Ministry of Health (MOH),<sup>5</sup> Bahrain has shown that they occupied the first rank. In 2006, there were 2,317 deaths reported by the Public Health Directorate (PHD), 39.1% of which were among the elderly ( $\geq 70$  years). Of these, cardiovascular diseases (CVD) constituted the highest single cause of mortality with a cause specific death rate (CSDR) of 60.5 per 100,000 and a proportional mortality rate (PMR) of 19.4%. "Ill-defined" causes of death were the second cause of death with a CSDR of 59.4 per 100,000 and a PMR of 19%.<sup>5</sup> Health services in Bahrain are provided by governmental and private hospitals, health centers, and clinics. The main governmental hospital in the country is Salmaniya Medical Complex (SMC) where most of the hospitalized deaths occur.<sup>5</sup> Death registration in Bahrain started in June 1970 following an Amiri decree,<sup>6</sup> and is administered by the Birth and Death Registration Office (BDRO). A standard Death Certificate Notification Form is used in accordance with the United Nations and WHO recommendations,<sup>7</sup>

and is coded using ICD-10. When death occurs in health institutions, the physician must certify it and record the cause on the certificate; forensic doctors certify other deaths. Following certification, the death certificates are forwarded to the BDRO for coding and later to the Health Information Directorate (HID), MOH. Although Bahrain is known to have good health indicators compared to other countries, the WHO's recent assessment of the global status of the causes of death data rated the quality of mortality data in Bahrain low as a quarter of deaths were assigned to "ill-defined" causes despite the high rates of completeness (100%) and coverage (90%).<sup>1</sup> Few studies have investigated the possible causes of the low quality of mortality data in Bahrain. Hamza et al<sup>8</sup> reported that there was a lack of concordance between the documented cause of death and the underlying disease in the death certificates that were reviewed at SMC. They attributed the major reason for this discordance to the fact that there is a general tendency among doctors to assign death to "cardiac failure". Moreover, Mahroos<sup>9</sup> concluded that the national mortality statistics in Bahrain may overestimate the frequency of coronary heart disease (CHD) and emphasized the importance of taking measures to improve precision in certification. This problem has been exacerbated by the fact that autopsies are not generally practiced in the country unless there is suspicion of crime. The increase in "ill-defined" causes of death (Figure 1) has always been a problem in Bahrain,<sup>5,10</sup> which significantly affects the quality of vital statistics and can misguide the policy makers when prioritizing health problems. Thus, it is very important to understand the factors behind this chronic problem to improve the quality of death certificates and mortality statistics in the country. The objectives of this study were to find the actual cause of death in death certificates that had "ill-defined" causes in 2006, evaluate the correctness of the completion of those certificates, and recommend



**Figure 1** - Percentages of deaths with ill-defined causes in Bahrain from 1982-2007.

ways to decrease the proportion of “ill-defined” causes of death in Bahrain.

**Methods.** Although this study involved evaluating the correctness of completing death certificates that had “symptoms, signs, and abnormal clinical and laboratory findings not elsewhere classified” (ICD-10 codes R0-R99) as a cause of death in Bahrain during 2006, the term “ill-defined” was used throughout this paper to present this category. The Annual Health Reports of the MOH<sup>5</sup> were reviewed for the period from 1982 to 2007 and the percent of “ill-defined” causes of death for each year were abstracted. A retrospective review of all 2006 death certificates that had “ill-defined” as a cause of death in Bahrain was carried out in 2007. A list of all names and identity card numbers of decedents with “ill-defined” causes of death was obtained from the HID. Decedent’s death certificates were retrieved from the BDRO files, and copies of their death certificate forms were made. Relevant data were abstracted on a designed form<sup>11</sup> to evaluate the completeness of the death certificate. It included demographic characteristics of decedents, medical data, and administrative details. Furthermore, the list of names and identity card numbers of the decedents with “ill-defined” causes of death was given to the Medical Records Department, SMC to retrieve their files. The retrieved files were reviewed by one of the researchers to identify the actual cause of death.

Data were analyzed using the Statistical Package for Social Sciences (SPSS Inc, Chicago, IL, USA) program version 14. We use descriptive statistics to describe our data.

**Results.** The 2006 Annual Health Report indicated that there were 441 deaths with “ill-defined” causes, however, only 354 (75%) death certificates were retrieved from the BDRO of which, 32 had their medical records at SMC. **Table 1** presents the age, gender, and nationality of decedents whose death certificates were retrieved at the BDRO. Most of the underlying causes of death in the death certificates were recorded as “brought dead” and “cardiopulmonary failure” (**Table 2**). Of those whom had “brought dead” written as the place of death, 86% had died at their homes. **Table 3** shows the physicians who certified the death certificates with “ill-defined” causes of death by department, position, and qualification. Sixty percent of the death certificates were signed by SMC doctors and the remaining by forensic doctors. Fifty-five percent of the death certificates were certified by senior residents, and those with only MBBS as a qualification. Of the death certificates retrieved at SMC, 60% were corrected based on the details included in the medical files. Of those, 47.4% were certified by doctors from the accident and emergency department (A&E), 31.5% from medical, and 21.1% from surgical

**Table 1 -** Age, gender, nationality, and place of death of decedents with “ill-defined” causes of death.

Variables	n	(%)
<i>Age (years)</i>		
<10 years	19	(5.4)
10-30 years	27	(7.6)
31-50 years	89	(25.1)
51-70 years	88	(24.9)
71-90 years	112	(31.6)
>90 years	19	(5.4)
<b>Total</b>	<b>354</b>	<b>(100.0)</b>
<i>Gender</i>		
Male	250	(70.6)
Female	104	(29.4)
<b>Total</b>	<b>354</b>	<b>(100.0)</b>
<i>Nationality</i>		
Bahraini	263	(76.7)
Non-Bahraini	80	(23.3)
<b>Total*</b>	<b>343</b>	<b>(100.0)</b>
<i>Place of death</i>		
Home	222	(62.7)
Hospital	115	(32.5)
Abroad	17	(4.8)
<b>Total</b>	<b>354</b>	<b>(100.0)</b>

\*There are missing data due to incomplete information

**Table 2 -** The recorded underlying causes of death on the death certificates.

Causes of death	n	(%)
Brought dead	172	(48.6)
Cardio pulmonary failure	156	(44.0)
Old age	1	(0.3)
Normal death	1	(0.3)
Defined causes of death*	17	(4.8)
Unknown	7	(2.0)
<b>Total</b>	<b>354</b>	<b>(100.0)</b>

\*Other than R0-R99

**Table 3 -** Doctors who certified death certificates with “ill-defined” causes of death by department, position, and qualification (N=354).

Variables	n	(%)
<i>SMC Department</i>		
Medical	85	(26.0)
Accident and Emergency	59	(18.0)
Surgical	42	(13.0)
Pediatrics	3	(0.9)
Ear, Nose, and Throat	1	(0.3)
Family Physician Residency Program	6	(1.8)
Forensic	131	(40.0)
<b>Total*</b>	<b>327</b>	<b>(100.0)</b>
<i>Position</i>		
Junior Resident	139	(42.4)
Senior Resident	179	(54.6)
Chief Resident	10	(3.0)
<b>Total*</b>	<b>328</b>	<b>(100.0)</b>
<i>Qualification</i>		
MBBS	173	(54.6)
MBBS + other	144	(45.4)
<b>Total*</b>	<b>317</b>	<b>(100.0)</b>

SMC - Salmaniya Medical Complex, MBBS - Bachelor of Medicine, Bachelor of Surgery, or in Latin *Medicinae Baccalaureus, Baccalaureus Chirurgiae*. \*There are missing data due to incomplete information

departments. Of those certified by SMC doctors, the medical department doctors signed 43.4% of them occupying the first rank.

**Discussion.** Of the retrieved death certificates, 95.2% had ICD-10 codes from R0 - R99 and 4.8% were wrongly coded as “ill-defined.” If this percentage were redistributed to other causes of death, it could have led to a smaller number of “ill-defined” causes and would have increased the number of other causes of death, which was underestimated.

In this study, around one third of the deceased with “ill-defined causes” were over 70 years, which compares to those reported by other international studies that attributed this high percentage to the effect of age.<sup>12</sup> It was also similar to the proportion of all deaths (39.1%) in that age group in Bahrain during 2006. As for gender, there was a lower percentage of females (29.4%) with ill-defined causes of deaths than that among all deaths (40.5%) in the country during that year.<sup>5</sup> Moreover, the selection of a single underlying cause of death is frequently problematic in the deceased elderly, who often had several chronic diseases that concurrently led to their death.<sup>1,13,14</sup>

The underlying cause of death that was recorded in all the retrieved death certificates mostly included “brought dead” and “cardiopulmonary failure.” The high percentage of the former as an underlying cause of death could be due to the lack of guidelines and procedures followed by the A&E doctors on the importance of investigating and certifying decedents who are brought dead to the hospital and that the term “brought dead” is not a cause of death, but the state in which the decedent arrived to the hospital. Similarly, the high percentage of death certificates with the latter as the cause of death may be largely due to the physicians’ ignorance that “cardiopulmonary failure” is an “ill-defined” cause and that they have to assign the actual underlying cause instead. Hamza et al<sup>8</sup> raised concerns regarding this issue more than a decade ago, and reported discordance between the underlying causes of death and those reported in the SMC medical records. They attributed it to the fact that there was a general tendency among doctors to assign “cardiac failure” as a cause of death. Moreover, the overestimation of CVD in death certificates in Bahrain has been reported.<sup>9</sup> Furthermore, many physicians identify cardiovascular events such as cardiac arrest as the primary cause of death without realizing that a cardiovascular event is the final pathway in death due to any cause.<sup>15</sup> The Framingham Heart Study suggested that CVD causes of death were overestimated by at least 24% on death certificates.<sup>16</sup>

Although the governmental policy in Bahrain implies that forensic doctors should certify deaths occurring

outside the premises of health institutes; the policy is partially implemented. Moreover, investigations for the underlying cause of death are not carried out except if officially requested or upon suspicion of a crime. Thus, forensic doctors would label other deaths that had occurred outside health institutions as “cardiopulmonary failure.” This routine of writing “cardiopulmonary failure” as the cause of death may be one of the factors that increased the number of “ill-defined” causes of death. The percentage (62.7%) of deaths of those that occurred at home among the “ill-defined” was 3 times higher than that of the total deaths (20.7%) in 2006.<sup>5</sup> This implies that the major problem in mortality data in Bahrain rises from those who die at home. Forty percent of these death certificates were certified by forensic doctors while the rest by non-forensic doctors. This discrepancy between deaths that occurred at home with those signed by forensic doctors could have resulted from the absence of a system or a known procedure to advise the relatives where to go when death occurs at home.

Twenty-six percent of the death certificates were from the medical department, similar to other reports.<sup>17</sup> Over half of the death certificates were signed by doctors with only a MBBS qualification. This is not surprising as 42.4% of the death certificates were certified by junior residents. These findings are in line with previous studies that reported that death certification is usually assigned to the junior residents of the medical team.<sup>18,19</sup> However, it has been suggested that the process of death certification should be assigned to a senior member of the medical team.<sup>19</sup>

The low percentage of retrieved medical records could be partially due to the adoption of a policy by the SMC administration to demolish files of patients not attending the hospital for 7 years or over. However, the fact that some of the deceased had never attended SMC cannot be dismissed. The fact that 60% of the retrieved medical records could be corrected, emphasizes the importance of retrieving medical records in decreasing the proportion of “ill-defined.” Moreover, the high percentage of recording “ill-defined” causes of death by the A&E doctors may be due to the nature of the department and the unavoidable hastiness in procedures.<sup>20</sup>

The fact that the medical files of the deceased with “ill-defined” causes from other hospitals were not retrieved, might have possibly lead to a lower correction rate for the causes of death. There was a discrepancy between the numbers of deaths with “ill-defined” causes reported by the HID and those found in the BDRO, and this could have possibly inflated the reported percent of “ill-defined” causes in Bahrain.

In conclusion, the process of death certification in Bahrain should be re-evaluated with all the stakeholders

enforcing the role of each in improving the quality of mortality data and decreasing the category of “ill-defined” causes of death. The revised death certification procedures should highlight the importance of continuous training of all doctors on death certificate completion in medical school and during their practice. The revised policy should also stress upon increasing the awareness of physicians on the implications of incorrect death certification on the quality of mortality data and health indicators of the country. Specifically, forensic doctors should realize that “cardiopulmonary failure,” and A&E doctors that “brought dead,” are not causes of death.

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