Atlas of Death for the Main Causes of Neurologic Disorders in a Local Hospital in Isfahan/Iran

Zahra Tolou_Ghamari [1],[*]

[1] Isfahan Kidney Transplantation Research Center, Alzahra Research Centers, Isfahan University of Medical Sciences, Isfahan, Iran

[*] Corresponding author: Zahra Tolou_Ghamari, (University of London PhD); Isfahan Kidney Transplantation Research Center (IKTRC), Alzahra Research Centers, Isfahan University of Medical Sciences, Isfahan, Iran. Tel: +98-3136201250, E-mail: toloeghamari@pharm.mui.ac.ir

Abstract

Introduction: In a recent study of 5360 deceased records' within a local teaching hospital in Isfahan/Iran, neurological disorders' ranked as the main cause of mortality among others. Additionally based on previous global reports, it seems that approximately 150000 individuals die within hospital every day. Therefore the current study aims to provide an atlas for the major causes of death correlated to neurologic disorders' in a local hospital in Isfahan/Iran.

Methods: A retrospective survey of 1036 deceased individuals due to neurologic disorders' (comprised of n = 607 males and n = 429 females), was carried out from the years 2011 to 2014. The study was conducted to Isfahan Kidney Transplantation Research Center (IKTRC). Death reported data such as age, gender, final code of death, date of admission, and duration of hospital stay were noted in Excel. The statistical analyses of d-Base were performed using SPSS (version 20) for windows. Descriptive statistics such as mean, minimum, maximum was reported for variables of interest.

Results: Out of total population studied 59% were males. Age related death in the 79% was between 31 to 96 years old of life. Location of disorders that caused death were ranked as brain (n = 89%) > both brain and spinal cord (n = 5%) > spinal cord (n = 4%). Ranked reasons of death due to brain disorders resulted as: unspecified intracranial hemorrhage (n = 283; 41%) > stroke (n = 224; 32%) > traumatic intracranial injuries (n = 186; 27%) and other reasons (n = 24%). With a minimum of 1 and a maximum of 162 days, the mean hospital stay in this group was 11.9 days. In the 52% of deceased population due to spinal cord injuries, age at death was under 15 years old of life. The average hospital stay within this group of deceased before death was 15.3 days with a minimum of 1 to a maximum of 74 days. There were 7 reported deaths due to multiple sclerosis at the minimum and maximum age of 22 and 66 years old.

Conclusions: The evaluation based on clinical research maps from this study could help upcoming investigation for inserting the new strategy of the multi-dimensional difference of main reasons of death due to neurological disorders in Isfahan/Iran. Finally in order to achieve for improved clinical, pharmacological or surgical performance and management, or a more profitable founding of health incomes, further study in this direction recommended.

INTRODUCTION

According to a recent publication, a consistent and analogous record related to the reasons of death seems to be vital for public health investigation. Furthermore, in the coming decade death due to neurologic disorders are estimated to increase globally.

In overall expression, death could be authorized as the stoppage of all senses. The heartless occasion of human death could bring nervousness, agony, sorrow, reflective discomfiture and many other problems for the family of deceased individual. As of all origins, about 150000 individuals pass away every day in hospital. In a recent study of 5360 deceased person, within a local teaching hospital in Isfahan/Iran, neurological disorders were classified as the first place of death among others. Sarfo et al in 2016 mentioned that

every one out of three patients those attended hospital due to neurological disease in Ghana died in the hospital, due to non-communicable conditions in most events [1-3]. Keezer et al, in 2016 stated that comorbid diseases are significant reasons of death, in addition to forecasters of early mortality in epilepsy. They also mentioned that in the first two years after the index seizure, there was strong association among cause of death and etiology of epilepsy [4]. In another publication increased mortality has been reported among persons with autism spectrum disorder (ASD), particularly between those who also have the comorbid complaint of epilepsy or intellectual incapacity [5]. Sudden unexpected death in epilepsy (SUDEP) is the second important neurologic cause of whole vanished potential life-years after stroke, yet SUDEP may justified for less than half of all epilepsy-associated death events' [6]. Follow-up investigations of children and adolescents with epilepsy have exposed an advanced risk of mortality in children [7]. Medical and neurologic complications of acute stroke could unfavorably influence patient significance of quality and quantity of life [8]. Traumatic brain injury was reported as the major public health problem internationally [9]. Related to spinal cord disorders, intramedullary spinal cord tumors that are rare neoplasms could be potentially lead to severe neurologic worsening, reduced function, poor quality of life and death [10]. The current study aims to draw an atlas that describes frequency of neurological complications in which reported as final cause of death within a local teaching hospital in Isfahan/Iran.

METHODS

We conducted a retrospective study with the mission to provide the frequency for each specific term according to anatomical position of neurological disorders in 1036 deceased involved of 607 males and 429 females [1]. The study did not require institutional review board approval. It was conducted to Isfahan Kidney Transplantation Research Center (IKTRC).

We used death reported data from 21 March 2011 to 19 March 2014, with linkage (using the de-identified patient number) of multiple data files included; demographic such as age and gender, final code of disease diagnosis, final code of death, date of admission, duration of hospital stay, discharge diagnoses', deceased family's paid and health system paid [1-9]. The statistical analyses of d-Base were performed using Microsoft Excel and SPSS v. 20 (Chicago, IL, USA) for windows. Distribution analysis showed that most of the parameters follow non-Gaussian distribution. Descriptive statistics such as means, median and range was calculated for variables of interest.

RESULTS

Fig 1 shows distribution of neurological disorders according to anatomical locations that ended to death. In the 89% of population the location of disorders was related to brain. In the 5% disorders that ended to death were related to both anatomical location of brain and spinal cord. In the 4% of total population studied reported reason for death was due to injury in spinal cord. Fig 2 shows that age-related-death due to neurological disorders in 36% were below

the age of 50 years old of life. In the 89% of deceased that anatomical location reported into brain, with a minimum age related to newborn (death after birth) and a maximum age of 100 years old, the mean age at death was 57.3 years old. Of the total population studied in this group, 59% were males. With a minimum of 1 and a maximum of 162 days, the mean hospital stay in this group was 11.9 days. Ranking order of age within total population showed that age at death in the 93% was more than 15 years old. Related to the brain disorders that caused death, the order of disorders could be expressed from highest to lowest as: unspecified intracranial hemorrhage (n = 283) > stroke (n = 224) > traumatic intracranial injuries (n = 186) and in 24% of the rest population were due to the other reasons that could be seen in Fig 3. Death due to motor neuron disease (n = 7; involved 3 males and 4 females) was occurred at the minimum age of 46 and maximum age of 76 (mean age of 62.1) years old. The mean hospital stay with a minimum of 1 and a maximum of 61 was 23.9 days. Reported death in 7 patients with multiple sclerosis was involved of 2 males and 5 females. With a mean age of 48.2 year old, the minimum and maximum age at death was 22 and 66 years old respectively. The mean hospital stay with a minimum of 1 and a maximum of 34 was 13.9 days. Related to Parkinson disease with a minimum of 66 and a maximum of 83 the mean age of deceased (n = 4 females and 1 male) was 73.2 years old. With a mean of 5.8, the minimum and maximum duration of hospital stay in 5 deceased reported due to Parkinson disease was 1 and 16 days respectively.

Fig 4, shows distribution of age in population of deceased due to spinal cord injury in which 67% were females. Ages at death in 52% were under 15 years old of life. The average hospital stay within this group of deceased before death was 15.3 days with a minimum of 1 to a maximum of 74 days. There were other causes of death such as secondary malignant neoplasm of brain, benign neoplasm of meninges and so on (Fig 3).
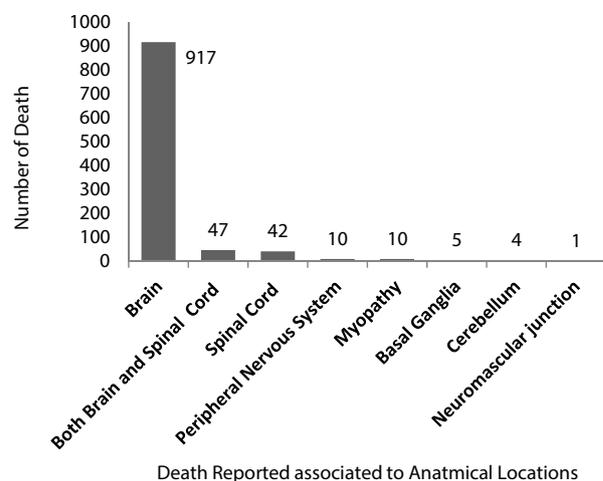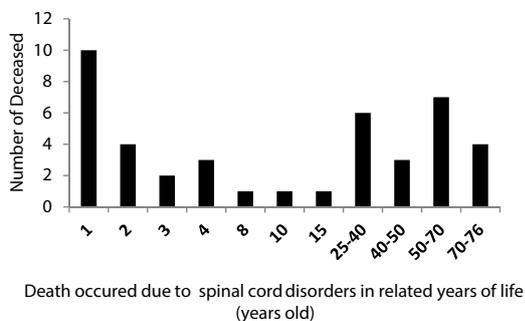

Figure 1: Anatomical Location Related to Neurological Disorders That Ended to Death (n = 1036).
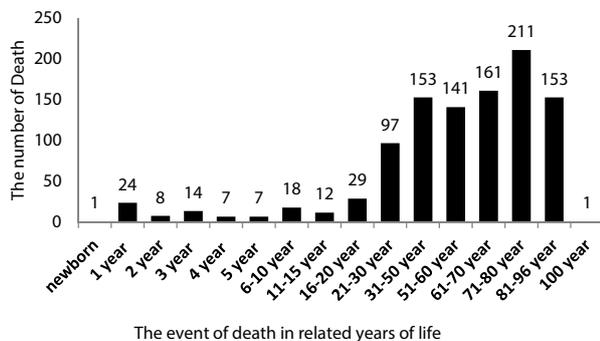
Figure 2: Distribution of Age in Total Population of Deceased Due to Final Cause of Neurological Disorders (n = 1036)
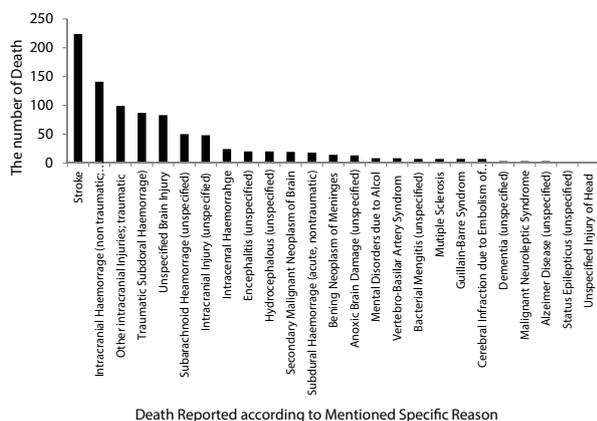
Figure 3: Clustered Reasons' For Brain Injury (n = 917)

Figure 4: Distribution of Age in Deceased Due to Spinal Cord Injury

DISSCUSSION

According to previous publications death could be occur at the point in which human life dismisses. Now a days neurological disorders are expected to increase in Isfahan/Iran and internationally, therefore, there is a need for study related to its' mortality.

In agreement with previous reports, stroke caused death in 32% of total population in this study [1-11]. Wolff V et al, in 2016 stated that stroke, is the major complication of reversible cerebral vasoconstriction syndrome that can result in persistent neurological disability, and rarely causes death [12]. As the location of reported death was related to brain in 89%,

unspecific intracranial hemorrhage caused death in 41% and traumatic intracranial hemorrhage caused death in 27%. Arnaout et al, in 2015 confirmed that presentation of cerebrovascular event may help to identify brain causes [13]. Christe et al, in 2010 mentioned that intracranial bleeding is hyperattenuating both in radiology and in postmortem imaging [14]. Chauny et al, in 2016 confirmed that special care may be required for patients with serious mechanism of injury, those display marks of neurologic worsening, and patients presenting with extreme anticoagulation or getting antiplatelet co-medication [15]. Pfeifer et al, in 2016 reported that around 50 to 60 % of trauma patients die due to their injuries prior to arrival at the hospital [16].

In this study, the highest rate of reported death (n = 64%) related to the neurological disorders' was started from the age of 50 to 100 years old. This is in agreement with previous publications that recommended an in-depth analysis for age, gender-specific mortality rates [17] and other factors that affecting the pattern of mortality [16]. In another publication the mortality rates related to the tumors of central nervous system reported to be increased within all age groups, most significantly in patients aged 70 years or older [18].

Death reported due to multiple sclerosis in this study occurred at the age between 22 and 66 years old. Manouchehrinia et al, in 2016 performed a meta-analysis of standardized mortality ratios, and concluded that mortality of multiple sclerosis compared to the general population has not changed over the past 50 years. Death due to cardiovascular diseases, suicide and infection is higher in patients with multiple sclerosis compared to the general population [19].

In this study there were 19 death reports due to secondary malignant neoplasm of brain. Previous publication suggested that due to dissimilar presentation of tumor in the central nervous system, it needs dissimilar management approaches [18].

Danilova et al, in 2016 confirmed that for public health analysis data related to death should be comparable on system of producing information on cause of death across regions and/ or over time [2].

Finally atlas of death due to neurological cause presented in this article could be a clue for further research to extend our understanding of the three-dimensional disparity of major reasons of death, which in turn is critical for directing protective events, altering performances and a more cost-effective allocation of health resources. Further research toward providing a systemic analysis for achieving more knowledge of reason of death for advanced pharmacotherapy and surgical managements' toward traumatic intracranial injuries or vague term that called unspecified intracranial hemorrhage at the regional level of Isfahan/Iran seem to be advantageous.

CONFLICTS OF INTEREST

There is no financial disclosure between the current article and any individual or organization.

supports from any agency or organization to provide this manuscript.

AUTHORS' CONTRIBUTIONS

Study concept, literature review, acquisition of data, design, analysis and interpretation of manuscript, drafting of the manuscript and critical revision of manuscript for intellectual content, performed by Zahra Tolou_Ghamari.

REFERENCES

1. Tolou-Ghamari Z. Investigation of final causes of death in 5360 deceased patients within a teaching hospital in Isfahan, Iran. American Journal of Experimental and Clinical Research. 2016;3(2):161-4.
2. Danilova I, Shkolnikov VM, Jdanov DA, Mesle F, Vallin J. Identifying potential differences in cause-of-death coding practices across Russian regions. Popul Health Metr. 2016;14:8. DOI: 10.1186/s12963-016-0078-0 PMID: 27006644
3. Sarfo FS, Awuah DO, Nkyi C, Akassi J, Opare-Sem OK, Ovbiagele B. Recent patterns and predictors of neurological mortality among hospitalized patients in Central Ghana. J Neurol Sci. 2016;363:217-24. DOI: 10.1016/j.jns.2016.02.041 PMID: 27000253
4. Keezer MR, Bell GS, Neligan A, Novy J, Sander JW. Cause of death and predictors of mortality in a community-based cohort of people with epilepsy. Neurology. 2016;86(8):704-12. DOI: 10.1212/WNL.0000000000002390 PMID: 26773074
5. Schendel DE, Overgaard M, Christensen J, Hjort L, Jorgensen M, Vestergaard M, et al. Association of Psychiatric and Neurologic Comorbidity With Mortality Among Persons With Autism Spectrum Disorder in a Danish Population. JAMA Pediatr. 2016;170(3):243-50. DOI: 10.1001/jamapediatrics.2015.3935 PMID: 26752506
6. Devinsky O, Spruill T, Thurman D, Friedman D. Recognizing and preventing epilepsy-related mortality: A call for action. Neurology. 2016;86(8):779-86. DOI: 10.1212/WNL.0000000000002253 PMID: 26674330
7. Selassie AW, Wilson DA, Wagner JL, Smith G, Wannamaker BB. Population-based comparative analysis of risk of death in children and adolescents with epilepsy and migraine. Epilepsia. 2015;56(12):1957-65. DOI: 10.1111/epi.13219 PMID: 26662192
8. Mamushet Y, Zenebe G, Addissie A. Medical and Neurological Complications among Stroke Patients Admitted for Inpatient Care in Addis Ababa, Ethiopia. Ethiop Med J. 2015;53(1):9-17. PMID: 26591287
9. Krishnamoorthy V, Vavilala MS, Mills B, Rowhani-Rahbar A. Demographic and clinical risk factors associated with hospital mortality after isolated severe traumatic brain injury: a cohort study. J Intensive Care. 2015;3:46. DOI: 10.1186/s40560-015-0113-4 PMID: 26561524
10. Samartzis D, Gillis CC, Shih P, O'Toole JE, Fessler RG. Intramedullary Spinal Cord Tumors: Part I-Epidemiology, Pathophysiology, and Diagnosis. Global Spine J. 2015;5(5):425-35. DOI: 10.1055/s-0035-1549029 PMID: 26430598
11. Tolou-Ghamari Z. Preliminary Study of Differences Between Prevalence of Multiple Sclerosis in Isfahan and its' Rural Provinces. Archives of Neuroscience. 2015;2(4). DOI: 10.5812/archneurosci.29034
12. Wolff V, Ducros A. Reversible Cerebral Vasoconstriction Syndrome Without Typical Thunderclap Headache. Headache. 2016;56(4):674-87. DOI: 10.1111/head.12794 PMID: 27016378
13. Arnaout M, Mongardon N, Deye N, Legriel S, Dumas F, Sauneuf B, et al. Out-of-hospital cardiac arrest from brain cause: epidemiology, clinical features, and outcome in a multicenter cohort*. Crit Care Med. 2015;43(2):453-60. DOI: 10.1097/CCM.0000000000000722 PMID: 25599468
14. Christe A, Flach P, Ross S, Spendlove D, Bolliger S, Vock P, et al. Clinical radiology and postmortem imaging (Virtopsy) are not the same: Specific and unspecific postmortem signs. Leg Med (Tokyo). 2010;12(5):215-22. DOI: 10.1016/j.legalmed.2010.05.005 PMID: 20630787
15. Chauny JM, Marquis M, Bernard F, Williamson D, Albert M, Laroche M, et al. Risk of Delayed Intracranial Hemorrhage in Anticoagulated Patients with Mild Traumatic Brain Injury: Systematic Review and Meta-Analysis. J Emerg Med. 2016;51(5):519-28. DOI: 10.1016/j.jemermed.2016.05.045 PMID: 27473443
16. Pfeifer R, Teuben M, Andruszkow H, Barkatali BM, Pape HC. Mortality Patterns in Patients with Multiple Trauma: A Systematic Review of Autopsy Studies. PLoS One. 2016;11(2):e0148844. DOI: 10.1371/journal.pone.0148844 PMID: 26871937
17. Chammartin F, Probst-Hensch N, Utzinger J, Vounatsou P. Mortality atlas of the main causes of death in Switzerland, 2008-2012. Swiss Med Wkly. 2016;146:w14280. DOI: 10.4414/smw.2016.14280 PMID: 26901250
18. Dahlrot RH, Poulsen FR, Nguyen NN, Kristensen BW, Hansen S, Holm NV, et al. Trends in tumors in the central nervous system in elderly in Denmark, 2008-2012. Acta Oncol. 2016;55 Suppl 1:91-7. DOI: 10.3109/0284186X.2015.1115123 PMID: 26781160
19. Manouchehrinia A, Tanasescu R, Tench CR, Constantinescu CS. Mortality in multiple sclerosis: meta-analysis of standardised mortality ratios. J Neurol Neurosurg Psychiatry. 2016;87(3):324-31. DOI: 10.1136/jnnp-2015-310361 PMID: 25935887