Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/21404
DOI URL: http://dx.doi.org/10.21474/IJAR01/21404

ISSN NO. 2320-5407

RESEARCH ARTICLE

MAJOR ORGANS CONTRIBUTING TO MORTALITY IN THE ICU IN A TERTIARY CARE CENTRE

S. SreeRanjani[1], G.R. Rajashree[2] and P. Padmapriya[3]

1. MBBS, D.A, D.N.B (Anaesthesiology), FIPM, MHA, ACME, PhD Professor and Head – Department of Anaesthesiology Vice Principal - Administration Bhaarath Medical College and Hospital, Affiliated to Bharath University (BIHER), Chennai, Tamilnadu.
2. MBBS, M. D (Anaesthesiology) Dean Bhaarath Medical College and Hospital, Affiliated to Bharath University (BIHER), Chennai, Tamilnadu.
3. PhD Research Scientist Department of Research Bhaarath Medical College and Hospital, Affiliated to Bharath University (BIHER), Chennai, Tamilnadu,

Manuscript Info

Manuscript History
Received: 14 May 2025
Final Accepted: 17 June 2025
Published: July 2025

Key words: -
Non-Communicable diseases, Prevalence, Public Health Care, ICU, Mortality, COPD, CAD, Lung

Abstract

Background: The exposure to several risk factors and concomitant presence of non-communicable diseases (NCDs) are the leading cause of death globally, accounting for more fatalities than all other causes combined, such as road traffic accidents. Not only the highly developed nations, even countries with low and moderate incomes are affected. Hospital admission statistics are largely lacking in developing nations regarding common major primary organ involvements. This study will assist us in evaluating the major organ systems primarily involved and the prevalent disease patterns found in ICU, which contribute to mortality. **Methods:** Our study covered the patients who were admitted to the ICU in BMCH between January 1, 2023, and December 31, 2024. The primary diagnosis and comorbidities of each patient were noted and analysed. **Results:** The major causes of mortality for the 149 cases in our centre were as follows: 26.17 percent had primarily cardiac problems, 15.44 percent had respiratory problems, 12.75 percent had encephalopathy and stroke, 12.75 percent had Multiple Organ Dysfunction Syndrome (MODS), 12.08% had renal problems, 12.08% had cancer, 2.68 percent had liver complications, and 1.34% had only diabetes mellitus, trauma, poisoning, and tuberculosis cases. **Conclusion:** According to our study, the heart was the major primary contributor to death in our intensive care unit, followed by the lung, brain, and kidney. In the upcoming years, there will be a significant global increase in the prevalence of cardiovascular diseases, pulmonary disorders, and chronic kidney diseases, which will have a negative impact on the society and the economy. Hence, action needs to be taken at prevention of these diseases – such as lifestyle changes, early detection and treatment to preserve body homeostasis and slow the development of systemic diseases via the heart-lung- brain -kidney axis.

Corresponding Author: - S. SreeRanjani
Address: - MBBS, D.A, D.N.B (Anaesthesiology), FIPM, MHA, ACME, PhD Professor and Head – Department of Anaesthesiology Vice Principal - Administration Bhaarath Medical College and Hospital, Affiliated to Bharath University (BIHER), Chennai, Tamilnadu.

Introduction: -

Non-communicable diseases (NCDs) are the major cause of death worldwide, rationale for more deaths than all The exposure to several risk factors and concomitant presence of non-communicable diseases (NCDs) are the leading cause of death globally, accounting for more fatalities than all other causes combined such as road traffic accidents. Not only the highly developed nations, even countries with low and moderate incomes are affected. 73% of fatalities from non-communicable diseases (NCDs) occur in low- and middle-income nations. Non-communicable diseases (NCDs) present around 5.87 million deaths that report for 60 % of all deaths in India. Over two-thirds of all NCD-related deaths in the WHO's South-East Asia Region (SEAR) occur in India. [1,21,22]

Some organ systems are more primarily involved in mortality compared to others. According to a study[2], cardiovascular diseases account for at least 19 million of NCD fatality in 2021, followed by cancer (10 million), chronic respiratory diseases (4 million), and diabetes (which causes more than 2 million deaths, including kidney diseases). These four disease types are responsible for 80% of all premature NCD deaths. In Asian continent, it is often linked to other factors such as poverty, illiteracy, tobacco consumption, exposure to allergens, solid biomass fuel, working/living in congested and poor sanitary conditions, social, geographical issues, and economic barriers in seeking appropriate health care. India presently faces a double burden of disease: non-communicable diseases have emerged with both immediate and long-term effects, while communicable diseases have not been significantly reduced. [2,17]

Hospital admission statistics are largely lacking in developing nations regarding common major primary organ involvements. This study will assist us in evaluating the major organ systems involved and the prevalent disease patterns found in ICU, which contribute to mortality. The study hospital, Bhaarath Medical College and Hospital has over 1000 inpatient beds and is a tertiary medical care set up, which mostly provides healthcare to the public in the southern region of Chennai. We planned the research using the information repository available in the Medical Records Department. Annually, the BMCH accepts more than 1000 ICU patients.

Aim of the study: The aim of the present study is to determine the primary major organ system responsible for mortality in our ICU

Methodology: The study was a retrospective observational, single-centre study. This study was approved by Bhaarath Medical College and Hospital (BMCH) Institutional Review Board. All patients who were admitted in the ICU at BMCH from 1st January 2023 to 31st December 2024 and were declared dead were included in this study. Deaths were clinically confirmed by ECG. Fatalities were noted to be 149 during the study period. To maintain anonymity, patient identifying information was removed.

Statistical Analysis & Results:

Of the 149 cases of death in the ICU in the study period, the associated ailments were myocardial infarction, Congestive Cardiac Failure, Acute respiratory distress, Pulmonary Oedema, renal disease, Stroke, cancer with and without metastases, liver disease, and co morbidities were Diabetes, Hypertension, and bronchial asthma. Of the major organ systems primarily involved, 26.17 % were with predominantly cardiac issues, 15.44 % with respiratory problems, 12.75 % were with encephalopathy and stroke - Brain, 12.08% with renal issues, and 2.68 % with liver complication. The other causes of mortality were 12.75 % with Multiple Organ Dysfunction Syndrome (MODS) with more than one primary organ involvement, 12.08% were with cancers and 1.34 % with only diabetes mellitus, trauma, poison, and TB (non lung) cases. Among the 149 patients, the comorbidities were; 31 were with diabetes mellitus (DM), 12 were with systemic hypertension (SHTN) and 25 were both with DM & SHTN. Male were 57.05% and female were 42.25%. Maximum cases fell between the age group 51 to 80.51-60 were 36, 61-70 were 34 and 71-80 were 36.

Discussion:

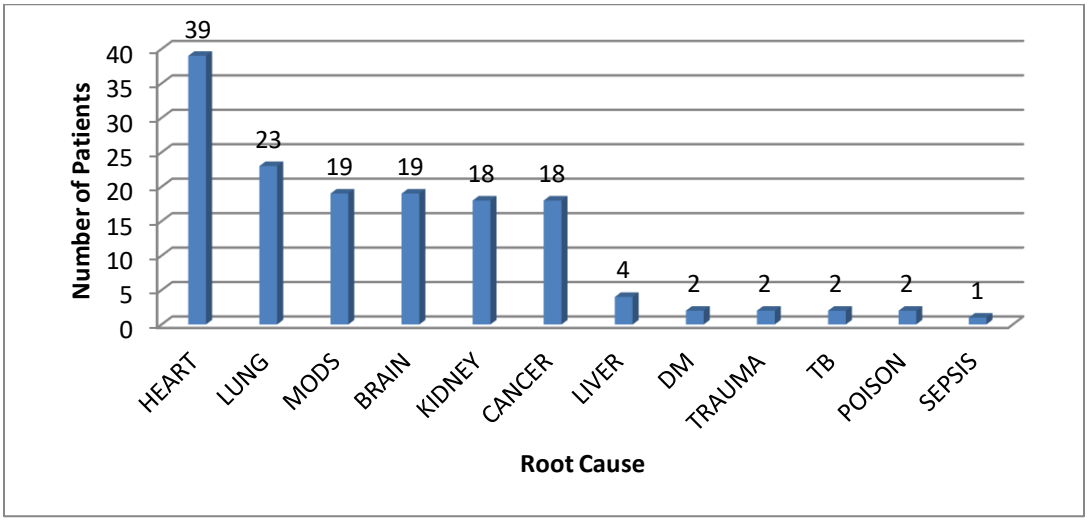
The patient population at BMCH is from the Tambaram city municipality, located in the Chengalpattu district of Tamil Nadu state, India. This constitutes a broad geographic distribution as Tambaram covers an area of 87.64 sq. km in the Chengalpattu district, and has a population of 722,982.

The spectrum of age group of people admitted and with fatal outcome in the ICU, at our institution was similar to few other studies. The elderly population, namely above 80 years had higher fatalities compared to the non-elderly population namely between 51 to 80 years of age and similar to another study [3]. Studies by Attias D etal., and S.B. Garko et al., [4,7] also showed a continuous increase in the absolute rate of ICU admissions and fatalities in the elderly. In our study ICU admissions were gradually rising with age, peaking between the ages of 51 and 80.

Table 1: Major Primary Organ Involvement & other causes of mortality

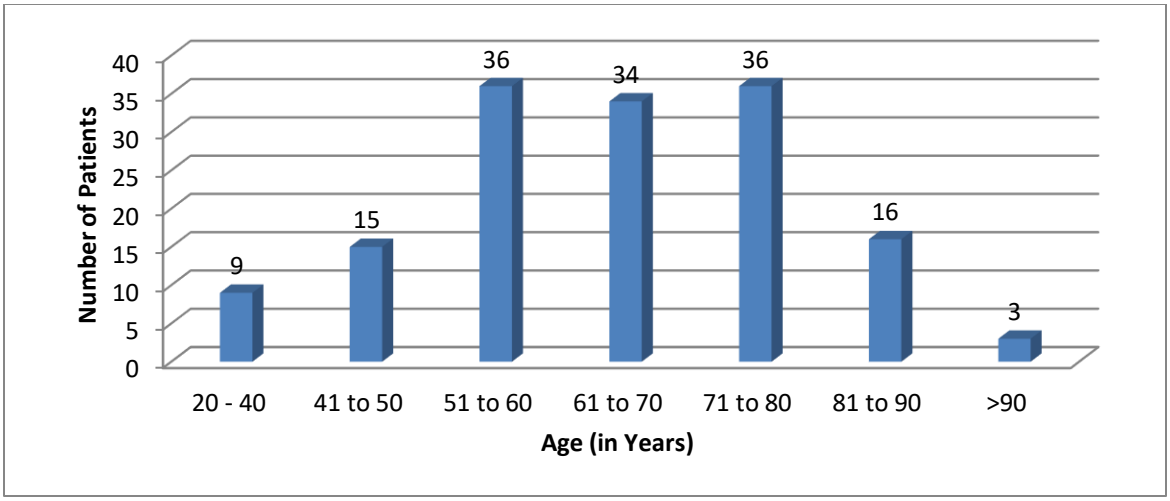
Diagnosis	Number	Percent
Major Primary Organ Involvement		
HEART	39	26.17
LUNG	23	15.44
BRAIN	19	12.76
KIDNEY	18	12.08
LIVER	4	2.68
Other causes of mortality		
CANCERS	18	12.08
MODS	19	12.76
POISON	2	1.34
DM	2	1.34
TB (Other than lung)	2	1.34
TRAUMA	2	1.34
SEPSIS	1	0.67
Total	149	100

Figure 1: The root cause for the fatality



The most common primary organ involvement in ICU mortality in our study was the Heart. The underlying diseases were Hypertensive heart disease (HHD), ischemic heart disease (IHD), Acute heart failure (AHF), and Chronic rheumatoid heart disease (CRHD). Our study findings are comparable to research findings of Cindric A and Dass C. Kanmantha Reddy. In elderly individuals, heart as the primary major organ contributes to high rates of morbidity and mortality as seen in some studies. [5,6]

Figure 2: Age wise Analysis



In a study conducted in a tertiary centre in Addis Ababa, Ethiopia, the common cause of fatality was cardiogenic pulmonary oedema and acute heart failure. The most frequent reason, according to a study conducted in Spain, the Netherlands, and Poland, were heart problems. [7,8,13] The co morbidities in these fatalities were obesity, diabetes and hypertension, suggesting that cigarette smoking, and a sedentary life style leads to more burden of diseases [18,22]. The second common primary organ involved in ICU mortality was the Lung. Worldwide the burden of respiratory disorders on the healthcare system is also increasing. Lung cancer, TB, pneumonia, COPD, and bronchiectasis continued to be the top five reasons for respiratory hospitalizations. Patients with concomitant cardiac and respiratory conditions experience overlapping symptoms of dyspnoea and chest discomfort. Similar results were observed in the studies by Umoh VA in Nigeria. [7] Similar observations were reported by Kumar A. et al which is in alignment with our study report [11]. The most likely significant contributing causes to the increased prevalence are COPD due to tobacco. Indoor and outdoor air pollution also contributes to the COPD conditions. Research by Shrestha B et al. in Nepal found that COPD affected nearly 50% of the hospitalized patients. [9]

The third common primary organ involved in ICU mortality was the Brain. Major Neurological impairments such as intracranial hemorrhage, infarcts were present in 12.76 percent of the fatalities noted in ourICU. A study stated that in general, a majority of population over 85 years of age had bilateral peripheral neurological deficits [10]. Age-related alterations in myelin protein expression and a decreased capacity to repair injured myelin have been found in pathophysiological investigations [19,20].

The fourth common primary organ involved in ICU mortality was the Kidney and nearly equal to the third cause of mortality. Renal problems such renal failures affect over 800 million people worldwide, or over 10% of the global population. Low and middle-income nations are the not well equipped to deal with the consequences of kidney disease, the cost of these conditions is disproportionately high there. As the population ages and the number of people with diabetes mellitus (DM) increases, the incidence of both acute and chronic kidney disease is expected to increase as well. About 30% of diabetic people in India develop diabetic nephropathy [14,15]. Other causes of mortality noted in our ICU were multi organ dysfunction syndrome (MODS) where the primary organ involved in the mortality was either more than one or could not be pin pointed. Others causes of ICU mortality were cancer, liver complications, due to diabetes mellitus, traumatic cases, poison subjects, TB cases and sepsis cases which was similar to some studies. [12,13,16]

In the upcoming years, there will be a significant global increase in the prevalence of cardiovascular diseases, pulmonary disorders, and chronic kidney diseases, which will have a negative impact on the society and the economy. A sedentary life style and unhealthy habits like smoking and alcoholism contribute to the above.

Conclusion: According to our study, the heart was the major primary organ contributing to death in our intensive care unit, followed by the lung, brain, and kidney. The comorbidities associated with these were Diabetes Mellitus, hypertension and COPD. Hence, society needs to be educated and action needs to be taken at prevention of these diseases – such as following healthy lifestyle, early detection, and treatment to preserve body homeostasis by which we can slow the development of systemic diseases via the heart-lung- brain -kidney axis.

Acknowledgement: -
The Authors would like to thank Dr. S. Gothai Nachiyar, Bio-Statistician, BMCH, BIHER for her valuable inputs.

References: -

1. Abraham A, Alabdali M, Alsulaiman A, et al. The sensitivity and specificity of the neurological examination in polyneuropathy patients with clinical and electrophysiological correlations. PLos One 2017; 12: e0171597.
2. Adhikari TB, Neupane D, Kallestrup P. Burden of COPD in Nepal. Int J Chron Obstruct Pulmon Dis. 2018 Feb 9;13: 583–89.
3. Alamoudi OS. Prevalence of respiratory diseases in hospitalized patients in Saudi Arabia: A 5 years study 1996-2000. Annals of Thoracic Medicine. 2006 Jul 1;1(2):76-80.
4. Attias D, Mansencal N, Auvert B, et al. Prevalence, characteristics, and outcomes of patients presenting with cardiogenic unilateral pulmonary edema. Circulation. 2010;122(11):1109–1115. doi:10.1161/CIRCULATIONAHA.109.934950.
5. Cindric A, Kristic J, Kavur MM, Pezer M. Glycosylation and aging. Adv Exp Med Biol 2021;1325: 341–73.
6. Dass C. Kanmanthareddy, Rheumatic Heart Disease, in StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.
7. Garko S.B., N. Ekweanic, C.A. Anyiam. Duration of Hospital stay and Mortality in medical wards of Ahmadu Bello university Teaching Hospital, Kaduna; Nigeria, Annals of African Medicines. 2003;2 22(2):68-71.
8. Germans T, Tim J, Visser CA, et al. Acute pulmonary congestion in patients with systolic heart failure versus diastolic heart failure: experience of a heart emergency unit. Neth Heart J. 2005;13(6):208–213.
9. Indian chronic kidney disease guidelines: Indian Society of Nephrology. (2023). Accessed: April 27, 2023: https://isn-india.org/images/CKD-1.pdf.
10. Iqbal MA, Gupta M. Cardiogenic Pulmonary Edema. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.
11. Kumar A, Agarwal MK, Saini RK, Agarwal R, Agarwal R, et al. The pattern of respiratory diseases in a tertiary care center. Int J Contemp Med Res. 2017;4(1):78-80.
12. Kurmani S, Squire I. Acute heart failure: definition, classification and epidemiology. Curr Heart Fail Rep. 2017;14(5):385–392. doi:10.1007/ s11897-017-0351-y.
13. Natanim Degefu Melaku Getachew, Abera Jambo, Shambel Nigusse, Mesay Dechasa, Tigist Gashaw, The Burden and Contributing Factors of Cardiogenic Pulmonary Edema Among Acute Heart Failure Patients Admitted to Tertiary Hospital, Eastern Ethiopia Open Access Emergency Medicine 2023:15 405–414.
14. Navaneethan SD, Mandayam S, Arrigain S, Rahman M, Winkelmayer WC, Schold JD: Obstructive and restrictive lung function measures and CKD: National Health and Nutrition Examination Survey (NHANES) 2007-2012. Am J Kidney Dis. 2016, 68:414-21.
15. Parrinello CM, Crossa A, Harris TG. Seasonality of tuberculosis in New York City, 1990-2007. Int J Tuberc Lung Dis 2012; 16:32-8.
16. Parivakkam Mani A, K S, Sundar R, et al. (May 19, 2023) Pulmonary Manifestations at Different Stages in the Chronic Kidney Disease: An Observational Study. Cureus 15(5): e39235. DOI 10.7759/cureus.39235.
17. Ponikowski P, Voors AA, Anker SD, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J. 2016;37(27):2129–2200. doi:10.1093/eurheartj/ehw128.
18. Ramesh S, Kosalram K. The burden of non-communicable diseases: A scoping review focus on the context of India. J Edu Health Promot 2023; 12:41.
19. Rani PK, Raman R, Rachapalli SR, Pal SS, Kulothungan V, Sharma T. Prevalence and risk factors for severity of diabetic neuropathy in type 2 diabetes mellitus. Indian J Med Sci 2010; 64:51-7.
20. Shrestha B, Dhungel S, Chokhani R. Echocardiography based cardiac evaluation in the patients suffering from chronic obstructive pulmonary disease. Nepal Med Coll J. 2009 Mar;11(1):14-8.
21. Tirfe M, Nedi T, Mekonnen D, et al. Treatment outcome and its predictors among patients of acute heart failure at a tertiary care hospital in Ethiopia: a prospective observational study. BMC Cardiovasc Disord. 2020;20(1):16. doi:10.1186/s12872-019-01318-x.
22. WorldHealth Organization. Implementation roadmap for accelerating the prevention and control of noncommunicable diseases in South-East Asia 2022–2030. WHO SEARO; 2023.