OPEN ACCESS

Research Paper

Medico-Legal Study of Sudden Death among People Younger than 40 Years in Baghdad

Kauthar Yusuf Maree[1], Saad Kadhum[2]

ABSTRACT:

BACKGROUND:

Sudden death is a significant global public health concern affecting individuals under 40. Understanding sudden death dynamics is crucial for addressing health and legal implications. Exploring epidemiology, causes, and risk factors is essential for implementing preventive measures, healthcare policies, and forensic practices.

OBJECTIVE:

To identify the causes of sudden death among individuals under 40 in Baghdad. Also, to assess the impact of lifestyle and family history contributions and examine the patterns of age, sex, and gender in sudden death cases within this particular demographic group.

METHODS:

A cross-sectional study was conducted on 69 medico-legal cases involving individuals under the age of 40 in Baghdad from January 1st to June 30th 2023. Collected data included demographics, cause of death, social history, family history, chronic illnesses, and consanguinity. Postmortem examinations and further investigations were conducted, and statistical analysis included percentages, ratios, Chi-square tests, and t-tests.

RESULTS:

A significant percentage of sudden deaths occurred in individuals aged between 31 and 39. Myocardial infarction and bronchopneumonia were the primary reasons for sudden death. Cardiovascular-related causes were predominant. The majority of cases had no history of smoking exposure, and 24.6% had parents who were consanguineous. The incidence of younger age mortality was linked to a positive family history.

CONCLUSION:

Myocardial infarction and bronchopneumonia were the most common causes of sudden death. There is a complex relationship between smoking and sudden death. A significant association exists between a positive family history and younger age of death.

KEYWORDS: consanguinity, postmortem, sudden death, smoking.

1M.B.Ch.B. Medicolegal Directorate of Baghdad (Baghdad, Iraq).
2M.B.Ch.B, F.I.B.M.S .(Forensic Medicine). Collage of Medicine / Al-Nahrain University (Baghdad, Iraq).

Iraqi Postgraduate Medical Journal, 2025; Vol. 24(3): 381-386
DOI:10.52573/ipmj.2025.153453 *Received: September 22 , 2024* *Accepted: October 20 , 2024*

INTRODUCTION:

Sudden death refers to sudden and unexpected natural deaths that are not preceded by significant symptoms. There is no universally accepted definition of sudden death, with time periods ranging from 1 to 48 hours used in several countries. The World Health Organisation defines sudden death as a death occurring within 24 hours after the onset of symptoms [(1)], whereas the Association for European Cardiovascular Pathology defines it as a natural death occurring within 6 hours of the beginning of symptoms in an apparently healthy subject or one whose disease is not so severe that a fatal outcome would be expected [(2)]. Understanding the dynamics and patterns of sudden death among individuals under 40 years old in Baghdad is crucial for addressing broader health and legal implications within the region.

Sudden cardiac death is a global public health concern, with increasing prevalence across various populations. In Europe, the estimated incidence of sudden cardiac death is 249,538 cases annually [(3)]. In Australia and New Zealand, sudden cardiac death incidence varies across regions and age groups. East Asia, particularly Japan and China, has lower rates, while South Asia and southeast Asia face data scarcity. In North America and Europe, where more extensive research is available, the incidence of Sudden Cardiac Death typically ranges from 50 to 100 per 100,000. Despite the increasing prevalence of sudden death events, there is a need for enhanced preventive measures and

medical interventions. Understanding the epidemiology and trends of sudden death is crucial for effective public health interventions [4]. The lack of data from less developed regions underscores the need for comprehensive research on the global epidemiology of sudden cardiac death, highlighting its multifactorial nature influenced by demographic shifts and lifestyle changes [5].

Sudden death in young people under 40, are primarily caused by cardiac diseases, accounting for 78% of cases [2]. Common cardiac causes include hereditary or congenital heart diseases that alter the heart's structure or function, such as hypertrophic cardiomyopathy, Long QT syndrome, Brugada syndrome, Wolff Parkinson White syndrome, congenital coronary artery anomalies, and ventricular heart disease [6].

Sudden death can result from neurological disorders such as epilepsy, brain tumours, cerebrovascular diseases, infections, and strokes [7,8]. Infections like meningitis, encephalitis, and abscess can cause inflammation, necrosis, and pus formation, leading to sepsis, shock, and death [9].

Airway blockage, asthma, infectious disorders, and respiratory syncytial virus are common causes of respiratory failure, which can lead to sudden death [10,11].

Sudden death due to gastrointestinal causes in individuals under 40 is rare but crucial [12]. Gastrointestinal causes include intussusception, volvulus, small intestinal obstruction, gastroenteritis, intestinal perforation, and sepsis, which can lead to sudden death, especially if not diagnosed before autopsy [13]. However, the cause of death becomes apparent after opening the peritoneal cavity [14].

Genitourinary causes of sudden death in people under 40 are rare and often result from congenital anomalies, infections, trauma, malignancies, and ectopic pregnancy [15].

Individual vulnerability to sudden death syndrome is greatly influenced by genetic predispositions, lifestyle behaviours, and socioeconomic factors [16,17].

PATIENTS AND METHODS:

From January 1st to June 30th, 2023, the study conducted a postmortem cross-sectional study on 69 medicolegal cases in Baghdad. The cases were firsthand eyewitnesses. The study excluded accidents, suicidal, criminal deaths, putrefied bodies, and individuals aged 40 years or older. The study collected data including sex, age, cause of death, social history, smoking, family history of sudden death, chronic diseases, past medical history, and consanguinity.

The forensic autopsy was conducted on all bodies included in the study, noting any grossly apparent diseases and collecting tissue samples for histopathological analysis and toxicological screening to aid in determining the cause of death.

This study employed percentage ratios to compare results, generated tables and graphs to visually represent findings, and evaluated the associations between qualitative and quantitative variables using the chi-square test and t-test. Statistical analysis was performed using IBM SPSS version 25 and Microsoft Excel 2010, ensuring a significant p value of less than 0.05.

RESULTS:

The demographic distribution of the study population revealed a diverse age range (from 5 days to 39 years) among the deceased individuals, with the majority falling within the 31-39 year old category (31.9%). There was a nearly balanced sex distribution, with 50.7% females and 49.3% males. The overall age mean was 20.2±14.3, indicating a wide age variation in the study population. As shown in Table 1.

Table 1: Demographic Distribution.

Age Category	Frequency	Percent
1 day -10 years old	21	30.4
11- 20 years old	11	15.9
21-30 years old	15	21.7
31- 39 years old	22	31.9
Sex		
Female	35	50.7
Male	34	49.3
Total	**69**	**100**
Age Mean ± Sd. (Years)	**20.2±14.3**	

The cardiovascular system was the most commonly affected (36.2%), followed by respiratory-related causes (31.9%), and the least number of fatalities were due to genitourinary conditions as shown in Table 2.

Table 2: System Affected.

System Affected	Frequency	Percent
Cardiovascular related causes	25	36.2
Respiratory related causes	22	31.9
Gastrointestinal tract (GIT) related causes	11	15.9
Central nervous system (CNS) related causes	6	8.7
Multiple organs	3	4.3
Genitourinary	2	2.9
Total	69	100

A substantial portion of the deceased had no history of smoking exposure (58%), while 24.6% were actively smoking. 17.4% of cases showed evidence of passive smoking.

The leading causes of death varied, with bronchopneumonia (20.3%) and myocardial infarction (20.3%) being the most frequent causes of sudden death, followed by hypertrophic cardiomyopathy (7.2%). Other cases of sudden death, including severe asthma attacks, ruptured aortic aneurysms, and gastrointestinal causes, each resulted in one fatality (1.4%).

Analysing the association between causes of death and age groups, that the most common cause of sudden death in (1 day- 10 years of age) was bronchopneumonia, accounting for 10 deaths at 47.60%, while MI was the predominant cause of sudden death in age groups (21-30) and (31-39), accounting for 4 cases at 26.70% and 13 cases at 45.5% respectively, as shown in Table 3

Table 3: Association between age and system affected.

Age Categories (years)	Cardio-vascular Causes	Respiratory Causes	GIT Causes	CNS Causes	Multi-organ involvement	Genitourinary causes
1 day – 10	2 (8.00%)	12 (54.50%)	3 (27.30%)	3 (50.00%)	0 (0.00%)	1 (50.00%)
11-20	3 (12.00%)	4 (18.20%)	2 (18.20%)	2 (33.30%)	0 (0.00%)	0 (0.00%)
21-30	7 (28.00%)	2 (9.10%)	2 (18.20%)	1 (16.70%)	2(66.70%)	1 (50.00%)
31-39	13(52.00%)	4 (18.20%)	4 (36.40%)	0 (0.00%)	1 (33.30%)	0 (0.00%)
***p* value**	**0.000**					
Association	**Statistically Significant**					

Most individuals had a negative family history of SD (87%), and the majority had no significant past medical history (79.7%) (Table 4&5) However, the association between a positive family history and a younger age of death was statistically significant (p=0.050).

When reviewing the past medical history of the sudden death cases the majority of the cases (79.7%) had a negative past medical history, while (10.5%) had hypertension and only (1.4%) of the cases had an atrial septal defect, as shown in Table 4.

Table 4: Past Medical History.

Past Medical History	Frequency	Percent
Negative	55	79.7
Hypertension	8	10.5
Diabetes Mellitus	6	8.6
Hypertrophic cardiomyopathy	2	2.9
Atrial septal defect	1	1.4
Total	69	100

Consanguinity between parents was observed in 24.6% of cases. The relationship between consanguinity and sudden death warrants further exploration to understand potential genetic influences.

Analyzing the association between causes of death and age groups revealed that the most common cause of sudden death in (1 day- 10 years of age) was bronchopneumonia account for 10 deaths 47.60%, while MI was the predominant cause of sudden death in age groups (21-30) and (31-39) accounting for 4 cases 26.70% and 1cases 45.5% respectively.

DISCUSSION:

The study found that a significant proportion of deceased individuals were aged 31-39, which aligns with broader trends in sudden death findings in both studies of Risgaard B, Winkel BG, Jabbari R, Behr ER, Ingemann-Hansen O, Thomsen JL, et al. And Abbas R, Abbas A, Khan TK, Sharjeel S, Amanullah K, and Irshad Y [18,19].

The study found a sex distribution ratio of almost 1:1, which aligns with the findings of a 2015 study in France. This study found a nearly equal distribution of male and female sex, but a higher incidence of sudden death in men [20]. The differences may be due to age differences in subject inclusion criteria, as the present study included individuals below 40 years of age, while the previous study focused on those above 18. Age-related factors influencing sudden death might also contribute to variations in the results.

The study found that bronchopneumonia, myocardial infarction, and cardiovascular-related causes were the most common conditions leading to sudden cardiac arrests, a finding consistent with a 2009 study by Ilonca Vaartjes et al. [21].

The study also revealed that cardiovascular diseases ranked first among natural causes of death. This finding aligns with the results of previous study conducted by Al-Qazzaz MA, Al-Khateeb NGH, and Al-Jouboory SKK [22]. However, this finding contradicts a 1998 study by Al-Khatib G. Hashim, which found that the respiratory system was the most common system involved in sudden death cases, possibly because Al-Khatib's study focused on children's age group [23]. Both studies highlight the importance of cardiovascular events in sudden death cases.

Smoking exposure analysis shows a significant proportion of individuals with a negative smoking history, highlighting the need to consider non-smoking-related factors in sudden cardiac death investigations. However, active and passive smoking cases highlight the importance of exploring the impact of smoking on sudden cardiac deaths, as it is a significant risk factor in cardiovascular and respiratory diseases [24]. A 2018 study found that active smokers had a 3.06 times higher risk of sudden cardiac death compared to non-smokers, possibly due to a smaller sample size [25].

The study reveals a statistically significant association between a positive family history of sudden death and a younger age of death. This finding aligns with the findings of Kaikkonen KS, Kortelainen M-L, Linna E, and Huikuri HV, who found a higher incidence of sudden cardiac death among first-degree relatives of sudden cardiac death victims compared to acute myocardial infarction survivors and controls, indicating a genetic predisposition to sudden cardiac death [26].

CONCLUSION:

The study reveals myocardial infarction and bronchopneumonia are the leading causes of sudden death among individuals under 40 in Baghdad. The age group (31-40 year) was the most affected by sudden death. The study also found a significant association was found between a positive family history and younger age of death. The study found no significant association between sex and the causes of sudden death.

It is recommended to conduct further studies for a longer period of time with a larger sample size to evaluate the relationship between sex and sudden death

REFERENCES:

1. ICD-10 version:2019. (n.d.). https://icd.who.int/browse10/2019/en
2. Basso C, Aguilera B, Banner J, Cohle S, D'Amati G, De Gouveia RH, et al. Guidelines for autopsy investigation of sudden cardiac death: 2017 update from the Association for European Cardiovascular Pathology. Virchows Archiv 2017;471:691–705. https://doi.org/10.1007/s00428-017-2221-0.
3. Empana JP, Lerner I, Valentin E, Folke F, Böttiger B, Gislason G, et al. Incidence of sudden cardiac death in the European Union. **Journal of the American College of Cardiology** [Internet]. 2022 ;79(18):1818–27. Available from: https://doi.org/10.1016/j.jacc.2022.02.041
4. Chugh SS, Reinier K, Teodorescu C, Evanado A, Kehr E, Samara MA, et al. Epidemiology of Sudden Cardiac Death: Clinical and research implications. Progress in Cardiovascular Diseases [Internet]. 2008;51(3):213–28. Available from: https://doi.org/10.1016/j.pcad.2008.06.003
5. Wong CX, Brown A, Lau DH, Chugh SS, Albert CM, Kalman JM, et al. Epidemiology of Sudden Cardiac Death: Global and regional Perspectives. Heart Lung and Circulation [Internet]. 2019 ;28(1):6–14. Available from: https://doi.org/10.1016/j.hlc.2018.08.026
6. Japundžić-Žigon N, Šarenac O, Lozić M, Vasić M, Tasić T, Bajić D, et al. Sudden death: Neurogenic causes, prediction and prevention. **European Journal of Preventive Cardiology** [Internet]. 2017

;25(1):29–39. Available from: https://doi.org/10.1177/2047487317736827
7. Vaartjes I, Hendrix A, Hertogh EM, Grobbee DE, Doevendans PA, Mosterd A, et al. Sudden death in persons younger than 40 years of age: incidence and causes. **European Journal of Cardiovascular Prevention & Rehabilitation** [Internet]. 2009;16(5):592–96. Available from: https://doi.org/10.1097/hjr.0b013e32832d555b
8. Schoppen ZJ, Balmert LC, White S, Olson R, Arunkumar P, Dellefave-Castillo LM, et al. Prevalence of Abnormal Heart Weight After Sudden Death in People Younger than 40 Years of Age. **Journal of the American Heart Association** [Internet]. 2020;9(18). Available from: https://doi.org/10.1161/jaha.120.015699
9. Maron BJ, Haas TS, Murphy CJ, Ahluwalia A, Rutten-Ramos S. Incidence and causes of sudden death in U.S. college athletes. **Journal of the American College of Cardiology** [Internet]. 2014 ;63(16):1636–43. Available from: https://doi.org/10.1016/j.jacc.2014.01.041
10. Ficker DM, So EL. Neurological conditions and sudden death. In: Springer eBooks [Internet]. 2008. p. 888–97. Available from: https://doi.org/10.1007/978-1-84628-854-8_65
11. Erickson CC, Salerno JC, Berger S, Campbell R, Cannon B, Christiansen J, et al. Sudden death in the young: information for the primary care provider. PEDIATRICS [Internet]. 2021;148(1). Available from: https://doi.org/10.1542/peds.2021-052044
12. McGuone D, Crandall LG, Devinsky O. Sudden Unexplained Death in Childhood: A Neuropathology review. Frontiers in Neurology [Internet]. 2020;11. Available from: https://doi.org/10.3389/fneur.2020.582051
13. Byard R. Respiratory conditions. In: Byard R, editor. Sudden Death in the Young. Cambridge: Cambridge University Press; 2010:344.66.
14. Blau DM, Baillie VL, Els T, Mahtab S, Mutevedzi P, Keita AM, et al. Deaths Attributed to Respiratory Syncytial Virus in Young Children in High–Mortality Rate Settings: Report from Child Health and Mortality Prevention Surveillance (CHAMPS). Clinical Infectious Diseases [Internet]. 2021;73(Supplement_3):S218–28. Available from: https://doi.org/10.1093/cid/ciab509
15. Gilbert JD, Byard RW. Fatal Ischemic Enteritis with Hemorrhage—A Late Complication of Treated Wilms Tumor. Journal of Forensic Sciences [Internet]. 2012;58(1):234–36. Available from: https://doi.org/10.1111/j.1556-4029.2012.02264.x
16. Balagopal PB, De Ferranti SD, Cook S, Daniels SR, Gidding SS, Hayman LL, et al. Nontraditional risk Factors and Biomarkers for Cardiovascular Disease: Mechanistic, research, and Clinical Considerations for Youth. Circulation [Internet]. 2011;123(23):2749–69. Available from: https://doi.org/10.1161/cir.0b013e31821c7c64
17. Bhatnagar A. Environmental determinants of cardiovascular disease. Circulation Research [Internet]. 2017;121(2):162–80. Available from: https://doi.org/10.1161/circresaha.117.306458
18. Risgaard B, Winkel BG, Jabbari R, Behr ER, Ingemann-Hansen O, Thomsen JL, et al. Burden of sudden cardiac death in persons aged 1 to 49 years. Circulation Arrhythmia and Electrophysiology [Internet]. 2014;7(2):205–11. Available from: https://doi.org/10.1161/circep.113.001421
19. Abbas R, Abbas A, Khan TK, Sharjeel S, Amanullah K, Irshad Y. Sudden cardiac death in Young Individuals: A Current review of evaluation, screening and Prevention. **Journal of Clinical Medicine Research** [Internet]. 2023;15(1):1–9. Available from: https://doi.org/10.14740/jocmr4823
20. Naneix AL, Périer MC, Beganton F, Jouven X, De La Grandmaison GL. Sudden adult death: An autopsy series of 534 cases with gender and control comparison. **Journal of Forensic and Legal Medicine** [Internet]. 2015;32: 10–5. Available from: https://doi.org/10.1016/j.jflm.2015.02.005
21. Vaartjes I, Hendrix A, Hertogh EM, Grobbee DE, Doevendans PA, Mosterd A, et al. Sudden death in persons younger than 40 years of age: incidence and causes. **European Journal of Cardiovascular Prevention & Rehabilitation** [Internet]. 2009;16(5):592–96. Available from: https://doi.org/10.1097/hjr.0b013e32832d555b
22. Al-Qazzaz MA, Al-Khateeb NGH, Al-Jouboory SKK. Medico-legal study on natural deaths. ResearchGate [Internet]. 2012 Apr 1; Available from:

https://www.researchgate.net/publication/288464387_Medico-legal_study_on_natural_deaths

23. Al-khateeb N. A forensic medical study of child deaths in Baghdad with a comparative study between the periods before and during the embargo [Master's thesis]. Baghdad: Al-Mustansiriyah University, College of Medicine; 1998
24. Gan H, Hou X, Zhu Z, Xue M, Zhang T, Huang Z, et al. Smoking: a leading factor for the death of chronic respiratory diseases derived from Global Burden of Disease Study 2019. BMC Pulmonary Medicine [Internet]. 2022;22(1). Available from: https://doi.org/10.1186/s12890-022-01944-w
25. Aune D, Schlesinger S, Norat T, Riboli E. Tobacco smoking and the risk of sudden cardiac death: a systematic review and meta-analysis of prospective studies. **European Journal of Epidemiology** [Internet]. 2018;33(6):509–21. Available from: https://doi.org/10.1007/s10654-017-0351-y
26. Kaikkonen KS, Kortelainen ML, Linna E, Huikuri HV. Family history and the risk of sudden cardiac death as a manifestation of an acute coronary event. Circulation [Internet]. 2006 ;114(14):1462–67. Available from: https://doi.org/10.1161/circulationaha.106.624593