

Research Article

A descriptive epidemiological study of leukemia in Al-Muthanna, Iraq

Ali Jawad Alyasiri^{1*}¹*Department of Biology, College of Science, Al-Muthanna University, Iraq.***Corresponding author: Ali.abdulaali.sci@mu.edu.iq***Article Info****Keywords:** *Cancer, Leukemia, Epidemiological.***Received:** 05.10.2025**Accepted:** 10.11.2025**Published:** 18.11.2025**Abstract**

This study was designed to describe the incidence of cancer in southern Iraq, specifically Muthanna City, over a ten-year period from 2014 to 2023. The study relied on statistics from the Ministry of Health, the Iraqi Cancer Council, and the Muthanna Health Directorate. The study focused on leukemia, a common cancer among children. The study showed a significant increase over this ten-year period, with a greater impact on females and children being more affected than adults.



© 2025 by the author's. The terms and conditions of the Creative Commons Attribution (CC BY) license apply to this open access article.

1. Introduction

Cancer is a deadly disease that causes illness and death for millions of people across the globe. Cancer is characterized by abnormal cell division resulting from a variety of health and environmental factors [1]. Studies have recorded that children under the age of 14 are affected by leukemia [2]. Greater attention to cancer patients, especially children, has led in recent years to a decline in mortality rates [3, 4]. Wars, economic sanctions, and internal conflicts in Iraq have led to the collapse of the country's health system, which has cast a shadow over many diseases, including cancer [4, 5]. The study aims to review leukemia cases in Muthanna City according to available demographic characteristics.

2. Methodology

The research concept was based on studying the status of cancer in Muthanna City, particularly leukemia. Cross-sectional data spanning a decade were selected. The data were taken from the websites of the Iraqi Ministry of Health/Iraqi Cancer Council and compared with data obtained from the city's Health Department. The data were analyzed according to demographic characteristics and then analyzed.

3. Results and Discussion

3.1. Number of cancer cases in Muthanna province (general incidence trend)

Figure 1 shows an increase in the number of cancer cases recorded in the city, reflecting an increase in risk factors or not, but rather the development and increase in early detection [6]. The factors causing cancer include environmental and population pollution, such as water and soil pollution, radiation, air pollution, contaminated food, and unhealthy lifestyle practices [7]. Some increases in incidence rates are not due to the disease itself, but rather to the availability of a comprehensive patient registration system [8]. The lack of regular cancer screening and delayed reporting of the disease leads to the disease being detected in its late stages, increasing complications and mortality [9].

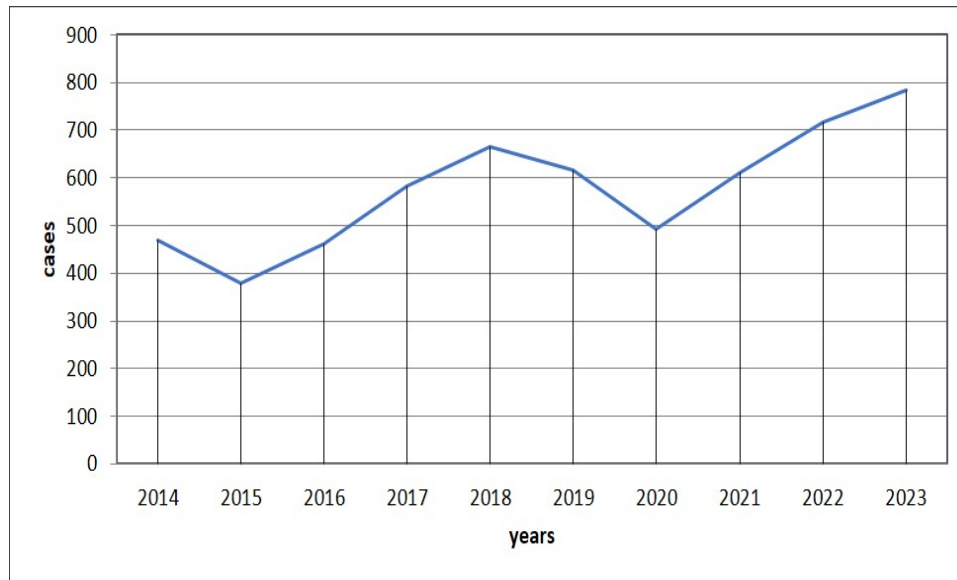


Figure 1: Total number of cancer cases in Al-Muthanna province

The general rise in cancer rates is a warning sign in a particular region, with many implications that must be addressed, such as the collapse of health infrastructure, poor public awareness, and poor practices [10].

3.2. Gender Distribution

Figure 2 illustrates the gender distribution, showing a discrepancy between males and females. Males accounted for the highest percentage in 2018-2019, while females accounted for the highest percentage in the remaining years.

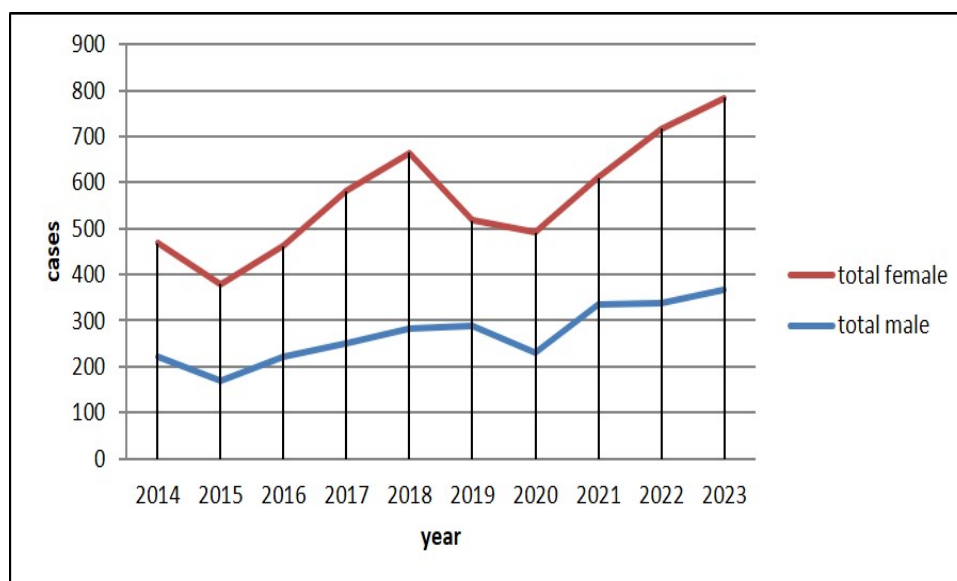


Figure 2: Gender Distribution of cancer cases in Muthanna province

Also in the same context, Table 1 shows that males have the highest increase in the infection rate due to many environmental and health factors and incorrect and unhealthy lifestyles. Females also experienced a significant increase of nearly 100%, likely due to environmental and social changes, lack of health awareness, delayed early diagnosis, and uneven community response to health awareness programs. This

10% increase indicates a shift in the disease pattern. This requires organized interventions, including early screening programs for both sexes; and occupational and health awareness programs. 2018 saw a significant jump in female cases (383 cases), one of the highest numbers on record. 2023 saw the highest number of cancer cases overall, which may indicate increased awareness and early detection. We have also seen a real increase in incidence rates. Improvements have been made to the reporting and monitoring system [11].

Table 1: Represents the variation of cancer cases according to gender in Muthanna

Gender	Year with Highest Incidence	Year with Lowest Incidence	Total Increase
Female	2023 (415 cases)	2015 (209 cases)	+98.5%
Male	2023 (368 cases)	2015 (170 cases)	+116.5%

3.3. Total number of leukemia cases (General Incidence Trend)

The number of leukemia cases increased from 18 in 2014 to 48 in 2023, an increase of +166.7%. The highest percentage of leukemia cases compared to the total cancer incidence was observed in 2016 (8.88%) and 2015 (7.65%) Figure 3. Epidemiological data on leukemia cases in Muthanna Governorate from 2014 to 2023 showed 377 confirmed cases. The average incidence of leukemia among the total cancer cases recorded in those years was approximately 6.58%, indicating that leukemia constitutes a significant proportion of the cancer burden in the governorate. In terms of time trends, the highest incidence of leukemia was observed in 2016, accounting for 8.87% of all recorded cases, while the lowest incidence was recorded in 2015, at only 3.85%. These values reflect annual fluctuations in incidence rates, which may be related to environmental factors, diagnostic factors, or changes in the number of people subject to clinical monitoring [12].

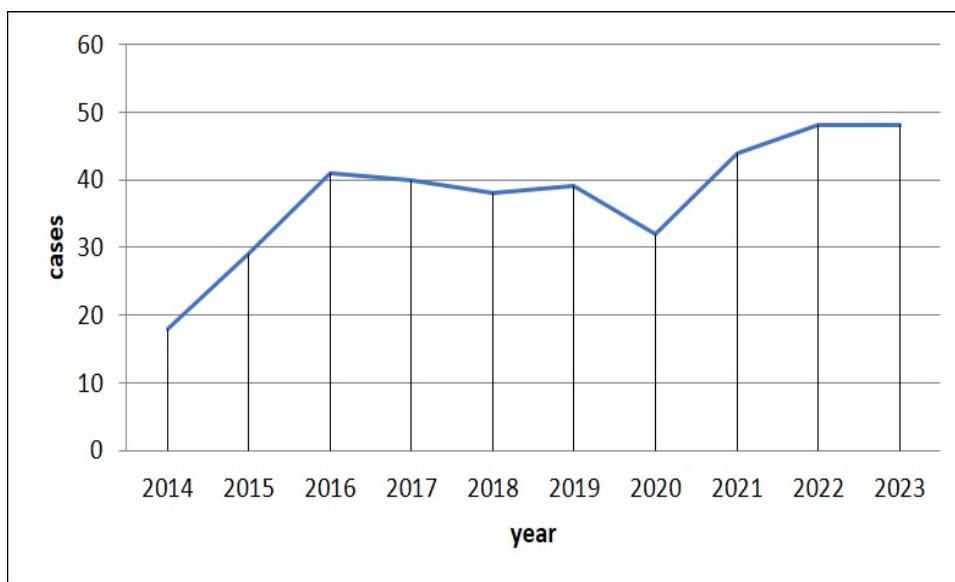


Figure 3: Leukemia in Muthanna province

3.4. Leukemia in males and females

Males often outnumbered females in incidence, particularly in 2015 (20 males versus 9 females), 2016 (31 males versus 10 females), and 2021 (29 males versus 15 females) Figure 4. The sex distribution results showed that the incidence rate was higher among males than among females. These findings suggest potential differences in exposure to causative agents or responses between males and females [13].

3.5. Description of a full decade of leukemia in Muthanna province (2014-2023)

Leukemia cases accounted for approximately 4-8% of all cancer cases in the city, a serious indicator that must be addressed, especially among children and young people. The data in Table 2 indicate that males were more susceptible to the disease than females during their school years. The increase in the number of cases over the years reinforces the interest in cancer-causing factors, whether environmental or health-related [14].

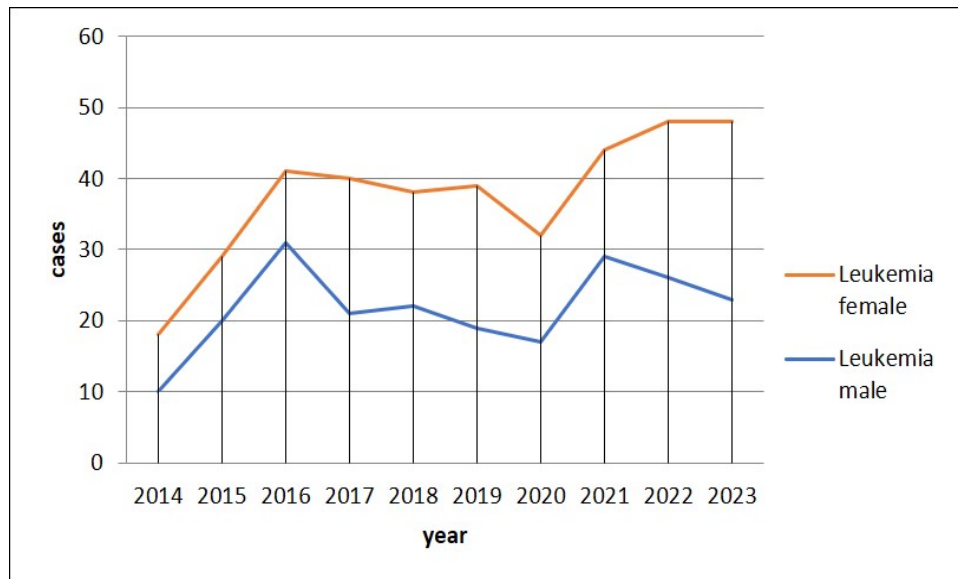


Figure 4: Gender Distribution of leukemia cases in Muthanna province

Table 2: Represents the variation of Leukemia cases according to gender in Muthanna

Year	Leukemia Cases	Male	Female	Total cancer Cases	Leukemia percentage of total Cancer
2014	18	10	8	468	3.85%
2015	29	20	9	379	7.65%
2016	41	31	10	462	8.88%
2017	40	21	19	582	6.87%
2018	38	22	16	665	5.71%
2019	39	19	20	617	6.32%
2020	32	17	15	491	6.51%
2021	44	29	15	611	7.20%
2022	48	26	22	716	6.70%
2023	48	23	25	783	6.13%

4. Conclusion

According to available statistical results, Muthanna City has witnessed a significant increase in cancer cases, particularly leukemia cases among children, with a notable increase in the proportion of males and significant variations in incidence rates over the study years.

Article Information

Conflict of Interest: No conflict of interest.

Acknowledgements: The authors express their gratitude to the institutions and organizations mentioned in the research, especially the staff of the Statistics Department of the Muthanna Governorate Health Directorate for their assistance in collecting patient data and their cooperation.

Authors' Contributions: The author designed this study, analyzed the data, drafted the manuscript, in addition to collecting the data and preparing the manuscript.

Disclaimer (Artificial Intelligence): The author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.), and text-to-image generators have been used during writing or editing of manuscripts.

Competing Interests: Authors have declared that no competing interests exist.

References

- [1] B. K. Mohanti, P. Mathur, U. Jayarajah, B. M. Biswal, and S. Prinja. Introduction to Cancer World. In *Radiation Oncology—Principles, Precepts and Practice*., volume I—Technical Aspects., pages 1–30. Springer, 2025.
- [2] J. Pan, W. Wang, X. Wu, F. Kong, J. Lin, and M. Zhang. Inflammatory cytokines in cardiac pacing patients with atrial fibrillation and asymptomatic atrial fibrillation. *Panminerva Medica*, 60:86–91, 2018.
- [3] L. A. Theodore, K. Cross, L. Gammie, M. L. Minkos, D. Stern, and A. Perri Elias. Childhood leukemia. In *Health-related disorders in*

children and adolescents: A guidebook for educators and service providers,, pages 37–44. American Psychological Association, US, 2023.

- [4] F. Erdmann, L. E. Frederiksen, A. Bonaventure, L. Mader, H. Hasle, L. L. Robison, et al. Childhood cancer: survival, treatment modalities, late effects and improvements over time. *Cancer epidemiology*, 71:101733, 2021.
- [5] A. Hammerich, M. Lodge, R. Hajjeh, I. F. N. P. H. Fouad, N. Pourghazian, and I. Fadhil. *cancer control in the Eastern Mediterranean region*. Eastern Mediterranean Region Special Report, 2022.
- [6] S. A. Abed, R. D. Nafea, S. S. Hussein, D. M. Hameed, and I. A. Taher. Types of Cancer Prevalence in Al Muthanna Province for Two Years' Duration (2018-2019). *Medico-legal Update*, 21:1448–1456, 2021.
- [7] P. Boffetta. Human cancer from environmental pollutants: the epidemiological evidence. *Mutation Research/Genetic Toxicology and Environmental Mutagenesis*, 608:157–162, 2006.
- [8] W. Hamilton, F. M. Walter, G. Rubin, and R. D. Neal. Improving early diagnosis of symptomatic cancer. *Nature Reviews Clinical Oncology*, 13:740–749, 2016.
- [9] E. R. Myers, P. Moorman, J. M. Gierisch, L. J. Havrilesky, L. J. Grimm, S. Ghate, et al. Benefits and harms of breast cancer screening: a systematic review. *Jama*, 314:1615–1634, 2015.
- [10] R. Beaglehole, R. Bonita, and R. Magnusson. Global cancer prevention: an important pathway to global health and development. *Public health*, 125:821–831, 2011.
- [11] R. C. Fitzgerald, A. C. Antoniou, L. Fruk, and N. Rosenfeld. The future of early cancer detection. *Nature medicine*, 28:666–677, 2022.
- [12] R. Sharma and C. Jani. Mapping incidence and mortality of leukemia and its subtypes in 21 world regions in last three decades and projections to 2030. *Annals of Hematology*, 101:1523–1534, 2022.
- [13] D. Crosby, S. Bhatia, K. M. Brindle, L. M. Coussens, C. Dive, M. Emberton, et al. Early detection of cancer. *Science*, 375, 2022. p. eaay9040.
- [14] N. Aziz, W. Nabi, M. Khan, A. H. B. Gulzar, S. Rath, A. A. A. Cheema, et al. *Analyzing Two Decades of Leukemia Mortality in the US (1999-2020)*. Clinical Lymphoma Myeloma and Leukemia, 2025.