

Hematologic Malignancies among Patients at Al-Amal Oncology Center in Ibb Governorate, Yemen

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Abstract

Background: Hematologic malignancies (HMs) are a public health problem. The World Health Organization (WHO) reports that the incidence of these tumors will increase by approximately 48% in developing countries by 2030. Yemen is one of the developing countries that suffers from a lack of information about the frequency and patterns of hematologic malignancies.

Objectives: This study sought to determine the pattern and distribution of haematologic malignancies among patients attending Al-Amal Center for Oncology in Ibb Governorate, Yemen.

Methods: A retrospective descriptive study of all cancers detected at Al-Amal Oncology Center in Ibb Governorate, Yemen during the study period from 2008 to 2023. SPSS version 26 and Microsoft Excel version 16 were used for data analysis and graphing, respectively to identify the pattern and distribution of HMs in Ibb Governorate, Yemen.

Results: Overall, 6,156 cancer cases were detected during period from 2008 to 2023. HMs represented 979 (15.9%) of all collected cases, and their ages between 1 and 108 years with a mean age of 40.5 years. A statistically association was detected between age and HMs. Of these, 549 (56.1%) were males and 430 (43.9%) were females, with a M: F Ratio of 1.2:1. No statistical significance was detected. Married and illiterate individuals constituted 607 (62%) and 512 (52.3%), respectively. A statistical association was found between marital status and education level and HMs. Non-Hodgkin Lymphoma (NHL) which constituted 448 (46 %) of all the HMs, was the commonest, followed respectively by Leukemia 398 (41%), Hodgkin lymphoma (HL) 110 (11%), other malignancies 23 (2%).

Conclusions : This study revealed a relatively high prevalence of HMs among diagnosed cancer cases in the study area. It also indicated that the pattern of HMs in the current study appears to be lower than some other studies carried out in different regions of Yemen. NHL is the most common type of HMs, followed by leukemia. Age, marital status, and educational level were strongly associated with HMs.

Keywords: Haematological malignancies; Non-Hodgkin Lymphoma; Leukemia and Ibb governorate, Yemen.

Introduction

Cancer is considered one of the top three causes of mortality globally (Mahdi et al., 2022). Cancer that develops from blood cells is called hematological malignancies (HMs) (Goswami et al., 2020; Pérez et al., 2019) that arise primarily from the uncontrolled growth of hematopoietic and lymphoid tissues (Egesie et al., 2017; Hungria et al., 2019) that differ in their incidence, prognosis, etiology, treatment and survival (Krok-Schoen et al., 2018; Mangone et al., 2023) and were estimated to represent about 6.5% of all cancers worldwide in 2012 (Goswami et al., 2020; James et al., 2022). HMs are classified according to four common subtypes: leukemia (acute and chronic), Hodgkin lymphoma (HL), non-Hodgkin lymphoma (NHL), and multiple myeloma (MM) (Keykhaei et al., 2021).

These disorders have significance impact on global health, posing challenges for health care systems worldwide (An et al., 2023). The causes of HMs remain unclear, but are thought to be related to environmental exposure to ionizing radiation, chemicals such as benzene and pesticides, infectious agents, and smoking, as well as genetic factors (Egesie et al., 2017). WHO reports that the incidence of HMs will increase by about 48% in developing countries by 2030. HMs represent the fourth most common cancer and the second leading cause of cancer death in developing countries and approximately 1.29 million people live with HMs (Krok-Schoen et al., 2018). A combination of factors, including limited diagnostic and clinical resources and lack of access to novel treatments,

contribute to the increased incidence of these malignancies in Africa and Asia, although their prevalence in these countries is lower than in Western countries (Egesie et al., 2017). Although comprehensive cancer treatment is available in only 15% of developing countries, it is available in more than 90% of developed countries (Mahdi et al., 2022). In high-income countries, HMs account for 1% of all deaths. They contribute to 6-10% of all causes of death from malignancies, with 50% among young people (An et al., 2023).

Yemen is one of the least developed countries in the Eastern Mediterranean region, and according to the WHO/Regional Office for the Eastern Mediterranean (2018), the health situation in Yemen is one of the least favorable in the world. Yemen has been facing a dirty, illegal and unjust war for 11 years and a blockade by the brutal aggression countries, which has led to a significant shortage of health facilities. The health system suffers from weakness and many problems that have been exacerbated by the ongoing conflict. The three-tier primary health care system, which relies on health units, health centers and hospitals, is insufficient to cover the health needs of the population, especially since the population growth rate is faster than the expansion of available health facilities (Ibrahim et al., 2024). Cancer is a significant public health problem in Yemen and the incidence of cancer in Yemen is not accurately known due to limited pathology resources, scarcity and poor quality of medical records, and limited epidemiology resources. Furthermore, the recent ongoing civil conflict has contributed to the obscurity of the cancer burden at the national level (Ibrahim et al., 2024). The distribution of HMs increased at National Oncology Center in Sana'a and increased in south-west Yemen (Al-Nuzaili et al., 2024).

Ibb governorate is located on the southwestern side of the escarpment of the Yemen highlands and it is one of the most densely populated governorates in Yemen. Ibb Governorate receives thousands of displaced persons from neighboring governorates due to the ongoing political conflict, which has increased the burden on the weak health system, especially the Al-Amal Center for Oncology, the only center in the governorate, which was opened on 5/22/2006 and provides its services to about (2000) cancer patients annually from Ibb governorate and neighboring governorates. Information on the epidemic of haematologic malignancies in Yemen, especially in Ibb governorate, are limited. This information may be useful for planning and formulating policies for the prevention, control

and treatment of these cancers. This study sought to determine the pattern and distribution of haematologic malignancies among patients attending Al-Amal Center for Oncology in Ibb Governorate, Yemen.

Materials and Methods

Patients

This is a retrospective descriptive study conducted in Al-Amal Cancer Center in Ibb governorate. A total of 6156 cancer patients were collected during period from 2008 to 2023. The collected data included details such as gender, age, place of residence, marital status, educational status, and family history of cancer.

Statistical Analysis

Data analysis was conducted using the SPSS software version 26 and Microsoft Excel version 16. The Chi-squared test was used to determine the statistical significance. $P < 0.05$ was considered to indicate a statistically significant difference.

Results

A total 6156 cancer patients were collected from Al-Amal Center for Oncology in Ibb Governorate. HMs represented 979 (15.9%) of collected cases (Fig.1). Participated patients were aged between 1-108 years with a mean age of 40.5 years. The highest incidence of HMs was detected in the age group 22-43 years 293 (29.9%) followed by 270 (27.6%) and 255 (26.1%) in the patients aged between 1-21 years and 44-64 years, respectively. However, the lowest incidence rate was 20 (2.4%) in the patients aged 87 years and older. The current study indicated a significant relationship between the age of the studied cases and the incidence of the disease ($P < 0.00$). In this study, males represented 549 (56.1%), while females represented 430 (43.9%), with a male: female ratio of 1.2:1. The present study showed no statistically significant relationship between gender and HMs ($P > 0.919$). This study showed that, the most of HMs cases were from rural area 792 (80.9%). No statistically significant association was found ($P > 0.944$). Married subjects represented 607 (62%) and illiterate patients 512 (52.3%). A statistical association was found between HMs and marital status and educational level of the study population. Only 28 (2.86%) of HMs patients had relatives infected with HMs and insignificance association was detected between family history of HM and HM ($P > 0.827$) (Table 1).

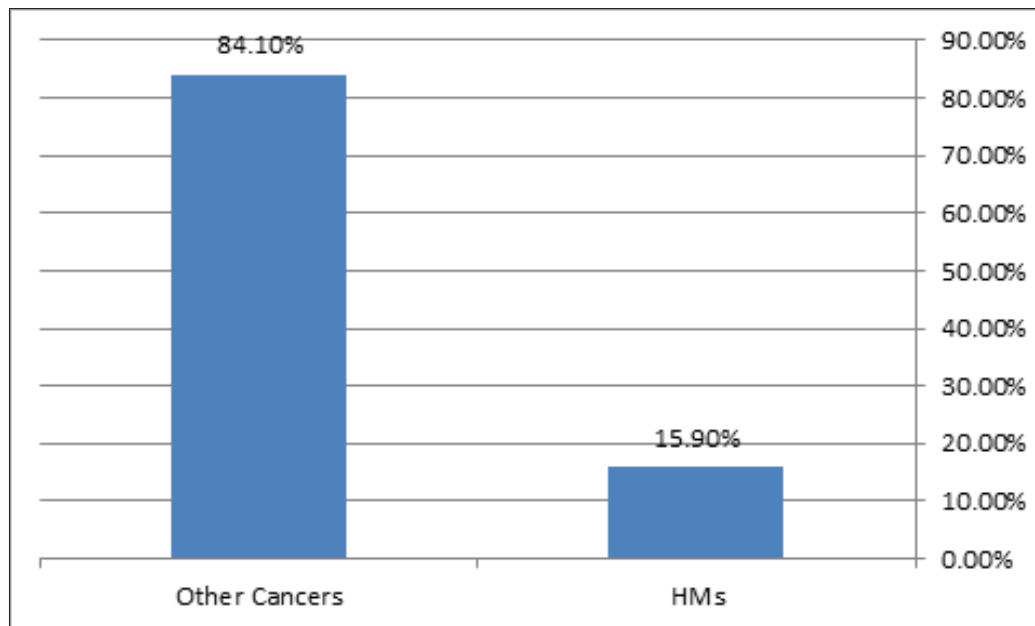


Figure 1: Percentage of HMs among studied population

Table 1: Sociodemographic characteristics distribution of studied patients with haematological malignancies

Factor	No.		
	No.	%	P* value
Age (year)			
1 to 21	270	27.6	0.00
22 – 43	293	29.93	
44 – 64	255	26.05	
65 – 86	141	14.4	
≥87	20	2.4	
Gender			
Male	549	56.1	0.919
Female	430	43.9	
Marital Status			
Married	607	62	0.00
Unmarried	372	38	
Residence			
Urban	187	19.1	0.944
Rural	792	80.9	
Education level			
Illiterate	512	52.3	0.00
Basic	327	33.4	
Secondary	82	8.4	
Graduated	58	5.9	
Genetic status			
Yes	28	2.86	0.827
No	951	97.14	

* $p < 0.05$ is considered as significant.

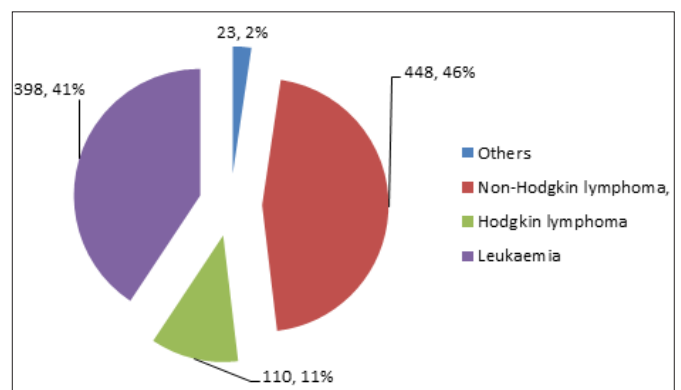


Figure 2: Distribution of HMs cases according to the types of HMs in the study area.

Figure 2 shows the distribution of HMs by malignancy type, with the highest level of observed for NHL 448 (46%) followed by leukemia, HL and others types of malignancies, 398 (41%), 110 (11%) and 23 (2%) respectively.

Discussion

To our knowledge, this is the first epidemiological study on HMs in Ibb Governorate, Yemen. It was conducted using data collected from Al-Amal Oncology Centre, which is available to cancer patients. In this study, HM constituted 979 (15.9%) of all collected cancers cases, 6156 cases. This study revealed a relatively high prevalence of HMs among cancer cases diagnosed in the study area and lower than studies conducted in different regions in Yemen, such as studies conducted in Taiz, Hadramout and Aden which revealed that prevalence rates were 24.8%, 22.6%, 18.9%, respectively (Daakeek et al., 2022; Elidrissi Errahhali et al., 2016; James et al., 2022). The result of the current study was lower than the results conducted in Pakistan 45.36% (Mangone et al., 2023), Iran 20% (Elidrissi Errahhali et al., 2016) and Indonesia (Cahyadi et al., 2023). The incidence of HMs in this study was higher than the findings of a studies conducted in USA 9.3% (Sarwar

et al., 2020), Morocco 10.9% (Elidrissi Errahhali et al., 2016), Nigeria 12.34% (Daakeek et al., 2022), and in Madagascar 12.45% (Pérez et al., 2019). These variations in prevalence could be attributed to differences in sociodemographic factors, study population, type of study, type of sample, sample size, and availability facilities for diagnosis of HMs. The mean age of HM patients in this study was 40.5 years. This result was similar with the result reported by Abdul Hamid Gamal in Yemen (Hamid, 2024) and in Aden, Yemen (Al-Kahiry, 2012). Similar result reported in Saudi Arabia (Ahmed et al., 2020). However, the mean age of the present study was higher than that studies carried out in Taiz, Yemen (Mulatie et al., 2025) and Nigeria (Daakeek et al., 2022). However, the mean age of HMs in the current study was lower than reported in Egypt (Hussein et al., 2019), Madagascar, United Kingdom (Pérez et al., 2019) and in Italia (Mangone et al., 2023). Thus, the median age at diagnosis of HMs in Yemen is younger than that found in Western countries, but it is similar to that in Asia. The present study indicated that significant relationship between age of studied cases and HMs ($P > 0.00$). This study showed the higher frequency of HMs seen at age group between 22-43 years 293 (29.9%) and the lowest prevalence rate was in patients aged between 44-64 years 255 (26.1%). This could be attributed to people aged between 22-43 years are more active and worked than other people and prolonged exposure to carcinogens. Similar findings were reported by study conducted in Aden, Yemen, Nigeria, and in India (Al-Kahiry, 2012; James et al., 2022). In contrast, another studies conducted in Morocco, Egypt, Chile, and Italia reported that HMs were prevalent among patients aged 60 years and older (Elidrissi Errahhali et al., 2016; Hussein et al., 2019; Mangone et al., 2023; Pérez et al., 2019). Concerning sex, male predominance of HMs has been observed throughout the world. The current study reported that males represented 549 (56.1%), however, females 430 (43.9%), with a male: female ratio of 1.23:1 and there was no statistically significant was detected ($P > 0.919$). Such a finding is consistent to that reported in Yemen, Italia, Eastern Morocco, Bangladesh, Pakistan, United Kingdom, France and in USA (Elidrissi Errahhali et al., 2016; Hamid, 2024; Krok-Schoen et al., 2018; Mangone, et al., 2023; Sarwar et al., 2020). The result of this study was the opposite trend to reports of HMs in Chile (Pérez et al., 2019). Regarding marital status, the results reported significance association between marital status and HMs ($P > 0.001$). Married subjects represented 607 (62%) of HMs patients. This may be because married people are responsible for their families and therefore have more workloads and more susceptible to risk factors of HMs. Concerning educational level of study population, finding of this study revealed that statistical association between educational level of study population and HMs ($P > 0.001$). More than half 512 (52.3%) of patients in the current study were illiterate, however, only 58 (5.9%) were graduate people. The higher prevalence of HMs in illiterate patients justifies the need to develop effective programs to educate people about risk factors of HMs and improve the management of HMs diseases in the community. In relation to the types of HMs, this study reported that NHL was the most common occurring HMs in this area and represented 448 (46%) of all cases followed by

leukemia, HL and others types of malignancies, 398 (41%), 110 (11%) and 23 (2%) respectively. These findings are in agreement with literature review reported that NHL is the commonest HM globally (Otu & Ejikeme et al., 2021). The finding of the present study was in concordance with reports from local studies conducted in Aden and Hadramout with in Yemen (Al-Kahiry, 2012; Daakeek et al., 2022) and studies carried out in Bangladesh, Nigeria, USA, and in Europe countries (Egesie et al., 2017; Otu & Ejikeme et al., 2021; Sant et al., 2010; Sarwar et al., 2020). Whereas, in contrast to the results of the current study, a studies conducted in Sana'a, Taiz and Ibb cities within Yemen (Al-Nuzaili et al., 2024; Nasher et al., 2021). In addition to studies conducted in Saudi Arabia and Indonesia (Ahmed et al., 2020; Cahyadi et al., 2023). Study carried out in Africa also outlined that leukemia had the highest pooled prevalence (53.69%), followed by lymphoma 38.36% (Mulatie et al., 2025). The variation in these results could be attributed to differences in type of sample, sample size, study population, sociodemographic factors, and methods of diagnosis. Leukemia was the second most common HMs in this study after NHL, representing for 398 (41%) of all HMs. This incidence rate was lower than that observed in the previous study done in Taiz, Ibb cities, Sana'a, Hadramout with in Yemen (Al-Nuzaili et al., 2024; Daakeek et al., 2022; Nasher et al., 2021) and studies in Egypt, Saudi Arabia, Nigeria, and in Chile (Ahmed et al., 2020; Egesie et al., 2017; Hamid, 2019; Pérez et al., 2019) but it was higher than those observed in Indonesia (Cahyadi et al., 2023; Elidrissi Errahhali et al., 2016).

The Limitations of the Study

Diagnosis of HMs in this center is based on clinical evaluation and primary tests due to absence of specialized diagnostic facilities as immunophenotype, cytochemical and other facilities required for current standard diagnosis of HMs. As result of using retrospective study, some information were lost.

Conclusion

This study revealed a relatively high prevalence of HMs among diagnosed cancer cases in the study area. The pattern of HMs in the current study appears to be lower than some other studies in different regions of Yemen, which showed that males are more affected, and that NHL is the most common type of hematological malignancy, followed by leukemia. Age, marital status and educational level were significantly associated with HMs. The present study highlighted the burden of HMs in the study area and could provide information for health policy planning and for future programs on HM control. Further studies on the various aspects of HMs are needed for better control and prevention system in Yemen.

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Author's Contributions

Al-Muraisi Baheej contributed to data collection, study design, manuscript writing, and formatting. Al-Mohani Sadeq performed statistical analyses and interpretation of results, and reviewed the final manuscript.

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Not Applicable.

Data Availability

Data are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Ethical approval was obtained from Jiblah University for Medical and Health Sciences. Patient consent was not required because the data used was anonymous and encrypted. All data is kept strictly confidential.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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