

# Epidemiology of haematological malignancies in the Region of Greater Casablanca over the period 2008-2012

Y. Aghlallou<sup>a,b</sup>, C. Nejjari<sup>a,c</sup>, A. Quessar<sup>d</sup>, A. Marfak<sup>e</sup>, K. Bendahhou<sup>f</sup>, A. Benider<sup>f</sup>

<sup>a</sup>Laboratory of Epidemiology, Clinical Research and Community Health, Faculty of Medicine and Pharmacy of Fez, Morocco.

<sup>b</sup>Faculty of Sciences and Technics, Sidi Mohamed Ben Abdellah University, Fez, Morocco

<sup>c</sup>Mohammed VI University for Health Sciences, Casablanca, Morocco.

<sup>d</sup>Faculty of Medicine and Pharmacy of Casablanca, Hassan II University, Morocco.

<sup>e</sup>High Institute of Nurses Careers and Health Technics of Rabat (ISPITS), Rabat, Morocco.

<sup>f</sup>Mohammed VI Centre for the Treatment of Cancer, CHU Ibn Rochd, Casablanca, Morocco.

## Abstract

The objective of this study is to describe the epidemiological profile of haematological malignancies in the Region of the Greater Casablanca over the period 2008-2012. The data are obtained from the Greater Casablanca Cancer Registry (GCCR)(1).

2179 cases of haematological malignancies were diagnosed between January 2008 and December 2012 in the Greater Casablanca region (1246 in men and 933 in women). The age of the patients varies between 4 years and 78 years with a mean age of 46 years. The most frequent haematological malignancies are : Non Hodgkin's lymphomas (1032 cases), Hodgkin's lymphomas (379 cases), and Multiple Myelomas (200 cases).

This study demonstrates the interest of estimating the different HMs. This estimation will allow both the development of etiological studies and the implementation of appropriate devices for the management of these cancerous pathologies.

**Keywords :** Haematological malignancies, Region of the Greater Casablanca, Cancer registry

## 1. INTRODUCTION

Cancer is a real public health problem. Indeed, according to Globocan estimates[2], there are an estimated 18.1 million new cases of cancer and 9.6 million cancer-related deaths in 2018. The number of cases reported for haematological malignancies represents 6.5% of all cancer cases worldwide[3]. HM presents a group of cancers that result from a malignant transformation of cells in the bone marrow or lymphatic system[4].

In Morocco, the epidemiological profile is based on the cancer registry of the Region of the Greater Casablanca [1]. The GCCR was set up in 2004 and constitutes an epidemiological cancer surveillance system not only for the Region of the Greater Casablanca but also for the whole of Morocco. Between 2008 and 2012, 24,232 new cases of cancer were recorded, including 2,179 cases of haematological malignancies. This shows that HMs occupy an important place in relation to the most frequent cancers. MHs are all cancers of the blood and lymphoid organs. These diseases

have distinctive morphological, immunophenotypic, genetic and clinical characteristics. The availability of data on the incidence of MHs enables better planning of cancer control and the development of appropriate strategies based on prevention, screening, diagnosis and treatment, thus allowing better management of the country's limited resources.

The Cancer Registry of the Region of the Greater Casablanca is a population-based registry that provides comprehensive and continuous data of all cancer cases registered in the region, which represents 10% of the population of Morocco. The objective of this work is to describe the hematological malignancies registered by the GCCR during the period 2008-2012.

## 2. PATIENTS AND METHODS

The Region of the Greater Casablanca (Figure 1) is located on the Atlantic coast in northwest Morocco, with an area of 1,615 km<sup>2</sup> and a population of about 4 million [5].



In this work we have

The main

included all the haematological malignancies recorded in the Greater Casablanca region between 2008 and 2012.

All haematological malignancies have been classified into six groups according to the third edition of the International Classification of Diseases in Oncology (ICD-O-3)[6]: non-Hodgkin's lymphoma (NHL), acute myeloid leukaemia (AML), Hodgkin's lymphoma (HL), myeloproliferative syndromes (MPS), myelodysplastic syndromes (MDS) and multiple myeloma (MM).

Population data for the Region of the Greater Casablanca for the years 2008-2012 have been estimated on the basis of the two General Population and Housing Censuses 2004 and 2014 published by the Office of the High Commissioner for Planning (HCP)[5].

TABLE 1: Estimated population of the Region of the Greater Casablanca for the years 2008 – 2012

Year	Men	Wemen	Total
2008	1 912 207	1 967 359	3 879 566
2009	1 946 627	2 002 772	3 949 399
2010	1 981 663	2 038 820	4 020 483
2011	2 017 336	2 075 519	4 092 855
2012	2 053 647	2 112 878	4 166 525

Fig 1 : Prefectures and provinces of the Region of the Greater Casablanca.

types and sub-types of HMs are shown in Tables 2 and 3.

### 3. RESULTS

2179 HMs cases were included during the period 2008 and 2012, representing nearly 9% of all new cancer cases. The distribution of recorded cases is shown in Table (2). Non-Hodgkin's lymphoma (NHL) alone accounts for 47% of HMs, followed by Hodgkin's lymphoma and acute leukaemia with a frequency of 17% and 14% respectively. The mean age of the recorded cases was about 46 years. 12% of the recorded HMs were reported in children and adolescents, while 88% of HMs cases were observed in adults (Table 2).

With 1032 cases, NHLs are the most frequent HMs and

represent 47.4% of all recorded HMs cases. The average age of patients is 48 years. Diffuse Large Cell Lymphoma is the most common (22.7%), followed by Follicular Lymphoma (2.8%) and Burkitt's Lymphoma (1.6%). Crude incidence rates (CIR), Moroccan Population Standardized Rates (MPSR), and World Population Standardized Rates (WPSR) are shown in Table 4.

Hodgkin's lymphoma (HL) is in second place and accounts for 17.4% of MHs, with 379 cases. The average age of cases is 34 years. LHs are more common in women than in men (Table 4).

The Acute Leukaemia (AL) (13.9%) comes in third place, with 303 cases. The average age of the cases is 31 years. The subtypes of LAs are distributed as follows: acute myeloid leukaemia (187 cases) and acute lymphoblastic leukaemia with 116 cases.

Multiple myeloma (MM) ranked in fourth place with 200 cases (9.2%). Other MHs are infrequent and represent only 12.1% of all MHs.

Tableau 2 : New cases of HMs over the period 2008-2012.

Type of haematological malignancy	Number	%
<b>Non-hodgkin lymphoma (NHL)</b>	<b>1032</b>	<b>47,4</b>
Diffuse large cell lymphoma	495	22,7
Follicular lymphoma	62	2,8
Burkitt's lymphoma	35	1,6
Mantle cell lymphoma	18	0,8
Marginal zone lymphoma	14	0,6
Mature T/NK cell neoplasms	71	3,2
Lymphoplasmacytic lymphoma / Waldenström's macroglobulinemia	4	0,2
Other non-Hodgkin lymphomas	333	15,3
<b>Hodgkin lymphoma (HL)</b>	<b>379</b>	<b>17,4</b>
<b>Acute leukemias</b>	<b>303</b>	<b>13,9</b>
Acute myeloid leukemias	187	8,6
Acute lymphoblastic leukemias	116	5,3
<b>Multiple myeloma (MM)</b>	<b>200</b>	<b>9,2</b>
<b>Chronic lymphocytic leukemia (LLC)</b>	<b>104</b>	<b>4,8</b>
<b>Chronic myloid leukemia (CML)</b>	<b>139</b>	<b>6,4</b>
<b>Myeloproliferative syndromes (MPS)</b>	<b>2</b>	<b>0,1</b>
<b>Myelodysplastic syndromes (SMD)</b>	<b>6</b>	<b>0,3</b>
<b>Non-specific leukemia</b>	<b>14</b>	<b>0,6</b>

Table 3: Distribution of HMs in two age groups.

Type of haematological malignancy	Mean age	< 18 ans		≥ 18 ans	
		Number	%	Number	%
<b>Non-hodgkin lymphoma (NHL)</b>	<b>48</b>	<b>80</b>	<b>7,8</b>	<b>952</b>	<b>92,2</b>
Diffuse large cell lymphoma	55	15	3,1	472	96,9
Follicular Lymphoma	55	0	0,0	63	100,0
Burkitt's Lymphoma	11	34	94,4	2	5,6
Mantle cell lymphoma	62	0	0,0	19	100,0
Marginal zone lymphoma	60	0	0,0	14	100,0
Mature T/NK Cell Neoplasms	47	9	12,1	62	87,9
Lymphoplasmacytic lymphoma / Waldenström's macroglobulinemia	58	0	0,0	4	100,0
Other non-Hodgkin lymphomas	50	22	6,5	316	93,5
<b>Hodgkin lymphoma (HL)</b>	<b>34</b>	<b>74</b>	<b>19,5</b>	<b>305</b>	<b>80,5</b>
<b>Acute lymphoblastic leukemias (ALL)</b>	<b>23</b>	<b>50</b>	<b>43,1</b>	<b>66</b>	<b>56,9</b>
<b>Acute myeloid leukemias (AML)</b>	<b>38</b>	<b>37</b>	<b>19,8</b>	<b>150</b>	<b>80,2</b>
<b>Multiple myeloma (MM)</b>	<b>59</b>	<b>0</b>	<b>0,0</b>	<b>200</b>	<b>100,0</b>
<b>Chronic lymphocytic leukemia (CLL)</b>	<b>62</b>	<b>1</b>	<b>1,0</b>	<b>103</b>	<b>99,0</b>
<b>Chronic myloid leukemia (CML)</b>	<b>47</b>	<b>8</b>	<b>5,8</b>	<b>131</b>	<b>94,2</b>
<b>Myeloproliferative syndromes (MPS)</b>	<b>47</b>	<b>0</b>	<b>0,0</b>	<b>2</b>	<b>100,0</b>
<b>Myelodysplastic syndromes (SMD)</b>	<b>47</b>	<b>1</b>	<b>16,7</b>	<b>5</b>	<b>83,3</b>
<b>Non-specific leukemia</b>	<b>42</b>	<b>5</b>	<b>35,7</b>	<b>9</b>	<b>64,3</b>
<b>Total</b>	<b>46</b>	<b>272</b>	<b>12,0</b>	<b>1907</b>	<b>88,0</b>

Table 4: Distribution of the 2179 HMs in the Region of the Greater Casablanca according to sex and type of haematological malignancy.

HMs	N (M)	N (W)	N (M+W)	CIR (M)	CIR (W)	CIR (M+W)	SRMP (M)	SRMP (W)	SRMP (M+W)	SRWP (M)	SRWP (W)	SRWP (M+W)
<b>NHL</b>	<b>623</b>	<b>409</b>	<b>1032</b>	<b>6,30</b>	<b>4,00</b>	<b>5,70</b>	<b>6,00</b>	<b>3,60</b>	<b>4,80</b>	<b>7,40</b>	<b>4,50</b>	<b>5,90</b>
Diffuse large cell lymphoma	305	190	495	3,08	1,86	2,73	2,94	1,67	2,30	3,62	2,11	2,83
Follicular Lymphoma	29	33	62	0,29	0,32	0,34	0,28	0,29	0,29	0,34	0,37	0,35
Burkitt's Lymphoma	30	5	35	0,30	0,05	0,19	0,29	0,04	0,16	0,36	0,06	0,20
Mantle cell lymphoma	16	2	18	0,16	0,02	0,10	0,15	0,02	0,08	0,19	0,02	0,10
Marginal zone lymphoma	8	6	14	0,08	0,06	0,08	0,08	0,05	0,07	0,10	0,07	0,08
Mature T/NK Cell Neoplasms	36	35	71	0,36	0,34	0,35	0,35	0,31	0,33	0,33	0,39	0,36
Lymphoplasmacytic lymphoma / Waldenström's macroglobulinemia	4	0	4	0,04	0,00	0,02	0,04	0,00	0,02	0,05	0,00	0,02
Other non-Hodgkin lymphomas	198	135	333	2,00	1,32	1,84	1,91	1,19	1,55	2,35	1,50	1,90
<b>HL</b>	<b>187</b>	<b>192</b>	<b>379</b>	<b>1,86</b>	<b>1,93</b>	<b>1,95</b>	<b>1,80</b>	<b>1,80</b>	<b>1,80</b>	<b>1,90</b>	<b>1,80</b>	<b>1,90</b>
<b>AML</b>	<b>102</b>	<b>85</b>	<b>187</b>	<b>1,39</b>	<b>1,07</b>	<b>1,36</b>	<b>1,32</b>	<b>0,96</b>	<b>1,14</b>	<b>1,63</b>	<b>1,20</b>	<b>1,41</b>
<b>ALL</b>	<b>71</b>	<b>45</b>	<b>116</b>	<b>1,09</b>	<b>0,69</b>	<b>0,98</b>	<b>1,04</b>	<b>0,62</b>	<b>0,83</b>	<b>1,28</b>	<b>0,78</b>	<b>1,02</b>
<b>MM</b>	<b>113</b>	<b>87</b>	<b>200</b>	<b>1,14</b>	<b>0,85</b>	<b>1,10</b>	<b>1,09</b>	<b>0,77</b>	<b>0,93</b>	<b>1,34</b>	<b>0,96</b>	<b>1,14</b>
<b>CLL</b>	<b>61</b>	<b>43</b>	<b>104</b>	<b>0,62</b>	<b>0,42</b>	<b>0,57</b>	<b>0,59</b>	<b>0,38</b>	<b>0,48</b>	<b>0,72</b>	<b>0,47</b>	<b>0,59</b>
<b>CML</b>	<b>70</b>	<b>69</b>	<b>139</b>	<b>0,40</b>	<b>0,39</b>	<b>0,44</b>	<b>0,39</b>	<b>0,35</b>	<b>0,37</b>	<b>0,48</b>	<b>0,44</b>	<b>0,46</b>
<b>MPS</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0,01</b>	<b>0,01</b>	<b>0,01</b>	<b>0,01</b>	<b>0,01</b>	<b>0,01</b>	<b>0,01</b>	<b>0,01</b>	<b>0,01</b>
<b>MDS</b>	<b>5</b>	<b>1</b>	<b>6</b>	<b>0,05</b>	<b>0,01</b>	<b>0,03</b>	<b>0,05</b>	<b>0,01</b>	<b>0,03</b>	<b>0,06</b>	<b>0,01</b>	<b>0,03</b>
<b>NON-SPECIFIC LEUKEMIA</b>	<b>8</b>	<b>6</b>	<b>14</b>	<b>0,08</b>	<b>0,06</b>	<b>0,08</b>	<b>0,08</b>	<b>0,05</b>	<b>0,07</b>	<b>0,10</b>	<b>0,07</b>	<b>0,08</b>

N: number of new cases; M: Men; W: Women; CIR: Crude incidence rate; SRMP : standardized rate on the moroccan population; SRWP: standardized rate on the world population.

#### 4. DISCUSSION

This study focused on estimating the incidence of haematological malignancies in the Region of the Greater Casablanca. 2179 people developed haematological malignancies during the 2008-2012 period, representing 9.0% of all cancer cases recorded during the same period. This result is identical to that reported at the registry of the city of Rabat[7]. In a study conducted in the eastern region of Morocco, MSMs represent 11% of all cancer cases, which is relatively higher than that reported in our study[8]. The percentage of HMs found in our study is similar to that found in the United States[9]. In Europe, the number of new HMs patients was estimated to be approximately 230,000 per year, representing approximately 8% of all new cancer cases[10]. However, studies conducted in Iran or Nigeria report much higher percentages (24.8% and 20% respectively) (10,11).

In our study, the average age of patients with MH in the greater Casablanca region was 44 years, which is identical to the value found in the literature [12],[13],[14],[15]. However, in the eastern region, MHs affect older people with a mean age of 52 years[8]. In Western countries, HMs affect older subjects compared to our country[16].

During the period 2008-2012, we found that HMs affect men more than women, the same finding was reported in the literature[17], [18], [19]. Men are more likely to develop MH than women as a result of exposure to environmental factors through their occupational activity[20].

In the age group <18 years, the incidence of MHs remains rare and represents 12% of all people affected by this pathology. Non-Hodgkin's lymphomas were predominant and accounted for 29% of cases in this age group. These results are comparable to those found in the eastern region of Morocco[8]. The same results were observed in several countries[21], [22],[23]. In this same age group, the second most common cancer was Hodgkin's lymphoma (27%) followed by ALL (18%), AML (14%) and CML (3%) respectively. These results are comparable to those found in Algeria[23]. However, in North America and Latin America, leukemia was the most common[23]. Several risk factors have been associated with HMs in adolescents such as Epstein-Barr virus infection, diet, genetic and environmental factors[24], [25],[26],[27],[28].

In our study 88% of HMs were observed in the age group  $\geq 18$  years. NHLs accounted for half of the HMs (952 cases). This was followed by HLs (16%), MMs (10%), AMLs (8%), CMLs (7%), CLLs (5%) and ALL (3%) respectively. The male predominance found in our study is comparable to the results reported in the literature[12],[14],[18],[19].

Non-Hodgkin's lymphoma (NHL) accounts for 47.4% of MHs cases. This result is identical to that reported at the Cancer Registry of Rabat (29). However, this rate is significantly higher than that found in other studies: 36.4% in France[17], 31.1% in Cameroon[13] and 29.7% in the Eastern region[8]. The most frequent subtype of MHs is the diffuse large cell lymphoma (495 cases), the same result found in the cancer registry of the city of Rabat[29] and the

study conducted in the eastern region of Morocco[8]. Follicular lymphoma is the most common subgroup of LHs with 62 cases. Followed by Mature T/NK Cell Neoplasms and Burkitt's Lymphoma. These results are different from those reported at the level of the cancer registry of Rabat[7] and at the level of the Oriental region[8]. Further studies need to be conducted to identify the determinants of the geographical variation of the different NHL subgroups.

Hodgkin's lymphomas came second and accounted for 17.4% of HMs. This value is similar to that found by Elidrissi E et al[8]. However, in the registry of Rabat the frequency of LHs is estimated at 10.4%[7]. In several countries, the incidence of LH is much lower than that found in the Region of the Greater Casablanca [30],[31].

Multiple myeloma is the third most common HMs (9.2%). This result is comparable to that found in the Eastern region (12.4%) and in other regions of the world[30],[32],[33].

This study allowed us to describe the epidemiological profile of HMs in the Region of the Greater Casablanca. Further studies must be carried out to provide the indicators necessary for the evaluation of risk factors and the development of programmes for the control of haematological malignancies.

#### CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest. This study was carried out as part of a thesis topic at the Faculty of Medicine and Pharmacy of Fez, Morocco.

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