

The epidemiological profile of cancer in Beni Mellal: a cross-sectional descriptive study

Aboufaras Mohamed^{1,2}, Selmaoui Karima¹, Ouzennou Nadia³

¹Biology Department, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco

²Laboratory of Biosciences and Management of Health Care and Techniques, Higher Institute of Nursing Professions and Health Techniques, Regional Hospital Center-Dchira District, Beni Mellal, Morocco

³Higher Institute of Nursing and Technical Health Professions, Guéliz, Marrakech, Morocco

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ABSTRACT

In Morocco, where cancer is a major public health problem, the characteristics of cancer in the Beni Mellal-Khenifra region of Morocco are unknown. Our objective was to establish the epidemiological profile of cancer in this region and the main risk factors influencing cancer. We conducted a cross-sectional study, including all types of cancer, with a sample of 100 patients at the Beni Mellal regional oncology center. Data collected in June and July 2021 using a questionnaire, pre-tested, and analyzed using SPSS and Excel. The questionnaire included sections on cancer-related clinical characteristics and other items related to cancer risk exposures. Gyneco-mammary cancers occupied the first position (49%). The most common localization of cancer in women was breast cancer, with a proportion of 63% of cases recorded during the period studied. In men, lung cancer was the most frequent location at 17%. We found some possible risk factors for cancer: tobacco and alcohol use, dietary habits, use of hormonal contraceptive methods, low income, pollution, sun radiation, exposure to asbestos, family history of cancer, and diseases associated with cancer. Women's cancers are very common in the region. Several factors are responsible for this frequency. These results suggest several avenues for further research.

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Corresponding Author:

Mohamed Aboufaras

Higher Institute of Nursing and Technical Health Professions

Dechira, Beni Mellal, Morocco

Email: Mohamed.aboufaras@uit.ac.ma

1. INTRODUCTION

Cancer is currently one of the major public health problems worldwide, In 2017, 24.5 million new cases of cancer were recorded worldwide [1]. A statistical analysis across 20 regions of the world conducted by the International Agency for Research on Cancer (IARC) indicated that 1 in 8 men and 1 in 10 women will develop the disease in their lifetime [2]. In Africa, cancer is an emerging health problem. In the next two decades, cancer death rates in Africa are expected to exceed the global average by 30%. Cancer death rates have exceeded those of acquired immunodeficiency syndrome (AIDS), tuberculosis, and malaria combined [3]. In Morocco, cancer is a major public health problem. According to the latest data from the IARC, published on Globocan 2018, Moroccans have a 14.67% probability of contracting cancer before the age of 75. In 2018, more than 50,000 new cases of cancer were recorded in the Kingdom [4]. Morocco is among the countries where there has been a significant increase in cancer cases, with a 45% increase from 2000 to 2019 [5].

Cancers are indeed multifactorial diseases. Risk factors are generally divided into two groups: avoidable factors and non-avoidable factors. The first are elements relating to the environment and our behavior or lifestyle: tobacco, a balanced diet, and infections by certain viruses or bacteria. There are so many factors against which it is possible to protect ourselves. The non-avoidable factors are related to our age, our sex, and our genetic heritage [5].

The fight against this scourge will succeed with perfect knowledge of the particularities of cancer in each region and in each country. In Morocco, except for data from the register of the Rabat region, which started in 2005, and from the population registers of greater Casablanca, which were created in 2004 with the last edition in 2016, no exhaustive national database on cancers is available. Therefore, the incidence and prevalence must be estimated, and the results of these estimates remain approximate.

National epidemiological profiles of cancer disease burden are heterogeneous, contextual, and multifactorial [1]. So it is needed to study the epidemiological profile of each context to adapt control measures. Since the Beni Mellal-Khenifra region is home to a new oncology center, our study aimed to determine the epidemiological profile and potential factors impacting all types of cancer in the area. By highlighting these epidemiological data, we aim to raise awareness among all stakeholders about the magnitude of the cancer problem in the region and encourage the implementation of prevention and early detection strategies. This research seeks to provide crucial information to guide public health efforts and contribute to the fight against cancer in the Beni Mellal region.

2. METHOD

2.1. Participants and design

This is a pilot, cross-sectional, and descriptive study, that seeks to describe the epidemiological profile of cancer in the Beni Mellal-Khenifra region of Morocco. It is a region located in the center of the country with a population of 2,520,776 and an area of 28,374 Km², or 3.99% of the national territory. It encompasses five provinces: Azilal, Béni Mellal, Fquih Ben Salah, Khenifra, and Khouribga. It has only one oncology center which was inaugurated in 2019.

The recruited patients were adults aged 18 and above, diagnosed with cancer by an oncologist, and receiving treatment at the oncology center. They were willing and able to participate in the questionnaire. The study included all cases of malignantly invasive cancers, encompassing carcinomas, sarcomas, lymphomas (hematopoietic cancers), and melanomas confirmed by an oncologist and treated at the Beni Mellal oncology center during the study period. The study involved a sample of 100. Exclusion criteria were applied to ensure only invasive cancers were considered, leading to the exclusion of borderline tumors, intraepithelial neoplasms, and benign tumors from the study. The sampling method used in this study is accidental non-probability for patients meeting the inclusion and exclusion criteria.

2.2. Data collection and analysis

Data collection was carried out during the months of June and July of the year 2021. The instrument used in this study was a questionnaire. The questions were formulated in a simple, clear, and precise manner. The questionnaire was pre-tested with five patients with the aim of correcting and reformulating questions that were not understood. The questionnaire was developed in such a way as to respond to the elements present in the frame of reference resulting from the literature review. It consisted of 31 questions, including patient demographic and socioeconomic information, questions related to environmental factors, questions related to behavioral factors, and questions related to family history and cancer-related disease.

Several elements were considered to respect the ethical dimension. First, we respected anonymity and volunteerism and had the oral consent of the participants. Regarding the regulatory aspect, before starting the investigation, we had the written agreement of the delegation of the Ministry of Health. We also obtained an agreement from the Ethics Committee of the Faculty of Medicine in Oujda under number 29/2020, an agreement obtained within a research project aimed at studying the characteristics and behaviors of cancer patients in the region. Data entry and statistical processing were carried out using SPSS version 23 software. The data were analyzed descriptively or graphically using Microsoft Excel software.

3. RESULTS AND DISCUSSION

3.1. Participant characteristics

Women made up the majority of cancer patients (58%). The average age of the cancer patients surveyed was 51.35 years. Most respondents (58%) of participants were not educated. The 34% of patients had no function and 28% are housewives. Almost all had health coverage (96%). All the socio-demographic characteristics of the participants will be presented in Table 1.

Table 1. Sociodemographic characteristics of participants

Characteristics	Women (58) N (%)	Male (42) N (%)	Total (100)
Age			
Less than 30	3	4	07
30 – 50	15	4	19
Over 50	40	34	74
Monthly income			
Less than 2,000 dh	19	07	26
Between 2,000 dh and 5,000 dh	28	24	52
More than 5,000	11	11	22
Place of residence			
Rural	19	11	30
Urban	24	21	45
Peri urban	15	10	25
Level of education			
Illiterate	35	23	58
Primary	14	8	22
Primary	9	9	18
Higher	0	2	02
Occupation			
No occupation	17	17	34
Housewife	28	0	28
Private employee	12	08	20
government employee	01	09	10
Liberal function	00	08	08
Province			
Beni Mellal	27	17	44
Azilal	3	1	4
Fkih Ben Salah	20	18	38
Khouribga	7	4	11
Khenifra	1	2	3

3.2. Frequency of cancers

The most common cancer location, considering both sexes, was breast cancer. It ranked first and represented 40% of cases. Lung cancer ranked second with a proportion of 10% of cases, followed by stomach cancer with a proportion of 9% of cases as shown in Table 2. According to the overall data of our study, the most affected devices in all the patients identified were, in order of frequency: Gyneco-mammary, Digestive, Thoracic, Ear, Nose, and Throat, and Genito-Urinary. In men, the most common location of cancer was the lung. It represented 17% of the registered cases, followed by that of Cavum cancer with a proportion of 14.2%, and prostate cancer in third place with 12.2% of cases. In women, the most common cancer site was breast cancer, with 63% of cases recorded during the period studied. Cervical cancer ranked second with 12.2% of cases, followed by stomach and colorectal cancer with 6.4% and 3.2%, respectively. Cancer is a multifactorial disease involving several determinants. The analysis of epidemiological data is of great importance for the prioritization and implementation of a cancer control program. In light of the foregoing, we conducted this study to describe the epidemiological profile of cancer and to investigate some influencing factors in Morocco's Beni MellalKhenifra region. Our study shows that gynecological-mammary cancers came in first place (49%), and that the most frequent cancer location was breast cancer. In men, lung cancer was the most common (17%); in women, the dominant type was breast cancer with a proportion of 63%.

Table 2. Frequency of cancer according to gender and age

				Type of cancer							
				N							
				B	L	C	CR	P	CV	S	O
				40	10	8	6	5	9	9	13
Gender	Women	Age	Less than 30; N=3	0	0	0	0	0	2	0	1
			30 to 50; N=15	14	0	0	1	0	0	0	0
			Over 50; N=40	26	0	8	2	0	0	2	2
	Men	Age	Less than 30; N=4	0	0	0	0	0	3	0	1
			30 to 50; N=4	0	0	0	1	1	0	0	2
			Over 50; N=34	0	10	0	2	4	4	7	7

Note: B: Breast, L: lung, C: Cervix, CR: Colorectal, P: Prostate, CV: Cavum, S: Stomach, O: Other

Apart from cavum cancer, which we found to be the second most common cancer in men. These results were consistent with the data from the cancer registry of the greater Casa Blanca region. This is the most important registry in Morocco. Indeed, the analysis of the data of 11,923 cases showed that the main cancer locations in men were lung cancer (25.9%), followed by prostate cancer (13.5%), and bladder cancer (8.7%). In women, gynecological and breast cancers alone account for more than half of all cancers in women. Breast cancer was the most common cancer among 36.4% of women, followed by cervical cancer (15%) and thyroid cancer (6.7%) [6].

Worldwide, female breast cancer is considered the most commonly diagnosed cancer for both sexes, surpassing lung cancer [7]. According to Globocan 2020, breast cancer accounted for an estimated 2.3 million new cases (11.7%). Following breast cancer, the next most commonly diagnosed cancers are lung cancer (11.4%), colorectal cancer (10.0%), prostate cancer (7.3%), and stomach cancer (5.6%) [7]. The global incidence of breast cancer is experiencing a rapid increase, with a 57.8% rise in the past 30 years and an annual increase of 0.5% in the incidence rate [8].

In North Africa, the frequency of this cancer has increased significantly, the incidence has doubled between 2002 and 2018, going from 23.3 cases per 100,000 inhabitants in 2002 to 48.9 cases per 100,000 inhabitants in 2018 [3]. In Morocco, this cancer is the most frequent and is considered a major public health problem, with the incidence of breast cancer ranging from 39.9 to 49.2 per 100,000 women [9]. In both sexes, this cancer ranked first with 19.2% of cases, followed by lung cancer with 12.3% and colorectal cancer with 7.8% [10].

Concerning cervical cancer, it ranks second in the Beni Mellal-Khenifra region and in Morocco, with a 13% female prevalence. The incidence of this cancer is higher in Marrakech region than in the rest of the kingdom [11]. It is ranked as the fourth most common cancer in women worldwide [3]. This difference between Morocco and the other regions, especially developed countries, is justified by the fact that around 85% of the cases of this cancer are recorded in low- or middle-income regions such as North Africa [12].

Lung cancer has been the most common cancer in the world for several years; in 2018, more than 2 million new cases were recorded [2]. In Africa, lung cancer is very common and is increasing in both men and women. with a prevalence 3-5 times higher in men than in women [3]. This corroborates our results, this increase in lung cancer. Prostate cancer, which was ranked third in the Beni Mellal region and second in Casablanca, is a very common and serious malignancy in men. The number of cases of this cancer has increased from 5 to 13 cases per 100,000 inhabitants between 2002 and 2018 in North Africa [3].

3.3. Exposures

3.3.1. Exposure to behaviors

Approximately 30-40% of cancers can be prevented through lifestyle modifications [13]. Our results showed that 30% of the patients were smokers and 15% drank alcohol. Tobacco is a key risk factor for several cancers, especially lung cancer. The link between smoking and lung cancer is well-established and widely recognized by the scientific community. Tobacco contains many carcinogenic substances that, when inhaled, can damage lung cells and cause genetic mutations [14]

The patients in our study had a positive attitude towards physical activity. Thus, 60% of them believed that physical activity could reduce the risk of cancer, and 59% practiced it with varying frequencies and durations. On the other hand, 10% of cancer patients believed that physical activity increases the risk of cancer, and 30% thought that physical activity did not influence this risk.

Physical activity has been found to significantly reduce the risk of various cancer types, such as bladder, breast, colon, endometrial, esophageal adenocarcinoma, and gastric cardia. There is moderate evidence linking physical activity to reduced risks of lung, ovarian, pancreatic, and renal cancers, and limited evidence for prostate cancer. Sedentary behavior, regardless of physical activity levels, has been associated with an increased risk of colon, endometrial, and lung cancers. Additionally, obesity is a known risk factor for several cancer types, including endometrial, postmenopausal breast, colorectal, esophageal, renal/kidneys, meningioma, pancreatic, gastric cardia, liver, multiple myeloma, ovarian, gallbladder, and thyroid cancers [13]. Nonetheless, the Moroccan Government has limited efforts aimed at encouraging physical activity, fostering a nutritious diet that emphasizes vegetables and fruits, and addressing the issues of overweight and obesity. These areas demand immediate attention and additional research to enhance their implementation [15].

Regarding food, it was found that 70% of participants consumed excessive red meat (more than 3 times a week) and 40% consumed cold cuts. For women, it was observed that 69% of study participants were using hormonal contraceptive methods. The duration of exposure was between 10 and 30 years for 67.5% of women with cancer and over 30 years for the rest. Figure 1 summarizes the headcount of cancer patients with respect to each behavior

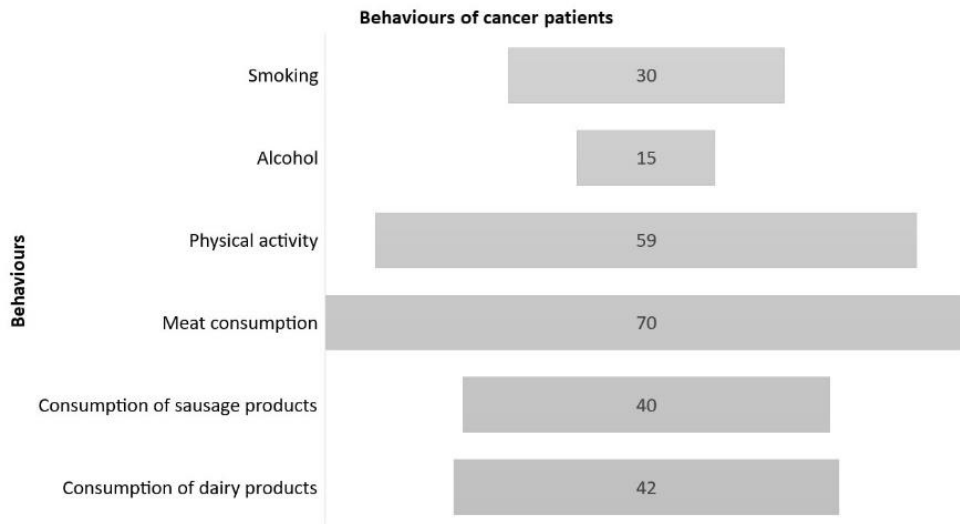


Figure 1. Behaviors of cancer patients

3.3.2. Exposure to environmental conditions

Participants who suffered from air pollution made up 31%, while exposure to water pollution and soil pollution made up 19% and 11%, respectively. Solar radiation exposure during hot hours (11 a.m.-4 p.m.) accounted for 85% of the total. This pollution, particularly air pollution, could be responsible for lung cancer. Indeed, an epidemiological and biological study has confirmed that a significant portion of lung cancer cases in non-smokers is attributed to air pollution. The main factors contributing to this are exposure to environmental tobacco smoke, environmental exposure to radon, air pollutants, and exposure to nitrogen dioxide [15].

The association between professional activity and sun exposure was permanent in 31% of patients, high in 11%, occasional in 8%, and absent in half of patients. Among people exposed to the strong heat of the sun, only 9% did not protect themselves against radiation. With regard to exposure to asbestos, 25% of participants were in contact with this material. The 15% have worked or tinkered in premises built with asbestos and 31% live with someone working in contact with asbestos. All the environmental exposures are shown in Figure 2.

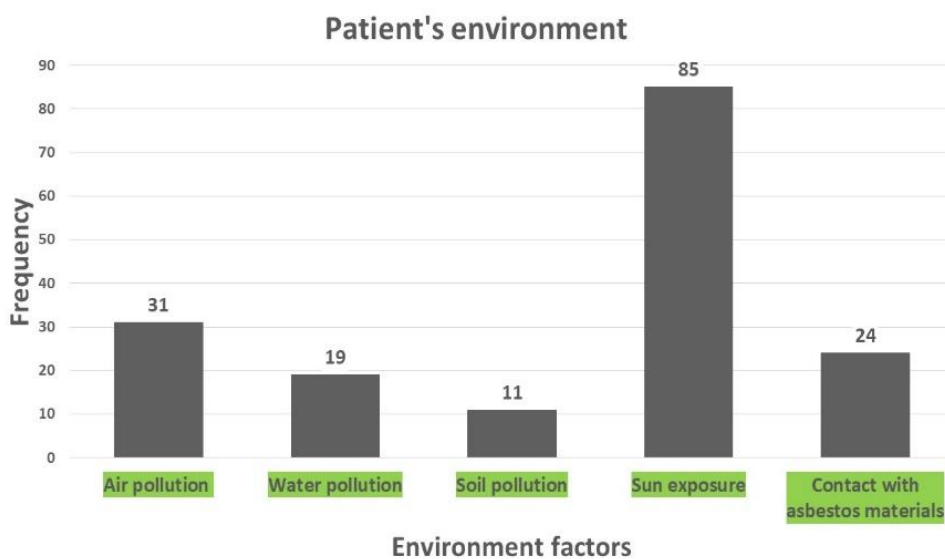


Figure 2. Distribution of cancer patients by environmental factors

A recent review highlights the significant role of environmental factors in the incidence of cancer. Fine particulate matter air pollution, for example, contributed to a considerable proportion of various diseases, including ischaemic heart disease, cerebrovascular disease, lung cancer, low respiratory infections, and chronic obstructive pulmonary disease (COPD) mortality. However, the exact contribution of pollution to overall cancer incidence is not available. It is essential to note that environmental exposures are not evenly distributed, leading to environmental inequalities. Vulnerable population groups, such as the elderly, children, and ethnic minorities, often face higher exposures to environmental hazards, emphasizing the importance of addressing environmental disparities in cancer prevention efforts [16].

Indeed, apart from the previously mentioned factors, there are several other known or suspected contributors to cancer. These include occupational exposures in industries like aluminum production, rubber production, painting, and firefighting. Exposure to certain dyes, intermediates, or chemicals used in these industries, such as magenta, auramine, and 4-aminobiphenyl, may also pose risks. Environmental exposures, such as X radiation, gamma radiation, and arsenic, have been linked to cancer development as well. Additionally, certain medications like cyclophosphamide and chlornaphazine, as well as opium consumption, have been associated with increased cancer risk. Understanding and addressing these various risk factors are crucial in comprehensive cancer prevention strategies [17].

3.3.3. Other exposures

Regarding biological factors, we found that 74% of the patients were older than 50 years, and more than half (52%) had a family history of cancer. Our results also show that 34% of the patients had comorbidities associated with cancer, 19% had hypertension, 11% had diabetes and 4% had other associated diseases. In terms of morbidity and mortality, cancers are a major public health concern. Epidemiological studies have shown that more than 70% of these cancers are due to environmental factors and other preventable factors such as tobacco, alcohol, diet, food additives, infections (viruses, bacteria, and parasites), occupation, radiation, sun exposure, sexual behavior, pollution, exposure to industrial products, obesity, lack of physical activity, and stress [18].

In addition to the aforementioned exposures, viral infections can also lead to the development of cancers. Eight human viruses have been classified by the International Agency for Research on Cancer as carcinogenic or probably carcinogenic for humans. These include high-risk human papillomaviruses, hepatitis B and C viruses, Epstein-Barr virus (EBV), human T-Cell Lymphotropic Virus Type 1 (HTLV-1), Human herpesvirus 8 (HHV-8), Merkel cell polyomavirus, and human immunodeficiency virus-1 (HIV-1). In Morocco, these viral infections may contribute to more than 14,000 cases of cancer annually [19]. In our study, the majority of patients were exposed to sunlight (85%), 31% suffered from air pollution, and 25% of participants were in contact with asbestos. These results are consistent with more international studies that report that these exposures are risk factors for cancer [18].

Morocco is a country in full epidemiological transition, characterized by the increase in non-communicable diseases. This increase is largely linked to a marked change in lifestyles and certain behaviors. Considering this, we found in the Beni Mellal-Khenifra region that 70% of people consumed excessive red meats, 15% of men were consumers of alcoholic beverages, and 69% of women were using hormonal contraceptive methods for a duration that varied between 10 years and more than 30 years.

In Morocco, the nutritional transition is a key factor in the epidemiological transition. Indeed, the daily fat intake, for example, increased from an average of 42 g in 1968–1970 to 59g in 1997/98. Other parameters have also changed; the prevalence of overweight increased from 21.4% in 1968/70 to 25.1% in 1997/98, and that of obesity increased from 4.1% to 10.3% for the same period [20].

A case-control study carried out in Casablanca, including 225 patients with colorectal cancer and 225 controls, showed that this cancer was associated with excessive intakes of red meat ($p=0.0001$), cold cuts ($p=0.001$), and the risk of colorectal cancer. A person who consumes red meat daily is 4.4 times more likely to develop colorectal cancer than a person who does not. On the other hand, the consumption of fish ($p=0.0001$), fresh vegetables, and cooked vegetables ($p=0.0001$) were protective factors against this cancer [21]. Regarding women's cancers (breast cancer and cervical cancer), an analytical study conducted in Oujda, in eastern Morocco, found that hormonal contraception favored the occurrence of these cancers. The 8% of women with cervical cancer used hormonal injectable contraceptives, while 3% used oral contraceptives combining ethinylestradiol and progesterone [22].

Our results are in line with other international studies. A review of Australian literature found that smoking, alcoholism, and the use of hormonal contraceptives were risk factors for the occurrence of cancer in Australia [23], [24]. In addition, smoking, excessive alcohol consumption, and obesity were the most important cancer behaviors in high-income countries [24].

Smoking, whether active or passive, is responsible for a very high number of cancers, especially lung cancer [25]. Our study showed that almost half of the participants (48%) had a family history of cancer.

These results are consistent with a retrospective analytical study conducted in the eastern region of Morocco that found a statistically significant association between cervical cancer and family history, 15% of women who had this history were sick. However, no association was detected with breast cancer in this region [22]. In our sample, we found that 34% of the participants presented a defect associated with their cancer, which was distributed according to the order of frequency as follows: 58.8% are hypertensive; 35.2% are diabetic; and 5.8% are cardiac patients.

The relationship between cancer and several diseases, is clearly determined by several studies, especially with diabetes and high blood pressure. According to a recent series of studies and meta-analyses, cancers affecting the pancreas, liver, colon, breasts, urinary tract, and endometrium occur more frequently in diabetic patients. It should be noted that this work mainly concerns type 2 diabetic patients. Hepatocellular carcinoma is increased by a factor of two to three in the event of diabetes, pancreatic cancer is also more often found in diabetes, with an increase of about 80%; In the case of bladder cancer, it is also more common in diabetic patients (risk increased by about 40%) [26], [27].

Arterial hypertension and cancer are two very common conditions throughout the world, sources of significant morbidity and mortality. Many studies report a strong association between these two conditions. Hypertension seems to increase the incidence and mortality of certain cancers: kidney, ENT, colon, rectum, lung, bladder, and melanoma. Some hypertension treatments seem to be implicated in certain types of cancer. However, possible pathophysiological links between these two conditions are still unknown [28].

Cancer is also associated with socioeconomic factors, such as social inequalities and low income. For our study, we found that more than 26% of the patients had a very low income (less than 200 dollars), and only 22% of the patients had an income exceeding 500 dollars. For several types of cancer, the frequency varies according to the social category. A large-scale Moroccan case-control study of 3,032 people showed that the control group had higher incomes than the group of colorectal cancer cases [29].

The risk factors for cancer are multiple, and there are both common and specific factors for each type of cancer. Breast cancer is the most commonly diagnosed cancer among women, both in our study and worldwide. Several risk factors have been identified in relation to this disease. Female sex is a major risk factor as breast cancer primarily affects women. Hormonal factors, such as hormonal replacement therapy and exposure to diethylstilbestrol, play significant roles. Other risk factors include older age, family history of breast or ovarian cancer, genetic mutations, overweight or obesity, race/ethnicity, alcohol intake, smoking, and exposure to chemicals or radiation. Pregnancy and breastfeeding, menstrual history, menopause, insufficient vitamin supplementation, breast tissue density, excessive artificial light exposure, intake of processed food, and previous history of breast cancer also influence the risk. Understanding these risk factors can contribute to better prevention and effective screening strategies for this common and serious disease [30].

4. CONCLUSION

We aimed to establish a comprehensive cancer map for the Beni Mellal-Khenifra region. Breast cancer and cervical cancer are continuously increasing and represent the two locations most affected by cancer in women in this region. Our study reveals unique epidemiological characteristics in our region, such as specific exposures to sunlight, air pollution, and asbestos linked to cancer. Additionally, we identify exposures behaviors, such as smoking, excessive alcohol consumption, and family history of cancer. This innovative research emphasizes the importance of targeted public health approaches to effectively prevent and manage cancer in our region.

Our work marks a pioneering step towards setting up a cancer registry in the Beni Mellal-Khenifra region, laying the groundwork for future integration into the national cancer registry. As we look forward, we propose crucial recommendations to fortify our progress. It is imperative to maintain vigilant monitoring and reporting of cancer data, fostering a deep understanding of cancer epidemiology within the region. Additionally, we advocate for the expansion and refinement of early detection programs, ensuring swift diagnosis and timely interventions.




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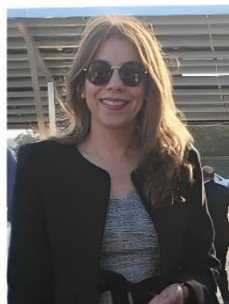
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BIOGRAPHIES OF AUTHORS

Aboufaras Mohamed    is an epidemiologist and teacher in nursing sciences working on a wide-ranging project on cancer patients' behaviour and oncology care. He is also interested in the study of nursing pedagogy. He can be contacted at email: mohamed.aboufaras@uit.ac.ma.



Selmaoui Karima    is professor of biology at the Faculty of Science, Ibn Tofail University and the head of the International Relations Office at Ibn Tofail University. She has worked on several projects focusing on climate change, sustainable agriculture, and biocontrol. Her research interests include seed treatment, fruit treatment, and fungal biocontrol. She has supervised a number of master's and doctoral students on environment and climate change. She can be contacted at email: karima_selmaoui@yahoo.fr.



Ouzennou Nadia    is a professor and researcher in health and biology at ISPITS in Marrakech. He is involved in a number of research projects in the field of health and nursing. His research focuses mainly on maternal and child health, oncology and non-communicable diseases. He is the author of several peer-reviewed international publications. She can be contacted at email: nadia.ouzenou@gmail.com.