International Journal of Innovation and Modern Applied Science

Vol. 11 Issue 02 , December 2025

Doi : https://doi.org/10.57109/5012

ISSN No.: 665-8984

Epidemiological profile of cancer patients in the region of Laayoune Sakia El Hamraa, Morocco

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ABSTRACT: This study addresses the management of cancer patients in the Laayoune Sakia El Hamraa region, with particular attention to the epidemiological profile of cancer, prevailing approaches to care, and the principal challenges encountered. It further advances a set of strategies and interventions designed to strengthen the effectiveness of patient management. The findings demonstrate that sociodemographic determinants exert a considerable influence on both the type of cancer diagnosed and its clinical stage. The sampling frame was composed of 286 individuals identified from the oncology hospital database, from which 100 patients with various cancer types were selected for detailed analysis. Within this cohort, breast cancer (ICD-10 code C50) emerged as the most prevalent diagnosis, accounting for 47 cases. Distribution by stage revealed that 38 patients were diagnosed at stage I, 36 at stage II, 18 at stage III, and 8 at stage IV. In response to the identified gaps, the study proposes targeted strategies including economic interventions such as food subsidies and logistical measures, notably meal delivery services, aimed at improving consistent access to appropriate nutrition. Although the research acknowledges certain methodological constraints, it offers a robust platform for subsequent interventions and future investigations dedicated to optimizing cancer care, particularly in resource-limited and underserved contexts. The results underscore the importance of adopting a comprehensive and holistic model of nutritional management as a means of enhancing both the quality of life and clinical outcomes of patients affected by cancer.

Keywords: Epidemiology, Cancers, socio-demographics, Laayoune, Morocco.

1. INTRODUCTION

Like many developing nations, Morocco has undergone significant demographic, socioeconomic, epidemiological, and nutritional transitions. These changes have been marked by population aging, increased urbanization, and notable shifts in lifestyle and dietary habits, collectively contributing to a new epidemiological landscape dominated by the rising burden of non-communicable diseases (NCDs). The country's demographic profile has been reshaped by a sharp decline in fertility rates, dropping from 7.2 children per woman in 1962 to 2.33 in 2021 (HCP, 2022). This shift has altered the national age pyramid, narrowing its base due to reduced fertility while expanding its peak with longer life expectancy and a growing elderly population (HCP, 2020). Parallel to this, Morocco has experienced rapid urbanization, with the urbanization rate increasing from 29.1% in 1960 to 64.3% in 2022 (HCP, 2023). As in other developing contexts, this urban expansion is often uncontrolled, exerting heavy pressure on natural resources, accelerating deforestation, pollution, and environmental degradation (Joshua, 2017; Yogender, 2022). While urbanization can improve access to services, it also generates health disparities, disproportionately exposing poorer populations to higher health risks (Phillips, 1993; Dye, 2008).

Urban lifestyles have further encouraged sedentary behaviors due to office-based work, prolonged screen time, and limited access to green spaces, thereby contributing to obesity, diabetes, and cardiovascular diseases (Biswas et al., 2015; Lavie et al., 2019). Combined with an aging demographic, these factors have driven the rising prevalence of chronic and degenerative diseases (Ministry of Health & UNICEF, 2011). Morocco is now facing a profound epidemiological transition in which NCDs have become the leading causes of morbidity and mortality, accounting for 83% of all deaths. Among individuals aged 30–70, NCDs represent 24% of premature mortality (Ministry of Health, 2023). These demographic and epidemiological transformations are closely tied to changes in diet. Morocco's traditional Mediterranean food model has increasingly given way to Westernized dietary patterns, driven by industrial food production and media influence. This has led to higher consumption of fast food, processed products, and energy-dense foods, fueling obesity, diabetes, and other metabolic disorders (Soualem, 2008; DP, HCP, 2019). Nutritional disorders remain a major determinant of health, impacting physical, mental, and socio-economic well-being, and they hinder national development by perpetuating cycles of poverty and disease (Ministry of Health, 2017). Although the government has implemented nutrition programs significant challenges persist. The Moroccan nutritional landscape is therefore characterized by a dual burden: persistent deficiencies such as anemia and undernutrition coexist with emerging problems like obesity and overweight, particularly within the same families or social groups. Compared to other EMRO countries, Morocco is classified as undergoing an early nutritional transition, with moderate levels of obesity and undernutrition combined with widespread micronutrient deficiencies (FAO, 2003). This transition has created striking disparities across regions, socio-economic classes, and residential settings, further complicating the national health profile. Against this backdrop, the central problem addressed in this research is the complex interplay between demographic change and cancer in Morocco, with a specific focus on the Laayoune Sakia El Hamraa region. The study seeks to answer the following question: *What is the relationship between nutrition and cancer, particularly in identifying specific foods, nutrients, and dietary practices associated with either an increased or decreased risk of developing various cancers, and how can this knowledge guide cancer prevention strategies and nutritional interventions in patient care?*

2. METHODOLOGICAL FRAMEWORK OF THE STUDY

This research is a descriptive and analytical study conducted between 2020 and 2024, designed to examine the relationship between dietary habits and cancer occurrence at the local level. Its primary objective is to identify potential associations between nutrition and different types of cancer, thereby providing a deeper understanding of the epidemiological and nutritional situation in the Laayoune region. Empirical data were collected from the University Hospital Center of Laayoune and complemented by recent peer-reviewed scientific publications, which were carefully selected and cited to ensure a solid and rigorous analytical foundation.

The study was designed as a cross-sectional, descriptive, analytical, and correlational epidemiological survey. It was carried out at the University Hospital of Laayoune and aimed to characterize the epidemiological profile of cancer patients across multiple dimensions: individual, biological, and organizational. A quantitative research approach was adopted to collect structured, large-scale data, thereby enabling systematic description and robust statistical analysis. The main variables included:

- Individual factors: age, sex, medical history, and dietary habits.
- Biological factors: type of cancer, stage of disease progression, and treatment outcomes.
- Organizational factors: access to healthcare, quality of services, and support systems available to patients.

This quantitative approach allowed for precise measurement and analysis of epidemiological patterns and facilitated the identification of relationships between nutrition and cancer.

3. TARGET POPULATION AND SAMPLING

3.1. Sampling Frame

A central element of this study was the development of an appropriate sampling frame, essential for ensuring representativeness and validity. The frame comprised 286 individuals listed in the oncology hospital database of the University Hospital of Laayoune. It included detailed clinical and biological records such as medical history, cancer type, treatment received, and other relevant information.

The adoption of this sampling frame provided several advantages:

- It allowed results to be extrapolated to the wider population of cancer patients in the region.
- It enabled the use of advanced statistical methods, such as hypothesis testing, ANOVA, and multiple regression, to detect associations and causal links between dietary factors, cancer types, and clinical outcomes.
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2.2. Stratification Criteria

To improve precision and optimize sample size, stratification of the study population was carried out using the following criteria:

- Cancer type (e.g., breast, lung, colorectal).

- Cancer stage (early, advanced, metastatic).
- Age and sex, to explore demographic differences in incidence and response to treatment.
- Socioeconomic status and education level, given their influence on dietary behaviors and healthcare access.

2.3. Data Collection Instruments

A triangulated approach was applied to enhance data validity and reliability. Three complementary methods were used:

- Observation: Direct observation of patients' living and treatment conditions to capture contextual and behavioral information.
- Questionnaire: A structured tool designed to collect quantitative data on demographics, diet, medical history, and other relevant variables.
- Qualitative interviews: Semi-structured interviews aimed at exploring patients' perceptions, lived experiences, and challenges in accessing care.

This combination of quantitative and qualitative instruments ensured a comprehensive understanding of the epidemiological and nutritional profiles of cancer patients.

4. TOOLS AND TECHNIQUES

4.1. Quantitative Analysis

Statistical analyses were performed using SPSS software (version 21.0, code 867267). The process included:

- Data preparation: cleaning, coding, and handling missing values.
- Descriptive statistics: calculation of frequencies, percentages, means, medians, and standard deviations.
- Tests of association: Chi-square tests were applied to examine relationships between categorical variables.

The Chi-square procedure followed the standard steps:

1. Formulation of hypotheses (H_0: independence; H_1: association).
2. Construction of contingency tables.
3. Calculation of observed and expected frequencies.
4. Computation of the Chi-square statistic ($\chi^2 = \Sigma ((O-E)^2 / E)$).
5. Determination of degrees of freedom ((rows−1) × (columns−1)).
6. Comparison of χ^2 with the critical value at $\alpha = 0.05$.
    - χ^2 > critical value → reject H_0.
    - χ^2 < critical value → fail to reject H_0.

In addition, **logistic and linear regression models** were employed to predict outcomes and identify the most influential independent factors, while controlling for confounding variables.

3.2. Significance Level

The threshold for statistical significance was set at $\mathbf{p < 0.05}$, indicating that results with less than a 5% probability of occurring by chance were considered statistically significant.

5. RESULTS & DISCUSSION

To examine cancer patients through both their nutritional and epidemiological profiles, this study applies the proposed methodology in an empirical setting. Using IBM SPSS, the analysis was conducted on a sample of 100 patients, focusing on the key factors influencing cancer outcomes in the Laayoune Sakia El Hamraa region of Morocco. The process began with the formulation of research hypotheses, followed by quantitative analysis to evaluate the demographic characteristics and overall profile of respondents. Subsequently, inferential statistics, including chi-square tests, were employed to assess associations between variables. The findings of these tests were then interpreted and discussed in relation to existing literature.

This research takes place in a significant local context, as patients in Laayoune have, for the past year, benefited from comprehensive cancer care with the establishment of an oncology and hematology center, supported by the initiatives of the Lalla Salma Foundation for Cancer Control.

Adopting a multifactorial approach, the study explores the interplay between cancer, nutrition, and various sociodemographic and behavioral determinants, while accounting for regional specificities and potential risk factors. This framework aims to generate a nuanced understanding of these relationships within the Laayoune Sakia El Hamraa population.

As illustrated in Figure 1, the distribution of cancer types within the study cohort highlights **breast cancer (C50)** as the most prevalent, with 47 cases. This is followed by **lung cancer (C34)** with 10 cases, and both **bladder cancer (C67)** and **colorectal cancer (C18)** with 7 cases each. Meanwhile, **stomach cancer (C16)** and **colon cancer (C53)** each account for 3 cases, while **brain tumors (C71)**, **pancreatic cancer (C25)**, and **nasopharyngeal cancer (C11)** were each reported in 2 patients. Other cancer types were observed at lower frequencies. Overall, breast cancer represents the predominant diagnosis in the study population.

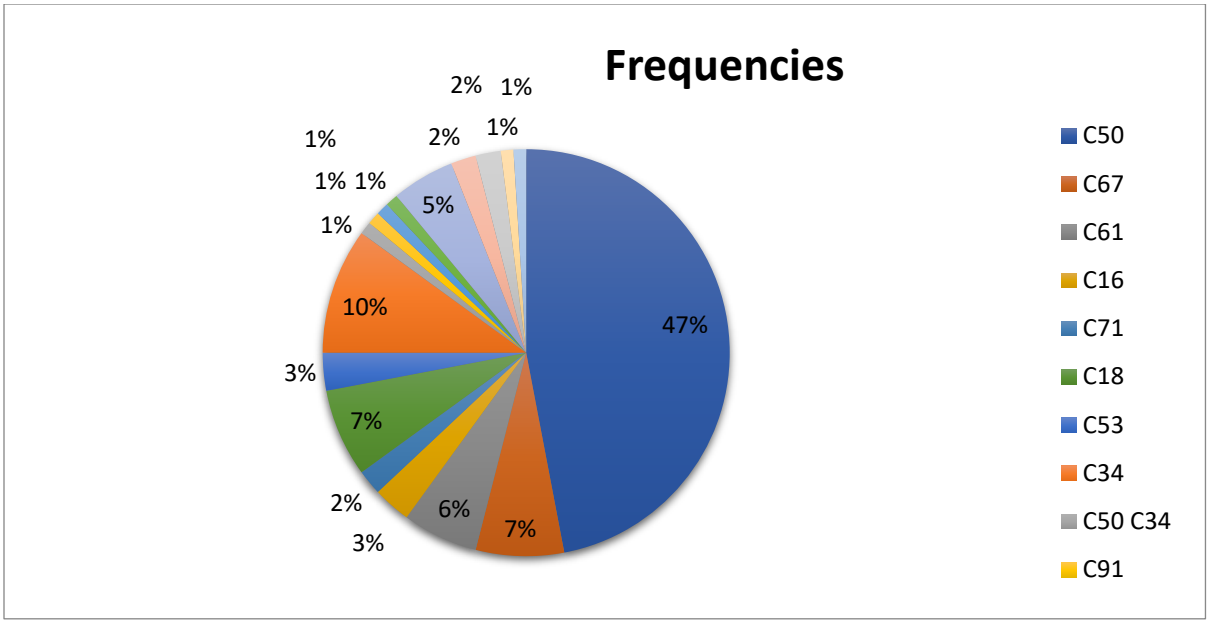

Figure 1: Different Types of Cancer Patients.

Figure 2 below shows the distribution according to the different stages of cancer. According to the frequency analysis, stage 1 comprises 38 respondents while stage 2 comprises 36, stage 3 comprises 18 and stage 4 comprises 8. This distribution shows that most of the patients are from the initial stage of cancer, which is more curable. This pattern implies a possibility of early diagnosis.

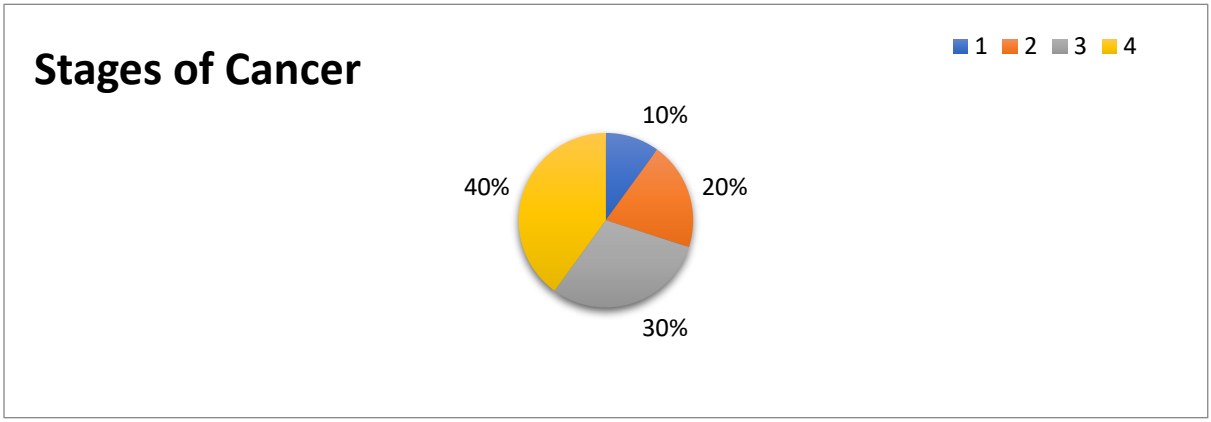

Figure 2*:* Relative frequencies of different stages of cancer.

According to the figure 3 below, 17 respondents reported having suffered from obesity. Then comes cardiovascular diseases with 9 patients. It is important to note that cancer affects 41 respondents. This fact shows that the chosen phenomena have a considerable impact on this region. All these results are remarkable because they reveal the popularity of comorbidities in cancer patients. This is important because comorbidities could exacerbate treatment outcomes and other aspects of health.

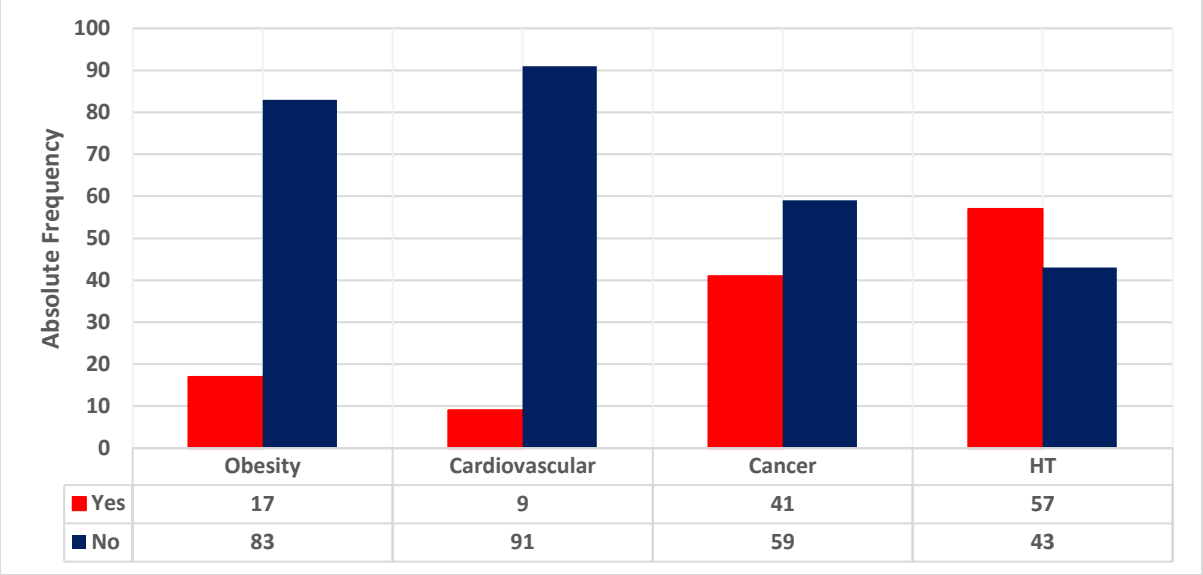

Figure 3: Personal medical history.

Frequency analysis of family medical history (Figure 4) revealed that diabetes is one of the most common pathologies and 62 respondents reported its history. Regarding obesity, 35 cases also indicate a family tendency. The incidence of cardiovascular diseases is also a common problem in the study population, with 38 respondents reporting a family history of such diseases. The percentage of cancer coincides most with that of cardiovascular diseases, which was also 38. The data highlight the complex and multifactorial potential of carcinogens. Therefore, these results highlight the complex relationship between lifestyle factors and genetic predispositions in the development of cancer in people from this region.

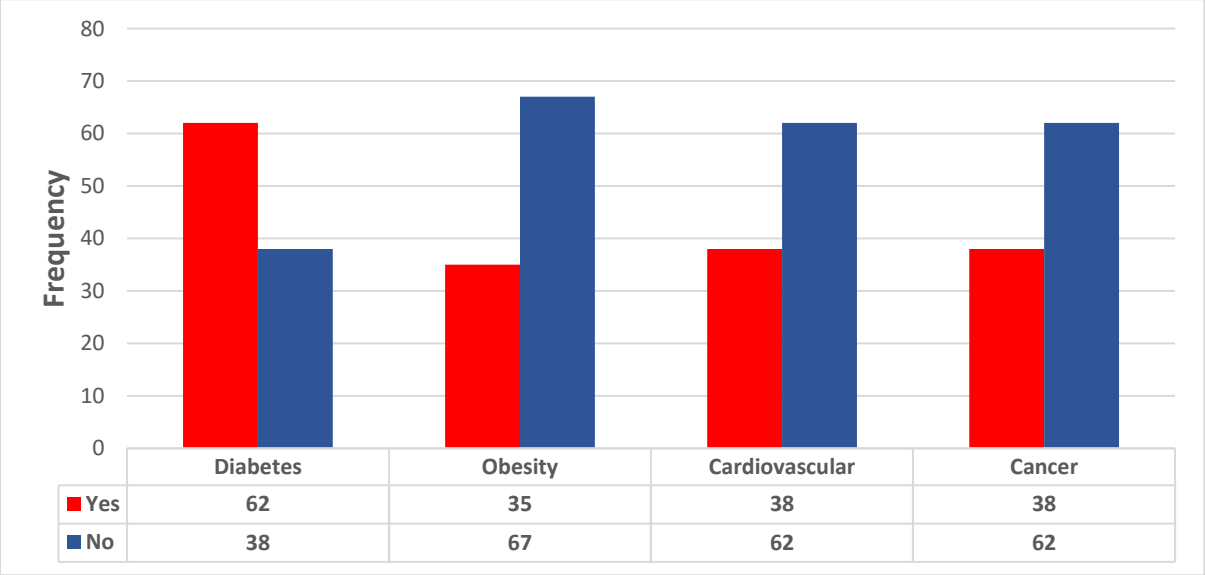

Figure 4: Family medical history

This section presents the results on the demographic characteristics of the patients who participated in the survey. Frequency analysis is used for the representation, consisting of text and graphs. The figure below shows the demographic composition of the main factors such as gender, age, marital status and residential area.

Frequency analysis (Figure 5) revealed that more female respondents responded to the survey, 65 compared to 35 male respondents. This shows a higher representation of females in the survey. Regarding age, it was found that the majority (37) of the study participants are in the age bracket of 36-50 years. This was followed by 28 respondents in the age bracket of 61-75 years, and 24 respondents are between 51-60 years. Civil status shows that 69 respondents in the study sample are married, 18 of whom are widows. The urban population is highly represented in the results, as 77 participants are urban, while the remaining 23 are rural. Therefore, most of the study participants are middle-aged married women residing urban areas.

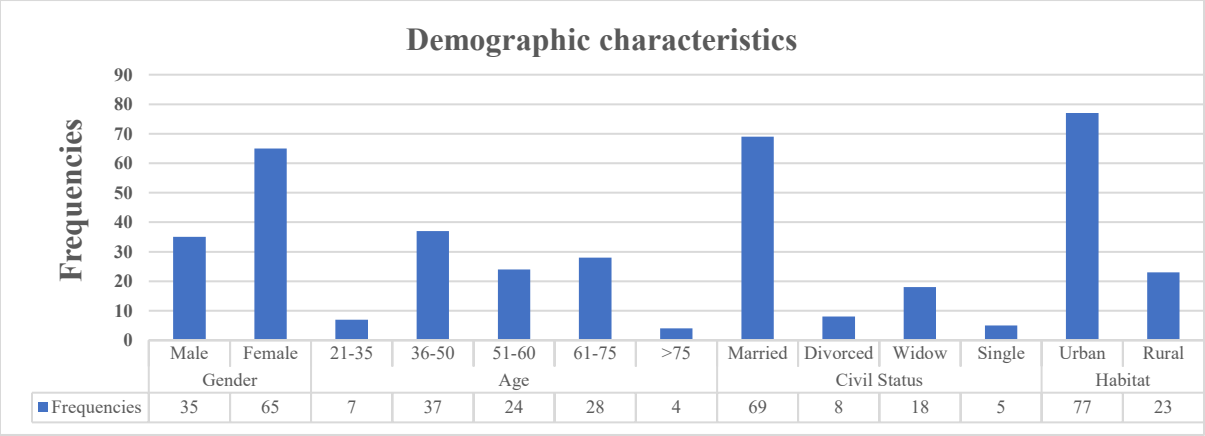

Figure 5: Demographics of survey participants.

In Figure 6 below, we can see that the majority (55) of respondents reported having a professional activity against 45 without work.

Figure 6 below also shows that only 10% of spouses of heads of households reported having a professional activity compared to a majority of 90% who were unemployed.

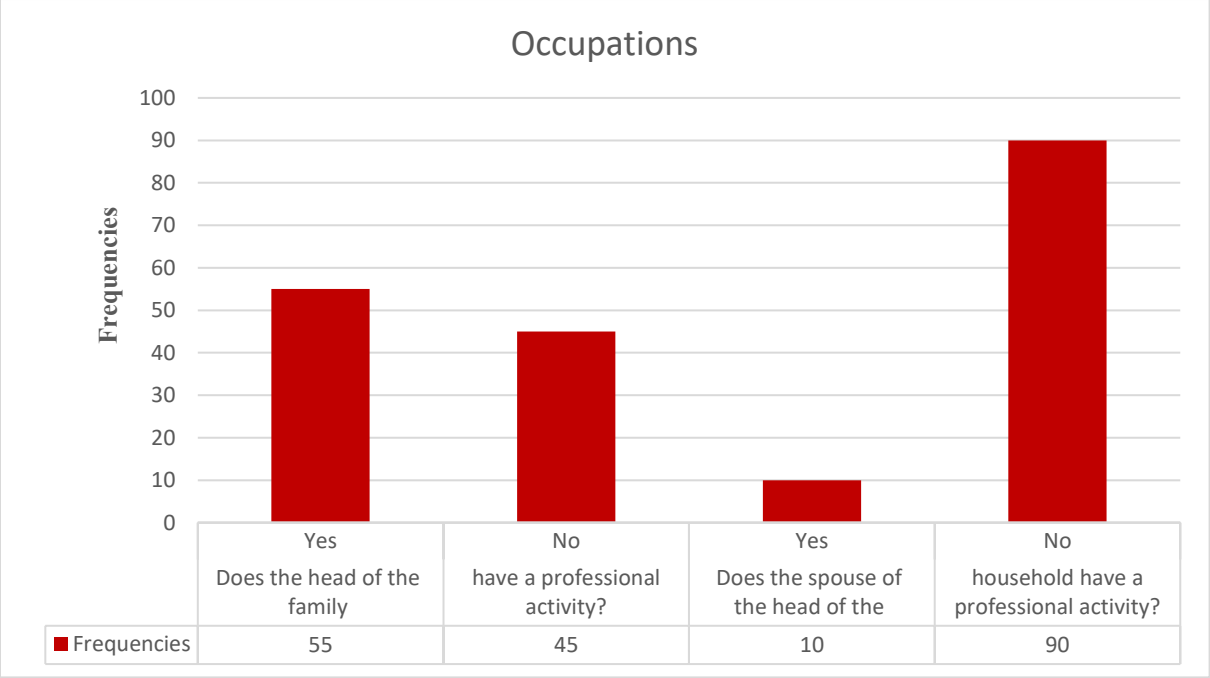

Figure 6: Occupation of head of household and spouse.

In Figure 7 below, it can be seen that the majority (53) of respondents have households of 4 to 6 people. At the same time, 35 and 12 respondents in the sample reported between 0 and 3 individuals and more than 7. In terms of income categories, 53 households have active support, 29 have none and 18 have two. This suggests a potential strain on the resources of single-income households.

It is important to note that most of the respondents (81) usually use public health services. In terms of social coverage, the most widely applied scheme is the CNSS-P, reported by 39 households. This is followed by the CNOPS for 32 households, the CNSS for 26 and the OCP for only 3. Thus, the results show that most cancer patients in the region rely on public health services, while the type of social security is diverse, with the CNSS-P being the most common source.

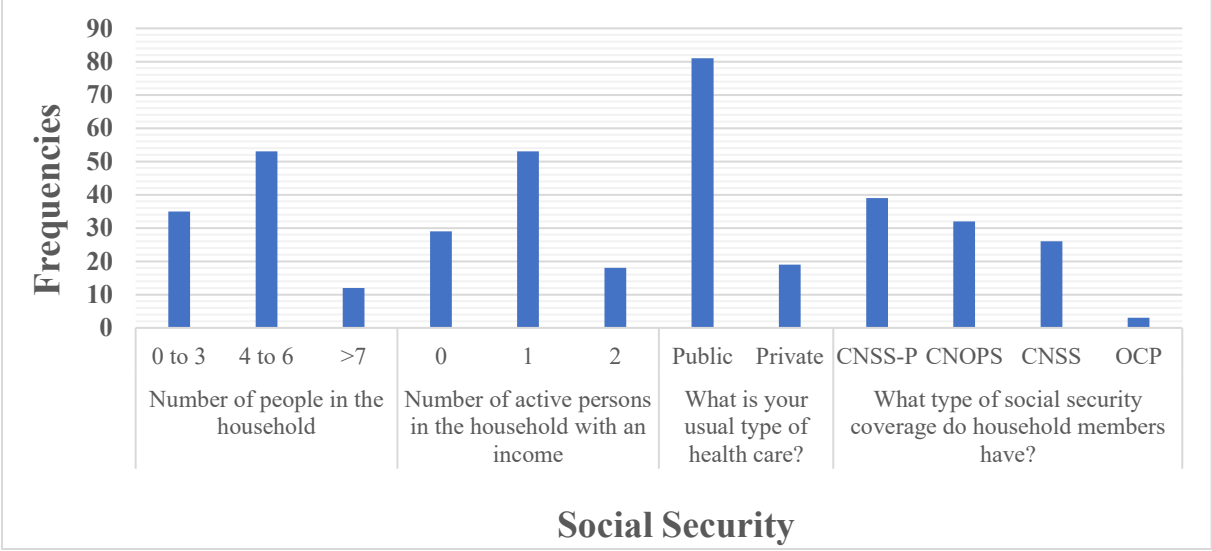

Figure 7: Health care and social security information.

Analysis of Figure 8 below shows that among the women surveyed, a significant majority reported a number of pregnancies of 0 to 3, representing 71 of the respondents. 26 women surveyed had 4 to 5 pregnancies, and 3 of them had more than five pregnancies in their lifetime. Intuitively, the situation with children is similar, as 74 had between 0 and 2. Others 24 reported a number of between 3 and 5 children and only 2 reported having more than five children. Thus, the results reinforce the notion of a declining number of pregnancies and children among the surveyed population.

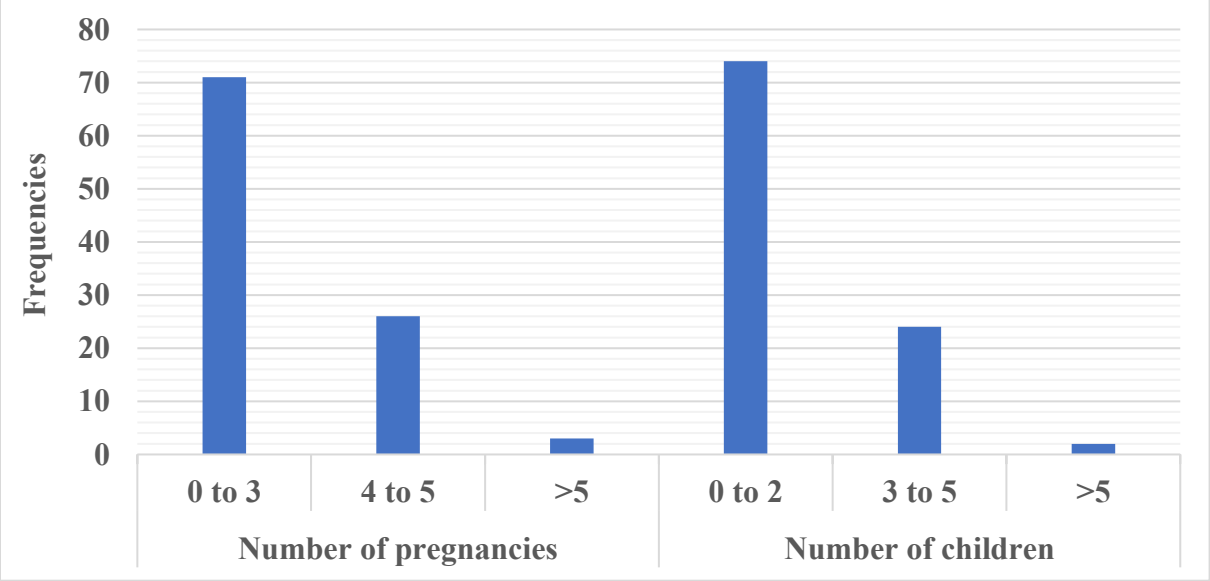

Figure 8: Background to the number of pregnancies and children.

6. CONCLUSION

This research focused on assessing the epidemiological profile of cancer patients. The analysis showed that most patients were women, urban residents, aged between 36 and 75 years, married, and non-smokers. Using the chi-square test to examine variable relationships, it was found that age, sex, and marital status influenced the type of cancer, while only sex was associated with cancer stage. Age also played a role in patients' medical history, with cardiovascular diseases showing a significant effect on cancer outcomes.

The study therefore highlights the importance of sociodemographic characteristics and medical background in shaping cancer profiles. It provides a detailed epidemiological picture of cancer patients in the Laayoune Sakia El Hamraa region through hypothesis formulation, descriptive data analysis, and inferential testing of variable relationships. These findings carry potential implications for cancer prevention and management, offering guidance for developing tailored public health strategies that consider modifiable risk factors and encourage targeted nutritional interventions. By shedding light on patterns such as the prevalence of certain cancer types linked to dietary habits, the research underscores possible connections between nutrition and cancer occurrence. The evidence generated offers a strong foundation for practical recommendations and health policies aimed at reducing cancer incidence through nutritional improvements. Overall, the study enriches the understanding of epidemiological factors related to cancer while pointing toward future research and intervention pathways in nutrition and public health.

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