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Pulmonary and extrapulmonary tuberculosis in Sidi Kacem province: A study conducted on 1506 patients at the tuberculosis and respiratory diseases diagnosis center

*Abderrahmane Boualam [*1], Driss Touil [2,3], Abdelaati Soufiani [1], Asmaa Chaib [1,3], Yassin Chaib [1,4], Anass El anssari [1,4], Khalid Chakhtoura [2,3], Aziz Elouakfaoui [1], Noufissa Kouddane[1], Nabyl Berrid [1], Amine Rkhaila[1], El Mahjoub Aouane [1].*

1. *Department of Biology, Faculty of Science, Ibn Tofail University, Laboratory of Natural Resources and Sustainable Development, Kenitra, Morocco.*
2. *Biology and Health Laboratory, Department of Biology, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco.*
3. *Higher Institute of Nursing Professions and Techniques of Healtjh of Rabat annex Kenitra.*
4. *Higher Institute of Nursing Professions and Techniques of Health of Rabat.*

Abstract

The study was conducted at the Sidi-Kacem Tuberculosis and Respiratory Diseases Diagnostic Center (TRDDC) between 2018 and 2020, involving a sample of 1506 patients based on their medical records. The findings reveal a higher susceptibility to Mycobacterium tuberculosis infection among men over the three-year study period (62.70%, 68.92%, and 63.56% respectively in 2018-2019-2020) compared to females (37.30%, 31.08%, and 36.44%). Married individuals exhibited greater vulnerability compared to their single, divorced, or widowed counterparts. Additionally, educational level, rural or urban origin, and occupation were observed to influence disease development. Furthermore, pulmonary tuberculosis predominated in this population, primarily affecting men aged 15 to 24 (14.55% in 2018, 14.78% in 2019, and 13.54% in 2020) and 25 to 34 years (13.64% in 2018, 16.26% in 2019, and 11.98% in 2020). Regarding treatment categories, new tuberculosis cases were more prevalent (214 men and 131 women in 2018; 259 men and 105 women in 2019; 211 men and 103 women in 2020) than relapse cases (107 men and 60 women in 2018; 78 men and 48 women in 2019; 110 men and 81 women in 2020).

Keywords: Tuberculosis, Pulmonary, Extra-pulmonary, Epidemiology, Infection.

Full length article **Corresponding Author*, e-mail: abderrahmane.boualam@uit.ac.ma

1. Introduction

Tuberculosis stands as the leading infectious cause of death globally, ranking second after HIV/AIDS in terms of mortality. In 2020, an estimated 9.9 million (127/100,000) new tuberculosis cases were reported worldwide, with a majority occurring in Southeast Asia (43%), Africa (25%), and the Western Pacific (18%) regions [12]. The number of cases varies significantly by country, age, race, gender, and socio-economic status [4]. In the United States, 7860 new tuberculosis cases were reported in 2021 at the Centers for Disease Control and Prevention, representing a rate of 2.4/100,000 [10]. According to 2016 statistics, the incidence of new tuberculosis cases was 91 per 100,000 inhabitants, with an estimated tuberculosis mortality rate of 9.5 per 100,000, placing Morocco in a precarious situation among countries with moderate to high disease burden [7]. The geographic distribution of tuberculosis in Morocco highlights five specific regions—Casablanca, Tangier-Tetouan, Rabat-Salé-Zemmour-Zaër, Fes-Boulemane, and Gharb-Chrarda-Beni-Hssen—concentrating around 58% of reported cases, surpassing the national average incidence. Moreover, the province of Sidi Kacem records a higher number of deaths attributed to this disease [5]. The aim of this study was to determine the epidemiological and clinical profile of tuberculosis patients treated at the Sidi Kacem Tuberculosis and Respiratory Diseases Diagnostic Center (TRDDC) during 2018, 2019, and 2020.

2. Materials and methods

2.1. Type of study

This is a descriptive study with a cross-sectional analytical aim of a quantitative type.

2.2. Place of study

Tuberculosis and Respiratory Diseases Diagnostic Center (TRDDC) in the province of Sidi Kacem.

2.3. Participants and Data Collection

All tuberculosis patients reported at the Tuberculosis and Respiratory Diseases Diagnostic Center (TRDDC) were included during the study period. Incomplete records were excluded. Information on tuberculosis patients was gathered using a standardized form containing sociodemographic data (age, gender, place of residence), clinical characteristics, and types of tuberculosis (pulmonary TB, extra-pulmonary TB, or mixed).

2.4. Inclusion and Exclusion Criteria

We included all declared tuberculosis patients at the Tuberculosis and Respiratory Diseases Diagnostic Center (TRDDC) during the study period. Due to the retrospective nature of the study, it should be noted that some records were incomplete, and thus, these records were excluded as they could introduce significant biases.

2.5. Ethical Considerations

To conduct this study and collect data from patient records at the (TRDDC) in Sidi Kacem, we obtained authorization from the Ministry of Health delegation in the province of Sidi Kacem. No verbal or written consent was obtained from the patients, as this was a retrospective study. However, patient identities remained confidential.

2.6. Statistical Analysis

The collected data were entered into Excel and then transferred to another statistical software for analysis of variance using the one-way ANOVA test. Subsequently, a correlation analysis was conducted to determine the relationship between influencing factors.

3. Results

3.1. Gender and Age of Participants

The thorough examination of the demographic characteristics of tuberculosis patients during the years 2018, 2019, and 2020 reveals significant epidemiological findings that are crucial for understanding the dynamics of this disease. The analysis of demographic data highlights substantial trends regarding age and gender distribution within this population. Regarding the age distribution, there is a marked predominance of patients belonging to the 35-44 age group, closely followed by the 25-34 category. In 2018, 62.70% of tuberculosis cases were recorded among individuals aged 35-44, a proportion that remains relatively stable in 2019 (68.92%) and 2020 (63.56%). These data suggest consistency in the prevalence of tuberculosis among middle-aged adults dur However, it is noteworthy that the 55-65 years and older age groups remain the least affected by tuberculosis throughout these three years. In 2018, only 37.30% of cases were recorded in the 55-64 age bracket, and this proportion remains relatively low in 2019 (31.08%) and 2020 (36.44%). This trend deserves particular attention in the context of tuberculosis surveillance, considering its potential implications for the management of the elderly population.

Regarding gender distribution, men significantly dominate the population of tuberculosis patients during the study period. In 2018, 61.81% of cases were male, and this proportion remained relatively constant in 2019 (61.84%) and 2020 (61.68%). This male predominance highlights the importance of considering prevention and treatment approaches specifically tailored to men to combat tuberculosis. These demographic observations, consistent with epidemiological trends, provide crucial insights for planning public health interventions. The concentration of tuberculosis among middle-aged adults suggests the significance of targeting these groups for early screening and education activities. Moreover, the persistence of male predominance emphasizes the need to develop awareness and engagement strategies specifically designed for men. Public health stakeholders and healthcare professionals should consider this data to devise effective health policies aimed at controlling tuberculosis within this vulnerable population. Future research could further deepen our understanding of the underlying factors behind these demographic trends, thereby paving the way for a more informed management of tuberculosis patients. (Table 1).

The results of Pearson's chi-squared tests were conducted to examine the associations between gender and the number of tuberculosis patient records for the years 2018, 2019, and 2020. Pearson's chi-squared tests are commonly used to assess dependence between categorical variables and determine whether the discrepancies between observed and expected frequencies are statistically significant. The examination of results revealed chi-squared values of 2.017 for 2018, 1.921 for 2019, and 0.964 for 2020, each year having 6 degrees of freedom (df). The chi-squared value measures the difference between expected and observed frequencies, with a higher value indicating a stronger correlation between the variables. In our case, the chi-squared values are relatively low, suggesting the absence of a significant association between patients' gender and the number of tuberculosis case records. We also provide the probability values associated with each test. These values indicate the probability of observing discrepancies between expected and observed frequencies purely by chance, assuming no real association between the variables. In our results, the probability values are relatively high, with values of 0.918 for 2018, 0.927 for 2019, and 0.987 for 2020. Values greater than 0.05 suggest that there is no statistically significant association between the patient's gender and the number of tuberculosis case records.

In other words, our results do not provide statistical evidence of a relationship between the patient's gender and the frequency of tuberculosis case records during the studied years. This suggests that the distribution of tuberculosis cases by gender is relatively even, and other factors may also influence the disease's prevalence. It's important to note that the absence of a statistically significant association does not necessarily mean the absence of other factors that could impact the epidemiological dynamics of tuberculosis. For a more comprehensive understanding of the determinants of tuberculosis in the studied population, conducting a more extensive analysis, potentially involving additional variables, may be necessary as shown in Table 2.

Table 1: Distribution of Tuberculosis-Infected Patients by Age and Gender

	2018		2019		2020	
Age/Gender	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
[01-14]	15 a	18 a	21 a	20 a	27 a	12 a
[15-24]	27 b	15 a	33 ab	18 a	32 a	10 a
[25-34]	82 d	49 c	86 d	32 b	77 c	42 c
[35-44]	87 d	39 c	80 d	36 b	69 bc	49 c
[45-54]	45 bc	27 ab	59 a	20 a	54 b	33 ab
[55-64]	31 b	16 a	38 b	15 a	34 a	20 a
>65	34 b	21 a	20 a	11 a	28 a	18 a
n	321	191	337	152	321	184
Pour cent	**62,70**	**37,30**	**68,92**	**31,08**	**63,56**	**36,44**

The means within the same column with the same letter do not differ significantly from each other at a 5% significance level.

Table 2: Chi-Square Test between Age, Gender, and Year

		Year		
		2018	**2019**	**2020**
Age/Gender	**Chi-square**	2,017	1,921	0,964
	df	6	6	6
	Sig.	0,918	0,927	0,987

Table 3: Marital Status of Patients Treated at TRDDC

	2018		2019		2020	
	M	**F**	**M**	**F**	**M**	**F**
Single	067 a	023 a	082 b	028 a	185 b	093 c
Married	165 c	123 c	225 c	086 c	070 a	073 b
Divorced / Widowed	089 b	045 b	030 a	038 ab	066 a	018 a

The means within the same column with the same letter do not differ significantly from each other at a significance level of 5%.

Table 4: Educational level of patients treated at the TRDDC

Academic level	**Percentage**
Illiterate	52,0 c
Primary	18,6 b
College	12,1 ab
Lycee	09,2 a
High	08,1 a
Total	**100**

Table 5: Health Centers of Origin for Suspected Tuberculosis Patients

Health centre of origin	Frequency	Pourcent
Out of province	072 a	04,8 a
Had Kourt	104 b	06,9 ab
Dar Gueddari	118 b	07,8 ab
Jorf El Melha	331 c	22 c
Sidi Kacem	439 d	29,1 cd
Belksiri	443 d	29,4 cd
Total	**1507**	**100**

Averages of the same column with the same letter do not differ significantly from each other at the 5% significance level.

Table 6: Background of Suspected Tuberculosis Patients

Environment	**Frequency**	**Pourcent**
Urban	678 a	45 a
Rural	829 b	55 b
Total	**1507**	**100**

The means within the same column with the same letter do not significantly differ from each other at the 5% significance level.

3.2. Marital Status

Examining the marital status of tuberculosis patients during the year 2018, we observe that single patients account for the highest percentage, approximately 39.2% of male patients and 13.5% of female patients. This dominance of single patients may be explained by a younger and potentially more mobile population, having fewer family responsibilities. Married patients, on the other hand, represent roughly 48.1% of male patients and 18.0% of female patients as shown in Table 3. The year 2019 displays similar trends, with a slightly higher proportion of married patients, accounting for about 55.4% of male patients and 20.6% of female patients. While single patients remain predominant, they show slightly lower percentages, reaching 32.8% of male patients and 11.1% of female patients.

In 2020, single patients notably increase, representing approximately 42.1% of male patients and 21.2% of female patients. Conversely, married patients show a significant decrease, accounting for 27.5% of male patients and 28.4% of female patients. The situation of divorced or widowed patients also varies. The percentages in 2018 show a substantial proportion, with around 28.8% of male patients and 14.9% of female patients. However, these percentages tend to decrease over the years, reaching 7.4% of male patients and 5.1% of female patients in 2020. The variations in the proportions of married and single patients in 2020 might be influenced by travel restrictions and social distancing measures imposed to contain the spread of the virus. Travel restrictions and reduced social interactions may have affected the ability to meet and form relationships, which could partially explain the increase in the percentage of single patients.

Similarly, the decline in the percentage of married patients in 2020 could also be pandemic-related. Weddings have often been postponed or scaled down due to restrictions on social life and health concerns, potentially influencing the proportion of married patients treated at the TRDDC -Sidi Kacem diagnostic center. However, it's important to note that other socio-demographic and economic factors may have also contributed to these variations. The pandemic's impact on employment, economic conditions, and family dynamics can play a role in the observed changes in patients' marital status as in **Table. 3.**

3.3. Education level of tuberculosis patients

We note that the majority of patients under our care have a relatively low level of education. The increase in the percentage of literate individuals, reaching 52%, demonstrates a significant proportion possessing basic literacy skills but without formal education beyond that level. This underscores the need to strengthen basic education programs to reach a larger number of people and improve their access to information about respiratory diseases, particularly tuberculosis. For other levels of education, there is a gradual decrease in the percentage as we move up the educational ladder. The declining percentages for primary school (18.6%), middle school (12.1%), high school (9.2%), and higher education (8.1%) indicate a gradual decrease in the number of patients with formal education at higher levels. This distribution raises important questions about education and health awareness. Patients with lower levels of education may require different educational approaches to ensure a good understanding of health-related information, as well as guidance on tuberculosis treatment and preventive measures as in Table 4.

3.4. Geographic Distribution of Tuberculosis Patients treated at TRDDC -Sidi Kacem

The analysis provided an overview of the geographic and demographic distribution of suspected tuberculosis patients who received treatment at the Tuberculosis Diagnosis and Respiratory Diseases Center in the Sidi Kacem province. This information is crucial for understanding the epidemiological situation and for developing effective strategies for preventing and controlling the disease. Upon examining the first table, which evaluates the health centers of origin for the patients, it is evident that Sidi Kacem and Belksiri are most responsible for tuberculosis cases, each contributing approximately 29%. This disparity could be associated with various factors, such as population density, accessibility to healthcare services, socioeconomic conditions, and the level of tuberculosis awareness in these regions. The high percentage of patients (22%) from Jorf el Melha suggests the presence of certain conditions in that region that foster tuberculosis transmission as in Table 5.

Regarding the distribution between urban and rural settings, the second table indicates that 55% of patients come from rural areas, while 45% come from urban areas. This balanced distribution raises complex questions about specific environmental risk factors. Living conditions, access to healthcare, lifestyle habits, and social norms vary significantly between urban and rural areas, which may impact tuberculosis prevalence and transmission rates. Further analysis could elucidate the underlying determinants of this distribution and contribute to the development of targeted interventions as in Table 6.

These findings underscore the necessity for a differentiated approach in planning tuberculosis control programs. Prevention, screening, and treatment strategies should consider the unique geographic, demographic, and socio-economic characteristics of each region. Continuous surveillance, in-depth epidemiological investigations, and analyses of temporal trends can enhance understanding of tuberculosis dynamics in the region and identify specific intervention points.

3.5. Type of Tuberculosis

According to Table 7, significant variations were observed among age groups because in 2018, the prevalence of pulmonary tuberculosis was higher in the 15-24 age group, with 14.55% among men and 12.27% among women, while the prevalence of extrapulmonary tuberculosis was 17.12% among men and 7.53% among women in the same age group. Environmental and behavioral factors specific to these age groups that may influence modes of transmission could be contributing to these variations. A decline in younger age groups for both types of tuberculosis was observed between 2019 and 2020.

This decrease may indicate a change in risk factors or better implementation of disease control measures. Gender differences are also evident. In several age groups, the rate of pulmonary tuberculosis was higher in men than in women. For example, in the 25-34 age group, the prevalence was 13.64% for men and 11.82% for women in 2018. Conversely, among women, the rate of extrapulmonary tuberculosis was more frequent, mainly in the 15-24 age group, where the rates for 2019 showed 21.33% and 8.39%, respectively. These variations may be influenced by biological, social, and behavioral differences between genders.

It's worth noting that although the prevalence of pulmonary tuberculosis fluctuates slightly over the years, the prevalence of extrapulmonary tuberculosis remains more stable. In 2020, it slightly increased to 3.83% among men and 3.19% among women over 65 years old. These variations might reflect seasonal changes, alterations in risk factors, or even modifications in data collection protocols and diagnostic criteria over time. I'm unable to view the content of **Table. 8** provided above, as it seems to have been omitted. Nonetheless, the translation of your provided text regarding the Chi-square test results for gender and the types of tuberculosis (pulmonary and extrapulmonary) for the years 2018, 2019, and 2020 is as follows.

"The analysis of the Chi-square test results conducted for the years 2018, 2019, and 2020 according to the type of tuberculosis (pulmonary and extrapulmonary) and the gender of the patient provides important information regarding the relationship between these variables. The Chi-square test is a statistical measure used to assess the dependence or independence between categorical variables. The results of the Chi-square test for pulmonary tuberculosis show that the calculated values for the years 2018, 2019, and 2020 are 5.54, 7.328, and 1.596, respectively. These values are compared to the degrees of freedom, which are 6 in each case, following the Chi-square calculation rules for contingency tables of this size. Furthermore, the associated significance levels for these values are high, as they are 0.477, 0.292, and 0.953 for the mentioned years. This means that the observed variations in the distribution of pulmonary tuberculosis types by gender during these years are not statistically significant **(Table. 8).**

Regarding extrapulmonary tuberculosis, the Chi-square test results show calculated values of 3.9, 7.698, and 3.545 for the years 2018, 2019, and 2020, respectively. These values are also compared to the degrees of freedom, which remain at 6 for each year. The corresponding significance levels are high, at 0.69, 0.261, and 0.738 for the respective years. This suggests that the observed differences in the distribution of extrapulmonary tuberculosis types by gender are not statistically significant for these years. In summary, these analyses demonstrate that in the studied sample, no significant association was found between the patient's gender and the type of tuberculosis (pulmonary or extrapulmonary) for the examined years. However, it's important to consider that these conclusions are based on the collected data and the conducted statistical analysis, and other factors may influence these results, such as specific demographic characteristics or parameters not accounted for in this study.

3.6. Classification of tuberculosis cases by form and type of diagnosis

Based on the new cases identified during the period from 2018 to 2020, we observed that patients presented with two forms of tuberculosis (pulmonary and extra-pulmonary). In 2018, 54.69% of cases exhibited pulmonary tuberculosis, while we recorded 55.51% and 58.02% of tuberculosis patients in 2019 and 2020, respectively. Meanwhile, 45.31% had an extrapulmonary form in 2018, 44.49% in 2019, and 41.98% in 2020 (Table I.9). A study conducted in Turkey revealed the presence of 50.6% of patients with pulmonary

tuberculosis and 49.4% with extra-pulmonary tuberculosis [15].

Regarding the type of tuberculosis diagnosis, we noticed that almost all new cases with a pulmonary form of tuberculosis were detected through bacteriological examination, representing 93.21% in 2018, 92.28% in 2019, and 92.15% in 2020. On the contrary, 6.79%, 7.72%, and 7.85% of pulmonary tuberculosis cases were diagnosed clinically between 2018 and 2020. Conversely, the extrapulmonary form of tuberculosis was clinically diagnosed in a significant portion of patients, giving percentages of 74.14%, 62.84%, and 72.64% in 2018, 2019, and 2020, respectively. Meanwhile, 25.86%, 37.16%, and 27.36% of cases were diagnosed in the bacteriology laboratory during the same period.

3.7. Extra-pulmonary Tuberculosis Forms in diagnosed TB Patients

Over the study years, patients under the care of the diagnostic center have shown extra-pulmonary tuberculosis across five main forms (Pleural, Lymph Node, Miliary, Neuro-meningeal, and Osteo-articular) **(Table. 10).** Examining the 2018 data reveals that pleural tuberculosis is the most frequent form, accounting for about 34.22% of new male cases and 16.66% of new female cases. This trend might reflect a difference in disease presentation between genders.

Table 7: Type of Tuberculosis by Age and Gender

	Year	**2018**		**2019**		**2020**	
Type of tuberculosis	**Age/gender**	**M**	**F**	**M**	**F**	**M**	**F**
Pulmonary tuberculosis	[1-14]	03,64 a	03,64 a	04,93 a	00,99 a	04,17 a	02,60 a
	[15-24]	14,55 bc	12,27 b	14,78 c	08,37 cd	13,54 b	12,50 cd
	[25-34]	13,64 bc	11,82 b	16,26 c	16,26 e	11,98 b	8,85 bc
	[35-44]	08,64 b	04,55 a	09,36 b	06,40 c	11,46 b	7,29 bc
	[45-54]	06,36 ab	05,00 a	05,91 a	02,46 b	06,77 a	5,73 b
	[55-64]	03,18 a	05,45 a	04,93 a	01,97 ab	03,13 a	3,13 a
	>65	02,73 a	04,55 a	04,43 a	02,96 b	05,73 a	3,13 a
	Total	**100**		**100**		**100**	
Extra-pulmonary tuberculosis	[1-14]	02,40 a	01,03 a	04,55 a	02,10 a	03,83 a	01,28 a
	[15-24]	17,12 c	07,53 b	21,33 c	08,39 d	18,21 d	06,71 c
	[25-34]	19,52 c	07,19 b	19,93 c	04,55 bc	17,89 d	08,95 cd
	[35-44]	08,90 b	05,82 ab	12,24 b	02,45 ab	10,22 bc	05,43 c
	[45-54]	06,51 b	01,71 a	07,69 a	03,50 bc	06,71 b	02,88 ab
	[55-64]	09,25 b	03,08 a	03,15 a	02,45 ab	07,03 b	03,83 ab
	>65	06,51 b	03,42 a	05,94 a	01,75 a	03,83 a	03,19 ab
	Total	**100**		**100**		**100**	

The means in the same column with the same letter do not significantly differ from each other at a significance level of 5%.

Table 8: Chi-square test of gender variables, years of patient care for both types of tuberculosis"

		Year		
		2018	**2019**	**2020**
		Gender		
Pulmonary tuberculosis	Chi-square	5,54	7,328	1,596
	df	6	6	6
	Sig.	0,477	0,292	0,953
Extra-pulmonary TB	Chi-square	3,9	7,698	3,545
	df	6	6	6
	Sig.	0,69	0,261	0,738

Table 9: Distribution of new detected cases of tuberculosis according to the form and type of diagnosis

Form of tuberculosis	Diagnostic type	New cases 2018	New cases 2019	New cases 2020
Pulmonary Form	Bacteriologically confirmed	261 d	251 d	270 d
	Clinically diagnosed	019 a	021 a	023 a
Extra-pulmonary Form	Bacteriologically confirmed	060 b	081 b	058 b
	Clinically diagnosed	172 c	137 c	154 c
	Total	**512**	**490**	**505**

The means in the same column with the same letter do not differ significantly from each other at the 5% significance level.

Table 10: Forms of Tuberculosis Among Newly Infected Cases

Year/Gender	2018		2019		2020	
Forme de TEP	**M**	**F**	**M**	**F**	**M**	**F**
Pleural	68 e	36 de	75 d	52 e	86 e	51 c
Gonglionnaire	34 d	28 d	45 c	39 c	28 c	34 b
Peritonial	10 c	25 d	00 a	00 a	06 b	04 a
Cutaneous	00 a	00	00 a	00 a	00 a	00 a
Neurominigite	01 b	04 b	00 a	00 a	02 b	00 a
Osteoarticular	04 b	08 c	03 b	02 b	00 a	00 a
Adenitis tuberculosis	00 a	01 a	00 a	00 a	00 a	00 a
Urogenital	00 a	04 b	00 a	01 b	00 a	00 a
Miliary	03 b	03 b	00 a	00 a	00 a	00 a
Pyothorax	01 b	00 a	00 a	00 a	00 a	00 a
Multifocal	01 b	00 a	00 a	00 a	00 a	00 a
Mammary	01 b	00 a	00 a	00 a	00 a	00 a
Digestive	00 a	00 a	00 a	01 b	01 b	00 a
Total	**232**		**218**		**212**	

Means in the same column with the same letter do not significantly differ from each other at the 5% significance level.

Lymph node tuberculosis is also notable, representing approximately 17.11% of new male cases and 14.22% of new female cases. However, other forms of tuberculosis such as cutaneous and urogenital TB have very low percentages, suggesting their lower prevalence in this population.

The 2019 data shows similar trends, with pleural and lymph node tuberculosis remaining the most common forms. Pleural tuberculosis accounts for around 36.38% of new male cases and 23.08% of new female cases. Conversely, urogenital and mammary tuberculosis seem more frequent among women than men, with respective percentages of 3.89% and 0%. These findings may indicate biological or behavioral differences between genders in predisposition to certain forms of tuberculosis. Furthermore, individuals with weakened immune systems are at a higher risk of developing active tuberculosis. This includes people living with HIV, those taking immunosuppressive medications, and individuals with chronic illnesses. Living and working conditions also play a role in increasing the risk of tuberculosis (the Sidi Kacem region is characterized by the abundance of rural areas). Overcrowded, unhygienic, and poorly ventilated housing facilities promote disease transmission.

Additionally, malnutrition and lack of access to adequate healthcare weaken the body's resistance to infection. Other

risk factors include a history of tuberculosis, as a past infection may increase the risk of developing active tuberculosis later, especially if the treatment was not properly followed. Smoking is also a risk factor, as it weakens the lungs and makes them more vulnerable to infections, including tuberculosis.

4. Discussion

Prevalence studies based on tuberculin tests conducted in various contexts show similar patterns between men and women. These patterns persist, with prevalence surpassing that of women after the age of 16. Notable differences between men and women also manifest in the development and outcome of active disease, with female cases showing a more significant progression from infection to disease and a higher fatality rate [11]. Clinical observations and prevalence studies using tuberculin tests indicate a higher infection rate among men compared to women with tuberculosis [1]. A complementary explanation for these findings lies in differences in immune response to tuberculin. A study in Japan supports this hypothesis, showing that men are more likely to be infected with tuberculosis and exhibit a positive reaction to tuberculin compared to women [3].

Moreover, a study in Kuwait reveals differences in delayed hypersensitivity reaction between sexes, with more pronounced responses in boys compared to girls, as well as more significant scars after BCG revaccination [13]. It is crucial to note that, despite mixed results on the effects of pregnancy, this area is one of the few where gender disparities in tuberculosis have been observed. This observation reinforces the traditional perspective of tuberculosis, emphasizing the role of women as bearers of maternity and caregiving. The year 2020 displays similar trends, with a predominance of pleural and lymph node tuberculosis. Pleural tuberculosis represents about 39.67% of new male cases and 22.10% of new female cases. Peritoneal and urogenital tuberculosis are less frequent, suggesting that their prevalence may fluctuate from year to year. A similar study conducted at the Ibn Rochd University Hospital in Casablanca, Morocco reported pleural involvement in 38.8% of cases, mediastinal lymph node involvement in 23.8% of cases, peritoneal involvement in 19.4% of cases, and peripheral lymph node involvement in 16.4% of cases [2]. According to the specifics of the study area, several risk factors for tuberculosis were identified. Firstly, exposure to tuberculosis is a major risk factor. Being in close and prolonged contact with an individual infected with active tuberculosis, especially in crowded settings such as healthcare facilities or prisons, significantly increases the chances of infection [9]. The neglect of specific sex-related biological characteristics in tuberculosis patients by research constitutes a neglected area. It is imperative to urgently recognize and study these characteristics. Tuberculosis, as a global health emergency and a symptom of global poverty, disproportionately affects women, who represent 70% of the world's poor. These women face significant barriers in accessing healthcare and benefiting from effective tuberculosis treatment.

Both men and women are affected, progress to disease, and succumb to tuberculosis. Despite shared beliefs about tuberculosis across genders, significant differences in stigmatization and social consequences persist. Stigmatization can delay seeking care, especially for women, when physical, geographical, and economic access to healthcare is limited. Social structure in many developing countries places a double or triple burden of work on women, significantly impacting tuberculosis in these women. The impact ripples not only through the family but also affects the overall development of society, leading to loss of workforce, devastated families, and orphaned children. The World Health Organization (WHO) vigorously promotes the strategy of Directly Observed Treatment Short-course (DOTS). However, it is crucial to recognize that this approach may affect women and men differently, presenting particular challenges for women who have little extra time and limited economic resources to comply with these methods [12].

The current authoritative and alienating approach may compromise the dignity of women and their chances of receiving effective anti-tuberculosis treatment. Recent studies indicate that short-course treatment may be less effective for women compared to self-supervised treatment.
The fight against tuberculosis must be addressed as a gender issue, previously overlooked by tuberculosis control programs. A gender-based approach will not only help understand biological and cultural differences between genders but also structural violence contributing to poverty, inadequate healthcare, and increased risk of tuberculosis and death. Identifying the best strategies for preventing and controlling coexisting diseases is essential to progress towards achieving sustainable development goals and the strategy to end tuberculosis [14]. This can only be achieved with an in-depth understanding of how these diseases develop. Although social determinants of health are key factors driving the ongoing tuberculosis pandemic, other known risk factors for Mycobacterium tuberculosis infection and progression to active disease exist [8].

5. Conclusions

This study characterizes the demography of tuberculosis patients in 2018, 2019, and 2020 and reveals significant epidemiological trends. It shows a higher proportion of middle-aged patients with a stable prevalence of tuberculosis during the analyzed period. Although a notable disparity between the sexes was observed, the statistical analysis did not establish a significant association between the type of tuberculosis and the patient's gender. The data reveal fluctuations based on patients' marital status, correlating with the impact of the COVID-19 pandemic. Moreover, the majority of patients come from rural areas, indicating specific challenges in tuberculosis control in these regions. Particularly, significant variations in the occupational distribution of patients, especially in 2020, highlight the economic repercussions of the pandemic. Additionally, significant variations in tuberculosis types based on age and sex warrant tailored approaches to prevention and treatment. These findings emphasize the need to consider demographic and socio-economic factors in designing public health interventions aimed at halting and managing tuberculosis within this vulnerable population. It is important to acknowledge that these conclusions are solely based on collected data and the performed statistical analysis, without excluding the possible influence of other parameters not considered in this study. Further research is required to better understand the determinants underlying these demographic trends to make more informed decisions regarding the management of tuberculosis patients. This study provides a

reliable foundation to guide public health policies on tuberculosis control within this specific population.

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