

PREVALENCE, SOCIOECONOMIC AND DEMOGRAPHIC DETERMINANTS OF SMOKING AMONG ADULTS IN SALÉ- MOROCCO: A CROSS-SECTIONAL SURVEY

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Abstract

Background: Smoking is one of the main preventable risk factors for non-communicable diseases (NCD). **Objective:** The objective of this study was to estimate the prevalence of smoking and identify the associated socioeconomic and demographic determinants in the adult (18+) population of Salé, Morocco. **Methods:** A cross-sectional study was conducted in February 2021 using a two-stage stratified probability sampling design. Based on a questionnaire, we collected information on tobacco use and some socioeconomic and demographic variables. **Results:** The prevalence of smoking among adults (both genders) was 23.3% (23.0% in urban and 26.3% in rural). The proportion of smokers was largely higher among men (47.5%) compared to women (1.1%). Additionally, smoking was found to be significantly associated with age, household wealth index, educational level, marital status, occupation, average monthly household income, being the head of household, and having access to improved sanitation facilities (both sexes combined). **Conclusion:** Smoking is a real public health problem in Salé. This requires a comprehensive approach and commitment from all stakeholders to reduce smoking-related mortality and morbidity. Prevention, awareness and social inclusion remain the best methods to reduce the prevalence of smoking.

Keywords: Prevalence, Smoking, Epidemiology, Chronic diseases, Risk factors, Salé-Morocco.

Introduction

Smoking and passive tobacco exposure cause and/or increase the risk of serious chronic diseases such as many types of cancer (lung, head and neck, stomach, liver, pancreas, bladder, cervix, kidney, colon, and leukemia). It is also the main cause of chronic lung diseases such as chronic obstructive pulmonary disease (COPD) and asthma, as well as cardiovascular diseases, eye diseases, diabetes, gingivitis, fertility problems, and general health deterioration [1]. Smoking and passive smoking are therefore important causes of premature mortality and weigh heavily on social security [2]. According to the World Health Organization (WHO), smoking is an important preventable risk factor for non-communicable diseases (NCD). Globally, smoking kills about 8 million people each year, including 1.2 million non-smokers who are unintentionally exposed to cigarette smoke. Tobacco-related deaths will rise to more than 10 million by 2030, with developing countries accounting for more than 80% of all deaths. The global prevalence of smoking was 21.9% in 2016 and 19.8% in the Euro-Mediterranean region [3].

The scourge of smoking also affects Morocco; the Registry of Cancer of Casablanca (2008–2012) revealed that tobacco was responsible for 18.5% of cases of cancer diagnosed in both sexes and 35.4% of cancers in men [4]. Regarding the prevalence of tobacco in Morocco, the WHO estimates that 24.0% of Moroccan adults smoked in 2018 [3]. The Ministry of Health in Morocco conducted a survey in 2017, called the STEPwise Approach to NCD Risk Factor Surveillance (STEPS-2017), using the WHO standard collection method, analysis, and dissemination of data on NCD risk factors in different countries. According to this survey, the prevalence of smoking (in all its forms) was 13.45% among Moroccan people [5]. The same survey found that men smoked more than women did at all times (26.9% versus 0.4%). In addition, smoking was more common in urban areas compared to rural areas. The National Survey on Population and Family Health (NSPFH-2018) revealed that 11.3% of Moroccans were smokers, and the vast majority of them were men (21.1% versus only 1.0% of women) [6]. According to another national study conducted by the Moroccan Ministry of Health in 2000, 17.2% of Moroccans were smokers [7].

Furthermore, many studies showed that smoking has a very heavy epidemiological and economic burden on both the population and the health system in Morocco [8, 9, 10]. Indeed, a study on the epidemiological and economic burden of smoking conducted in 2021 by the Ministry of Health in Morocco showed that, in 2019, the mortality due to smoking was 12,800 premature deaths [11]. In addition, this study revealed that smoking was responsible for 74,000 prevalent cases of ischemic heart disease, 4,227 new cases per year of lung cancer, 4,000 prevalent cases of ischemic stroke, and 20,300 prevalent cases of severe COPD [11]. According to the same study, the direct medical cost of tobacco, or the cost of managing tobacco-related morbidities, was expected to be 3.16 billion dirhams, representing 5.2% of overall health spending. Treatment accounted for 63.3% of the total cost, hospitalizations and consultations accounted for 20.8%, while the contribution of paraclinical investigations amounted to 15.9%. By pathology, 79.3% of the total cost was attributed to ischemic heart disease, followed by COPD, which accounted for 10.5%, followed by lung cancer and stroke, with 5.7% and 4.5% respectively. The same source also revealed that tobacco was responsible for a national business productivity loss of 316.43 million dirhams in 2019 due to absences caused by the disease. By calculating the costs of smoking mortality, which measure the value of lives lost due to smoking, or the loss of productivity due to early deaths due to smoking-related diseases, the study showed that the cost of premature tobacco deaths was expected to be 1.71 billion dirhams in 2019. Ischemic heart disease was responsible for 53.1% of this cost, lung cancer, COPD and ischemic stroke accounted for 34.2%, 6.5%, and 6.2%, respectively. Moreover, a retrospective survey conducted in 2014 in Casablanca found that the risk of smoking-related death was 16.2% for men and 2.0% for women [12]. Ischemic heart disease and cerebrovascular disease were, respectively, the third and fourth leading causes of death from smoking.

Investigating the socioeconomic and demographic characteristics of smoking can help in the development of targeted interventions and tailored treatments for vulnerable and disadvantaged populations [13]. The National Survey on Common Risk Factors for NCDs, STEPS-2017, and the NSPFH-2018 are both useful sources of national and regional levels data on several NCDs and their associated risk factors. However, data at the provincial level is limited or even non-existent. As a result, extending the results to the total city population often leads to misleading and biased conclusions. According to our review of the literature, studies on NCDs prevalence and socioeconomic and demographic risk factors in a Moroccan city have never been done. Consequently, we were asked to conduct a cross-sectional survey on a representative sample of Salé's whole population in February 2021. The main objective of this study was to assess the prevalence of the main chronic diseases and identify certain socioeconomic and demographic risk factors in affected people. This document presents the survey's findings relating to tobacco use among adults in the studied population. It is a contribution having the following goals and

objectives: 1) to assess the prevalence of smoking among adults in Salé; and 2) to identify socioeconomic and demographic determinants of smoking in the studied population. Furthermore, we hope to contribute to the advancement of knowledge regarding the severity of smoking as well as the social, economic, and demographic characteristics of smokers. We also believe that we can provide clear and trustworthy information to decision-makers to assist them in making programs and implementing plans and actions to reduce NCD risk factors.

Material and methods

Study area

Salé is a commuter town in northwestern Morocco, located on the right bank of the Bou Regreg River, opposite the national capital Rabat. It has a population of 890,403 people, according to the 2014 Moroccan census. We chose this city because it is part of the Rabat-Salé-Kénitra region, which has one of Morocco's highest prevalence of chronic diseases (23.5 % living with at least one chronic disease, 5.0% were diabetics, and 7.3% were hypertensive) and the second highest prevalence of smoking (13.6%) after the Dakhla- Oued ed Dahab (16.4%) [6].

Survey design and participants

Survey design

It was a questionnaire-based cross-sectional household survey performed in Salé in February 2021. The framework for this survey was the set of basic Census Districts (CDs) established prior to the implementation of the NSPFH-2018 in the Salé prefecture. We eliminated CDs that have previously been used by the NSPFH-2018 sample.

The survey was successfully completed on 466 households out of 488 randomly selected households using a stratified probabilistic sampling design with two degrees:

- First degree: a systematic random sampling proportionate to the size of a probabilistic sample of CDs in each admitted stratum (size in terms of the number of households).
- Second degree: systematic random sampling of homes from each of the selected CDs with equal probabilities. To obtain the initial sample size n_0 , we employed the following formula admitting the normality of the population distribution assumption [11]:

$$n_0 = \frac{N \cdot z^2 \cdot p(1-p)}{(N \cdot \varepsilon^2 + z^2 \cdot p(1-p)) \cdot \bar{H}} \quad (1)$$

With n_0 : starting sample size; N : total population in Salé; \bar{H} : average household size in terms of number of people; z : set at 1.96 for a 95% Confidence Interval; p : proportion of the population suffering from at least one chronic disease; and ε : margin of error permitted.

After calculating the initial sample size, it was adjusted depending on population size, sampling design effect,

and response rate [14]. Taking the population size N into consideration, the formula for computing sample size became:

$$n_1 = n_0 \frac{N}{N+n_0} \tag{2}$$

Because the sample design was not a simple random sample, the sample size was modified to account for the influence of the sampling design $Deff$ using the formula:

$$n_2 = n_1 \cdot Deff \tag{3}$$

Finally, the response rate r has to be taken into account. As a result, the ultimate sample size was:

$$n = \frac{n_2}{r} \tag{4}$$

With, $N = 1120186$ [15]; $\bar{H} = 4.3$: average household size in the Rabat-Salé-Kénitra region; $z = 1.96$: for a 95% confidence interval; $p = 23.5\%$: proportion of the population suffering from at least one chronic disease in the Rabat-Salé-Kénitra region ; $\varepsilon = 2\%$: margin of error allowed; $Deff = 1.109$: calculated based on the NSPFH-2018 ; and $r = 98.9\%$: the household response rate in the NSPFH-2018 [6], the sample size of the households to be selected was 444 households.

The sample size was chosen to minimize sampling errors caused by the fact that data was gathered on just a subset of the population. Another type of error that might affect the survey is observation error, which happens because of the risks associated with the observation. It is determined by the coaching rate, the interviewers' skill and training, the clarity of the questionnaire, and other factors [16]. To improve the accuracy of the results, we increased the sample size by 10% [17]. The total number of households to be surveyed was $444 \cdot (1+10 \text{ percent}) = 488$ households. Selected households distributed as 93% in urban (452 households) and 7% in rural (36 houses), according to the Moroccan High Commission for Planning's 2014-2050 Population and Household Projections.

Probabilities of inclusion

CD inclusion probability

The CDs were chosen within each stratum. The probability of G_{dhi} (CD "i" of stratum "h" of Commune/Arrondissement "d") being included in the sample of CDs of size ndh was calculated as follows:

$$P_{dhi} = n_{dh} * (N_{dhi} / N_{dh}) \tag{5}$$

With $N_{dh} = \sum_i N_{dhi}$, N_{dhi} : designates the size of the G_{dhi} and N_{dh} : designate the size of the stratum "h" of the Commune/Arrondissement "d"

Household inclusion probability

A systematic proportional probability sample of households was carried out in each of the CDs considered (urban and rural areas).

The probability of the household being included in the sample was calculated as follows:

$$P_{dhij} = (P_{dhi}) * (M / S_{dhi}) \tag{6}$$

With $M =$ Number of selected households and $S_{dhi} =$ total number of households in the Census District G_{dhi} .

Household sampling weight

The inverse of the inclusion probability of each home j in our sample yields the sampling weight W_j .

$$W_j = 1 / P_{dhij} \tag{7}$$

Participants

The study questionnaire was filled out for each household in the sample drawn. The head of household reported information on all household members. In the absence or inability of the head of household to answer the questionnaire, any other qualified person belonging to the same household reported the information. Thereafter, information was gathered for all individuals of the selected households without any selection criteria.

Data collection, variables, and tools

The questionnaire of this study was performed using the literature (namely the NSPFH-2018 questionnaire). It was divided into five sections: the first dealt with sociodemographic data, the second with chronic diseases information, the third was devoted to medical coverage; the fourth focused on measuring household well-being; and the fifth to collect data on the conditions of the habitats.

In addition, we gathered information on socioeconomic and demographic variables such as age, gender, area of residence, wealth index, educational level, marital status, household size, occupation, average monthly household income (AMHI) in Moroccan Dirham (MAD), smoking status, being or not the head of the household, access to improved water sources, and access to improved sanitation facilities. Furthermore, the categories of the well-being quantile (wealth index) were determined according to the work of Binder and Coad [18].

Taking into account the long-term effects of smoking on the health, economic, and social level of individuals, we grouped former smokers with current smokers in the multivariate analysis. Therefore, the prevalence of smoking among adults (18+) was calculated by dividing the number of adults who reported smoking formerly or currently by the adult population. In addition, we introduced the smoking variable (0 = never smoker, 1 = smoker) into the logistic regression model.

Measuring the association between smoking and socioeconomic and demographic variables

In this study, we measured the prevalence of smoking in Salé in 2021 (the significance of the differences observed between the groups was verified using the Khi-2 homogeneity test). Using a logistic regression model, we also attempted to determine the effect of certain socioeconomic and demographic factors on the probability (risk) of smoking in the adult population (18 years and older). We limited our analysis to this age

group (18 years and older) given the significant increase in chronic diseases and smoking with age and the low prevalence of smoking at young ages [19, 20, 21].

Data grouping and statistical analysis

We categorized and presented the data as numbers and percentages. Given the large difference between men and women regarding smoking status, we analyzed and presented results separately according to gender. The Chi-square test was used to assess the association between smoking and various socioeconomic and demographic characteristics. The 95% confidence interval was calculated using standard errors. Extraneous variation may affect study findings. Consequently, approaches for controlling important confounding factors should be used (Multivariate Analysis). Thus, multiple logistic regression was utilized to reveal the actual socioeconomic and demographic factors of smoking in Salé.

For data entry, we utilized the Census and Survey Processing System (CSPPro version 7.1, 2018). The Statistical Package for Social Sciences software (SPSS version 26.0, 2019) and Microsoft Excel 2016 were used to analyze the data.

Results

Main socioeconomic and demographic characteristics of studied population

The present study included 488 households. Of these, 466 households were successfully surveyed (a response rate of 95.5%). As indicated in **Table 1**, our sample included 1308 participants aged 18 and above. 52.2% of them were women, with a sex ratio of 92 males per 100 women and an average age of 42.86 (± 0.45) years. According to age, 25.6% belonged to the age group 18–29, 39.7% were aged between 30 and 49, 28.1% were between 50 and 69, and 6.6% were 70 and over. 92.2% of the population surveyed was concentrated in urban areas (91.2% of men and 93.2% of women). Individuals belonging to the poorest and poorer households presented 3.5% and 4.6%, respectively, while 92.0% were from either the middle (19.6%), richer (35.3%) or richest (37.0%) households. Men and women were almost similarly distributed according to the wealth index. In terms of household size, more than half of the subjects surveyed (51.9%) belonged to households containing one to four individuals. 24.3% of the studied population had no level of education (17.2% of men and 30.8% of women), whereas 16.8% had a higher level of education. Regarding marital status, 30.0% were single at the time of the survey, while 61.7% were married. Otherwise, 61.0% of men worked versus just 23.9% of women, and more than half of the women were homemakers. In addition, 15.4% of the studied population were jobless. Furthermore, 13.8% of the population lived in households with a monthly income of less than 3,000 MAD. The proportions of heads of households were 35.6%, with a big difference between men and women (62.5% versus only 11.0%, respectively). Moreover, we found that 97.9% and

99.8% of the subjects included in our study had access to improved water sources and adequate sanitation facilities, respectively.

Prevalence of smoking according to the main socioeconomic and demographic characteristics

According to our study results (**Table 2**), the overall prevalence of smoking among adults was 23.3% (95% CI: 21.0%, 25.6%). A difference of 46.4 points between men and women was noted, 47.5% (95% CI: 43.6%, 51.4%) versus only 1.1% (95% CI: 0.5%, 2.0%), respectively. The prevalence of smoking among women was relatively low across all major socioeconomic and demographic factors. The findings also found that smoking prevalence increased significantly with age in both men and women (p -value <0.05), increasing from 32.9% in those under 30 to 65.4% in those aged 50 to 69. Men's smoking prevalence decreases to 35.9% after the age of 70. Among women, however, only young females under the age of 30 smoked (3.5%). Furthermore, smoking prevalence was 23.0% in urban areas (47.6% of men and 0.9% of women), compared to 26.3% in rural areas (46.0% of men and 2.9% of women). In addition, there was no statistically significant difference between the two areas of residence (p -value >0.05). Furthermore, smoking prevalence fell from 31.2% among participants from the poorest families to less than one-fifth of those from the richest households. In addition, 59.5% of men in the poorest families smoked. Moreover, the poorest households had the greatest rate of smoking among women (7.6%). Furthermore, we found that smoking dropped significantly as the family wealth index grew, particularly in men (p -value <0.05). Similarly, smoking was more prevalent among men and women with a primary and medium educational level (33.4%) than among those with a higher educational level (14.4%). In terms of marital status, married individuals smoked more than others did (28.1%), notably married males. On the other hand, smoking was more prevalent among single women (3.6%). Moreover, we found that the prevalence of smoking was much greater in retired men (65.4%) than in other occupations. Likewise, 5.3% of unemployed women reported smoking. Similarly, as household size grew, so did the prevalence of smoking among women. People in households with an average monthly household income of less than 3,000 MAD and more than 10,000 MAD had about the same smoking prevalence. In contrast, smoking was quite common among women from households earning less than 3,000 MAD per month (6.7%). Furthermore, a significant difference was noted between household heads and non-household heads (45.6% versus 10.9%, respectively). In addition, among the heads of households, 54.3% of men were smokers. On the other hand, we noted no difference in smoking behaviors between individuals with access to improved water sources and those with adequate sanitation facilities (23.4% and 23.1%, respectively).

Socioeconomic and demographic determinants of smoking

Based on binary logistic regression results, we examined the association between some socioeconomic and demographic characteristics and the prevalence of smoking. As shown in **Table 3**, in both sexes, smoking was significantly associated with age, household wealth index, educational level, marital status, occupation, average monthly household income, being head of household, and having access to improved sanitation facilities (p -value<0.05). In addition, age, household wealth index, educational level, marital status, occupation, being head of household, and having access

to improved water sources significantly affected the prevalence of smoking among men (p -value<0.05). On the other hand, age, marital status, household size, average monthly household income, and having access to improved sanitation facilities were the main socioeconomic and demographic determinants of smoking in women (p -value<0.05).

Table 1: Main socioeconomic and demographic characteristics of the studied population, Salé-Morocco, 2021

		Men		Women		Both	
		N	%	N	%	N	%
Age	18-29	164	26.1	171	25.0	335	25.6
	30-49	233	37.2	287	42.1	520	39.7
	50-69	192	30.7	175	25.7	367	28.1
	70 & +	37	6.0	49	7.2	86	6.6
Area of residence	Urban	571	91.2	636	93.2	1207	92.2
	Rural	55	8.8	46	6.8	101	7.8
Wealth Index	Poorest	28	4.4	18	2.6	46	3.5
	Poorer	30	4.8	30	4.4	60	4.6
	Middle	121	19.4	136	19.9	257	19.6
	Richer	212	33.9	250	36.6	462	35.3
Educational level	Richest	235	37.5	249	36.5	484	37.0
	None	108	17.2	210	30.8	318	24.3
	Primary	108	17.3	127	18.5	235	17.9
	Middle school	160	25.5	126	18.4	285	21.8
Marital status	Secondary	141	22.5	110	16.2	251	19.2
	Higher	109	17.4	110	16.1	219	16.8
	Single	212	33.8	181	26.5	393	30.0
	Married	399	63.7	409	59.9	808	61.7
Occupation	Widowed	8	1.3	63	9.3	71	5.4
	Divorced	7	1.2	30	4.4	37	2.8
	Working	382	61.0	163	23.9	545	41.6
	Unemployed	101	16.2	100	14.7	202	15.4
	Retired	75	11.9	14	2.1	89	6.8
	Student	48	7.7	41	6.0	89	6.8
Household size	Homemaker	2	0.3	363	53.1	364	27.8
	Unable to work	18	2.9	2	0.3	20	1.5
	1-4	334	53.4	345	50.5	679	51.9
AMHI	5-7	237	37.8	269	39.4	505	38.6
	8 & +	55	8.8	69	10.1	124	9.5
	<3,000	91	14.6	89	13.1	180	13.8
	3,000-4,999	134	21.4	294	43.0	428	32.7
	5,000-9,999	200	31.9	196	28.7	396	30.2
Head of the household	10,000 & +	201	32.1	104	15.2	304	23.3
	No	235	37.5	608	89.0	842	64.4
Access to improved water sources	Yes	391	62.5	75	11.0	466	35.6
	No	18	2.9	11	1.6	29	2.2
Access to improved sanitation facilities	Yes	608	97.1	671	98.4	1279	97.8
	No	1	0.2	1	0.2	3	0.2
	Yes	624	99.8	681	99.8	1306	99.8
Total		626	100	683	100	1308	100

Table 2: Prevalence of smoking among adults according to the main socioeconomic and demographic characteristics, Salé-Morocco,2021

		Men				Women				Both			
		%	95% CI		p-value	%	95% CI		p-value	%	95% CI		p-value
			LL	UL			LL	UL			LL	UL	
Age	18-29	32.9	26.1	40.4	<0.001	3.5	1.5	7.1	0.003	17.9	14.1	22.3	<0.001
	30-49	44.8	38.4	51.1		0.0	-	-		20.0	16.7	23.6	
	50-69	65.4	58.7	72.1		0.7	0.1	2.6		34.5	29.9	39.6	
	70 & +	35.9	21.3	51.2		0.0	-	-		15.5	8.7	23.8	
Area of residence	Rural	46.0	32.8	58.6	0.757	2.9	0.2	9.7	0.424	26.3	18.8	35.9	0.430
	Urban	47.6	43.6	51.7		0.9	0.4	1.9		23.0	20.7	25.5	
Wealth Index	Poorest	46.6	29.1	64.5	0.033	7.6	0.6	23.2	0.263	31.2	18.6	44.6	0.054
	Poorer	59.5	42.2	76.0		0.0	-	-		29.7	19.5	42.3	
	Middle	58.5	49.8	67.2		1.2	0.3	4.6		28.2	23.2	34.1	
	Richer	43.8	37.3	50.6		1.2	0.3	3.2		20.8	17.3	24.7	
Educational level	Richest	43.6	37.2	49.8		0.5	0.0	1.9		21.4	18.0	25.3	
	None	49.8	40.7	59.3	<0.001	0.6	0.1	2.2	0.075	17.3	13.4	21.7	<0.001
	Primary	60.4	50.8	69.0		0.0	-	-		27.8	22.2	33.6	
	Middle school	57.8	49.8	65.0		2.4	0.7	6.2		33.4	28.1	39.0	
Marital status	Secondary	38.4	30.6	46.5		2.6	0.8	7.1		22.7	17.9	28.2	
	Higher	29.0	21.4	38.4		0.0	-	-		14.4	10.4	19.7	
	Single	29.0	23.0	35.1	<0.001	3.6	1.7	7.4	0.001	17.3	13.8	21.3	<0.001
	Married	56.8	52.0	61.7		0.2	0.0	1.1		28.1	25.1	31.3	
Occupation	Widowed	(.)	19.9	80.1		0.0	-	-		5.1	1.9	12.8	
	Divorced	(.)	35.2	93.5		0.0	-	-		14.7	5.3	27.1	
	Working	47.7	42.7	52.7	0.001	0.8	0.1	2.8	0.002	33.7	29.9	37.8	<0.001
	Unemployed	46.7	37.0	56.2		5.3	1.9	10.6		26.1	20.5	32.6	
Household size	Retired	65.4	54.1	75.4		0.0	-	-		55.1	44.7	65.1	
	Student	24.6	14.5	38.5		0.0	-	-		13.3	7.6	21.7	
	Homemaker	(.)	-	-		0.2	0.0	1.3		0.2	0.0	1.3	
	Unable to work	37.1	19.4	61.7		(.)	-	-		33.5	17.2	56.8	
AMHI	1-4	48.3	43.2	53.9	0.803	0.6	0.1	1.8	0.015	24.1	20.9	27.3	0.633
	5-7	45.7	39.3	51.9		0.8	0.2	2.4		21.8	18.3	25.5	
	8 & +	49.8	36.2	62.1		4.6	1.2	11.1		24.6	17.3	32.3	
Head of the household	<3,000	54.2	43.6	63.8	0.498	6.7	2.9	13.4	<0.001	30.7	24.2	37.6	<0.001
	3,000-4,999	49.0	40.9	57.7		0.0	-	-		15.4	12.2	19.1	
	5,000-9,999	45.0	38.2	51.9		0.0	-	-		22.8	18.8	27.0	
	1,0000 & +	45.8	39.0	52.7		1.2	0.1	4.4		30.6	25.6	35.9	
Access to improved water sources	No	36.0	30.2	42.5	<0.001	1.2	0.5	2.2	0.350	10.9	9.0	13.2	<0.001
	Yes	54.3	49.3	59.1		0.0	-	-		45.6	41.0	50.0	
Access to improved sanitation facilities	No	22.8	8.0	44.6	0.030	6.1	1.0	35.3	0.014	16.4	6.9	33.7	0.439
	Yes	48.2	44.2	52.2		1.0	0.5	2.0		23.4	21.1	25.8	
Total	No	(.)	-	-	0.292	(.)	-	-	<0.001	(.)	-	-	0.075
	Yes	47.3	43.5	51.4		1.0	0.5	2.0		23.1	20.9	25.5	

Table 3: Socioeconomic and demographic determinants of smoking by logistic regression, Salé-Morocco, 2021

	Men		Women		Both	
	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)
Age	<0.001	0.998 (0.979;1.018)	0.031	0.999 (0.962;2.036)	<0.001	1.001 (0.983;1.018)
Area of residence	0.822	1.651 (0.744;3.667)	0.199	1.358 (1.149;5.333)	0.450	0.822 (0.406;1.666)
Wealth Index	0.007	8.732 (0.974;78.260)	0.816	41.298 (1.661;110.839)	0.035	4.729 (0.687;32.579)
Educational level	0.002	2.190 (1.183;4.052)	0.098	4.939 (2.504;7.903)	<0.001	2.255 (1.321;3.851)
Marital status	<0.001	5.926 (2.742;12.807)	0.005	7.729 (3.508;15.028)	<0.001	1.304 (0.766;2.221)
Occupation	0.001	1.572 (0.643;3.847)	0.494	2.144 (1.252;6.901)	0.021	1.364 (0.609;3.054)
Household size	0.721	1.055 (0.536;2.074)	0.003	1.883 (1.549;5.221)	0.713	1.785 (1.013;3.147)
AMHI	0.679	0.091 (0.010;0.855)	0.019	0.019 (0.040;2.286)	<0.001	0.209 (0.031;1.432)
Head of the household	<0.001	0.811 (0.405;1.624)	0.341	4.777 (4.138;10.913)	<0.001	5.889 (3.733;9.289)
Access to improved water sources	0.034	3.690 (0.894;15.231)	0.098	10.817 (1.608;27.263)	0.375	2.931 (0.714;12.031)
Access to improved sanitation facilities	0.219	0.000 (0.000;0.542)	<0.001	0.000 (0.000;1.205)	0.043	0.003 (0.000.1.205)

OR: Odds Ratio; CI: Confidence Interval

Discussion

In the current paper, we assessed smoking prevalence among adults in Salé. Additionally, we investigated the main socioeconomic and demographic determinants of smoking behaviors among the studied population. The overall prevalence of smoking among adults was 23.3%. This prevalence exceeds that recorded among adults of the Rabat-Salé-Kénitra region in 2018 (13.6%) [5]. In comparison to the national-level statistics published by the Ministry of Health in Morocco, the prevalence of smoking in Salé far surpasses that indicated by the STEPS-2017 survey (13.45% [5]), as well as that documented during the NSPFH-2018 (11.3%) [6]. In contrast, smoking prevalence in Salé was almost the same as that estimated by WHO for the national level in 2018 (24.0%) [3]. Furthermore, across all socioeconomic and demographic variables included in this study, the prevalence of smoking among women was low compared to men; there was a 46.4-point disparity between males and females in smoking prevalence (47.5% versus only 1.1%, respectively). The same finding was revealed in STEPS-2017 [5], as well as in the NSPFH-2018 [6]; men smoke more than women at all times (26.9% vs. 0.4% and 21.6% vs. 1.0%, respectively). Likewise, gender differences in smoking behaviors have been noted in many studies [22, 23]. However, the area of residence had no significant effect on smoking conduct in Salé. Similarly, there was no significant difference between urban and rural areas nationally [5, 6]. The absence of geographical disparities in smoking conducts in Salé could be attributed to the high urbanization rate in this city. In addition, we found that age was strongly associated with smoking prevalence in both men and women of the studied population (p -value <0.05). Among men, the highest smoking rates were observed in the 30-49 and 50-69 age groups. After the age of 70, men tend to quit smoking. Likewise, the survey conducted by the Moroccan Ministry of Health revealed that the 30-44 and 45-50 age groups recorded the highest prevalence of smoking nationally, and the average age at which people started smoking was 19 years (19 years in urban areas and 18.7 years in rural areas), and the average duration of smoking was 21.6 years [5]. According to the same survey, more than 60% of tobacco users smoked 10 to 24 cigarettes a day. On the other hand, our study revealed that, among women, only young girls under 30 were smokers. This shows that smoking is starting to become more and more widespread among Moroccan women in the same way worldwide [24]. Furthermore, we noted that the overall highest prevalence of smoking was recorded among single and jobless women as well as among those belonging to poor households (poorest wealth index, household size of more than eight people, average household monthly income of less than 3,000 MAD, and no access to improved water sources). This proves that poverty significantly increases tobacco use, especially among women.

Additionally, smoking was found to be significantly associated with age, household wealth index,

educational level, marital status, occupation, average monthly household income, being the head of household, and having access to improved sanitation facilities in both sexes. In men, age, household income index, educational level, marital status, employment, being head of family, and having access to better water sources all had a significant impact on smoking prevalence. On the other hand, age, marital status, household size, average monthly household income, and access to improved sanitation facilities were the significant socioeconomic and demographic factors of smoking in women. Similarly, multiple logistic regression revealed that age, sex, marital status, occupation and area of residence were the main predictors of active smoking in Morocco [25]. Moreover, it should be noted that the actual prevalence of tobacco use could be higher than reported, if we consider that there is a social construction in Morocco around female smoking, which is considered inappropriate behavior even in public spaces. Therefore, even in epidemiological studies, women still try to conceal their cigarette use [26]. In addition, the growth of other types of smoking, such as water pipe smoking, often referred to as “chichi”, among both young men and women may have an impact on the total prevalence of smoking in a community. In addition, many studies do not include these types of smoking in their research [8].

Perspectives

The findings of our study further highlight a strong correlation between poverty and tobacco use, underscoring the need for socioeconomic interventions to address this public health challenge. A comprehensive strategy involving all stakeholders is essential, focusing on prevention, cessation support, and community engagement to mitigate the health and economic burdens associated with smoking in Salé.

Conclusion

Our study revealed that, in 2021, the prevalence of smoking among the population aged 18 and older in Salé was 23.3%. This prevalence exceeded largely that recorded nationally and regionally. If the women were not too attached to cigarettes (1.1%), tobacco use was highly frequent among men (half of the men were smokers (47.5%). Our findings revealed also that, among women, only young girls under 30 were smokers. This shows that smoking is starting to become more and more widespread among Moroccan women, particularly, among poor. Furthermore, we proved that poverty significantly increases tobacco use, especially among women. It was also found that there are many socioeconomic and demographic factors significantly associated with the prevalence of smoking in the studied population. Therefore, we have pointed out that Salé is dealing with a serious health problem that can lead to several problems as well as a heavy epidemiological and economic burden on both the population and the health system in this city. This significant public health challenge necessitates a holistic strategy and dedication

from all parties involved to decrease mortality and illness linked to smoking. Furthermore, it highlights the need to explore methods to enhance the effectiveness of smoking prevention and intervention initiatives, particularly for girls. Additionally, other important actions would be taken to decrease the demand for tobacco, including addressing second-hand smoke, implementing pictorial health warnings, increasing taxes, promoting tobacco cessation, and forbidding both direct and indirect forms of tobacco promotion. Moreover, our findings imply that decision-makers and healthcare managers in Salé should focus more on developing effective smoking prevention strategies. Furthermore, it remains crucial to develop professional support facilities and proven medications to assist smokers in quitting. Furthermore, civil society participation can be beneficial, particularly in raising public awareness of the dangers of tobacco usage.

Limitations

The study's cross-sectional design limits the ability to establish causal relationships between smoking prevalence and socioeconomic factors, as data was collected at a single point in time. Furthermore, reliance on self-reported smoking status may introduce bias, as individuals could underreport their tobacco use due to social stigma. The absence of longitudinal data restricts the understanding of trends over time, hindering assessments of the long-term impact of interventions. Additionally, the focus on the adult population of Salé may not fully represent smoking behaviors in other age groups or regions, limiting the generalizability of the findings.

Ethical approval

The respondents were informed of the survey's objective as well as the significance of the results. Anonymity, confidentiality, and data protection have all been guaranteed, as has the right to refuse to participate in or withdraw from the inquiry at any time.

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