Original Article

Relationship between smoking and the most relevant noncommunicable diseases in El Salvador

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Relación entre tabaquismo y las principales enfermedades no transmisibles en El Salvador

Abstract
Introduction. Tobacco use is one of the main risk factors for the development of non-communicable diseases, such as hypertension, diabetes *mellitus*, cancer, cardiovascular diseases and chronic kidney failure. **Objective.** To analyze the relationship between smoking and the diagnoses of hypertension, diabetes, kidney failure and cancer in users of the El Salvador health network, 2019. **Methodology**. An analytical cross-sectional study was carried out with a population of 63,061 users with a history of smoking and a diagnosis of hypertension, diabetes *mellitus*, kidney failure and / or cancer. **Results**. The prevalence of smoking at the country level was (1,2 %), with passive smoking predominating, followed by active smoking and exsmokers. Indirect smoking predominates in women, with a prevalence of (0,7 %), and in men, direct tobacco consumption predominates with a prevalence of (0,1 %), passive smoking predominates in people among the 25 to 59 years (48,1 %). Finally, a positive correlation was found between the prevalence of tobacco consumption with the diagnosis of arterial hypertension (0,4), as well as that of cancer (0,4), followed by diabetes *mellitus* (0,2) and insufficient chronic kidney (0,09). **Conclusions**. Smoking is related to the diagnosis of hypertension, diabetes, kidney failure and cancer in users of the El Salvador health network.

Keywords
Smokers, non-smokers, diabetes *mellitus*, renal insufficiency.

Resumen
Introducción. El consumo de tabaco es uno de los principales factores de riesgo para el desarrollo de enfermedades no transmisibles, como la hipertensión, la diabetes mellitus, el cáncer, las enfermedades cardiovasculares y la insuficiencia renal crónica. **Objetivo**. Analizar la relación entre el tabaquismo y los diagnósticos de hipertensión, diabetes, insuficiencia renal y cáncer en usuarios de la red de salud de El Salvador, 2019. **Metodología**. Se realizó un estudio transversal analítico con una población de 63 061 usuarios con antecedente de tabaquismo y con diagnóstico de hipertensión, diabetes mellitus, insuficiencia renal y/o cáncer. **Resultados**. La prevalencia de tabaquismo a nivel de país fue de 1,2 %, con predominio de tabaquismo pasivo, seguido de tabaquismo activo y exfumadores. En las mujeres predomina el tabaquismo indirecto, con una prevalencia de 0,7 %, y en los hombres el consumo directo de tabaco, con una prevalencia de 0,1 %; el tabaquismo pasivo predomina en las personas entre los 25 a 59 años (48,1 %). Finalmente, se encontró una correlación positiva de la prevalencia de consumo de tabaco con el diagnóstico de hipertensión arterial (0,4), así como de cáncer (0,4), seguido de diabetes mellitus (0,2) e insuficiencia renal crónica (0,09). **Conclusiones**. El tabaquismo está relacionado con el diagnóstico de hipertensión, diabetes, insuficiencia renal y cáncer en usuarios de la red de salud de El Salvador.

Palabras clave
Tabaquista, no fumadores, diabetes mellitus, insuficiencia renal.

Introduction

Smoking is considered a trigger for the main noncommunicable diseases (NCDs), such as cardiovascular diseases, chronic obstructive pulmonary disease, lung cancer, diabetes *mellitus*, kidney failure, among others; smoking is also considered the leading preventable cause of death worldwide.[1] According to data from the World Health Organization (WHO), smoking, whether active or second-hand, or also known as passive smoking, causes death to more than 8 million people yearly; of this amount, more than 7 million of people correspond to active smokers and the rest (1,2 million) are non-smokers exposed to secondhand smoke. In general, from 1,3 million tobacco users, 80 % live in poor or low-income countries[2].

NCDs are among the leading causes of death in the world 1. These diseases

represent more than 75 % of deaths in a year, and provide the leading causes of premature death or disability in people (who are) suffering from them[3].

In El Salvador, tobacco consumption is increasingly evident in the adolescent and young adult populations. This group of people are considered as greater vulnerability for the early onset of tobacco consumption, as well as to acquire the risk of developing chronic non-communicable diseases. According to the Global Youth Tobacco Surveys (GYTS) conducted in El Salvador in 2009, 14,6 % of students aged 13 to 15 consume a tobacco product; 18,2 % of them are men and 11 % women. By 2015, these data increased to 32,4 % in students of the same ages[4].

In a study carried out in El Salvador, the main NCDs with a history of smoking are mentioned in 2016. They are disease of the heart, chronic obstructive pulmonary disease, respiratory infections, lung cancer, diabetes *mellitus* (DM), hemorrhagic cardiovascular disease, in - hypertensive disease and other cardiovascular diseases[5]. There is evidence of a possible relationship between smoking and main NCDs in the country; However, it is necessary to upgrade the scientist information and consider that relationship, specially all the groups of people who need to attend at top level main health centers in the country.

Therefore, the study searched to analyze the prevalence of active, passive smoking and ex-smokers as well as the relationship of these with the diagnoses of arterial hypertension, diabetes *mellitus*, renal failure and cancer in users of the health network of El Salvador during 2019. Thus, the results point tobacco control policies such as cessation, reduction of consumption and smoke-free environments and in early and concrete actions for tobacco prevention and control 6. These intervention strategies are key to reduce not only the number of diseases and deaths caused by its consumption but also the sanitary costs, which affect the economies of different countries[6,7,8].

Methods

An analytical cross-sectional study was carried out for this research[9,10]. The collected data allowed to measure the prevalence of smoking in users of the public health network, as well as to estimate the proportion of diagnoses of NCDs with tobacco smoking in El Salvador.

The unit of analysis was the administrative records of information of users of the public health network in the Online Morbidity and Mortality System of El Salvador (SIMMOW)[11].

For the study, the entire population that had medical consultation in 2019 was taken, with a total of 5 169 912, of which 63 061 participants met the following criteria: user registered at the SIMMOW during 2019[11,12], with a history of active smoking, and passive smoker or ex-smoker, in addition to have any of the following diagnoses: Hypertension, DM, kidney failure and cancer, as well as any age, sex and origin.

The data collection technique used was the review of SIMMOW records. It means the database includes information on users who have medical consultation in the different public service centers, either the first, second or third level.

For the collection of data, a file was structured that has 8 closed questions and categorized as nominal variables, including: sex, urban or rural origin, diagnosis of hypertension, DM, renal failure, cancer, history of active smoking, passive smoking and ex-smoker. The only scale-type variable was the age of the users. The data collection instrument was not validated.

Moreover, analysis of descriptive data was made through obtained proportions of active and passive tobacco smoking and ex-smokers classified by sex, age and geographical area. The results of prevalence calculation of active and passive tobacco smoking and ex-smokers are expressed by percentages nationwide.

The estimation of the correlation of tobacco variable and the main diagnoses of NCDs was made with Excel program version 2010. The statistical test used to evaluate the normality of the data was the Kolmogorov-Smirnov test; the statistical value provided by the test was 0,705, with a p-value of p =0,702, indicating a normal distribution. Pearson's correlation coefficient statistical test was used for the calculation of the correlation of variables[13].

The results are presented and analyzed in bar charts and tables, using Excel version 2010.

Ethical principles were respected in the research. The preliminary draft of this research was reviewed and approved without restrictions by the Ethics Committee of Evangelical University of El Salvador (UEES).

Results

Of 63 061 users of the public health network with a history of smoking, two were registered in the SIMMOW 2019 database, the female sex being prevailing (63 %). At

the same time as the user population with a history of smoking by age, the age group that predominates is between 25 and 59 years (39,2 %), followed by the ≥ 60 years old group (19,9 %). On the other hand, the range of 15 to 24 years represents 17,6 % of smoking in general, ≤ 5 years represent 14,5 % of passive smoking and the range of 5 to 14 years, 8,8 % in the different forms of smoking.

As far as NCDs with a history of smoking is concerned, 69 % of users were diagnosed with high blood pressure plus smoking, followed by the diagnosis of DM plus smoking, with 27,5 %, and the diagnosis of renal failure and smoking, with 3,3 %. On the other hand, the diagnosis of cancer, independently of the type, with a history of smoking, corresponds to 0,1 % (Figure 1).

A prevalence of smoking of 1,2 % is shown by the users ENT main diagnostics.

Figure 2 shows that passive smoking condition has a prevailing level, followed by active smoking and, in lower prevalence, by former smokers.

The prevalence of passive smoking is 0,7 % in females and 0,2 % in males. As to the prevalence of active smoking and ex-smokers the prevailing group is that of males, with 0,11 % whereas 0,08 % correspond to females (Figure 3).

The prevalence of smoking by age range is high in people aged from 25 to 59 years (0,4 %), followed by ≥ aged 60 (0,2 %); however, the presence of smoking in minor children is observed, considering that in those from 0 to 9 years of age this type of smoking corresponds exclusively to passive or second-hand smoking by 0,2 %; on the other hand, in people aged 10 to 24 years the prevalence of smoking is 0,1 % (Figure 4).

Table 1 shows the estimated correlation measurement results. The Pearson linear correlation index was 0,44 for the diagnosis of hypertension with smoking, (moderate). The Pearson linear correlation index is 0,21 (weak) for the diagnosis of DM and smoking. On the other hand, the prevalence of smoking and the proportion of users diagnosed with kidney failure has a correlation value of 0,09 (non-existent). The correlation of smoking prevalence and the proportion of users diagnosed with cancer, regardless
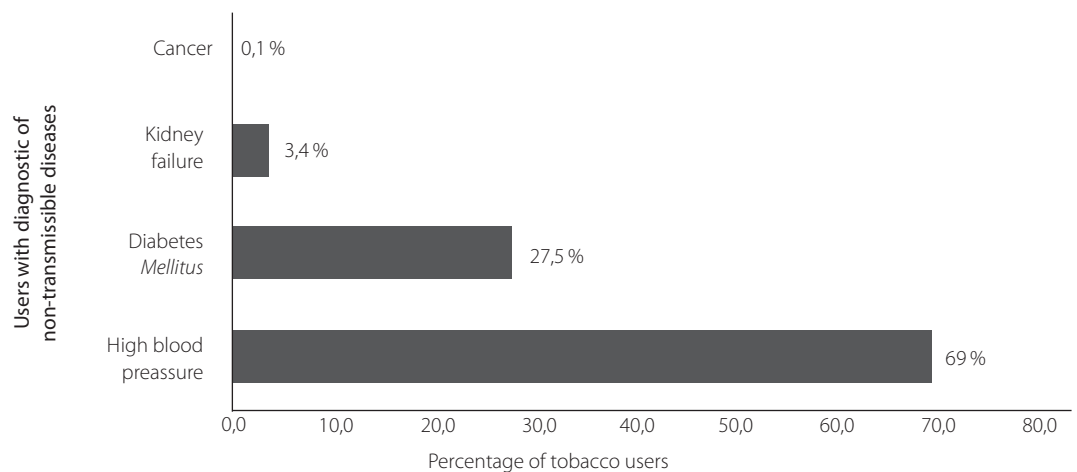

Figure 1. Distribution of users of the health network with diagnosis of non-communicable diseases and history of smoking, period 2019.
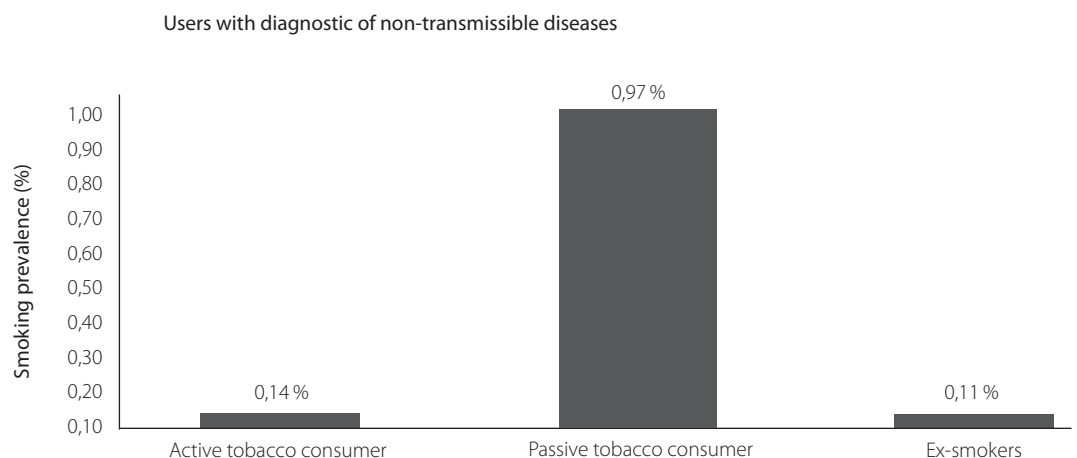

Figure 2. Smoking prevalence among users of the health care network, period 2019.

of type were also calculated, and the Pearson's linear correlation result was 0,39 (moderate).

Discussion

The correlation of smoking with the main NCDs in users of the health network of the period 2019 and the prevalence of smoking disaggregated by sex and age ranges were analyzed.

The results of the correlation of NCDs and tobacco show an index of positive linear correlation of smoking (either active and passive smokers or ex-smokers) with the non-communicable diseases studied.

According to the National Survey of Addictions (ENA 2008) carried out in Mexico, tobacco smoking is a factor related to NCDs, mainly cancer diseases, chronic respiratory diseases y DM[14].

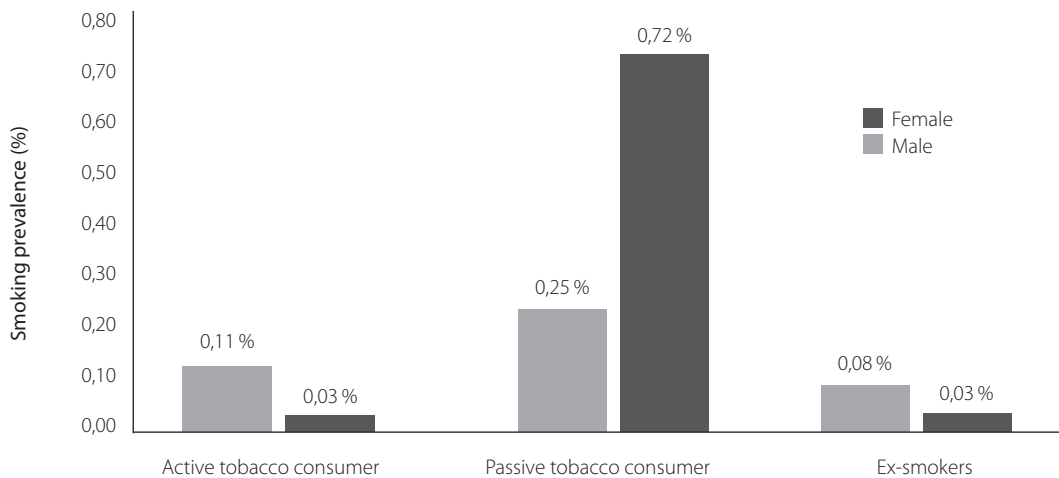Another study carried out in El Salvador shows the history of smoking in people

Figure 3. Prevalence of smoking by sex and smoking condition in health network users, period 2019.
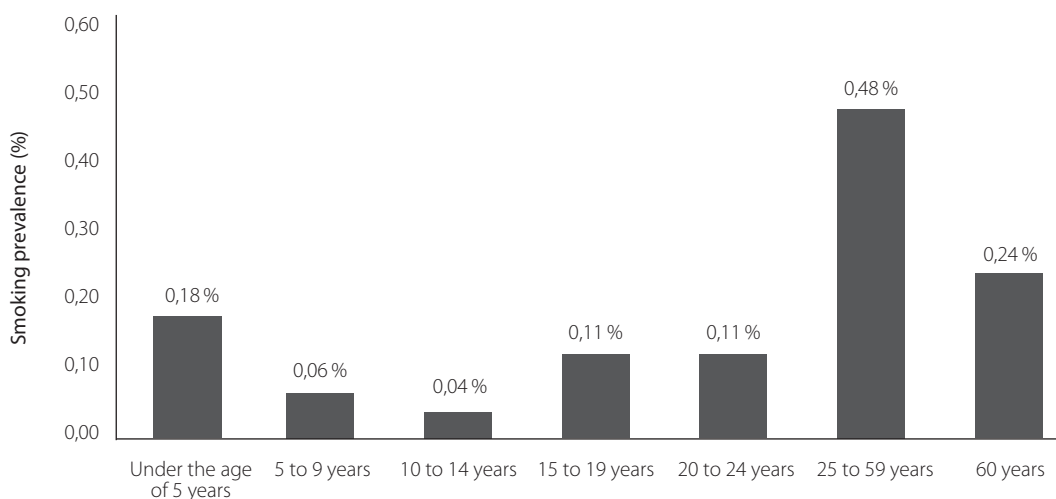

Figure 4. Prevalence of smoking by age ranges in health network users, 2019.

Table 1. Correlation of smoking prevalence and non-communicable diseases in users of the health network, period 2019.

ENT Diagnosis	Pearson Correlation Coefficient	P value
Arterial Hypertension	0,44 (moderate)	0,15
Diabetes Mellitus	0,21 (weak)	0,50
Kidney Failure	0,09 (non-existent)	0,77
Cancer	0,39 (moderate)	0,20

with NCDs and shows that in that year people diagnosed with NCDs who had smoking history died, including: ischemic heart disease (524), chronic obstructive pulmonary disease (296), lower respiratory tract infections (258), cancer of the trachea, bronchi, and lung (155), DM (132), kidney failure, and other diagnoses (151) in 2016[5].

A study on the relationship between smoking and cardiovascular diseases shows that the combination of particles of nicotine and tar leads to the development of heart disease and increased blood pressure[15,16].

In general, smokers have from 30 % to 40 % chance of developing DM than those who are not, so the more cigarettes are smoked or the greater exposure to tobacco smoke, the higher risk of developing DM[1,17].

The prevalence of smoking in users of the health network found in this study is low as compared to the problems presented in the National Survey of Alcohol and Tobacco conducted in El Salvador in 2014, which shows that the prevalence of smoking in El Salvador was 35,1 %[18].

Passive smoking is a problem that mainly affects children and women, which causes them to be risk groups to develop diseases related to this condition. This doubles the incidence of respiratory diseases such as pneumonia, bronchitis and bronchiolitis and asthma[19].

The World Youth Tobacco Survey (GYTS), conducted in El Salvador in 2015, found that adolescents and schoolchildren are highly exposed to second-hand tobacco in public, open or open places[4].

Active and passive smoking are higher in people aged 25 to 59 years. A study carried out in Cuba shows that the prevalence of active smoking is mainly in the range of 40 to 49 years[20].

Regarding active smoking, research results show that it starts in the 10 to 14-year-old range and increases from 15 to 19 years. The World Youth Tobacco Survey shows that people start using tobacco before they reach the age of 15[21,22].

Statistics from various countries show an increase in tobacco use in recent years among adolescents between the ages of 12 and 14. Approximately 25 million children and 13 million girls aged 13 to 15 in the Americas region smoke cigarettes or use smokeless tobacco.[23]

Women have a higher prevalence of smoking than men because they constitute the population with the highest exposure to secondhand smoke; in this sense, passive smoking is the predominant one in women. On the other hand, the active consumption of tobacco is higher in men, evidencing the continuation of this trend. According to the WHO Atlas of Tobacco, active tobacco use globally is higher in men than in women aged 15 years or older[23]. Other studies mention that the prevalence of tobacco use is higher in men than in women, maintaining the trend of active smoking initiation in the adolescent population as compared to the years 2016-2018[15,24,25].

One of the limitations of this research was the recording of smoking history at the SIMMOW database. It is to be considered that the registration of this characteristic of smoking history began in the period 2019 through the data of the registered consultation censuses, so it is possible that it has not been included in the total population of users who consulted with this background in this period. This situation leads to a lower record of patients with NCDs and the history of smoking. Therefore, the results presented in this study should be taken with caution, as updating data in a new study may present different results.

It should also be borne in mind that 98 % of the users of the study come from the first level of care and the rest from the care services of the second and third levels; that is, the majority of the population that consults and is registered in the SIMMOW of 2019 comes from the centers of the first level of health care in the country.

Passive smoking is present at all ages, from those under 5 years of age and to a greater extent in people aged 25 to 59 years. This shows the need to influence actions aimed at compliance with the Tobacco Control Law[13], so it is recommended to verify the interventions carried out and strengthen multisectoral support with various public and private institutions that are currently working on the problem.

Conclusions

The results of Pearson's statistical correlation with the prevalence of smoking and proportion of users with the diagnosis of major NCDs were positive. There is a greater correlation between tobacco use and hypertension, followed by cancer, DM and, finally, kidney failure.

The prevalence of passive smoking predominates in the female sex, distributed in all ages, with onset in children under 5 years, predominating in greater proportion in the range of 25 to 59 years.

The prevalence of active smoking occurs in a higher proportion in the male sex, with predominance in the range of 25 to 59 years. Likewise, active smoking is in the range of

10 to 14 years, increasing the prevalence in the range of 15 to 19 years.

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