Determinants of Smoking in Pregnant Women treated in Public Institutions in the Province of Tucumán, Argentina

Authors: Barrenechea Guillermo Gabriel[1], Leonardo Soares Bastos[2]

[1]Biochemistry Department – Public Health Laboratory. General Management of Integrated Health Programs (PRIS, for its acronym in Spanish). Ministry of Public Health. Tucumán
[2]Programa de Computaçao Científica (PROCC). Fundaçao Oswaldo Cruz - Fiocruz. Rio de Janeiro, Brazil

Abstract

Introduction: Smoking is one of the main preventable Public Health problems in the world. In Tucumán there is no information about specific groups such as pregnant women. The objective of this study was to estimate the prevalence of smoking in pregnant women and its determining factors in Tucumán.
Methods: The target population were pregnant women who attended the selected institutions. The "lme4" library of the R software was used. Bivariate analysis was performed using the Chi-square or Fisher test as appropriate. Logistic regression was used to determine the variables with association.
Results: The lifetime prevalence of smoking was 41.5%. 25.3% of women were smokers when they found out they were pregnant, 86.2% of them quit smoking at some point during their pregnancy. The educational level of the pregnant woman and her partner, the household rules and not being aware of the damage produced by smoking were some of the variables associated with being smokers.
Conclusions: In this study, smoking prevalence in pregnant women was reported to be 25%. It also presents determining factors in specific population groups about which there is scarce information in our area.

Key words: Smoking; Pregnant woman; Chronic diseases

Introduction

Smoking is one of the main preventable Public Health problems in the world[1]. Tobacco is the only product of legal consumption that causes death to approximately one-third to half of its consumers[2]. Pregnant women are an important group, due to the vulnerability of their physiological condition. Indeed, pregnancy is a time of special motivation for a woman to quit smoking. In fact, around 20% of pregnant women quit smoking spontaneously before contacting the Health Services and most women who continue smoking reduce the consumption of cigarettes. However, most women who quit smoking relapse before the first year after giving birth. This could suggest that they are not well-informed about the effects of tobacco on themselves and, mainly, the effect of environmental smoke on the baby[3].

Since 2005 Argentina has tobacco consumption prevalence data gathered from the National Risk Factors Survey (NRFS 2005, 2009, 2013 and 2018)[4-7]. With this information, a decrease in the prevalence of tobacco consumption is registered in most provinces, and there are reports about the effect of adopting the smoke-free legislation and its protective effect on a national and regional level[8]. One

thing to take into account is that the NRFS is mostly intended for people older than 18 years. Thus, we may know to what extent smoking prevalence decreased in Tucumán, but we are not able to know what happens with other specific population groups. In Tucumán there is information about the impact of smoking on mortality but not about the prevalence of this risk factor in certain population groups, such as pregnant women[9].

In Tucumán there is a smoke-free legislation since 2007. The purpose of this law is to restrict tobacco consumption in enclosed areas so as to avoid damage associated with exposure to environmental tobacco smoke and to stimulate smokers to quit or reduce consumption[9].

Smoking has various effects on pregnant women. For example, we can mention several negative effects such as intrauterine growth retardation: low birth weight, premature birth, stillbirths, neonatal death, lung volume reduction in nursing babies, problems of infant neurological development and sudden infant death syndrome[10-12]. There are also the well-known effects of exposure to environmental tobacco smoke on the environment of the pregnant woman[13]. In this study we want to evaluate not only smoking but also whether there is a relationship among environmental variables, such as: socioeconomic status, having a partner who smokes, educational level, consumption before pregnancy, not believing that tobacco affects the health of the mother or the child and kind of attitude towards smoking of the pregnant woman's household[14-17].

The objective of this study was to estimate smoking prevalence, quit rate and determinant factors in pregnant women treated in three big maternity hospitals of the public subsector of Tucumán in 2015.

Materials and Methods

We conducted a cross-sectional descriptive study using a primary source of data. Tucumán is located in the northwest region of Argentina. The province has 17 districts, with a total population of 1,511,516 inhabitants and an average of 30,000 live births in the last years. Approximately, an average of 50% attend the public health subsector, 90% of which go to the three maternity hospitals selected for this study[18]. The target population were pregnant women who went to the selected institutions to give birth. We included women who decided to participate in the study voluntarily and signed the informed consent and/or informed consent for minors if applicable. Women who refused to make the survey were not included.

A minimum number (n) of participants was calculated for the study to be representative of smoking in pregnant women in the selected institutions of the public subsector. The selected institutions include 90% of births that take place in the public subsector of Tucumán. We calculated the sample assuming that 50% of expectant mothers were smokers when they got pregnant. We established 5% precision with 95% confidence index (CI) and assuming 10% of losses. This resulted in a sample of 300 expectant mothers[19]. We estimated 50% prevalence of smoking in expectant mothers because we didn't have a reference value, and this value maximizes the number of surveys to be made. During the development of the project, 593 pregnant women of three institutions were surveyed. They were randomly selected from a list of women who had given birth in the institution and remained under observation.

A questionnaire was made with definitions and questions from other validated questionnaires such as the National Risk Factors Survey. It was applied for 24-48 hours after the delivery while the women were still at the institution. Retrospectively, we were able to find out what had happened during the pregnancy. We consulted secondary databases, the medical records of the pregnant woman and of the newborn baby, for specific data such as birth weight, number of prenatal examinations, gestational age, weight and size of the newborn and other variables.

Data analysis

For the data analysis, we used the "glmer" function of the "lme4" library of the R software[20]. We calculated proportions with their respective CIs (95%) to see the distribution of the response variable in the different groups under evaluation. A bivariate analysis was made between the dependent variable and other selected variables. We used the Chi-square or Fisher test as applicable. We determined which

variables show association by means of logistic regression. In order to verify the association in the exploratory phase of the specific variables, we used as cut-off point a significance level < 20% (p < 0.20). Finally, for the analysis of these binomial distribution response variables, we used logistic regression. A 5% significance level was used. All the reported variables showed at least one significant category.

Variable Definition

Independent variables

Among the independent variables selected to verify the association we analyzed **Age**, **Educational level** (educational attainment of the woman participating in the survey, with the following categories: Incomplete elementary level, Complete elementary level, Secondary level and higher), **Type of relationship** (divided in two categories: Stable relationship, for women who are married or cohabiting with their partners, and Unstable relationship, for single or divorced women or widows), **Partner's Educational level** (educational attainment of the woman's husband or partner: Incomplete elementary level, Complete elementary level, Secondary level and higher), **Household rules regarding smoking** (we consulted which were the smoking rules at home: Not allowed, Not allowed but with exceptions, No rules, Allowed), **Knowledge of the damage produced by smoking** (the reference category was "Has knowledge", followed by "Doesn't know" and finally "Doesn't have knowledge"); **100% smoke-free spaces law** (three categories: In favor, Doesn't know, and Against) and **Price increase,** through cigarette tax increase (also three categories: In favor, Doesn't know and Against).

To describe the socioeconomic conditions of participating women we evaluated the socioeconomic situation of pregnant women through the **Multidimensional Poverty Index** (MPI), which identifies multiple individual deprivations in terms of education, health and standard of living (dimensions)[22]. Each pregnant woman was given a score according to her household deprivations in each of the 10 indicators. The maximum score is 100% and each dimension receives the same 1/3 weight (so the maximum score in each dimension is 33.3%). In order to identify the multidimensionally poor, the deprivation scores of each household are summed up and the total household deprivation is obtained with the Multidimensional Poverty Index, taking into account the following categories:

Vulnerable: deprivation percentage between 20-32.9 %

Poor: deprivation percentage ≥ 33 %.

Extreme poverty: deprivation percentage > 50%.

Dependent variables

Some of the dependent variables of the study are:

Smoking: we considered as smokers those women who said that during their lives they had smoked more than 100 cigarettes or those who had smoked cigarettes within thirty days before finding out they were pregnant. **Quitting:** smokers were asked whether they quit or continued smoking when they found out they were pregnant. **Lifetime prevalence:** they were asked if they had smoked at least 10 cigarettes at some point in their life.

Among the ethical considerations, this study had the approval of the Health Research Ethics Committee dependent on the Ministry of Public Health of Tucumán, Argentina.

Results

The median age of surveyed women was 23 years (interquartile range [IQR]: 20 - 29 years) with a minimum of 13 and a maximum of 47 years. 48.6% of the deliveries were by C-section and only 8.0% had undergone less than three prenatal examinations. We obtained the distribution of women smokers and non-smokers in each level of the Multidimensional Poverty index (MPI) (Figure 1).
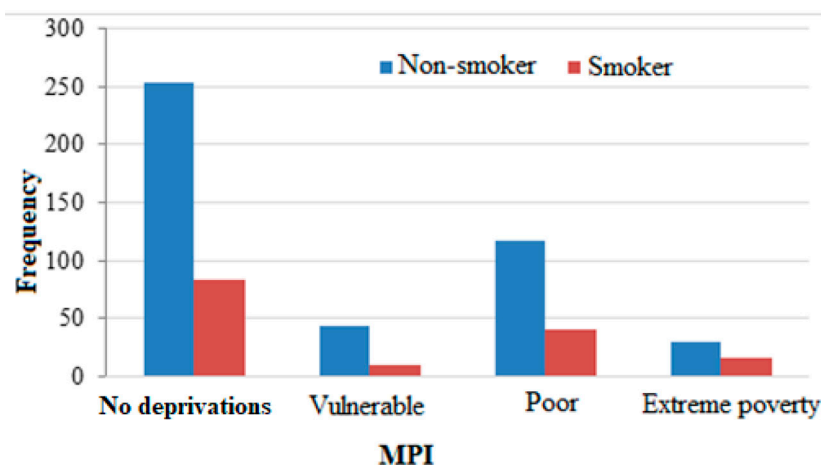
Figura 1. Distribution of surveyed women according to the Multidimensional Poverty Index (MPI). Tucumán, 2015

Most women belonged to the group of women with no deprivations.

The lifetime prevalence of smoking among the women who were surveyed was 41.5%, and the median age of first use was 15 years (IQR: 14 - 17 years). 25.3% of women were smokers when they found out they were pregnant. The median consumption of these women was 4 cigarettes a day (IQR: 2-10) (min: 1, max: 30). The median consumption among women who continued smoking during their pregnancy was reduced to 3 cigarettes a day (IQR: 2 – 5) (min: 1, max: 20).

86.2% of women who were smokers when they found out they were pregnant quit smoking at some point in their pregnancy. 32.2% did it the moment they found out they were pregnant, 42.1% during the first trimester, 9.2% during the second, 2,6% during the third trimester and 13.9% didn't quit smoking during their pregnancy. The median consumption of pregnant women who never quit smoking was 5 cigarettes a day (IQR: 3-5) (min: 1, max: 20).

Table 1 shows the percentage of women smokers according to the variables under evaluation. It also shows that the lower the educational level of the woman and her partner, the higher the percentage of women smokers. And there is a higher proportion of women smokers when the household smoking rules are weaker or non-existent.

Table 2 shows the values of the estimates and their confidence intervals regarding the variables that were significant at the individual level.

Logistic Regression
We reported those that were significant in at least one category.

Discussion

In this study the percentage of pregnant women was 25%, higher than the value for the general prevalence of all the age groups reported by the National Risk Factors Survey[24]. The prevalence of women smokers of childbearing potential in Argentina has been decreasing in the last years. According to the National Risk Factors Survey, in Tucumán the prevalence of smoking in women was 20.9%. This would show the need for this kind of studies that report prevalence values of risk factors in specific population groups not addressed by more general surveillance studies. With these studies we can also analyze what happens in the household of pregnant women, that is to say, the attitude towards smoking of the

TABLE 1. Proportion of women smokers in selected variables

Variables	Categorie	Non-smokers	IC (95%)	Proportion Smokers	IC 95%
Educational level	Secondary level or highe Elementary leve No education	81.5 70.3 68.2	76.1-86.2 64.8-75.4 54.2-81.4	18.5 29.7 31.8	13.8-24.0 24.6-35.2 18.6-47.6
Type of relationship	Unstable Stable	67.1 77.3	58.8-74.2 73.4-81.4	32.9 22.7	25.7-41.1 18.6-26.6
Partner's educational level	Secondary level or higher Elementary level No education	81.4 74.7 65.1	74.9-87.3 69.1-79.9 49.1-79.0	18.6 25.3 34.9	12.7-25.1 20.0-30.9 21.0-50.9
Household rules	Not allowed Not allowed but with exceptions No rules Allowed	81.4 72.4 55.5 49.2	77.1-85.3 62.1-80.0 38.1-72.1 36.8-61.8	18.6 27.6 44.4 50.8	14.7-22.3 19.9-37.9 27.9-61.9 38.2-63.2
Knowledge of the damag	Yes Doesn't know No	76.9 76.5 63.0	72.8-80.8 59.7-87.6 52.6-72.8	23.1 23.3 37.0	19.1-27.1 12.4-40.3 27.1-47.3
Alcohol consumption	No Yes	77.0 43.9	73.2-80.4 28.5-60.2	23.0 56.1	19.6-26.8 39.7-71.5
100% smoke-free spaces	In favor Agains Doesn't know	77.7 42.9 66.6	73.9-81.2 27.7-59.0 34.9-90.	22.3 57.1 33.3	18.8-26.1 40.9-72.3 10.0-65.1
Cigarette tax increase	In favor Against Doesn't know	79.7 56.1 69.2	75.5-83.2 45.3-66.1 52.4-82.9	20.3 43.9 30.8	16.8-24.5 33.9-54.3 17.0-47.6

TABLE 2. OR not adjusted for the proportion of pregnant women who are smokers according to sociodemographic variables. Tucumán, 2015

Variables	Categories	OR Not ajusted	95% CI
Educational level	Secondary level or higher Elementary level Incomplete elementary level	1.0 1.8 2.0	… 1.2-2.7 0.9-4.1
Place of residence	Rural Urban	1.0 1.7	… 1.1-2.8
Type of relationship	Unstable Stable	1.0 0.6	… 0.4-0.9
Partner's educational level	Secondary level or higher Elementary leve Incomplete elementary leve	1.0 1.5 2.3	… 0.9-2.4 1.0-4.8
Household rules	Not allowed Not allowed but with exceptions No rules Allowed	1.0 1.7 2.4 4.5	… 1.0-27 1.2-4.5 2.6-7.9
Knowledge of the damage	Yes Doesn't know No	1.0 1.0 2.0	… 0.5-2.0 1.2-3.1
Alcohol consumption	No Yes	1.0 4.3	… 2.2-8.3
100% smoke-free spaces	In favor Against Doesn't know	1.0 5.7 2.6	… 2.9-11.8 0.8-7.7
Cigarette tax increase	In favor Against Doesn't know	1.0 3.4 2.0	… 2.1-5.4 1.0-3.8

TABLE 3. OR adjusted for the proportion of women smokers according to sociodemographic variables. Tucumán, 2015

Variables	Categorie	OR Not ajusted	95% CI
Educational level	Secondary level or higher Elementary level Incomplete elementary level	81.5 70.3 68.2	… 1.0-3.0 0.3-2.6
Place of residence	Rural Urban	1.0 1.4	… 0.6-3.3
Type of relationship	Unstable Stable	1.0 0.7	… 0.3-1.7
Partner's educational level	Secondary level or higher Elementary level No education	1.0 1.2 1.2	… 0.7 2.1 0.5-3.0
Household rules	Not allowed Not allowed but with exceptions No rules Allowed	1.0 1.8 2.1 4.0	… 1.0-3.5 0.9-4.6 2.0-8.4
Knowledge of the damage	Yes Doesn't know No	1.0 0.8 2.1	… 0.3-2.2 1.1 -3.9
Alcohol consumption	No Yes	1.0 3.5	… 1.5-8.3
100% smoke-free spaces	In favor Against Doesn't know	1.0 3.2 3.4	… 1.2-8.2 0.6-20.2
Cigarette tax increase	In favor Against Doesn't know	1.0 1.8 1.3	… 0.9-3.7 0.5-3.5

people around her. These results show that the attitude of the household has an effect on the woman, increasing her chances of becoming a smoker.

If we compare this study with another one carried out in 15 cities of Argentina, we observe that the number of women who said they had smoked at some point in their life in Tucumán is lower than that reported for Argentina[25]. On the other hand, the median age of first use is similar to the average value reported for Argentina. But, the prevalence of smokers in Tucumán is higher than the one reported in that study, and the cessation rate is lower than the National one[26].

The percentage of women smokers in this study is lower than the one found in Spain, where 37.7% of Spanish women smoked before getting pregnant. On the other hand, that study reports a cessation rate of 41.4%, much lower than the one reported in Tucumán (86%). Most women in the previously mentioned study quit smoking at the beginning of their pregnancy (76.5%), more than the amount reported in this work (42%). However, the proportion of women who smoked during the whole pregnancy is lower in Tucumán (13.8%), in comparison with 18.2% reported in Spain[27].

Another study made in Spain reports a 30% prevalence of expectant mothers who are smokers (more than this study) and indicates also that 40% of pregnant women quit smoking before getting pregnant, which means that the cessation rate is several points lower than in Tucumán[28].

One of the limitations of the study is that the number of pregnant women hiding their smoking was not determined. Some studies report a 15% rate[29]. If we extrapolated that to our study, we would obtain a prevalence several points higher than the 25% that was actually found. This explains the importance and need to apply policies that produce an effect on this specific population group. Another limitation is the fact that it is a cross-sectional study and so we can't establish a causal relationship between associated factors and the event under evaluation. We can also say that since we work with pregnant women of the public subsector, results are focused on that specific population. Another pos-

sible limitation on the evaluation of factors associated with smoking in pregnant women could be the size of the obtained sample.

Conclusion

This study shows the prevalence and cessation rate of smoking in pregnant women of the public subsector in Tucumán. It also shows high prevalence of smoking in women by the time they get pregnant. Some of the factors that increase the possibility of smoking during pregnancy are: having elementary level education versus secondary level or higher, not having any rules regarding smoking inside the house or making exceptions versus houses were smoking is not allowed, not knowing the damages produced by smoking and not being in favour of the 100% smoke-free spaces law. Like other publications, we observed that the percentage of pregnant women who smoke increases in women who live in more unfavorable socioeconomic conditions[23]. This kind of study evaluating the factors associated with the event in question allows us to analyse and obtain information about the effect the household could have on the behaviour of the pregnant woman and which are the factors that influence it.

To know the prevalence of smoking in pregnant women is very important when evaluating the effect of policies intended to minimize its effects. Data obtained indicate that due to the high percentage of spontaneous cessation, pregnancy is an unavoidable opportunity to overcome the addiction and encourage pregnant women to quit smoking[30].

On the other hand, health professionals should regularly provide information about smoking when pregnant women attend their prenatal examinations, and more policies should be developed to improve access to information in programs and actions at the provincial level.

Conflicts of interest: There weren't any conflicts of interest during this study.

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