BRIEF REPORT

From planning to action in smoking cessation: Demographic and psychological symptom dimensions related to readiness to quit smoking

Carlos Alfonso Tovilla-Zárate[1] · Rebeca Robles-García[2] · Isela E. Juárez-Rojop[3] · Thelma Beatriz González-Castro[4] · María Lilia López-Narváez[5] · Alma Delia Genis-Mendoza[6] · Lizbeth Sánchez Mejía[1] · Ana Fresán[7]

Abstract

In Mexico, over 10 million persons are currently smokers. The motivation to quit smoking can be associated with individual and mental health factors. The aim of this study was to determine which variables related to smoking behavior, demographics, and current psychological symptoms distinguish highly motivated smokers (action stage) from less motivated smokers (planning stage) according to the readiness-to-quit model. 108 current smokers with no psychiatric diagnoses and no previous specialized attention for smoking cessation were interviewed. Nicotine dependence, readiness to quit, and psychological symptoms were assessed. Nicotine dependence was low to moderate (94.5%). Fewer depressive symptoms and smoking fewer cigarettes per day were the most important predictors for action motivation to quit. In assessing the motivation to quit smoking, individual demographic, background, and psychological characteristics should be considered since they can hinder the smoking cessation intervention.

Keywords Motivation · Smoking cessation · Mexico · Mental health · Psychological symptoms

Tobacco use is a significant public health problem and one of the world's leading preventable causes of morbidity and mortality. At present, there are approximately 1 billion smokers worldwide, with more than three-quarters living in low- and middle-income countries (Stubbs et al. 2017). In Mexico, a middle-income country with a total population of 85.2 million aged between 12 and 65, the National Survey of Drug, Alcohol and Tobacco Consumption (ENCODAT 2016–2017) reports that 14.9 million of Mexicans are currently smokers, comprising 5.4 million daily and 9.4 million occasional smokers (Reynales-Shigematsu et al. 2017).

✉ Ana Fresán
fresan@imp.edu.mx

Extended author information available on the last page of the article

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Although the benefits of smoking cessation are widely acknowledged, smoking can cause addiction. Nicotine is the most important active drug in tobacco and may account for the persistent risk of relapse (Rennard and Daughton 2014). Some individuals are very light smokers who regularly smoke tobacco yet seem not to be addicted to nicotine (Shiffman et al. 1995). However, the problem of smoking is more than an addiction, as it is a major risk factor for diseases such as cancer, COPD, and heart disease and has a significant association with mental health. Nicotine intake has been related to stress reduction while nicotine abstinence is associated with irritability, hostility, anxiety, and depression (World Health Organization 2002). As long-term psychological effects, the rate of episodes of depression and anxiety disorders is higher in individuals who are nicotine dependent (National Institute of Drug Abuse 2009). In Mexico, according to Benjet et al. 2004, current and former smokers were 1.8 times more likely to have depression than non-smokers and current smokers. Those who smoke a pack or more per day are three times more likely to experience depression than non-smokers. Despite the physical and mental risks, smoking cessation is difficult. According to the ENCODAT survey 2016–2017 (Reynales-Shigematsu et al. 2017), 73.6% of the nearly 15 million Mexican smokers report an interest in quitting, 56.1% of whom attempted to do so the last year while 2.9 million had made one attempt at quitting during the period assessed in the survey. However, it has been estimated that a current smoker may try to quit 30 times or more before successfully stopping smoking for a year or longer (Chaiton et al. 2016). Motivation to quit is one of the many factors that influence success in smoking cessation. In general, current models for smoking cessation treatment mainly rely on smokers with high motivation to begin treatment as smokers with low readiness to quit may not adhere to treatment and quit attempts are less likely to be successful (Danan et al. 2016).

The readiness-to-quit model for smoking cessation comprise five stages: *precontemplation*, where the person is not interested in quitting smoking, *contemplation*, the person considers quitting; *preparation*, the individual is actively preparing to attempt to quit smoking; *action*, there is an attempt to quit smoking in progress; and *maintenance*, designed to prevent relapses (Prochaska and DiClemente 1992). Most smokers' efforts fall into the *precontemplation* and *contemplation* stages (Etter et al. 1997; Rennard and Daughton 2014), and even those in the *preparation* stage may not take active actions to quit smoking.

Readiness to quit is an important feature in the process of smoking cessation. Smokers with high motivation levels are more likely to seek treatment or support for cessation (Challenger et al. 2007). Although individual readiness to quit varies, it may be associated with several individual and mental health factors in addition to those related to smoking (Daughton et al. 1998). Among individual factors, previous studies have shown that educational attainment, male gender, having lower nicotine dependence, and smoking fewer cigarettes were all factors associated with motivation to quit smoking (Abdullah and Yam 2005; Feng et al. 2010; Siahpush et al. 2006). In terms of mental health, the association is less clear. Some studies have found that severe symptoms encourage smoking cessation in hospitalized patients (Anzai et al. 2015), while others have found that people with depression and anxiety symptoms are less motivated to quit since they report that smoking alleviates their emotional problems and relieves stress (Clancy et al. 2013; Fidler and West 2009; Taylor et al. 2014).

To the best of our knowledge, no study has been conducted in Mexico to assess which factors affect individual readiness to quit in current smokers. Accordingly, the aim of the present study was to assess variables related to smoking behavior, demographics, and current psychological symptoms to distinguish the characteristics of smokers at the *action* stage of smoking cessation from those at the *contemplation* and *preparation* (planning) stages of the

readiness to quit model. We hypothesize that being male, having higher educational attainment, low nicotine dependence, smoking fewer cigarettes a day, and having less severe depression and anxiety symptoms will be the most important predictors for being at the *action* stage of smoking cessation.

Materials and methods

The study was conducted in accordance with Good Clinical Practices and all study procedures were approved by the Ethics and Research Review Boards of Comalcalco General Hospital and the University of Tabasco (UJAT-DAMC) in Mexico. All participants took part voluntarily in the study and provided written informed consent after having received a full explanation of the nature and procedures of the study.

Participants

A final sample of 108 male and female cigarette smokers aged 18 and over, from the blood donor center at *Comalcalco General Hospital* was included in the study. All subjects who attended the blood donor center were invited and those who agreed to participate were included. They were screened with the SCID-I and subjects who met the criteria for any Axis-I diagnosis were excluded if they had any medical or neurological disease at the time of the study or any current substance abuse or dependence (except for nicotine). Subjects were excluded if they reported any previous specialized smoking cessation treatment or program. Moreover, subjects with no interest in quitting smoking (RQL score of 1) were not included in the study, as we were only interested in those who reported an interest in quitting smoking (Fig. 1).

Assessments

Demographic characteristics (sex, age, years of education, employment, and marital status) and variables related to smoking behavior (age at onset of use, age when the subject smoked on a daily basis, number of cigarettes actually smoked per day, whether the individual gets up at night to smoke) were assessed by a face-to-face interview with each participant.

Nicotine dependence status was measured using the Fagerström Test for Nicotine Dependence (FTND) (Heatherton et al. 1991; Meneses et al. 2009), a six-item interviewer-administered questionnaire, with a total score ranging from 0 to 10. Scores from 0 to 3 indicate low dependence, scores from 4 to 6 moderate dependence, and scores $\geq$ 7 high dependence. The test showed adequate concurrent validity with the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) with a correlation of $r = 0.61$ ($p < 0.001$) (Rivadeneyra and Lucio 2011).

The Symptom Check List-90 (SCL-90) was used (Derogatis 1983) to assess psychological symptoms. It is a 90-item, self-report questionnaire designed to measure symptom intensity on a five-point Likert scale with nine different subscales: somatization, interpersonal sensitivity, obsession-compulsion, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. The SCL-90 has adequate reliability (Cronbach's alpha > 0.7) and construct validity (matrix correlation coefficients > 0.25) values (Cruz et al. 2005).
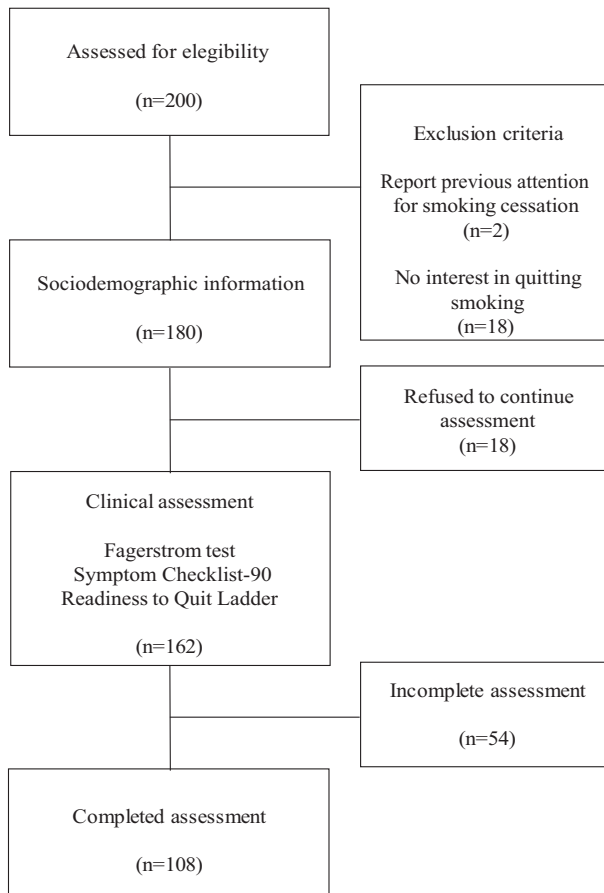
Fig. 1 Subject flow diagram

The Readiness to Quit Ladder (RQL) was used to assess motivation to quit smoking (Biener and Abrams 1991). This is a ten-point scale with responses ranging from 1 "*I have no interest in quitting smoking*" to 10 "*I have quit smoking and I will never smoke again*". Validity studies have shown this instrument is associated with indices of readiness for smoking cessation, conferring adequate concurrent validity [e.g., intention to quit ($r = 0.64$, $p < 0.001$), quit attempts ($r = 0.39$, $p < 0.001$) and cessation ($r = 0.27$, $p = 0.001$)] (Biener and Abrams 1991; Abrams et al. 2003; Layoun et al. 2017). Based on the RQL score, the sample was divided into two subgroups: the planning group (scores from 2 to 7, which includes thoughts but no actions about quitting) and the action group (scores from 8 to 10, which refers to actions for smoking cessation even if the participant continues to smoke).

Statistical analysis

Data analysis was performed using SPSS 21.0 software. Categorical variables were shown as frequencies and percentages while continuous variables were presented as means and standard deviations (SD). Comparisons between the planning and action groups were made using Chi-square tests ($\chi2$) for categorical variables and the independent samples t test for continuous

variables. Effect size was computed for the significant results obtained in the Chi-square tests (Cramer's V) and the *t* test (Cohen's *d*). Demographic features, variables related to smoking behavior and SCL-90 dimensions where significant differences emerged in the comparative analyses were included as explanatory variables in multivariate logistic regression models with the backward conditional method and the RQL-action for smoking cessation as the outcome variable. The Akaike Information Criterion (AIC) was found to be the best regression model for the present data.

Results

Demographic features and psychological symptoms of the sample

Of the participants included in the study, 63.9% (*n* = 69) were men with a mean age of 32.4 (SD = 15.4, range 18–83) and a mean of 12.9 years of education (SD = 3.8, range 1–20). Most had paid employment (75%, *n* = 81) and were single (55.6%, *n* = 60) at the time of the study.

The mean scores of the SCL-90 dimensions were as follows: somatization (1.1, SD = 0.8, range 0–3.4), interpersonal sensitivity (1.0, SD = 0.8, range 0–3.3), obsession-compulsion (1.2, SD = 0.7, range 0–3.1), depression (1.0, SD = 0.8, range 0–3.4), anxiety (1.1, SD = 0.9, range 0–3.6), hostility (1.1, SD = 0.9, range 0–3.5), phobic anxiety (0.8, SD = 0.9, range 0–3.3), paranoid ideation (1.1, SD = 0.8, range 0–3.3) and psychoticism (0.9, SD = 0.9, range 0–3.4).

Smoking behavior, nicotine dependence, and motivation to quit smoking

Initial onset of use of nicotine cigarettes was reported at the age of 15.4 (SD = 2.4, range 8–20 years) while the age when participants reported smoking daily was 16.5 (SD = 3.1, range 8–30). At the time of the study, the mean number of cigarettes smoked per day was 7.6 (SD = 7.3, range 1–50), while 37% (*n* = 40) of participants reported they got up at night to smoke. The mean score of the FTND was 3.4 (SD = 1.8, range 0–10) with over half the subjects recording low nicotine dependence (55.6%, *n* = 60), 38.9% (*n* = 42) moderate dependence and the remaining 5.6% (*n* = 6), high nicotine dependence. All respondents reported being interested in quitting smoking. According to the mean score of the RQL (6.2, SD = 2.3, range 2–9), participants plan to quit smoking in the next 6 months.

According to the categorization previously defined, 53.7% (*n* = 58) of the sample were included in the *planning motivation* group and 46.3% (*n* = 50) in the *action motivation* group.

Demographic features, psychological symptoms, and smoking behavior between groups

The comparisons between motivation groups are shown in Table 1. As may be seen, participants in the *action* motivation group were younger and more often single than those in the *planning* motivation group. They smoke fewer cigarettes a day and fewer participants get up at night to smoke. Moreover, lower scores in all SCL-90 symptom dimensions were observed in the *action* motivation group. Comparisons between the *planning* and *action* motivation groups showed a medium to large effect size except for the comparisons of marital status and whether participants got up at night to smoke, both with small effect size.

Table 1 Demographic features, psychological symptoms, and smoking behavior between planning and action motivation groups

	Planning $n = 58$	Action $n = 50$	Statistics	Effect size
	n (%)	*n* (%)		
Gender				
Men	33 (56.9)	36 (72.0)	$x^2 = 2.6$, $p = 0.10$	--
Women	25 (43.1)	14 (28.0)		
Marital status				
Single	27 (46.6)	33 (66.0)	$x^2 = 4.1$, $p = 0.04$	0.19
Married	31 (53.4)	17 (34.0)		
Employment status				
Not-remunerated	12 (20.7)	15 (30.0)	$x^2 = 1.2$, $p = 0.26$	--
Remunerated	46 (79.3)	35 (70.0)		
Get up at night to smoke				
No	30 (51.7)	38 (76.0)	$x^2 = 6.7$, $p = 0.009$	0.25
Yes	28 (48.3)	12 (24.0)		
Nicotine dependence – FTND				
Low	30 (51.7)	30 (60.0)		
Moderate	24 (41.4)	18 (36.0)	$x^2 = 0.9$, $p = 0.62$	--
High	4 (6.9)	2 (4.0)		
	Mean SD	Mean SD		
Age	37.2 16.8	26.8 11.4	$t = 3.6$, $p < 0.001$	0.72
Length of education (years)	12.4 4.1	13.6 3.4	$t = -1.6$, $p = 0.10$	–
Age at first cigarette smoking	15.3 2.8	15.4 1.9	$t = -0.2$, $p = 0.80$	–
Age of daily smoking	16.6 3.7	16.4 2.2	$t = 0.2$, $p = 0.80$	–
Number of cigarettes per day	10.3 8.8	4.6 3.0	$t = 4.3$, $p < 0.001$	0.86
SCL-90				
Somatization	1.4 0.7	0.9 0.6	$t = 3.4$, $p = 0.001$	0.76
Obsession-compulsion	1.4 0.7	1.0 0.7	$t = 3.0$, $p = 0.003$	0.57
Interpersonal sensitivity	1.3 0.9	0.8 0.6	$t = 2.8$, $p = 0.004$	0.65
Depression	1.3 0.9	0.7 0.6	$t = 4.0$, $p < 0.001$	0.78
Anxiety	1.3 0.9	0.8 0.7	$t = 3.0$, $p = 0.003$	0.62
Hostility	1.3 0.9	0.9 0.8	$t = 2.1$, $p = 0.03$	0.46
Phobic anxiety	1.2 1.0	0.5 0.7	$t = 3.9$, $p < 0.001$	0.81
Paranoid ideation	1.3 0.9	0.8 0.7	$t = 3.1$, $p = 0.002$	0.62
Psychoticism	1.1 1.0	0.6 0.6	$t = 2.6$, $p = 0.007$	0.60

Predictors of RQL-action for smoking cessation

A total of 13 variables were initially included in the model: age and marital status in the demographic characteristics section, number of cigarettes smoked per day, getting up at night to smoke, and the nine SCL-90 dimensions. The final logistic regression model, shown in Table 2, correctly classified 72% of the participants who reported smoking cessation actions and includes fewer cigarettes smoked per day and a lower score on the SCL-90 depression dimension as the most important predictors. This last model is adequate according to the reduction observed in AIC values.

Discussion

Several smoking-cessation programs have been designed (Noonan et al. 2018; Palmer et al. 2018). However, the literature shows that the success of these interventions is closely linked to people's motivation to quit smoking. In this study, we assess variables related to smoking

Table 2 Final multivariate logistic regression model for RQL-action for smoking cessation ($n = 108$)

	β	Odds Ratio	95% C.I.	p
Initial model AIC value of 216.0				
Age	0.01	0.98	0.93–1.02	0.38
Marital status-single	0.32	1.37	0.42–4.48	0.59
Number of cigarettes per day	− 0.12	0.88	0.78–0.99	0.04
Get up at night to smoke	− 0.60	0.54	0.18–1.61	0.27
SCL-90 somatization score	− 0.42	0.65	0.14–3.07	0.59
SCL-90 obsession score	− 0.66	0.51	0.14–1.84	0.30
SCL-90 interpersonal sensitivity score	0.47	1.61	0.33–7.71	0.55
SCL-90 depression score	− 1.58	0.20	0.03–1.41	0.10
SCL-90 anxiety score	0.88	2.41	0.38–15.17	0.34
SCL-90 hostility score	0.77	2.17	0.75–6.22	0.14
SCL-90 phobic anxiety score	− 1.22	0.29	0.07–1.10	0.07
SCL-90 paranoid ideation score	− 0.05	0.94	0.30–2.96	0.92
SCL-90 psychoticism score	1.11	3.03	0.51–17.93	0.22
Final Model AIC value of 181.5				
Number of cigarettes per day	− 0.16	0.85	0.76–0.95	*0.004*
SCL-90 depression score	− 1.69	0.18	0.04–0.76	0.02
SCL-90 anxiety score	1.04	2.8	0.80–10.1	0.10

behavior, demographics, and current psychological symptoms in order to distinguish the characteristics of smokers at the *action* stage of smoking cessation from those at previous stages of the readiness-to-quit model.

First, when demographic features were analyzed, we found a few differences between groups, with those in the *action* motivation group being more likely to be single and younger. Although several studies in the international scientific literature have shown how certain demographic features can influence motivation to quit smoking and even the success of clear attempts to quit, these results are controversial (Brathwaite et al. 2017). For example, in a study in Iran, marital status was unrelated to success or failure in quitting cigarette smoking (Orouji et al. 2017), whereas a study in Hong Kong showed that bachelors were less likely to cease smoking (Lai et al. 2017). Similarly, contradictory results are found regarding age. In a large study in South Korea assessing the government-run "Smoking Cessation Clinics", it was found that intention to quit was lower in young, economically disadvantaged smokers (Kim et al. 2013), while longitudinal data from three surveys in the Netherlands found that smokers aged 15 to 39 were more likely to attempt to quit (Nagelhout et al. 2013).

These results highlight the importance of considering the demographic background of the population in each study. The sample from this study was drawn from Tabasco, one of the three states in Mexico with the lowest smoking prevalence (9.5% compared to 17.6% in Mexico) and the third highest percentage of cessation attempts (67.3 vs. 56.1% of the whole country) (Reynales-Shigematsu et al. 2017). Our results are therefore not representative of the population in Mexico. However, in similar samples, being young and single in the *action* group should be a window of opportunity to promote smoking cessation in people with these characteristics as several chronic problems related to smoking can be prevented. Conversely, we can assume that older, married people paid more regular visits to health services (for health issues that may or may not have been related to smoking), where healthcare professionals may emphasize the importance of smoking cessation to improve health.

Even though nicotine dependence was generally low in our sample, individuals from the *planning* group reported smoking more than twice as many cigarettes as those in the *action*

group, while a higher percentage reported getting up at night to smoke. These behaviors may become barriers to smoking cessation and eventually lead to major nicotine dependence and health issues. Since the number of cigarettes smoked per day was a predictor of the level of motivation to quit smoking in the present study, one of the goals of intervention programs in the *planning* motivation groups should be to reduce the daily number of cigarettes smoked. According to a recent review by the Cochrane Tobacco Addiction Group (Lindson-Hawley et al. 2016), which includes studies on smokers with no immediate desire to quit tobacco use, this population can be helped to cut down the number of cigarettes smoked and to quit smoking in the long term, through the use of nicotine replacements. This review highlights the importance of increasing motivation to quit smoking since the absolute benefit of nicotine replacement use has yet to be determined, and only smoking cessation yields substantial health benefits.

One of the most consistent findings in the scientific literature is the association between smoking and mental disorders, such as affective disorders. Even though individuals in our sample were not evaluated with a diagnostic tool to identify psychiatric diagnoses and did not report the presence of a mental disorder, we observed that psychological symptoms assessed with the SCL-90 were more severe in the *planning* motivation group than in the *action* motivation group, and that less severe depression was a predictor of taking action to quit smoking. Previous findings suggest that the presence of psychopathology may be associated with lower motivation to quit smoking (Farris et al. 2017). In fact, one of the most common responses of individuals when asked why they smoke usually involves an effect of smoking that alleviates negative states related to affect or cognition (Hall et al. 2015).

In terms of the capacity of depressive symptoms to predict that a person will be in the *planning* motivation group (vs. the *action* group), our results tally with a recent meta-analysis of 5061 patients in which those with more severe depressive symptoms reported less motivation regarding smoking cessation (Secades-Villa et al. 2017). This sample also comprised individuals without a psychiatric diagnosis. In these cases, nicotine may have a self-treatment effect in "sub-syndromic" depressive symptoms, which in turn may contribute to nicotine dependence and diminished motivation to quit smoking (Keuthen et al. 2000).

These results have significant practical implications for the comprehensive and therefore effective evaluation and treatment of smoking. First, since there are at least two types of smokers requiring different therapeutic components depending on their motivational stage to quit (in other words, whether they are at the *planning* or *action* motivational stage). Second, given the association between less motivation to quit and the presence of depressive symptoms (regardless of the level of nicotine dependence), it is important to include both motivational and affective states in the regular evaluation of smokers (which usually focuses on the determination of nicotine dependence).

In keeping with this evaluation, additional treatment components should be added to pharmacological and/or psychological interventions designed to reduce nicotine dependence, including motivational interviews (Heckman et al. 2010) and evidence-based strategies to alleviate depressive symptoms, such as behavioral activation (MacPherson et al. 2016). This type of comprehensive intervention has provided preliminary evidence of effectiveness in achieving smoking abstinence, as well as improving depressive symptoms in various populations (see for example, an eight-session behavioral activation–based group treatment for young-adult and adult smokers: MacPherson et al. 2017).

It has been suggested that these comprehensive interventions are more effective than conventional treatment focusing solely on treating nicotine dependence (for example, through

nicotine replacement therapy) because they remediate the psychological basis shared by both depression and tobacco consumption through a common pathway, by increasing rewarding activities, which in passing constitutes a parsimonious complement to standard smoking cessation treatments (MacPherson et al. 2010).

We acknowledged several limitations in our study. First, this is a small sample size drawn from a specific scenario that restricts the generalization of results. Moreover, data should be interpreted with caution, since no causal inferences can be made due to the cross-sectional design of the study. Future studies should include a broader sample with different levels of nicotine dependence, a structured assessment of psychiatric comorbidities and, if possible, a follow-up of participants to evaluate changes in their smoking habits related to their motivation to quit. Other directions for future research include the evaluation of a comprehensive intervention for smokers with both low motivational states and high depressive symptoms (including a motivational interview, behavioral activation and standard smoking cessation treatment). Importantly, in addition to feasibility and acceptability studies, randomized clinical trials incorporating different control groups (with standard treatment, but also with different psychotherapeutic interventions to increase motivation to quit and treat depression symptoms) as well as the evaluation of the mechanisms of change involved are warranted.

Conclusions

Our findings underline the need for healthcare providers to screen for psychological symptoms, evaluate their impact on the motivation to quit smoking, and refer participants to treatment if these symptoms hinder the intervention for smoking cessation or if they cause functional impairment in the individual. Smoking cessation programs should be available for both motivational groups (*planning* and *action*) regardless of the level of nicotine dependence, on the understanding that each one will have specific objectives and goals in the short and long term, and that professional mental health evaluation should be incorporated as part of routine treatment for smokers.

Compliance with ethical standards

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Affiliations

Carlos Alfonso Tovilla-Zárate[1] · Rebeca Robles-García[2] · Isela E. Juárez-Rojop[3] · Thelma Beatriz González-Castro[4] · María Lilia López-Narváez[5] · Alma Delia Genis-Mendoza[6] · Lizbeth Sánchez Mejía[1] · Ana Fresán[7]

[1] División Académica Multidisciplinaria de Comalcalco, Universidad Juárez Autónoma de Tabasco, Comalcalco, Tabasco, Mexico

[2] Centro de Investigación en Salud Mental Global, Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz, Ciudad de México, Mexico

[3] División Académica de Ciencias de la Salud, Universidad Juárez Autónoma de Tabasco, Villahermosa, Tabasco, Mexico

4   División Académica Multidisciplinaria de Jalpa de Méndez, Universidad Juárez Autónoma de Tabasco, Jalpa de Méndez, Tabasco, Mexico

5   Hospital General de Yajalón, Secretaría de Salud, Yajalón, Chiapas, Mexico

6   Laboratorio de Genómica de Enfermedades Psiquiátricas y Neurodegenerativas, Instituto Nacional de Medicina Genómica, Ciudad de México, Mexico

7   Subdirección de Investigaciones Clínicas, Instituto Nacional de Psiquiatría Ramón de la Fuente Muñíz, Calz. México Xochimilco No. 101, Col. San Lorenzo, Huipulco, Tlalpan. C.P, 14370 Mexico City, Mexico