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Croyances et besoins des fumeurs diabétiques type 2 concernant l'arrêt du tabac

(Beliefs and needs regarding smoking cessation among type 2 diabetic smokers)

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1. Introduction

Diabetes and tobacco use are two major public health burdens. In Switzerland, 450'000 people live with diabetes, 90% of them have type 2 diabetes *(1)*. The prevalence of type 2 diabetes is increasing, notably in developed countries, due to an increase in overweight and obesity *(2)*. Smoking is the first cause of avoidable death worldwide *(3)*. Nevertheless, it is estimated that more than 25% of the Swiss population uses tobacco *(4)* and, in a Swiss cohort of middle-aged people, 20,8% of people with diabetes smoked *(5)*.

Among people with diabetes, smoking is associated with poor metabolic control *(6-11)* higher insulin needs *(12, 13)* and increased risk for hypoglycemia *(14)*. Higher risks of retinopathy, nephropathy and peripheral neuropathy are also linked to tobacco use *(15, 16)*. Worsened dyslipidemia is more likely to be found in diabetic smokers *(17)*. Since diabetes and tobacco use act synergistically on morbidity and mortality, diabetic people who smoke are at increased risk of micro and macrovascular complications and premature death *(18-20)*. For example, cigarette smoking raises the risk for coronary heart disease in diabetic patients *(21)* and it is estimated that up to 65% of cardiovascular deaths are caused by the interaction between diabetes and tobacco use *(22)*. In addition, studies suggest that smokers increase their risk of developing type 2 diabetes by 44% *(23)*. The results of a study, including men only, showed that, among other interventions reducing cardiovascular risk factors, smoking cessation is the best way to extend lifetime of diabetic people *(24)*.

There are gender specificities regarding both diabetes and smoking. If women are less likely to suffer from type 2 diabetes than men *(25)*, they have a stronger cardiovascular risk when they are *(21, 22, 26)*. Moreover, results suggest that diabetic women are more likely to suffer from high blood pressure, obesity and dyslipidemia than men and that this cluster of cardiovascular risks add to their cardiovascular adverse profile *(27)*. Regarding diabetic self care, women follow recommendations more closely and have a better glycaemic control than men *(28)*. Reasons to smoke differ between men and women. Women tend more to use tobacco consumption to manage their stress and weight *(29-32)*. Results suggest that weight gain is both a barrier to smoking cessation and a risk factor of failure of the cessation process among women *(33-35)*. Women seem also to be less likely to quit smoking compared to men *(36, 37)*.

It has been shown that diabetic smokers are less motivated to stop smoking than other smokers *(38, 39)*. This could be notably explained by fear to gain weight *(40, 41)*. Smokers with diabetes are also more likely to be suffering from depression, which is known to hinder efforts to stop smoking *(42)*. Moreover, the information about the benefits of smoking cessation and available options for help may not be appropriate enough for diabetic smokers *(43, 44)*. All these elements may contribute to the lower success rates in smoking cessation among smokers with diabetes *(45)*.

Results suggest that diabetic smokers are not fully aware of the risks of micro and macrovascular complications linked with tobacco use. Diabetic smokers are concerned about the impact of their weight, dietary adherence and the management of their diabetes *(46)* but they don't consider smoking cessation as a priority *(47)*. Indeed, after a diagnosis of diabetes, people will focus on weight loss, lower consumption of saturated fat and lower energy intake but the impact of a new diagnosis of diabetes on smoking cessation is borderline *(48)*. On the contrary, a new diagnosis of cardiovascular disease will increase the rates of smoking cessation *(48)*. Studies show that people with diabetes are less likely to be given cessation advice by health professionals *(43)*. Moreover, there is limited evidence on the efficacy of smoking cessation interventions in people with diabetes *(49)*.

Diabetic smokers may have specifics needs regarding tobacco cessation and may require a smoking cessation design that fits more to those needs to improve success rates. Furthermore, gender specificities should be better understood and integrated in smoking cessation interventions. Therefore, the aim of our study is to assess the attitudes, beliefs and needs of type 2 diabetic smokers regarding smoking cessation and understand potential gender differences. This information will help tailor a smoking cessation intervention adapted to gender and diabetes specificities.

2. Methods

Design

The study is a cross-sectional survey. We chose to use validated existing questionnaires that were of interest to us and also explored or confirmed areas of interests that emerged from a preliminary qualitative study. The survey was built using the website SurveyGizmo. The questionnaire started with a brief description of the study objectives and participants who were interested in taking part to the study, were asked to give their informed consent in order to begin the questionnaire. The survey was approved by the local ethic committee (CER-VD, protocol n° 302/15).

Sample and procedure

Inclusion criteria were being aged 18 years old or older, being a current smokers (i.e. having smoked at least 100 cigarettes in his/her life and smoking every day or most days) or a former smokers (i.e. having smoked at least 100 cigarettes in his/her life and but not currently smoking) and having been diagnosed with type 2 diabetes (self report). Exclusion criteria were being a pregnant or lactating woman, being unable to give an informed consent or not being able to speak or understand French. Participants were recruited via several distinct ways: at the outpatients'clinic of the Medical Policlinic of Lausanne (PMU) and in the private practice of 11 specialized physicians in diabetology in the area of Lausanne, via websites dedicated to smokers and/or people with type 2 diabetes and using the social media Facebook. Some patients of the PMU were approached personally, and asked if they wanted to participate to the survey. They could answer on the internet, by using a link to the survey, or they could make an appointment to answer the survey with a member of the study team (medical student, study nurse of principal investigator). Finally, we also sent a letter containing the internet link to the survey as well as a paper version of the survey to patients identified at the PMU and who met inclusion criteria. We also contacted diabetologists to ask if they were interested to participate, by giving the link to their eligible patients. We also sent them paper version of the survey, so they could give them to their patients.

We contacted some Swiss, French and Belgian internet websites, which were dealing with diabetes or with smoking cessation. The participating websites put the description of the study and the link to the survey on one of their webpages. The websites *stop-tabac.ch, cipret.ch* put the link on their website and on their newsletter. The regional diabetic associations from French part of Switzerland were also contacted and the website *diabetefreiburg.ch* put the link for the study on one of their pages. The Belgian association of diabetes also participated by posting the link on their website *diabete-abd.be*. We also created a Facebook add with the link to the survey. This add was aired in the French part of Switzerland, France and Belgium. People with interest in diabetes, smoking or smoking cessation were targeted. Finally, the Swiss journal *d-diabete* put an add for the study with the internet link.

The questionnaires were filled between May 2016 and November 2016.

Measures

All the data were self-reported. The survey contained questions about socio-economic data, diabetes-related health conditions, smoking status, motivations to smoke, interest in smoking cessation and conformity to gender norms.

We used the PHQ-2 score to detect depression among responders (50). This score is based on two questions that can be answered by yes or no. If one or two responses are yes, the score is considered positive for depression.

To evaluate the degree of nicotine dependence, we used the CDS-12 score *(51)*. This score contains 12 questions about smoking dependence. Each of the five answers proposed for every question are matched with a score from 1 to 5 points. The higher score is 60 points. Based on the total score, the level of dependence can be classified in 3 categories: moderate (0 to 24 points), intermediate (25 to 44 points) and strong (45 to 60 points).

We used 9 items of the Modified Reasons for Smoking Scale (MRSS) to understand motivation to smoke of the participants *(30)*. Items from MRSS are linked with subgroups of motivation to smoke: tension reduction, pleasure, habit, social function, stimulation and handling. For each proposition of the MRSS, responder had to evaluate if it was never, rarely, occasionally, frequently or always a trigger to smoke.

Finally, we modified the conformity to feminine norms inventory (CFNI) and the conformity to masculine norms inventory (CMNI) and extracted the 19 most predictive in order to assess the conformity of participants to gender-related role. The CFNI and CMNI are based on statements that are typically related to masculine or feminine norms. Responders had to answer, if they agreed or disagreed that those statement were conform to their personality.

Statistical analyses

We used the software STATA 14.0 to analyze the results. Basic descriptive analyses were performed to characterize the study population with means and standard deviations (SD) for discrete variables and and number and proportions for categorical variables. Differences between men and women were compared using chi-squared test or ttests for categorical and discrete data, respectively. Missing values were not imputed.

3. Results

Sample

In total, 492 participants answered the survey during a five months period, between May and November 2016. Among those 163 were disqualified because they had never smoked. Participants who did not answer the questionnaire to the end (partial questionnaires) were also excluded (n=172). Participants without type 2 diabetes or with other types or unknown types of diabetes were further excluded from analyses (n=31). The final sample consisted of 126 respondents with type 2 diabetes who were current or former smokers and who filled the survey to the end.

Demographic characterictics

Detailed demographic characteristics of the participants are shown in table 1. Among participants included in the final sample, 45.2% were from the outpatient clinic and 54.8% answered via an internet link. A higher proportion of responders were men (58.7% vs. 41.3% women). The mean age of the participants was 61.5 years old and women were on average younger than men (59.7 years old vs 62.9). The leading country of residence was Switzerland (53.2%) followed by France (34.1%) and Belgium (11.1%). Regarding civil status, most of the responders were married (43.4%) or divorced/separated (34.4%), a minority was single (15.6%) or widowed (6.6%). Regarding employment, 48.3% of them were retired, 27.6% were employed and 9.5% were unemployed or had social security. If a majority of the women (51%) and men (52.7%) completed the secondary level of education, women participants were more likely to have an obligatory school or lower level of education (27.5%) than men (14.9%). On the contrary, they were less likely to complete a tertiary level of education (13.7%) than men (28.4%).

Diabetes-related health conditions

Regarding diabetes-related health conditions, the mean BMI of the participants of the study, (calculated with self-reported weight and height of the participants), was 30.4 kg/m2 (SD 6.4) (29.4 kg/m2 for men, 31.9 kg/m2 for women), with no significant differences between men and women. The mean related diabetes duration was 9.5 years (SD 7.4). Regarding diabetes complications, 34.2% of responders reported not to have any complication, with a significant difference between women (51%) and men (only 23% reporting no complications). The detail of self-reported diabetes complications among men and women are shown in figure 1. The most frequently reported complications were feet problems (31.1% of men, 46% of women) and hypo/hyperglycemias (17.6% of men, 29% of women). Interestingly, 21.6% of male participants declared to suffer from erectile dysfunction.

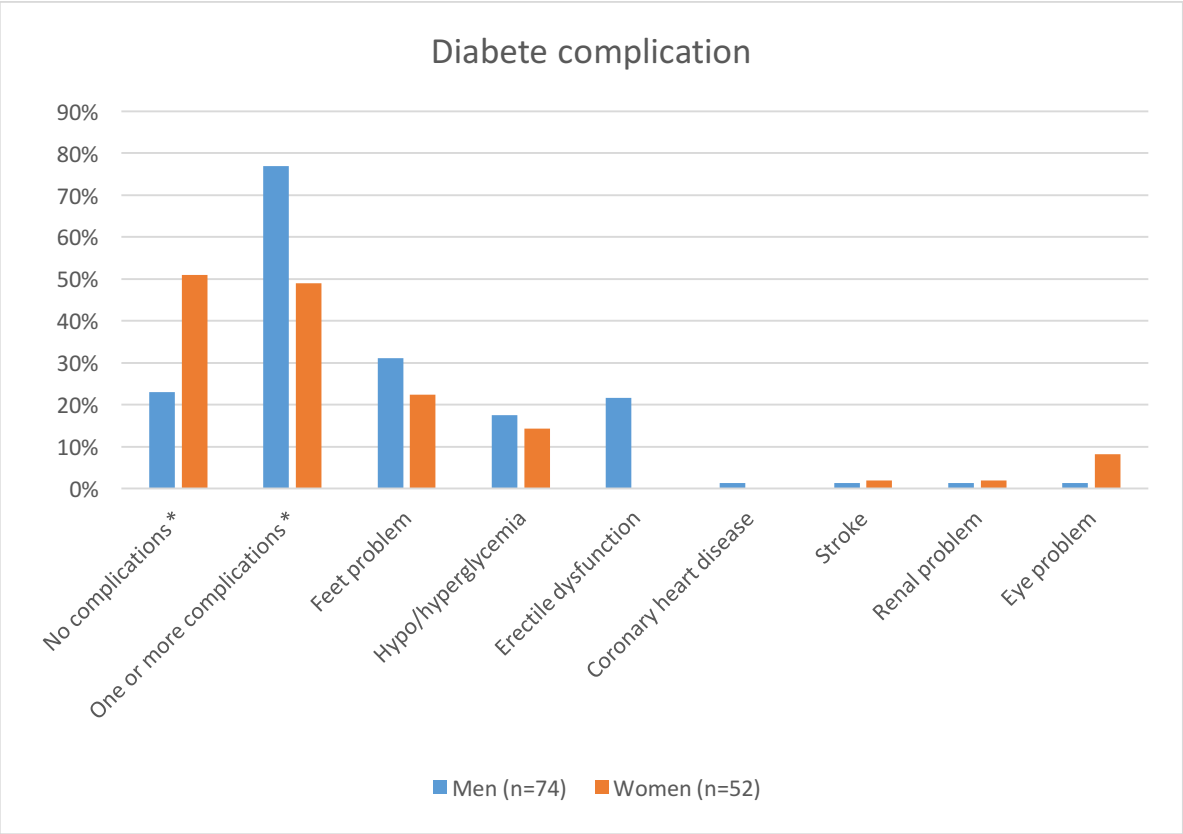

*Figure 1 : Self-reported diabetic complications among participants. (The * show the items with a significative difference between men and women)*

The PHQ-2, score to detect depression, was positive among 61.1% of the current smokers (n= 54). Only 33.3% of the former smokers had a positive PHQ-2 score (n= 69). The difference between current and former smoker is significative (p value = 0.002). There was no difference between men and women regarding de PHQ-2.

Smoking status

Smoking status of participants was divided between current smoker (43.7%) and former smoker (56.4%). Among responders, men were more likely to be former smoker (71.6%) than current smoker (28.4%). The contrary was observed among women participants, with 65.4% of current smokers vs. 36.6% of former smokers. A large majority of current smokers of both gender reported to smoke daily (90.5% for men, 94.1% for women). On average, men reported to smoke or have smoked more than women, among both current smokers (27.1 cigarettes/day (SD 15.5) for men, 20.3 (SD 8.6) for women) and former smokers (32.6 cigarettes/day (SD 19.1) for men vs 26.8 (SD 13.1) for women). This gender difference was statistically significant among current smokers (p value <0.05), but not among former smokers. Smoking status of participants are shown in table 2.

Degree of tobacco dependence

Responders who were current smokers were asked to evaluate their degree of dependence to nicotine on a Likert scale from 0 (not addicted at all) to 100 (completely addicted). The mean score was high, 76.9/100 (SD 23.5) and there was no significant difference between gender. We also used the CDS12 score, a validated questionnaire to measure the level of nicotine dependence of the participants. The mean score was 44.4 (SD 8.73) with no difference between men and women. Based on the score, we divided the smokers in 3 categorises, low, moderate and strong nicotine dependence. Figure 2 shows the results of CDS-12 among participants. The majority of smokers had a strong level of dependence. Most of the participants (61.1% of men and 63% of women) reported a strong degree of dependence, with no difference between men and women. None of the responders had a moderate degree of dependence. There was no significant difference between gender.

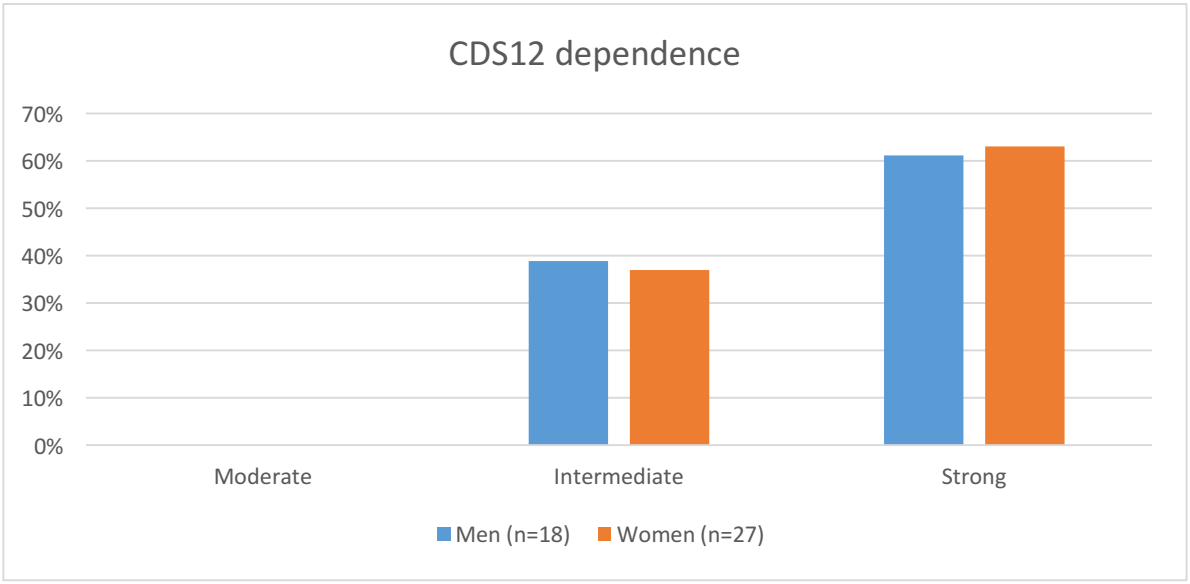

Figure 2: Self-reported degree of tobacco dependence

Motivations to smoke

Participants who smoked currently were also asked about their motivations to smoke. We used the validated MRSS score (scale based on frequency: 1 (never), 2 (rarely) 3 (occasionally), 4 (frequently), 5 (always)) to assess these motivations (figure 3A) and completed it with other motivations that seemed important to us (figure 3B). Among MRSS score items, the principal motivations to smoke expressed by smokers were pleasure to smoke (score of 3.75 (SD 0.97) among men and 3.61 (SD 1.23) among women), handling (score of 3.42 (SD 0.99) for men, 3.62 (SD 1.08) for women) and tension reduction/relaxation (score of 3.25 (SD 1.2) among men and 3.62 (SD 0.73) among women). There was no significant difference between men and women.

Figure 3A: Self-reported motivation to smoke (MRSS)

Among other motivation to smoke, loneliness was the leading mentioned reason (score of 2.74 (SD 1.59) among men, and 3.0 (SD 1.48) among women), followed by inactivity (score of 2.2 (SD 1.35) among men and 2.2 (SD 1.47) for women) and weight management (score of 2.0 (SD1.53) among men and score of 2.43 (SD 1.77) for women). Diabetic diet management or fear of teasing were not very strong motivations to smoke in our sample. There was no significant difference between men and women.

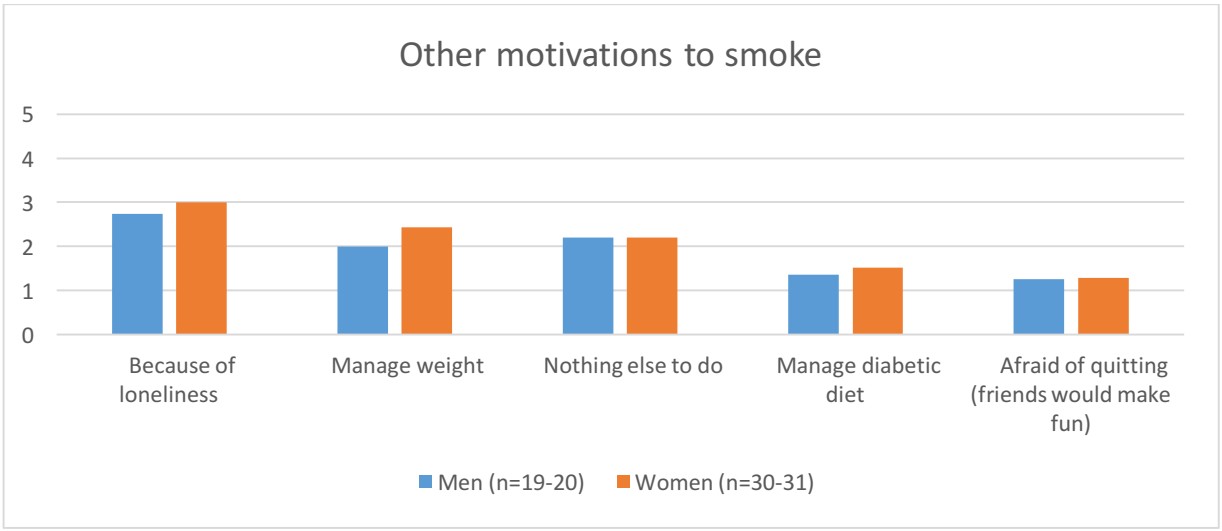

Figure 3B: self-reported other reasons to smoke

Motivations to quit smoking

We asked smokers about their intention to quit smoking. The majority of women (58.72%) reported that they wanted to quit smoking whereas only (33.33%) of men were willing to quit. However this difference was not statistically significant. The participants were also asked to evaluate their degree of motivation to quit on a scale from 0 (not motivated at all) to 10 (very motivated). Motivation to quit was significantly higher among women (6.09 (SD 3.09)) compared with men (3.71 (SD 2.85)) (p value = 0.0064). Responders also rated their confidence in their capacity to stop smoking on a scale from 0 (not confident at all) to 10 (totally confident). On average, the score was 4.4/10 with no difference between men and women.

Figure 4 shows the motivations to quit smoking. Participants were asked to rate different motivation from 1 (not a motivation at all) to 4 (important motivation). Leading motivations to quit smoking included health-related issues, with desire to protect health (mean score of 3.57 (SD 0.74)), to breathe better (mean score of 3.57 (SD 0.78)), to regain a good physical condition (mean score of 3.46 (SD 0.84)), to protect health of other (mean score 3.2 (SD 1.09)), and the fact of having a health problem (mean score of 3.3 (SD 1.05)). Other leading motivations were dependence-related with the desire to be free from dependence (mean score of 3.47 (SD 0.94)) and not to have craving symptoms anymore (mean score of 3.39 (SD 0.94)). The desire to save money (mean score of 3.45 (SD 0.97)), to be a role-model for children (mean score of 3.18 (SD 1.15)), to avoid halitosis (mean score of 3.16 (SD 1.11)) and to feel better (mean score of 3.13 (SD 1.1)) were also among the top motivations. Women were statistically more concerned about protecting health (mean score of 3.77 (SD 0.5) among women vs 3.24 (SD 0.97) for men, p value = 0.017), regaining good physical condition (mean score of 3.76 (SD 0.51) for women vs 2.94 (SD 1.03) among men, p value = 0.0008), not to have craving symptoms (mean score of 3.39 (SD 0.7) among women vs 2.81 (SD 1.11) for men, p value = 0.018), avoiding halitosis (mean score of 3.77 (SD 0.87) among women vs 2.5 (SD 1.21) for men, p value = 0.0022), feeling better (mean score of 3.37 (SD 0.96) for women vs 2.71 (SD 1.21) among men, p value = 0.0457), not smelling tobacco anymore (mean score of 3.3 (SD 1.02) among women vs 2.19 (SD 1.33) for men, p value = 0.0028) and the fact of already having a health problem (mean score of 3.52 (SD 0.86) for women vs 2.88 (SD 1.26) among men, p value = 0.0417). There was no difference between men and women regarding other items.

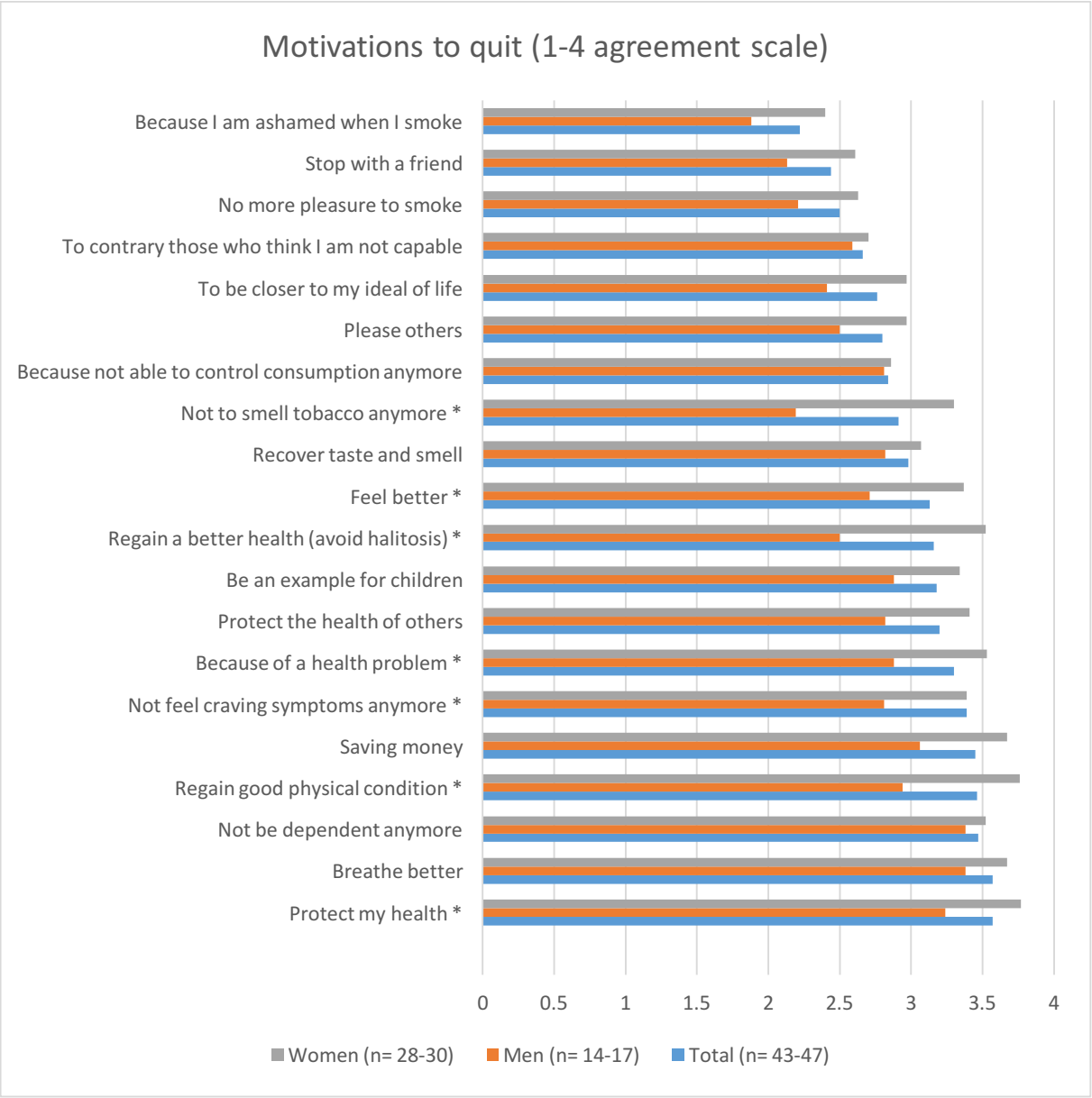

*Figure 4: Self-related motivations to quit smoking. (The * show the items with a significative difference between men and women)*

Information on smoking cessation

Current smokers were asked about who gave them information on smoking cessation. Only 50.9% of responders reported receiving informations from physicians, who were the main information provider, followed by relatives (34.5% of responders), other health professional (23.6%), internet (20%) and medias (12.7%). According to 23.6% of participants, they received no information. None of the responders received information about smoking cessation from patient association. Figure 5 shows sources of informations of participants regarding smoking cessation.

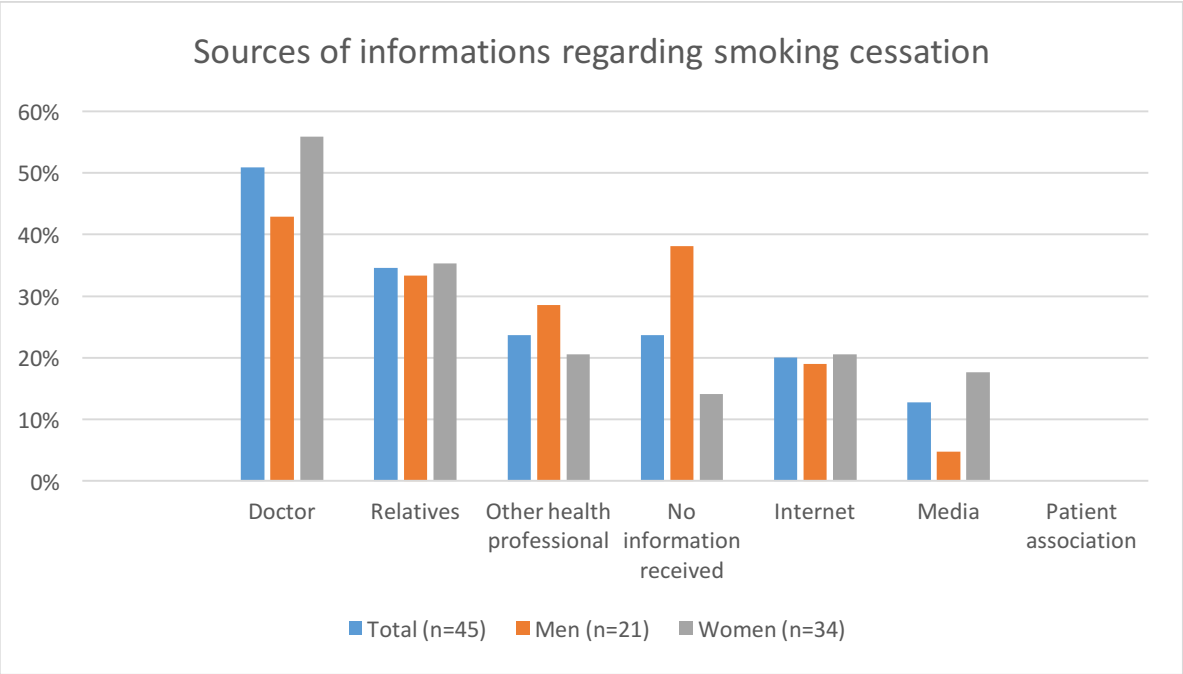

Figure 5: Sources of informations regarding smoking cessation of participants (self-reported)

Interest in aids for smoking cessation

We asked smoker participants to what degree on a 0 (not interested) to 4 (very interested) scale, they would be interested in several smoking cessation methods. To our surprise, the majority of smokers were not or poorly interested in external help. Only 45.8% of them reported being interested in a follow up with a health professional, which was the highest scored item. The responders also showed interest in groups with other diabetics (31.9%), acupuncture (29.5%) and e-cigarettes (29.1%). Acupunture interested statistically more women (40.7%) than men (11.8%) (p value= 0.04). There was no difference between men and women for other items. Figure 6 shows the percentage of participants interested in various methods for smoking cessation.

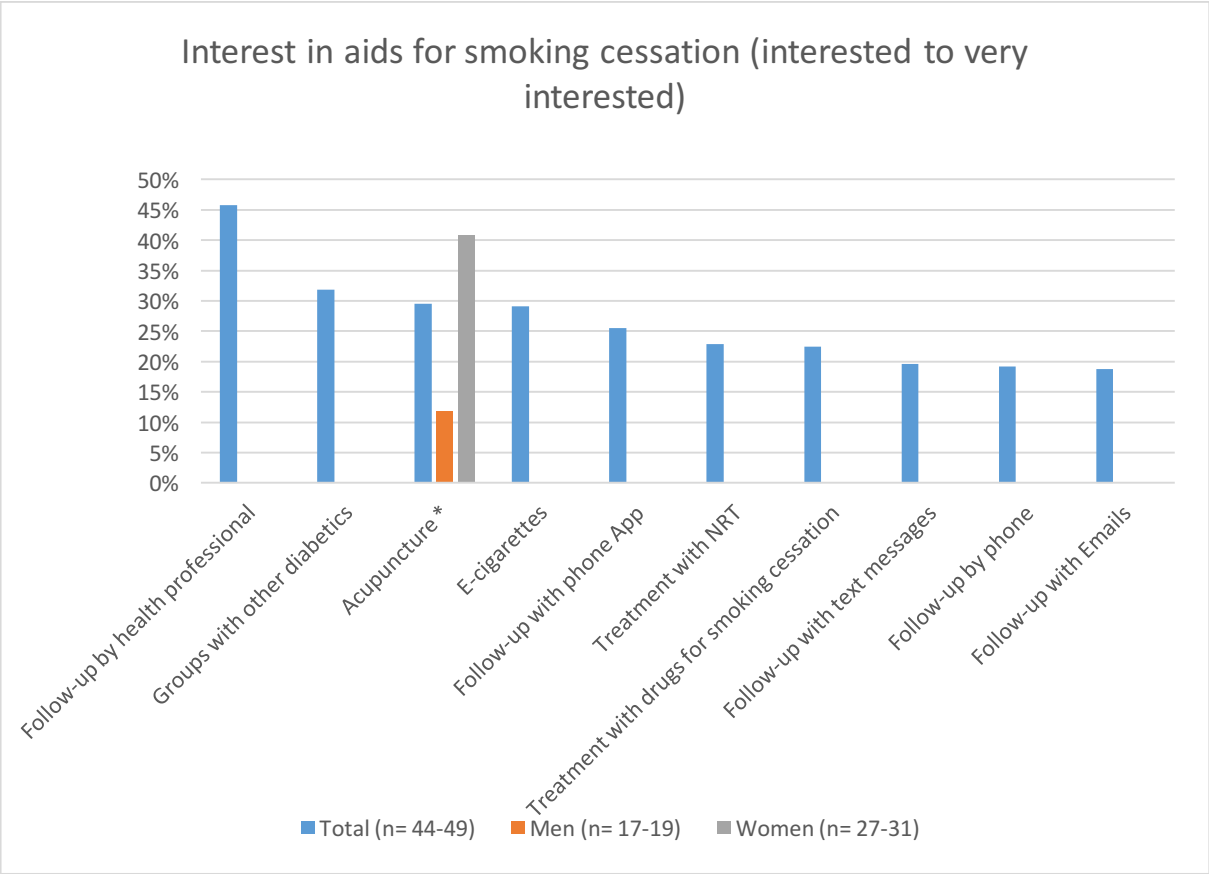

*Figure 6: Self reported interest in aids for smoking cessation. (The * shows the item with a significative difference between men and women)*

Conformity to gender norms

Finally we evaluated the conformity to gender norms of the participants. Figure 7 shows the result. Women (score of 28.04 (SD 3.12) were significantly more conform to feminine norms than men (score of 25.04 (SD 3.24)). Men (score of 20.85 (SD 2.71)) and women (score of 20.46 (SD 2.57)) were almost equally conform to masculine norms, with no significant difference.

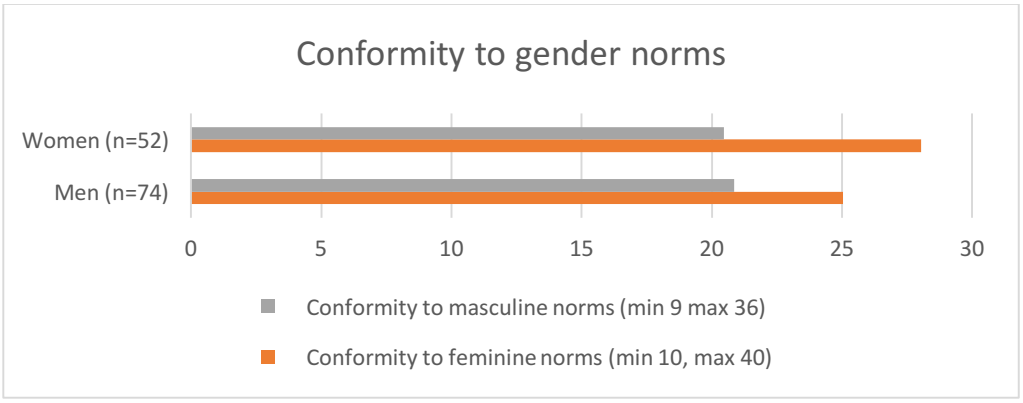

Figure 7: Self-reported conformity to gender norms

4. Discussion

In this sample of smokers with type 2 diabetes, the main reported reasons to smoke were reduction of tensions, handling, pleasure to smoke and loneliness. There were no difference between men and women. Smokers had a strong nicotine dependence and there were no difference between men and women regarding dependence. Unexpectedly, weight management was not part of the major reasons to smoke among this sample and there was no significant difference between men and women. The management of diabetic diet was not an important reason to smoke neither. Almost half of the smoker participants were willing to quit smoking. The leading motivations were often related to health, with a will to protect one's and other's health, to breathe better and to regain a good physical condition. Another important motivation cited was a wish to spare money. The desire to stop smoking was stronger among women, who worried more about health-related issue of tobacco use. Responders were not very interested in the suggested aids to quit. Only half of them reported being interested in a follow up with a health professional, which was the highest scored item. Women were statistically more likely to use alternative medicine as an aid in smoking cessation, such as acupunture. Finally, more than 60% of the smoker participants screened positive for depression, which can lower the success rate in smoking cessation.

These results, unlike other studies among non diabetic smokers, suggest that reasons to smoke do not differ between men and women *(29, 31-33)*. Futhermore, unlike others studies, the managing of weight and diabetic diet seemed not to be major reasons to smoke among diabetic women of the study. Regarding smoking cessation, smokers were for most of them motivated to quit which contrast with earlier findings suggesting that diabetic smokers are less motivated to quit than non diabetic smokers *(38, 39)*. Another difference compared with other survey assessing barriers to quit was that fear of weight gain was not especially a barrier to quit in our population *(40, 41)*. Also, the high motivations to quit and the fact that the leading reasons for smoking cessation were health-related, especially among women, seems to indicate that diabetic smokers are aware of the impact of smoking on their health. The high percentage of responders that seemed to be at risk of depression tend to confirm other results that suggest that diabetic people are more likely to be depressed and that it can reduce success rate in smoking cessation*(38, 41, 42)*. These results suggest a lack of education regarding smoking cessation among diabetics, which tend to confirm findings from other studies *(43)*.

One strength of the study is the heterogeneity of the participants, notably regarding geographic distribution and socio-economic data. The diversity of recruitment via the outpatient's clinic and internet, and the possibility to take part of the study online or with a paper version of the questionnaire sent at home helped to increase this diversity. Another strength of the study is the use of a substantial number of validated questionnaires exploring diverse areas and chosen based on preliminary qualitative interviews. Finally, the fact that responders could fill the survey on their own helped to decrease social desirability which is expected to be important in this population.

Our study has several limitations. First, the sample was relatively small and efforts will be made to include 80 more participants in order to reach the predefined sample size. Second, many respondents answered only partially the questionnaire despite efforts to force answers to certain questions and allow discontinued survey answering. The average time needed to fill in the questionnaire was 30 minutes and a shorter survey might have helped get more complete answers. Then, the data were all self-reported, which can lead to minimizations of smoking for example or inexact answers. In addition to this, people were free to participate to the study. Therefore, a selection bias can't be excluded and the sample may not be completely representative of the diabetic smoking population.

The health benefits of smoking cessation among people with type 2 diabetes is a major reason to develop smoking cessation interventions that fits their needs in order to increase success rates. Despite a strong dependency, a large part of the participants of this study reported being motivated to stop smoking, and had concerns about protecting their health. Including aspects such as relaxation methods, psychiatric help, alternative medicine, weight management techniques and to focus on the health benefit of smoking cessation are keys to increase success rates in smoking cessation among type 2 diabetic smokers and especially among women.

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6. References

1. IDF Diabetes Atlas, Sixth Edition: International Diabetes Federation; 2013 [cited 2014]. Available from: http://www.idf.org/diabetesatlas.
2. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. Diabetes Care. 1998;21(9):1414-31.
3. Murray CJ, Lopez AD. Measuring the global burden of disease. N Engl J Med. 2013;369(5):448-57.
4. Gmel G, Kuendig H, Notari L, Gmel C. Monitorage suisse des addictions: Consommation d'alcool, de tabac et de drogues illégales en Suisse en 2015. Lausanne, Suisse: Addiction Suisse, 2016.
5. Le Boudec J, Marques-Vidal P, Cornuz J, Clair C. Smoking cessation and the incidence of pre-diabetes and type 2 diabetes: a cohort study. J Diabetes Complications. 2016;30(1):43-8.
6. Melin EO, Thunander M, Svensson R, Landin-Olsson M, Thulesius HO. Depression, obesity, and smoking were independently associated with inadequate glycemic control in patients with type 1 diabetes. Eur J Endocrinol. 2013;168(6):861-9.
7. Gunton JE, Davies L, Wilmshurst E, Fulcher G, McElduff A. Cigarette smoking affects glycemic control in diabetes. Diabetes Care. 2002;25(4):796-7.
8. Kapoor D, Jones TH. Smoking and hormones in health and endocrine disorders. Eur J Endocrinol. 2005;152(4):491-9.
9. Nilsson PM, Gudbjornsdottir S, Eliasson B, Cederholm J. Smoking is associated with increased HbA1c values and microalbuminuria in patients with diabetes--data from the National Diabetes Register in Sweden. Diabetes Metab. 2004;30(3):261-8.
10. Sargeant LA, Khaw KT, Bingham S, Day NE, Luben RN, Oakes S, et al. Cigarette smoking and glycaemia: the EPIC-Norfolk Study. European Prospective Investigation into Cancer. Int J Epidemiol. 2001;30(3):547-54.
11. Lundman BM, Asplund K, Norberg A. Smoking and metabolic control in patients with insulin-dependent diabetes mellitus. J Intern Med. 1990;227(2):101-6.
12. Madsbad S, McNair P, Christensen MS, Christiansen C, Faber OK, Binder C, et al. Influence of smoking on insulin requirement and metbolic status in diabetes mellitus. Diabetes Care. 1980;3(1):41-3.
13. Bott U, Jorgens V, Grusser M, Bender R, Muhlhauser I, Berger M. Predictors of glycaemic control in type 1 diabetic patients after participation in an intensified treatment and teaching programme. Diabet Med. 1994;11(4):362-71.
14. Tschope D, Bramlage P, Binz C, Krekler M, Deeg E, Gitt AK. Incidence and predictors of hypoglycaemia in type 2 diabetes - an analysis of the prospective DiaRegis registry. BMC endocrine disorders. 2012;12:23.
15. Eliasson B. Cigarette smoking and diabetes. Prog Cardiovasc Dis. 2003;45(5):405-13.
16. Clair C, Cohen MJ, Eichler F, Selby KJ, Rigotti NA. The Effect of Cigarette Smoking on Diabetic Peripheral Neuropathy: A Systematic Review and Meta-Analysis. J Gen Intern Med. 2015.
17. Craig WY, Palomaki GE, Haddow JE. Cigarette smoking and serum lipid and lipoprotein concentrations: an analysis of published data. BMJ. 1989;298(6676):784-8.
18. Stamler J, Vaccaro O, Neaton JD, Wentworth D. Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial. Diabetes Care. 1993;16(2):434-44.
19. Moy CS, LaPorte RE, Dorman JS, Songer TJ, Orchard TJ, Kuller LH, et al. Insulin-dependent diabetes mellitus mortality. The risk of cigarette smoking. Circulation. 1990;82(1):37-43.
20. Uusitupa MI, Niskanen LK, Siitonen O, Voutilainen E, Pyorala K. Ten-year cardiovascular mortality in relation to risk factors and abnormalities in lipoprotein composition in type 2 (non-insulin-dependent) diabetic and non-diabetic subjects. Diabetologia. 1993;36(11):1175-84.

21. Huxley R, Barzi F, Woodward M. Excess risk of fatal coronary heart disease associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. BMJ. 2006;332(7533):73-8.
22. Suarez L, Barrett-Connor E, Suarez L, Barrett-Connor E. Interaction between cigarette smoking and diabetes mellitus in the prediction of death attributed to cardiovascular disease. Am J Epidemiol. 1984;120(5):670-5.
23. Willi C, Bodenmann P, Ghali WA, Faris PD, Cornuz J. Active smoking and the risk of type 2 diabetes: a systematic review and meta-analysis. JAMA. 2007;298(22):2654-64.
24. Yudkin JS. How can we best prolong life? Benefits of coronary risk factor reduction in non-diabetic and diabetic subjects. BMJ. 1993;306(6888):1313-8.
25. Sattar N. Gender aspects in type 2 diabetes mellitus and cardiometabolic risk. Best Pract Res Clin Endocrinol Metab. 2013;27(4):501-7.
26. Rich-Edwards JW, Manson JE, Hennekens CH, Buring JE. The primary prevention of coronary heart disease in women. N Engl J Med. 1995;332(26):1758-66.
27. Collier A, Ghosh S, Hair M, Waugh N. Gender differences and patterns of cardiovascular risk factors in Type 1 and Type 2 diabetes: a population-based analysis from a Scottish region. Diabet Med. 2014.
28. Yu MK, Lyles CR, Bent-Shaw LA, Young BA. Sex disparities in diabetes process of care measures and self-care in high-risk patients. Journal of diabetes research. 2013;2013:575814.
29. Women and smoking : a report of the Surgeon General 2001.
30. Berlin I, Singleton EG, Pedarriosse AM, Lancrenon S, Rames A, Aubin HJ, et al. The Modified Reasons for Smoking Scale: factorial structure, gender effects and relationship with nicotine dependence and smoking cessation in French smokers. Addiction. 2003;98(11):1575-83.
31. Fulkerson JA, French SA. Cigarette smoking for weight loss or control among adolescents: gender and racial/ethnic differences. J Adolesc Health. 2003;32(4):306-13.
32. Meyer KA, Kushi LH, Jacobs DR, Jr., Folsom AR, Meyer KA, Kushi LH, et al. Dietary fat and incidence of type 2 diabetes in older Iowa women.[see comment]. Diabetes Care. 2001;24(9):1528-35.
33. Willi C, de Torrente de la Jara G, Closuit A. The specificities of women and tobacco: an overwiew. In: Tolson KP, Veksler EB, editors. Research Focus on Smoking and Women's Health: Nova Biomedical; 2008. p. 199-224.
34. Robert C. Klesges LMK. Cigarette smoking as a dieting strategy in a university population. Int J Eat Disord. 1988;7(3):413-9.
35. Toll BA, Salovey P, O'Malley SS, Mazure CM, Latimer A, McKee SA. Message framing for smoking cessation: the interaction of risk perceptions and gender. Nicotine Tob Res. 2008;10(1):195-200.
36. Blake SM, Klepp KI, Pechacek TF, Folsom AR, Luepker RV, Jacobs DR, et al. Differences in smoking cessation strategies between men and women. Addict Behav. 1989;14(4):409-18.
37. Sorensen G, Pechacek TF. Attitudes toward smoking cessation among men and women. J Behav Med. 1987;10(2):129-37.
38. Solberg LI, Desai JR, O'Connor PJ, Bishop DB, Devlin HM. Diabetic patients who smoke: are they different? Annals of family medicine. 2004;2(1):26-32.
39. Ruggiero L, Rossi JS, Prochaska JO, Glasgow RE, de Groot M, Dryfoos JM, et al. Smoking and diabetes: readiness for change and provider advice. Addict Behav. 1999;24(4):573-8.
40. Iino K, Iwase M, Tsutsu N, Iida M. Smoking cessation and glycaemic control in type 2 diabetic patients. Diabetes, Obesity & Metabolism. 2004;6(3):181-6.
41. Haire-Joshu D, Heady S, Thomas L, Schechtman K, Fisher EB, Jr. Beliefs about smoking and diabetes care. Diabetes Educ. 1994;20(5):410-5.
42. Cinciripini PM, Wetter DW, Fouladi RT, Blalock JA, Carter BL, Cinciripini LG, et al. The effects of depressed mood on smoking cessation: mediation by postcessation self-efficacy. J Consult Clin Psychol. 2003;71(2):292-301.

43. Malarcher AM, Ford ES, Nelson DE, Chrismon JH, Mowery P, Merritt RK, et al. Trends in cigarette smoking and physicians' advice to quit smoking among people with diabetes in the U.S. Diabetes Care. 1995;18(5):694-7.
44. Thresia CU, Thankappan KR, Nichter M. Smoking cessation and diabetes control in Kerala, India: an urgent need for health education. Health Educ Res. 2009;24(5):839-45.
45. Scemama O, Hamo-Tchatchouang E, Le Faou AL, Altman JJ. Difficulties of smoking cessation in diabetic inpatients benefiting from a systematic consultation to help them to give up smoking. Diabetes Metab. 2006;32(5 Pt 1):435-41.
46. Wakefield M, Roberts L, Rosenfeld E. Prospects for smoking cessation among people with insulin-dependent diabetes. Patient Educ Couns. 1998;34(3):257-66.
47. Glasgow RE, Hampson SE, Strycker LA, Ruggiero L. Personal-model beliefs and social-environmental barriers related to diabetes self-management. Diabetes Care. 1997;20(4):556-61.
48. Manschot A, van Oostrom SH, Smit HA, Verschuren WM, Picavet HS. Diagnosis of Diabetes Mellitus or Cardiovascular Disease and lifestyle changes - The Doetinchem Cohort Study. Prev Med. 2014;59:42-6.
49. Nagrebetsky A, Brettell R, Roberts N, Farmer A. Smoking cessation in adults with diabetes: a systematic review and meta-analysis of data from randomised controlled trials. BMJ open. 2014;4(3):e004107.
50. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-13.
51. Etter JF, Le Houezec J, Perneger TV. A self-administered questionnaire to measure dependence on cigarettes: the cigarette dependence scale. Neuropsychopharmacology. 2003;28(2):359-70.

7. Tables

Table 1: Demographic characteristics of the participants (self-reported)

	Total (n=126)	*SD/%*	N	Men (n=74)	*SD/%*	N	Women (n=52)	*SD/%*	N	P-value (# gender)
Age, mean (SD)	61.5	***9.1***	126	62.9	*9.6*	74	59.7	*8*	52	0.0533
Gender, N(%)										
Women	52	***41.3***								
Men	74	***58.7***								
Country of residence, N(%)			126			74			52	0.017
Switzerland	67	***53.2***		47	***63.5***		20	***38.5***		
France	43	***34.1***		19	***25.7***		24	***46.2***		
Belgium	14	***11.1***		6	***8.1***		8	***15.4***		
Other	2	***1.6***		2	***2.7***		0	***0***		
Civil status, N(%)			122			73			49	0.289
Single	19	***15.6***		14	***19.4***		5	***10.2***		
Married or in couple	53	***43.4***		33	***45.2***		20	***40.8***		
Widowed	8	***6.6***		3	***4.1***		5	***10.2***		
Divorced or separated	42	***34.4***		23	***31.5***		19	***38.8***		
Employement, N(%)			116			69			47	0.223
Employed	32	***27.6***		16	***23.2***		16	***34***		
Retired	56	***48.3***		36	***52.2***		20	***42.6***		
Unemployed/social security	11	***9.5***		5	***7.3***		6	***12.8***		
Stay at home	1	***0.9***		0	***0***		1	***2.13***		
In training	0	***0***		0	***0***		0	***0***		
Other	16	***13.8***		12	***17.4***		4	***8.5***		
Education level, N(%)			125			74			51	0.108
Obilgatory school or lower	25	***20***		11	***14.9***		14	***27.5***		
Secondary level (apprenticeship, school)	65	***52***		39	***52.7***		26	***51***		
Tertiary level (University)	28	***22.4***		21	***28.4***		7	***13.7***		
Other	7	***5.6***		3	***4***		4	***7.8***		
Type of questionnaire N(%)			126			74			52	

Outpatient clinic	57	***45.2***		44	***59.5***		13	***25***		
Internet	69	***54.8***		30	***40.5***		39	***75***		

Table 2: Smoking status of the participants (self-reported)

	Total (n=126)	***SD/%***	**N**	**Men (n=74)**	***SD/%***	**N**	**Women (n=52)**	***SD/%***	**N**	**P-value (# gender)**
Smoking status			126			74			52	<0.001
Current smoker, N(%)	55	***43.7***		21	***28.4***		34	***65.4***		
Daily smoker	51	***92.7***		19	***90.5***		32	***94.1***		0.613
Not daily smoker	4	***7.3***		2	***9.5***		2	***5.9***		
Unknown										
Former smoker, N(%)	71	***56.4***		53	***71.6***		18	***34.6***		
Number of cigarettes/d, mean (SD)										
Current smokers	22.8	***12***	51	27.1	***15.5***	19	20.3	***8.6***	32	<0.05
Former smokers	31.2	***17.9***	69	32.6	***19.1***	52	26.8	***13.1***	17	0.25

Table 3: Diabete-related health condition in participants (self-reported)

	Total	***SD/%***	**N**	**Men (n=74)**	***SD/%***	**N**	**Women (n=52)**	***SD/%***	**N**
BMI (kg/m2), mean (SD)	**30.4**	*6.4*	121	**29.4**	*4.6*	73	**31.9**	*8.2*	48
Diabetes duration, mean (SD)	**9.5**	*7.4*	125	**10**	*7.9*	73	**8.7**	*6.8*	52
Diabetes complications			123			74			49
No complications	42	***34.2***		17	***23***		25	***51***	
One or more complications	81	***65.9***		57	***77***		24	***49***	
Feet problem	34	***27.6***		23	***31.1***		11	***46***	
Hypo/hyperglycemia	20	***16.3***		13	***17.6***		7	***29***	
Erectile dysfunction	16	***13.0***		16	***21.6***				
Coronary heart disease	1	***0.8***		1	***1.4***		0	***0***	
Stroke	2	***1.6***		1	***1.4***		1	***4.2***	
Renal problem	3	***2.4***		1	***1.4***		1	***4.2***	
Eye problem	5	***4.1***		1	***1.4***		4	***16.7***	