

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

4,800

Open access books available

122,000

International authors and editors

135M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.

For more information visit www.intechopen.com



The Characteristics of Nicotine Addiction Among Patients with Schizophrenia

Ewa Wojtyna and Agnieszka Wiszniewicz

Additional information is available at the end of the chapter

<http://dx.doi.org/10.5772/54308>

1. Introduction

Premature death connected mainly with somatic disorders is observed among patients with schizophrenia. The major reason for this phenomenon are metabolic disorders caused on the one hand by side effects of pharmacological treatment [1], on the other by genetically determined differences in metabolism. Finally, the importance of behavioral factor, which is the lifestyle of patients with schizophrenia, must not be ignored here. Obesity, physical inactivity, poor diet, and smoking are the major factors contributing to the development and intensification of cardiovascular diseases. These factors are so important because they can be modified, as opposed to the genetic factors or necessary pharmacological treatment.

This article addresses the issue of nicotine addiction among patients with schizophrenia.

1.1. Schizophrenia and nicotine addiction

1.1.1. Scope of phenomenon

The phenomenon of tobacco dependence involves 60-90% of patients with schizophrenia, and it is a much higher rate than among the general population, where the percentage of smokers varies between 25-47% [2-6].

A study by de Leon et al. [7] and Gurpegui et al. [8] has shown that in adults (over twenty years old) who are in the group of increased susceptibility to schizophrenia, or are already suffering from the disease there is a significantly higher risk of taking up smoking than among the general population [9]. No wonder then that the problem of

nicotine addiction and its consequences is becoming more and more urgent in clinical psychiatry.

Schizophrenics are most often among the so-called heavy smokers, which means, first of all, smoking at least 20 cigarettes a day, and often a shorter interpuff interval, and smoking cigarettes with a higher nicotine content [3, 10].

In this group of patients a higher risk of dependence on nicotine is observed [11], as well as a more severe abstinence syndrome when trying to quit smoking [12]. This last phenomenon probably results from the fact that in schizophrenics there are, independent of metabolism, higher levels of nicotine and cotinine than in the blood of non-schizophrenics smoking the same amounts of cigarettes [13]. This fact can be explained by a greater number of puffs per cigarette and shorter interpuff intervals [10]. It is not surprising, therefore, that schizophrenics stop smoking more rarely than non-psychotic people [14], and the treatment of nicotine addiction - behavioral and pharmacological - in this group is much less effective [15-18].

1.1.2. Health consequences of smoking in schizophrenics

Research shows that patients suffering from schizophrenia live roughly 20% shorter than healthy people, while cigarette smoking is here one of the main risk factors for premature death [19]. It was also shown that due to smoking these patients die on average 10 years earlier than the general population [20, 21].

This increased mortality is largely the result of cancer, cerebrovascular disease, respiratory diseases, and coronary heart disease. It is estimated that approximately 33% of psychotic patients suffer from this illness and in this group it accounts for more premature deaths than suicide [22].

This phenomenon is particularly relevant in the light of reports which indicate that in schizophrenics who smoke regularly there is a higher risk of coronary heart disease and stroke than in the general population [23]. It is estimated that, in the group with schizophrenia, the risk of death from cardiovascular problems is about 2.2 times higher than among the general population [24].

Also, in schizophrenia patients, respiratory diseases [25, 26] such as chronic obstructive pulmonary disorder (COPD) and pneumonia are frequently observed. Although lung cancer occurs less frequently in patients with schizophrenia than among the general population, the effects of cigarette smoking are clearly seen here [27]. In the case of COPD and lung cancer, cigarette smoking is undoubtedly a significant etiologic factor [28]. Smoking can also increase susceptibility to pneumonia [29]. As shown in the Copeland et al. [26] study, COPD and pneumonia are the diseases more frequently occurring in the last year of life in schizophrenics than in those mentally healthy. In this group of patients the risk of dying from respiratory diseases is estimated to be approximately 3.2 times higher than among the general population [30].

1.1.3. *Biological determinants of smoking*

1.1.3.1. *Genetic background*

The empirical data available suggest the existence of common risk factors for schizophrenia (and other mental illnesses) and smoking. The possibility of a genetic risk factor, particularly associated with the regulation of cholinergic neurotransmission is emphasized here [31-35].

1.1.3.2. *Self-medication hypothesis*

Self-medication hypothesis is based on the assumption that the use of psychoactive substances helps patients compensate for neurobiological deficits underlying a variety of ailments [36, 37]. Accordingly, intuitive reaching for cigarettes by schizophrenics would facilitate both dealing with the symptoms of the disease – positive and negative or with cognitive impairment, as well as with the side effects of treatment.

However, the importance of smoking in coping with the disease symptoms is not clear [38]. Some studies show an improvement within the range of negative symptoms by increasing the dopamine release in the prefrontal cortex [39-42]. These results, however, are subject to a number of constraints - sample size and methodological limitations. It is also worth remembering that research on animal models indicated that while occasional acute administration of nicotine did increase the dopamine release in the brain, chronic administration of nicotine resulted in a decrease in dopamine level, but these effects varied in different areas of the brain [41-43].

There is more data on the relief of drug-induced symptoms and on the cognitive deficits.

1.1.3.2.1. *Neuroleptics*

Referring the self-medication hypothesis to the problem of antipsychotic treatment [38], it should be assumed that smoking helps to reduce the adverse symptoms of antipsychotic treatment. The mechanism that may explain the reduced severity of extrapyramidal symptoms associated with high-dose neuroleptic treatment, may be the nicotine-induced acceleration of drug metabolism by cytochrome P450 (CYP1A2, CYP2D6 polymorphisms) [4, 44]. Thus alleviation of drug induced effects of the CYP1A2 metabolized neuroleptics can be expected but there should be no such effects in case of drugs metabolized in a different way. The empirical data do not provide conclusive evidence that heavy smoking has a really important role in alleviating the side effects of antipsychotic treatment, especially such as tardive dyskinesia or akathisia [38].

Antipsychotic drugs with anticholinergic properties influence the expression of nicotine acetylcholine receptors (nAChRs) [45]. This translates into a deterioration of neurotransmission in the cholinergic system in patients with schizophrenia.

1.1.3.2.2. *Cognitive factors – The role of the cholinergic system*

The cholinergic neurotransmission is one of the key phenomena important for cognitive functioning. This applies in particular to such areas of the brain as the prefrontal cortex and hippocampus, whose functions are regulated by cholinergic projections from other parts of the brain [46]. Cholinergic system dysfunction is manifested, among others, in impaired cognitive functions such as memory and attention disorders. On the other hand stimulation of this system results in memory improvement.

Research shows that administration of nicotine to schizophrenics, both smokers and non-smokers, activating the cholinergic system, reduces the cognitive deficits connected with e.g. working memory, attention, and spatial organization [47-49].

It was also observed that in schizophrenics cognitive deficits worsen with the increase of withdrawal symptoms, and restarting smoking alleviates these unwanted changes in cognitive functioning [49]. This suggests that the treatment of cognitive deficits connected with schizophrenia could contribute to increasing the chance of successful smoking cessation, and indirectly to improving the patient's overall health.

1.1.4. *Psychological determinants of smoking*

As shown above, in a group of schizophrenics there are a number of biological factors, specific to a lesser or greater extent to schizophrenia which explain the increased incidence of nicotine dependence in this group of patients. However, these factors are not the only ones that are relevant here. The psychosocial factors should not be ignored, especially that these factors are largely modifiable, and thus possible to be included in a therapeutic process.

Many reasons for smoking, mentioned by patients suffering from schizophrenia, are similar to those mentioned by healthy people. Some of the common arguments are: pleasure, addiction, weight control, the need for relaxation, or a desire to calm down.

Schmitz et al. [50] presume the possibility of an increased susceptibility to nicotine addiction in people who have difficulty coping with stress, tension, anxiety, or depression. Anxiety and depressive disorders have been repeatedly identified as a risk factor for taking up and continuing smoking [51]. In psychotic patients, the coexistence of these various disorders can further increase the tendency to smoking.

Patients with schizophrenia often emphasize that cigarettes are for them a product of first necessity, just like food, and help them endure life with the illness and prevent schizophrenia relapses [52]. Not without reason, therefore, schizophrenics often mention the sedative effect of nicotine as the main reason for smoking [38]. This temporary way of dealing with unpleasant symptoms, however, puts in motion a vicious circle, because the inability to cease smoking is also the cause of stress and can lead to a greater anxiety than in the beginning. After lighting a cigarette waiting for the calming effect is also important. However, in many cases of agitation, such an effect does not appear, which results in smoking more and more cigarettes in the hope that a higher dose of nicotine will eventually help [38].

Schizophrenics often emphasize that smoking is the fulfillment of a strong need related to addiction, it is also an opportunity to escape and helps to control emotions. In Solway et al. clinical studies [53] the psychotic patients singled out three main roles that smoking plays in their daily functioning. Smoking is a tool used to control stress, helps to make interpersonal contacts and meet the need for peace and comfort. Facilitating interpersonal relations occurs here by entering a group of smokers, which helps to cope with the sense of exclusion and of being different (tobacco use is thus understood as supporting the development of social networks and a source of social support). Solway et al. [53], however, draw attention to the fact that the respondents are increasingly aware of the fact that smoking - contrary to expectations - does not accomplish its purpose in terms of interpersonal contacts. Although many of the schizophrenics examined began to smoke in order to reduce discomfort in social situations, there is currently a trend towards unfavorable attitudes to smokers, which, in individuals suffering from mental illnesses, may create an additional barrier in the process of socializing.

People suffering from schizophrenia find it more difficult to quit smoking partly because of the withdrawal symptoms, including irritability, poor concentration, impatience and anxiety [6], and partly because they do not have enough support and motivation to do it successfully. The balance of gains and losses related to smoking cessation is in favor of the benefits of tobacco use [53]. The decision to maintain the addiction is often connected with the opinions functioning in society (especially among relatives), suggesting many obstacles and losses resulting from the process of smoking cessation.

According to de Leon et al. [54] the socio-economic status and poor education about the negative effects of smoking have a major impact on the initiation of smoking in people with severe mental illnesses. De Leon et al. [54] also suggest that in some countries where tobacco use by women is prohibited, the relationship between smoking and schizophrenia cannot be proven. This points to the fact that the number of cigarettes smoked by people with schizophrenia depends on their availability [54]. In Poland, the price of cigarettes is relatively high compared to the income of the mentally ill. However, patients cope with these economic constraints by selecting the cheapest cigarettes, usually without a filter, from illegal sources, or they roll the cheap tobacco cigarettes. Also, the surrounding people often provide the patient with cigarettes. In the Solway's research [53] some smokers suffering from severe mental illnesses stated that the reason for their initiation of smoking was the addiction of one of their family members or friends.

In the Solway's research [53], some respondents answered that they do not feel the need for smoking when cigarettes are not in sight, but at the time of distress, anxiety, or in a situation where there is a person smoking nearby, they feel a strong desire to smoke a cigarette. Meanwhile, in Poland, the functioning of patients is often based on life in communities which are dominated by smokers. Many smokers define the sole physical act of holding a cigarette as a highly satisfactory form of relaxation.

In conclusion, a number of biological and psychosocial phenomena are observed in patients with schizophrenia that exacerbate the problem of nicotine addiction and hinder the process of smoking cessation. A better understanding of the mechanisms associated with cigarette

smoking in this group of patients may help to improve their quality of life, their general health, but also reduce the economic effects associated with the treatment and the consequences of tobacco-related diseases in schizophrenics.

1.1.5. Aim of the research

The research was designed to characterize nicotine dependence in schizophrenics compared to smokers not having mental health problems. Indirectly, the research was also to determine whether the affective psychological factors such as anxiety or depression and the level of distress are important predictors of smoking in a group of psychotic patients.

2. Material and methods

2.1. Participants

204 smokers participated in the research, including 104 people with paranoid schizophrenia and 100 healthy persons. The schizophrenic smokers recruited for the research were in remission of psychotic symptoms or had residual symptoms and their condition was stable. These people have been treated for schizophrenia for at least 1 year. The control group were smokers who have not been diagnosed with a serious mental or somatic illness. At the time of the research, all the participants were in the active phase of nicotine dependence.

2.2 Design of research

The research was cross-sectional and was carried out in Mental Health Outpatient Clinics and Psychiatric Day Hospitals. The control group, consisting of mentally healthy people, was recruited in the Occupational Medicine Outpatient Clinics, where they came for periodic employee medical examinations. The research participants underwent a structured interview concerning smoking, and then the respondents were asked to complete five self-report questionnaires.

2.3. Tools

2.3.1. Interview

The interview with the respondents concerned their smoking history and included questions about the time of smoking initiation, the addiction process over time, the daily rituals related to smoking, number of attempts to stop smoking, length of periods of abstinence, the average number of puffs per cigarette, and the type of cigarettes smoked. Also, in the interview information was obtained about basic socio-demographic data, such as economic status, family, place of residence. In the case of patients with schizophrenia the interview contained additional questions about the course of the disease and its treatment.

2.3.2. *Fagerström test for nicotine dependence*

The study used the Fagerström Test for Nicotine Dependence (FTND) in order to estimate the severity of nicotine dependence [55]. This tool consists of 8 questions concerning factors associated with smoking. The result obtained is in the range of 0-11 points. The 0-4 points result corresponds to a low degree of dependence, 5-7 points – to a high degree, and the result of more than 7 points corresponds to a very high dependence. Although Steinberg et al. [56] demonstrated that, in the schizophrenic group, this tool carries the risk of underestimating the size of the problem, yet, in this study, the introduction of a detailed interview is an attempt to compensate for these deficiencies.

2.3.3. *The test of motivation for smoking cessation*

The test of motivation for smoking cessation consists of 12 items containing statements about the smoker dependent factors that contribute to smoking cessation (e.g., *Do you decide to quit smoking for yourself?*, *Do you know why you smoke?*, *Do you know how to cope in crisis situations?*). The respondent gave his own answers to these items by indicating whether the statement referred to him or not. The Cronbach's α coefficient for this scale is 0.91. Predominance of positive responses (≥ 6 points) corresponds to a relatively strong motivation to smoking cessation.

2.3.4. *The test of readiness to change*

This tool has been designed on the basis of the Transtheoretical Model of Behavioral Change (TTM) [57] assumptions. According to this model, the current smokers are at the stage of precontemplation, contemplation or preparation. The precontemplation stage is defined as the lack of need for changes in behavior. At the stage of contemplation an intention to change behavior within the next 6 months emerges (here: to stop smoking) (but making this change is not planned within the next 30 days). And finally, the preparation stage is referred to as planning changes within the next month and attempts to stop smoking (lasting a minimum of 24 hours) can be indicated in the past year [58].

The Test of Readiness to Change used in this research consists of 8 questions, making it possible to identify persons at the stage of precontemplation, contemplation, preparation, and action (i.e. the act of smoking cessation).

2.3.5. *Hospital Anxiety and Depression Scale (HADS)*

The Hospital Anxiety and Depression Scale (HADS) is a widely used, short, 14 item tool for studying anxiety and depression [59]. Each of the tool subscales consists of seven statements to which the tested person responds on a four point scale, where 0 corresponds to no intensity or to the weakest intensity of a given symptom, and 3 indicates the presence of a severe symptom.

This questionnaire was initially recommended as an ambulatory screening tool, but is now also commonly used to assess symptoms of depression and anxiety in different groups of

patients [60]. The sensitivity and specificity of this tool is satisfactory and is about 0.8 [61]. In our study, the scale reliability (Cronbach's α coefficient) was 0.86 for the depression subscale and 0.87 for the anxiety scale, which is consistent with the results obtained by other researchers [62, 63].

2.3.6. Distress thermometer

The Distress Thermometer is a single item screening tool that allows a subjective assessment of the severity of distress in the recent time. The respondent marks, on a scale of 0 to 10, how high was the level of stress he or she experienced during the last week. The validation studies of the Polish version of the tool have shown that the 4 point or more result indicates a high risk of comorbid depression and / or anxiety [64].

3. Results

The demographic characteristics of the respondents are shown in Table 1. The schizophrenics were more often single people, less educated, unemployed, and of worse financial situation than those in the control group.

Table 2 presents the comparison of the schizophrenics and the control group in terms of smoking.

The psychotic patients smoked more, took a greater number of puffs, showed a higher level of dependence and were less motivated to give up smoking than the mentally healthy persons.

It was also observed that the schizophrenics taking atypical medications ($n = 58$), smoked less and took puffs less frequently than those treated with conventional drugs ($n = 46$). There were no differences between the groups with respect to the age of smoking initiation (first cigarette), while the schizophrenics started smoking on a daily basis earlier than the healthy individuals. Those in the control group made attempts to quit smoking more often, and their abstinence periods were longer. It was also observed that as the period of being ill with schizophrenia gets longer, the number of cigarettes smoked grows ($r = 0.16$, $p < 0.05$) and the level of dependence increases ($r = 0.31$, $p < 0.01$).

Most schizophrenics had no intention to quit smoking, while people in the control group were more often at the contemplation or preparation stage for smoking cessation (Table 3).

Other motives for smoking cessation were also shown. In the mentally healthy individuals the major motive was their relatives' pressure, the desire to save money and, to a lesser extent, the beginning of health problems. The dominant motive in the schizophrenics, however, was the appearance of tobacco-related disease, manifested mainly by shortness of breath. The rarest motive turned out to be the pressure of relatives.

Smokers (N=204)	Schizophrenics (N=104)	Non-psychiatric (N=100)
Gender [n(%)]		
Male	61 (58.7)	54 (54.0)
Female	43 (41.3)	46 (46.0)
Age [years]		
Mean (SD)	44.31 (13.94)	44.02 (11.40)
Range	20 – 67	20 – 65
Marital status [n(%)]		
Single	32 (30.8)	25 (25.0)
Married	39 (37.5)	48 (48.0)
Widowed	13 (12.5)	15 (15.0)
Divorced	20 (19.2)	12 (12.0)
Level of education [n(%)]		
Primary	29 (27.9)	5 (5.0)
Vocational	54 (51.9)	35 (35.0)
Secondary	20 (19.2)	42 (42.0)
Higher	1 (1.0)	18 (18.0)
Residence[n(%)]		
With family	54 (52.0)	59 (59.0)
Alone	15 (14.4)	41 (41.0)
In a nursing home	35 (33.6)	-
Financial Situation [n(%)]		
Poor	60 (57.7)	18 (18.0)
Average	31 (29.8)	56 (56.0)
Good	13 (12.5)	26 (26.0)
Employment status [n(%)]		
Employed	18 (17.3)	69 (69.0)
Unemployed	23 (22.1)	16 (16.0)
Disability Pension	50 (48.1)	9 (9.0)
Retirement	13 (12.5)	6 (6.0)

Table 1. Socio-demographic characteristics of the smokers with schizophrenia and non-psychiatric controls.

Smoking	Schizophrenics (N=104)	Non-psychiatric (N=100)	Comparisons t
Cigarettes			
Cigarettes smoked per day [M(SD)]	25.98 (13.40)	20.09 (8.58)	3.72***
Range [n (%)]			
1-10	14 (13.5)	20 (20.0)	
11-20	42 (40.4)	46 (46.0)	
21-30	28 (26.9)	30 (30.0)	
">30	20 (19.2)	4 (4.0)	
Nicotine yield of cigarettes [M(SD)]	1.03 (0.22)	0.85 (0.22)	5.97***
Puffs per cigarette [M(SD)]	12.12 (3.57)	8.64 (2.39)	8.14***
Min to first cigarette of the day [M(SD)]	7.23 (4.58)	7.54 (3.97)	0.36
Nicotine dependence			
FTND [M(SD)]	7.63 (2.62)	6.30 (1.95)	4.12***
Years of daily smoking [M(SD)]	23.87 (14.26)	24.35 (12.02)	-0.26
Age of first smoking [M(SD)]	17.00 (4.49)	17.31 (5.59)	0.43
Age of daily smoking [M(SD)]	19.67 (3.84)	20.44 (8.53)	0.83
Smoking cessation			
Motivation to quit [M(SD)]	5.47 (3.54)	8.39 (2.24)	-7.07***
Past quit attempts [M(SD)]	2.05 (1.78)	3.92 (3.04)	-5.34***
Longest abstinence period [months] [M(SD)]	3.39 (4.55)	5.52 (6.18)	-2.80**

Notes: ** p<0.01; *** p<0.001

FTND – Fagerström Test for Nicotine Dependence

Table 2. Smoking characteristic of schizophrenic patients and healthy participants.

Stage of change	Schizophrenics (N =104) n (%)	Non-psychiatric (N =100) n (%)
Precontemplation	61 (58.6)	29 (29.0)
Contemplation	35 (33.7)	46 (46.0)
Preparation	8 (7.7)	25 (25.0)

Table 3. Readiness to smoking cessation

In the schizophrenics a higher level of distress and anxiety was observed than in the control group. Depression of the psychotic patients was also higher than in the healthy persons, but the difference did not reach statistical significance (table 4).

Factors	Schizophrenics (N=104)		Non-psychiatric (N=100)	Comparisons t
	subgroups	M (SD)		
Anxiety	all	9.20 (4.43)		5.28***
	typical treat.	9.49 (4.27) ^a	6.28 (3.44)	5.70***
	atypical treat.	7.50 (5.97) ^a		2.68
Depression	all	7.48 (3.65)		1.94
	typical treat.	7.53 (3.72)	6.56 (3.10)	2.01
	atypical treat.	6.87 (3.10)		0.68
Distress	all	5.42 (2.64)		3.47**
	typical treat.	5.67 (2.67) ^b	4.20 (2.37)	3.64***
	atypical treat.	5.31 (1.92) ^b		2.79*

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

typical treat. – typical neuroleptics (n=46)

atypical treat. – atypical neuroleptics (n=58)

^a comparison between typical and atypical treatment subgroups: $t=4.32$ ($p < 0.001$)

^b comparison between typical and atypical treatment subgroups: $t=2.15$ ($p < 0.05$)

Table 4. Level of anxiety, depression and distress among participants

In the subgroup of schizophrenics, in the patients treated with atypical neuroleptics, a lower level of distress appeared (but still significantly higher than in the control group) and anxiety.

The analysis of the correlation between the affective factors and distress and the parameters characterizing smoking, indicated that in both groups – in the schizophrenics and in the control group - higher levels of anxiety, depression and distress are associated with a greater number of cigarettes smoked (table 5).

To determine the predictive power of the affective factors and distress for the number of cigarettes smoked multivariate linear regression analysis was carried out (table 6).

Affective factors and distress explain a greater percentage of variance of the number of cigarettes in the group of mentally healthy persons ($adj.R^2 = 0.56$) than in the group of schizophrenics ($adj.R^2 = 0.34$).

	Smoking	Anxiety	Depression	Distress
Schizophrenic patients				
Cigarettes smoked per day		0.57***	0.64***	0.67***
Puffs per cigarette		-0.07	-0.03	-0.04
Nicotine dependence (FTND)		0.53***	0.49***	0.55***
Motivation to quit		-0.02	0.04	0.13
Non-psychiatric participants				
Cigarettes smoked per day		0.56***	0.21*	0.62***
Puffs per cigarette		0.12	-0.01	0.07
Nicotine dependence (FTND)		0.55***	0.17	0.53***
Motivation to quit		-0.14	-0.02	-0.06

Notes: * $p < 0.05$; *** $p < 0.001$

FTND – Fagerström Test for Nicotine Dependence

Table 5. Correlation between the affective factors and distress and the parameters characterizing smoking.

Factors	Schizophrenic patients (N=104)		Non-psychiatric smokers (N=100)	
	<i>adj.R</i> ² =0.34		<i>adj.R</i> ² =0.56	
	β	ΔR^2	β	ΔR^2
Anxiety	0.14	0.04	0.48***	0.24
Depression	0.36**	0.11	0.18	0.05
Distress	0.47***	0.19	0.55***	0.27

Notes: ** $p < 0.01$; *** $p < 0.001$

Table 6. Predictors of numbers of cigarettes smoked per day (multivariate linear regression model).

In both groups, the strongest predictor of smoking was distress and the predictive power of anxiety and depression was distributed differently in the group of schizophrenics and the control group. In the mentally ill patients depression was more strongly correlated with smoking, and in the control group, a stronger correlation with the number of cigarettes smoked was observed for anxiety.

4. Discussion

The study confirmed the observations of other researchers that schizophrenics smoke more than the mentally healthy and take a greater number of puffs per cigarette [10,

65]. In the group of mentally ill patients, similarly as in the Tidey et al. [10] studies, a variation in the number of cigarettes smoked and the number of puffs taken was observed depending on the type of treatment applied. The fact that patients taking atypicals smoked less than the patients receiving typical medication, may result from the different effect of taking these drugs. Several studies have shown that atypical drugs such as clozapine and olanzapine, are conducive to reducing smoking, reduce the desire to smoke and, finally, relieve the withdrawal symptoms [10, 66, 67]. Also, in patients taking atypicals, a lower level of distress is observed [68]. In this study, distress turned out to be a significant predictor of smoking, therefore it is possible that this mechanism is important in explaining the observed difference. In the presented work, however, neither the timing nor the doses of the administered medication were controlled, so these dependencies are worth researching more closely in the future.

The analysis of the factors motivating schizophrenics to stop smoking indicates a very serious problem. Only a significant deterioration of health, to be precise, shortness of breath making smoking impossible, inclined patients to consider reducing or giving up smoking. Lack of finances and bans on smoking in public places and in the place of residence were not a sufficient barrier for people with schizophrenia. Lack of pressure from the close environment to reduce smoking should also be noted. This may result from the fact that the closest people here are often smokers themselves (often these are other patients). Interviews with the patients showed that most often it was the family who supplied the patients with cigarettes, and thus contributed to continuing this addiction in schizophrenics.

The results of the study show the important role of affective factors and a feeling of distress in nicotine dependence. This importance is greater in the group of healthy persons than in schizophrenics, but the results obtained in this study (26% of the explained variance of the number of cigarettes smoked) suggest introducing psychological (and/or pharmacological) interactions, aimed at improving coping with stress and reducing the negative affect. These results also confirm the fact that cigarette smoking in schizophrenics is probably, to a much greater extent than in the mentally healthy, determined by factors other than affective [31-37].

The study also confirmed a significant relationship between distress and the number of cigarettes smoked. These results are consistent with other studies. It should be noted, that distress may have different sources and may be understood differently by the respondents. It is therefore a very general construct, and in this study should be understood as the so called aggregate variable [69].

5. Conclusion

The relationship between distress, affective factors, and cigarette smoking has important clinical implications. First of all - apart from the typical pharmacological treatment and nicotine replacement therapy - psychological treatment should be implemented into programs

for nicotine dependence to improve the functioning of schizophrenics in terms of coping with stress and maintaining good mood.

Secondly, it seems interesting to study the causes of the perceived distress. Knowing the sources of stress and the strategies of coping with it can help to build more effective programs supporting the treatment of nicotine addiction.

Weak pressure of the environment on the mentally ill to quit smoking, and even strengthening the addiction by the closest ones, points to a need for actions targeted at the schizophrenics' environment. Such interventions should be aimed at increasing the knowledge about smoking and its consequences, including families in the process of motivating to quit smoking and improving support given to patients.

Author details

Ewa Wojtyna and Agnieszka Wiszniewicz

*Address all correspondence to: ewa.wojtyna@us.edu.pl

Institute of Psychology, University of Silesia, Katowice, Poland

References

- [1] Stahl SM. Podstawy psychofarmakologii [Essentiale psychopharmacology]. Gdańsk: ViaMedica; 2009.
- [2] Chapman S, Ragg M, McGeechan K. Citation bias in reported smoking prevalence in people with schizophrenia. *The Australian And New Zealand Journal Of Psychiatry* 2009; 43(3) 277-282.
- [3] de Leon J, Diaz F. A meta-analysis of worldwide studies demonstrates an association between schizophrenia and tobacco smoking behaviors. *Schizophrenia Research* 2005; 76; 135-157.
- [4] Dervaux A, Laqueille X. Tabac et schizophrénie: aspects épidémiologiques et cliniques. *L'encéphale* 2008; 34(3) 299–305.
- [5] Goff DC, Cather C, Evins, AE, Henderson DC, Freudenreich O, Copeland PM, Bierer M, Duckworth K, Sacks FM. Medical morbidity and mortality in schizophrenia: Guidelines for psychiatrists. *Journal of Clinical Psychiatry* 2005; 66(2) 183-194.
- [6] Wang CY, Xiang YT, Weng YZ, Bo QJ, Chiu HF, Chan SS, Lee EH, Ungvari GS. Cigarette smoking in patients with schizophrenia in China: prospective, multicentre study. *The Australian And New Zealand Journal Of Psychiatry* 2010; 44(5) 456-462.

- [7] de Leon J, Diaz FJ, Rogers T, Browne D, Dinsmore L. Initiation of daily smoking and nicotine dependence in schizophrenia and mood disorders. *Schizophrenia Research* 2002; 56; 47-54.
- [8] Gurpegui M, Martínez-Ortega JM, Aguilar MC, Diaz FJ, Quintana HM, de Leon J. Smoking initiation and schizophrenia: A replication study in a Spanish sample. *Schizophrenia Research* 2005; 76; 113-118.
- [9] Dome P, Lazary J, Kalapos MP, Rihmer Z. Smoking, nicotine and neuropsychiatric disorders. *Neuroscience and Biobehavioral Reviews* 2010; 34(3) 295-342.
- [10] Tidey JW, Rohsenow DJ, Kaplan GB, Swift RM. Cigarette smoking topography in smokers with schizophrenia and matched non-psychiatric controls. *Drug and Alcohol Dependence* 2005; 80; 259–265.
- [11] Spring B, Pingitore R, McChargue DE. Reward value of cigarette smoking for comparably heavy smoking schizophrenic, depressed, and nonpatient smokers. *American Journal of Psychiatry* 2003; 160; 316-322.
- [12] Weinberger AH, Sacco KA, Creeden CI, Vessicchio JC, Jatlow PI, George TP. Effects of acute abstinence, reinstatement, and mecamylamine on biochemical and behavioral measures of cigarette smoking in schizophrenia. *Schizophrenia Research* 2007; 91; 217-225.
- [13] Williams JM, Ziedonis DM, Abanyie F, Steinberg ML, Foulds J, Benowitz NL. Increased nicotine and cotinine levels in smokers with schizophrenia and schizoaffective disorder is not a metabolic effect. *Schizophrenia Research* 2005; 79(2-3) 323-35.
- [14] Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and mental illness: A population-based prevalence study. *JAMA* 2000; 284; 2606-2610.
- [15] Addington J, el-Guebaly N, Campbell W, Hodgins DC, Addington D. Smoking cessation treatment for patients with schizophrenia. *American Journal of Psychiatry* 1998; 155; 974-976.
- [16] George TP, Ziedonis DM, Feingold A, Pepper WT, Satterburg CA, Winkel J, Rounsaville BJ, Kosten TR. Nicotine transdermal patch and atypical antipsychotic medications for smoking cessation in schizophrenia. *American Journal of Psychiatry* 2000; 157; 1835-1842.
- [17] George TP, Vessicchio JC, Termine A, Bregartnera TA, Feingold A, Rounsaville BJ, Kosten TR. A placebo controlled trial of bupropion for smoking cessation in schizophrenia. *Biological Psychiatry* 2002; 52(1) 53–61.
- [18] Richmond R, Zwar N. Therapeutic review of bupropion slow release. *Drug and Alcohol Review* 2003;22; 203–220.
- [19] Hennekens CH, Hennekens AR, Hollar D, Casey DE. Schizophrenia and increased risks of cardiovascular disease. *American Heart Journal* 2005; 150;1115–1121.

- [20] Hannerz H, Borga P, Borritz M. Life expectancies for individuals with psychiatric diagnoses. *Public Health* 2001; 115; 328–337.
- [21] Culhane MA, Schoenfeld DA, Barr RS, Cather C, Deckersbach T, Freudenreich O, Goff DC, Rigotti NA, Evins AE. Predictors of early abstinence in smokers with schizophrenia. *Journal of Clinical Psychiatry* 2008; 69(11) 1743–1750.
- [22] Baker A, Lubman DI, Hides L. Smoking and schizophrenia: Treatment approaches within primary care. *Primary Psychiatry* 2010; 17(1) 49–54.
- [23] Takeuchi T, Nakao M, Shinozaki Y, Yano E. Validity of self-reported smoking in schizophrenia patients. *Psychiatry and Clinical Neurosciences* 2010; 64: 274–278.
- [24] Curkendall SM, Mo J, Glasser DB, Rose Stang M, Jones JK. Cardiovascular disease in patients with schizophrenia in Saskatchewan, Canada. *Journal of Clinical Psychiatry* 2004; 65(5) 715–720.
- [25] Chafetz L, White M, Collins-Bride G, Nickens J. The poor general health of the severely mentally ill: Impact of schizophrenic diagnosis. *Community Mental Health Journal* 2005; 41(2) 169–184.
- [26] Copeland LA, Mortensen EM, Zeber JE, Pugh MJ, Restrepo MI, Dalack GW. Pulmonary disease among inpatient decedents: Impact of schizophrenia. *Progress in Neuro-Psychopharmacology and Biological Psychiatry* 2007; 31(3) 720–726.
- [27] Bushe CJ, Hodgson R. Schizophrenia and cancer: in 2010 do we understand the connection? *Canadian Journal of Psychiatry* 2010; 55(12) 761–767.
- [28] Shapiro SD, Ingenito EP. The pathogenesis of chronic obstructive pulmonary disease: advances in the past 100 years. *American Journal of Respiratory Cell and Molecular Biology* 2005; 32(5) 367–372.
- [29] Sherman CB. The health consequence of cigarette smoking. *Pulmonary diseases. Medical Clinics of North America* 1992; 76(2) 355–371.
- [30] Joukamaa M, Heliövaara M, Knekt P, Aromaa A, Raitasalo R, Lehtinen V. Mental disorders and cause specific mortality. *British Journal of Psychiatry* 2001; 179(6) 498–502.
- [31] Chambers RA, Krystal JH, Self DW. A neurobiological basis for substance abuse comorbidity in schizophrenia. *Biological Psychiatry* 2001; 50; 71–83.
- [32] de Leon J. Smoking and vulnerability for schizophrenia. *Schizophrenia Bulletin* 1996; 22; 405–409.
- [33] D'Souza MS, Markou A. Schizophrenia and tobacco smoking comorbidity: nAChR agonists in the treatment of schizophrenia-associated cognitive deficits. *Neuropharmacology* 2012; 62; 1564–1573.

- [34] Leonard S, Gault J, Adams C, Breese CR, Rollins Y, Adler LE, Olincy A, Freedman R. Nicotinic receptors, smoking and schizophrenia. *Restorative Neurology and Neuroscience* 1998; 12(2-3) 195-201.
- [35] Leonard S, Gault J, Hopkins J, Logel J, Vianzon R, Short M, Drebing C, Berger R, Venn D, Sirota P, Zerbe GO, Olincy A, Ross RG, Adler LE, Freedman R. Association of promoter variants in the alpha-7-nicotinic acetylcholine receptor subunit gene with an inhibitory deficit found in schizophrenia. *Archive of General Psychiatry* 2002; 59; 1085-1096.
- [36] Khantzian EJ. The self-medication hypothesis of addictive disorders: Focus on heroin and cocaine dependence. *American Journal of Psychiatry* 1985; 142; 1259-1264.
- [37] Markou A, Kosten TR, Kobb GF. Neurobiological similarities in depression and drug dependence: a self-medication hypothesis. *Neuropsychopharmacology* 1998; 18; 135-174.
- [38] de Leon J, Diaz FJ, Aguilar MC, Jurado D, Gurpegui M. Does smoking reduce akathisia? Testing a narrow version of the self-medication hypothesis. *Schizophrenia Research* 2006; 86(1-3), 256-268.
- [39] Domino EF, Mirzoyan D, Tsukada H. N-methyl-D-aspartate antagonists as drug models of schizophrenia: a surprising link to tobacco smoking. *Progress in Neuro-Psychopharmacology and Biological Psychiatry* 2004; 28(5) 801-811.
- [40] Glassman AH, Covey LS, Dalack GW, Stetner F, Rivelli SK, Fleiss J, Cooper TB. Smoking cessation, clonidine, and vulnerability to nicotine among dependent smokers. *Clinical Pharmacology and Therapeutics* 1993; 54(6) 670-679.
- [41] Lohr JB, Flynn K. Smoking and schizophrenia. *Schizophrenia Research* 1992; 8; 93-102.
- [42] Lyon E. A Review of the effects of nicotine on schizophrenia and antipsychotic medications. *Psychiatric Services* 1999; 50; 1346-1350.
- [43] Brody AL, Mandelkern MA, Jarvik ME, Lee GS, Smith EC, Huang JC, Bota RG, Bartzokis G, London ED. Differences between smokers and nonsmokers in regional gray matter volumes and densities. *Biological Psychiatry* 2004; 55(1) 77-84.
- [44] Carrillo JA, Herraiz AG, Ramos SI, Gervasin G, Vizcaino S, Benitez J. Role of the smoking-induced cytochrome P450 (CYP)1A2 and polymorphic CYP2D6 in steady-state concentration of olanzapine. *Journal of Clinical Psychopharmacology* 2003; 23(2) 119-127.
- [45] Grinevich VP, Papke RL, Lippiello PM, Bencherif M. Atypical antipsychotics as non-competitive inhibitors of alpha4beta2 and alpha7 neuronal nicotinic receptors. *Neuropharmacology* 2009; 57(2) 183-191.
- [46] Hasselmo ME, Sarter M. Modes and models of forebrain cholinergic neuromodulation of cognition. *Neuropharmacology* 2011; 36; 52-73.

- [47] Barr RS, Culhane MA, Jubelt LE, Mufti RS, Dyer MA, Weiss AP, Deckersbach T, Kelly JF, Freudenreich O, Goff DC, Evins AE. The effects of transdermal nicotine on cognition in nonsmokers with schizophrenia and nonpsychiatric controls. *Neuropsychopharmacology* 2008; 33(3) 480-490.
- [48] Harris B, Kongs S, Allensworth D, Martin L, Tregellas J, Sullivan B, Zerbe G, Freedman R. Effects of nicotine on cognitive deficits in schizophrenia. *Neuropsychopharmacology* 2004; 29; 1378-1385.
- [49] Sacco K, Termine A, Seyal A, Dudas M, Vessicchio J, Krishnan-Sarin S, Jatlow PI, Wexler BE, George TP. Effects of cigarette smoking on spatial working memory and attentional deficits in schizophrenia: Involvement of nicotinic receptor mechanisms. *Archives of General Psychiatry* 2005; 62; 649-659.
- [50] Schmitz N, Kruse J, Kugler J. Disabilities, quality of life, and mental disorders associated with smoking and nicotine dependence. *American Journal of Psychiatry* 2003; 160; 1670-1676.
- [51] Ziedonis D, Hitsman B, Beckham JC, Zvolensky M, Adler LE, Audrain-McGovern J, Breslau N, Brown RA, George TP, Williams J, Calhoun PS, Riley WT. Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health report. *Nicotine and Tobacco Research* 2008; 10(12) 1691-1715.
- [52] Forchuk C, Norman R, Malla A, Martin ML, McLean T, Cheng S, Diaz K, McIntosh E, Rickwood A, Vos S, Gibney C. Schizophrenia and the motivation for smoking, *Perspectives in Psychiatric Care* 2002; 38(2) 41-49.
- [53] Solway ES. The lived experiences of tobacco use, dependence, and cessation: Insights and perspectives of people with mental illness. *Health and Social Work* 2011; 36(1) 19-32.
- [54] de Leon J, Gurpegui M, Diaz FJ. Epidemiology of comorbid tobacco use and schizophrenia: Thinking about risks and protective factors. *Journal of Dual Diagnosis* 2007; 3(3/4) 9-25.
- [55] Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström Test for Nicotine Dependence: A revision of the Fagerström Tolerance Questionnaire. *British Journal of Addiction* 1991; 86(9) 1119-1127.
- [56] Steinberg ML, Williams JM, Steinberg HR, Krejci JA, Ziedonis DM. Applicability of the Fagerström Test for Nicotine Dependence in smokers with schizophrenia. *Addictive Behaviors* 2005; 30(1) 49-59.
- [57] Prochaska JO, DiClemente CC, Norcross JC. In search of how people change. Applications to addictive behaviors. *American Psychologist* 1992; 47(9) 1102-1114.
- [58] DiClemente CC, Prochaska JO, Fairhurst SK, Velicer WF, Velasquez MM, Rossi JS. The process of smoking cessation: An analysis of precontemplation, contemplation, and preparation stages of change. *Journal of Consulting and Clinical Psychology* 1991; 59; 295-304.

- [59] Zigmond A, Snaith R. The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica* 1983; 67(6) 361-370.
- [60] McCue P, Buchanan T, Martin CR. Screening for psychological distress using internet administration of the Hospital Anxiety and Depression Scale (HADS) in individuals with chronic fatigue syndrome. *British Journal of Clinical Psychology* 2006; 45(4) 483-498.
- [61] Bjelland I, Dahl A, Haug T, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale: An updated literature review. *Journal of Psychosomatic Research* 2002; 52; 69-77.
- [62] McPherson A, Martin CR. Is the Hospital Anxiety and Depression Scale (HADS) an appropriate screening tool for use in an alcohol-dependent population? *Journal of Clinical Nursing* 2011; 20; 1507-1517.
- [63] Olsson I, Mykletun A, Dahl A. The Hospital Anxiety and Depression Rating Scale: a cross-sectional study of psychometrics and case finding abilities in general practice. *BMC Psychiatry* 2005, 5; 46.
- [64] Wojtyna E. Termometr Dystresu jako narzędzie przesiewowe u osób chorych psychicznie. (in press).
- [65] Olincy A, Young DA, Freedman R. Increased levels of the nicotine metabolite cotinine in schizophrenic smokers compared to other smokers. *Biological Psychiatry* 1997; 42; 1-5.
- [66] McEvoy J, Freudenreich O, McGee M, VanderZwaag C, Levin E, Rose J. Clozapine decreases smoking in patients with chronic schizophrenia. *Biologic Psychiatry* 1995; 37; 550-552.
- [67] Hutchison KE, Rutter MC, Niaura R, Swift RM, Pickworth WB, Sobik L. Olanzapine attenuates cue-elicited craving for tobacco. *Psychopharmacology* 2004; 175; 407-413.
- [68] Ritsner M, Perelroyzen G, Ilan H, Gibel A. Subjective response to antipsychotics od schizophrenia patients treated in routine clinical practice: A naturalistic comparative study. *Journal of Clinical Psychopharmacology* 2004; 24(3) 245-254.
- [69] Spindel Z. O pewnych niebezpieczeństwach nadużywania etykiet zastępczych. Niespecyficzne Zmienne Zagregowane (NZZ) w badaniach psychologicznych. In: Popiołek K, Bańka A (eds.) *Kryzysy, katastrofy, kataklizmy w kontekście narastania zagrożeń*. Poznań: Stowarzyszenie Psychologia i Architektura; 2007. p335-356.

