

Case Report

Influence of Premenstrual Syndrome on Relapse in Nicotine Abuse a Case Report

Rouhollah Qurishi^{2*}, Marieke Arts-de Jong³, Ernst J Franzek², Linda Hartman² and Cornelis AJ De Jong¹

¹Nijmegen Institute for Scientist-Practitioners in Addiction, Netherlands

²Novadic-Kentron Addiction Care network, Netherlands

³Department of Obstetrics and Gynaecology, Radboud University Medical Center, Netherlands

*Corresponding author: Rouhollah Qurishi, Schijndelseweg 46, 5491 TB Sint-Oedenrode, Novadic-Kentron Addiction Care Network, Netherlands

Received: June 18, 2015; Accepted: September 24, 2015; Published: October 03, 2015

Abstract

Premenstrual Syndrome (PMS) is characterized by the occurrence of physical and psychological symptoms during the luteal phase of almost every menstrual cycle. These symptoms disappear at the beginning of menstruation, and a symptom-free period of at least a week ensues. Importantly, the severity or impact of symptoms must cause a significant impairment in woman's life. This case presents a nicotine dependent woman who loses control on nicotine use during the luteal phase. The nicotine use increases during this phase, and it decreases at the start of the menstruation.

It is important that doctors of addiction and family doctors are aware of the increase of nicotine desire in the luteal phase of women suffering from PMS.

Keywords: Nicotine; Premenstrual syndrome; Premenstrual dysphoric disorder

Introduction

Approximately, one fifth of all Dutch adults reported smoking on regular basis, of which less than half were female [1]. In general, gender-specific differences exist in addiction. A growing number of adolescent women abuse nicotine. Among women aged 14 to 24, nicotine dependence lies at 18.5%, which is comparable to 19.1% among men who are diagnosed as nicotine dependent. Women smoke fewer cigarettes and more "light" products. Metabolism of nicotine is faster in women than in men. Cotinine (a metabolite of nicotine) levels are lower in women. A special issue for women is the regulation of their weight via smoking [2]. Women are more likely to rely on cigarettes to cope with stress and negative emotions [3,4]. They tend to relapse in situation involving negative emotions, conflicts and stress, while men tend to relapse in positive situations, such as social events [5].

Whether Premenstrual Syndrome (PMS) could trigger nicotine abuse or relapse has been inadequately described in the literature. In this case study we present a patient with PMS and difficulties quitting smoking.

Case Report

Patient F, a female of forty years old, has been smoking more than half of her life, experiencing increased craving for cigarettes during her premenstrual period.

Her childhood was characterized by a lack of boundaries and clear rules after her parents divorced when she was six years old. She and her sister were raised by their father. He suddenly died from heart problems when she was 21 years. After his death, she started to experience feelings of anxiety and panic attacks for which she eventually got 'citalopram'. In this period she felt very vulnerable and found it difficult to keep upright in a social society. Therefore, she also used 'alprazolam' for a long period of time to regulate her panic attacks. During many years she had contact with different counsellors,

and at this moment she has been stable for six years. Currently, she is using a daily dose of 40 mg 'citalopram' mainly to stabilize her mood variations.

She started smoking around the age of thirteen. In the first three years she only sporadically smoked cigarettes. Afterwards, she smoked on average five cigarettes per day until the age of 37 years. In this period, she attempted to quit smoking several times being successful three years ago. During these last three years she did not smoke cigarettes at all. However, a couple of months ago she started again smoking four to five cigarettes a day on average. A week before her menstruation the patient experiences considerably more craving for cigarettes. During this period she smokes on average seven to ten cigarettes a day.

Her menarche was at the age of eleven. She always has had a regular cycle. In the week before her menstruation, she complains about a bloated feeling in her abdomen and tender breasts. Furthermore, she reports feelings of being very irritable, moody, emotional, labile, lacking energy, and rapid tantrums and crying. Her period generally takes five days with normal blood loss. During the first days she experiences many complaints, like pain in back and belly, tender breasts, mood swings and energy loss. She is never been pregnant. She is sexual active, and she is not using contraception, her husband is sterilized.

Discussion

PMS has been defined in many ways. The International Society of Premenstrual Disorders intended to develop a broad excepted, but well-described definition [6]. The definition enables better understanding of this very common, but poorly understood disease. Because of its chronic character the impact of PMS on psychosocial and social functioning is comparable with the impact of a depressive disorder [7]. PMS is a relative frequent occurring syndrome. In recent national population research, 12% of the women reported premenstrual complaints that displayed a negative effect on their

Table 1: DSM-IV Criteria for the diagnosis of Premenstrual Dysphoric Disorders (PMDD).

The DSM-IV criteria for the diagnosis of PMDD	
1	Depressive disorder
2	Anxiety or tension
3	Lability
4	Irritability
5	Reduced interest in ordinary activities
6	Concentration problems
7	Lack of energy
8	Reduced or increased appetite
9	Hypersomnia or insomnia
10	Feeling of not being able to cope ('overwhelmed')
11	Other physical symptoms, for example a tense feeling in the breasts symptoms that interfere with work, school, social activities and relations, symptoms are no expression of another disorder.

daily functioning [8]. In the Netherlands, PMS is reported in 3-5% of all fertile aged women [7]. Since the definition of PMS describes a cyclic complaint pattern, one should assure the patient maintains a daily complaint diary during two menstruation cycles to be able to diagnose. Although the diagnostic procedure is intensive, it is worth the effort.

The etiology of PMS and Premenstrual Dysphoric Disorders (PMDD) is unknown, but most likely there is an abnormal, intensified reaction on physiological hormonal fluctuations. A strong genetic predisposition for PMS is demonstrated in a large twin cohort [9].

In the eighties the diagnostic criteria for PMS were incorporated in the Diagnostic and Statistical Manual III (DSM III). In the DSM-IV the PMDD is also described [10].

The criteria for the diagnosis PMDD are mentioned in the DSM-IV R. The DSM-5 has a trial period of two years in Holland. No main changes were made about PMDD in the DSM-5.

The criteria for the diagnosis PMDD are presented in (Table 1). In most menstruation cycles during the last year, at least five of the following symptoms have to be present during the major part of the week of the luteal phase which persists during the start of the menstruation.

The first three criteria need to confirm by prospective daily reporting during at least two consecutive menstruation cycles.

Although there are underlying endocrinological changes during the menstrual cycle, these have never been shown to have a causal relationship with the symptoms of PMS/PMDD. The etiology of PMS/PMDD remains unknown, but the symptoms are most likely an abnormal reaction to physiological hormonal fluctuations. Usually PMS/PMDD symptoms appear after the age of 30 and after childbirth [11]. In the absence of a biological marker for PMS/PMDD, the diagnosis is a clinical one by means of a structured symptom checklist that patients have to keep record of during at least 2 menstrual cycles. The cyclical nature of the complaints seems more important than the exact description of symptoms. There are no specific criteria regarding the severity of premenstrual symptoms, which makes an endocrinological diagnosis of PMS/PMDD difficult.

The effects of nicotine are mediated by binding to nicotinic

acetylcholine receptors in the brains. This binding activates these receptors, which results in the release of various neurotransmitters and hormones which are responsible for the behavioral effects associated with smoking [12]. Dopamine is one of the most important neurotransmitters which is activated by nicotine, because it is responsible for the pleasurable (rewarding) effects. Nicotine modulates the release of glutamate, which facilitates the release of dopamine. Nicotine also influences the release of Gamma-Aminobutyric Acid (GABA), which inhibits the dopamine release in turn. Furthermore, nicotine stimulates the release of serotonin, which is involved in the regulation of mood, impulse control, hunger and aggression. Reduced amounts of serotonin associated with depression and different behavioral characteristics leads to an increased risk to start smoking, nicotine addiction and problems to stop smoking (including neurosis, novelty seeking and anxiety-related personality traits). By chronic exposure to nicotine, the body develops a tolerance against the release of a large portion of these neuro-chemicals. In the absence of nicotine, this leads to a relative deficiency status, which is characterized by symptoms that are opposite to the acute effects of nicotine. In addition, the GABA-mediated inhibition becomes less, while glutamate-mediated stimulation persists, and thus, the irritability of dopamine neurons increases the sensitivity to nicotine [13].

A number of research results support the assumption that there is a provoked hormonal response with PMS. First, the relation between hormonal changes during the cycle and PMS has a conditional character and no causal character [14]. Before puberty, during pregnancy and after the menopause PMS does not occur. Second, there is a plausible theoretical explanation: hormone fluctuations of estrogens and progesterone during the cycle initiate changes in the opioid, the aminobutyric acid (GABA) and the serotonergic system [15,16]. A strong reaction of one or more of these systems on physiologic hormone fluctuations can explain the symptoms of PMS. Last, serotonin seems to play a key role herein. In comparison with control groups, PMS-patients in their luteal phase have decreased serotonin serum, decreased adoption of serotonin in platelets and increased liquor levels of 5-Hydroxyindole Acetic Acid (5-HIAA), the breakdown product of serotonin [17].

Research suggests that men smoke primarily for pharmacological

reinforcement provided by nicotine, whereas women smoke primarily for psychological reinforcement obtained through social interaction and tension reduction [18,19].

A growing literature indicates that women are less likely than men to quit smoking successfully [20,21]. Identified barriers to quit smoking for women include negative affect [22,23], lack of social support [23], and weight concerns [24,25]. Heightened craving and cue reactivity during the follicular phase may in part reflect underlying hormonal activity. Fluctuations in estrogen and progesterone levels across the menstrual cycle may play a key role in modulating craving. Administration of progesterone during the follicular phase attenuates craving for cigarettes in female smokers [26]. This is congruent with basic science [27] and clinical research [28] examining cocaine use and ovarian hormone levels, which suggests that progesterone reduces cocaine cue reactivity and intake. To clarify the possible relationship between ovarian hormones and craving/cue reactivity.

Several barriers to smoking cessation appear to be more pronounced in women than in men. These include low confidence in quitting [29,30], smoking to relieve negative affect [31,32], fear of gaining weight after quitting [33,34] and higher rates of current and past depression [22,35]. Although inconsistent and conflicting is emerging on whether sex steroid hormones estradiol and progesterone, which fluctuate throughout the menstrual cycle, may have a role. Some studies on smoking behavior report smoking rates to be higher during menses [36] and luteal phases [37,38] of the cycle, whereas other studies report no phase effect [39,40].

Women could achieve greater success in smoking cessation interventions if the initial quit attempt coincided with the follicular phase (i.e., preovulatory phase) of their menstrual cycle rather than the luteal phase (i.e., premenstrual). Better treatment outcomes can be achieved by scheduling quit dates to coincide with the follicular phase of the menstrual cycle in female smokers [41].

Conclusion

The described case illustrates the relation between PMS and tobacco addiction. In practice we have seen the relevance of possible self-medication with opioids in women with premenstrual symptoms [42]. A growing body of research suggests that nicotine withdrawal and cigarette craving may vary across the menstrual cycle and that the luteal phase of the cycle may be associated with increases in each. This potential relationship suggests that careful timing of quit attempts during the menstrual cycle may improve initial success at abstinence [43].

In addition, it is important to make this form of comorbidity to the attention of physician's addiction.

It appears relevant to educate addiction specialists about comorbid PMS/PMDD and nicotine dependence so that women with this comorbidity are properly treated. If withdrawal is heightened within the luteal phase of the menstrual cycle, the timing of quit attempts during lower risk phases of the menstrual cycle (i.e., follicular phase) would increase the likelihood of successful cessation.

The available data did not allow us to account for premenstrual symptoms in the association of withdrawal and menstrual cycle phase. It will be important for future work to clarify the role of premenstrual

symptoms in the association between withdrawal and menstrual cycle phase. In addition, future studies should also examine the impact of successful treatment of premenstrual symptoms on cessation outcomes [44].

References

- [Life style, preventive research; smoking]. Dutch Central Bureau for Statistics (CBS). 2013.
- World Health O. International statistical classification of diseases and related health problems. 10th revision, edn: Geneva. 1992.
- Danielsson T, Rössner S, Westin A. Open randomized trial of intermittent very low energy diet together with nicotine gum for stopping smoking in women who gained weight in previous attempts to quit. *BMJ*. 1999; 319: 490-493.
- File SE, Fluck E, Leahy A. Nicotine has calming effects on stress-induced mood changes in females, but enhances aggressive mood in males. *The international journal of neuropsychopharmacology / official scientific journal of the Collegium Internationale Neuropsychopharmacologicum*. 2001; 4: 371-376.
- Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström Test for Nicotine Dependence: a revision of the Fagerström Tolerance Questionnaire. *Br J Addict*. 1991; 86: 1119-1127.
- O'Brien PM, Bäckström T, Brown C, Dennerstein L, Endicott J, Epperson CN, et al. Towards a consensus on diagnostic criteria, measurement and trial design of the premenstrual disorders: the ISPMO Montreal consensus. *Arch Womens Ment Health*. 2011; 14: 13-21.
- van der Leij F, Schultz WC, van de Wiel H, van Leeuwen JH. [The premenstrual syndrome]. *Ned Tijdschr Geneesk*. 2010; 154: A1341.
- Potter J, Bouyer J, Trussell J, Moreau C. Premenstrual syndrome prevalence and fluctuation over time: results from a French population-based survey. *J Womens Health (Larchmt)*. 2009; 18: 31-39.
- Kendler KS, Karkowski LM, Corey LA, Neale MC. Longitudinal population-based twin study of retrospectively reported premenstrual symptoms and lifetime major depression. *Am J Psychiatry*. 1998; 155: 1234-1240.
- Diagnostic and statistical manual of mental disorders: DSM-IV-TR. 4th edn, text revision. Washington, DC: American Psychiatric Association. 2000.
- NVOG. Nederlandse Vereniging voor Obstetrie en Gynaecologie [Dutch Society of Obstetrics and Gynaecology]. 2011.
- Benowitz NL. The biology of nicotine dependence: from the 1988 Surgeon General's Report to the present and into the future. *Nicotine Tob Res*. 1999; 1: S159-163.
- Mansvelder HD, McGehee DS. Cellular and synaptic mechanisms of nicotine addiction. *J Neurobiol*. 2002; 53: 606-617.
- Schmidt PJ, Nieman LK, Grover GN, Muller KL, Merriam GR, Rubinow DR. Lack of effect of induced menses on symptoms in women with premenstrual syndrome. *N Engl J Med*. 1991; 324: 1174-1179.
- Wardlaw SL, Thoron L, Frantz AG. Effects of sex steroids on brain beta-endorphin. *Brain Res*. 1982; 245: 327-331.
- Bethea CL. Regulation of progesterone receptors in raphe neurons of steroid-treated monkeys. *Neuroendocrinology*. 1994; 60: 50-61.
- Eriksson E, Alling C, Andersch B, Andersson K, Berggren U. Cerebrospinal fluid levels of monoamine metabolites. A preliminary study of their relation to menstrual cycle phase, sex steroids, and pituitary hormones in healthy women and in women with premenstrual syndrome. *Neuropsychopharmacology: official publication of the American College of Neuropsychopharmacology*. 1994; 11: 201-213.
- 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: 1575-1583.

19. Wetter DW, Fiore MC, Young TB, McClure JB, de Moor CA, Baker TB. Gender differences in response to nicotine replacement therapy: objective and subjective indexes of tobacco withdrawal. *Experimental and clinical psychopharmacology*. 1999; 7: 135-144.
20. Perkins KA. Smoking cessation in women. Special considerations. *CNS Drugs*. 2001; 15: 391-411.
21. Bohadana A, Nilsson F, Rasmussen T, Martinet Y. Gender differences in quit rates following smoking cessation with combination nicotine therapy: influence of baseline smoking behavior. *Nicotine & tobacco research: official journal of the Society for Research on Nicotine and Tobacco*. 2003; 5: 111-116.
22. Borrelli B, Bock B, King T, Pinto B, Marcus BH. The impact of depression on smoking cessation in women. *Am J Prev Med*. 1996; 12: 378-387.
23. Gritz ER, Nielsen IR, Brooks LA. Smoking cessation and gender: the influence of physiological, psychological, and behavioral factors. *J Am Med Womens Assoc*. 1996; 51: 35-42.
24. Pomerleau CS, Kurth CL. Willingness of female smokers to tolerate post cessation weight gain. *J Subst Abuse*. 1996; 8: 371-378.
25. Perkins KA, Levine MD, Marcus MD, Shiffman S. Addressing women's concerns about weight gain due to smoking cessation. *J Subst Abuse Treat*. 1997; 14: 173-182.
26. Sofuoglu M, Babb DA, Hatsukami DK. Progesterone treatment during the early follicular phase of the menstrual cycle: effects on smoking behavior in women. *Pharmacol Biochem Behav*. 2001; 69: 299-304.
27. Feltenstein MW, See RE. Plasma progesterone levels and cocaine-seeking in freely cycling female rats across the estrous cycle. *Drug Alcohol Depend*. 2007; 89: 183-189.
28. Sinha R, Fox H, Hong KI, Sofuoglu M, Morgan PT, Bergquist KT. Sex steroid hormones, stress response, and drug craving in cocaine-dependent women: implications for relapse susceptibility. *Experimental and clinical psychopharmacology*. 2007; 15: 445-452.
29. 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: 409-418.
30. Audrain J, Gomez-Caminero A, Robertson AR, Boyd R, Orleans CT, Lerman C. Gender and ethnic differences in readiness to change smoking behavior. *Womens Health*. 1997; 3: 139-150.
31. Ockene JK. Smoking among women across the life span: Prevalence, interventions, and implications for cessation research. 1993. *Annals of Behavioral Medicine*. 1993; 15: 135-148.
32. Ward KD, Klesges RC, Zbikowski SM, Bliss RE, Garvey AJ. Gender differences in the outcome of an unaided smoking cessation attempt. *Addict Behav*. 1997; 22: 521-533.
33. Jarry JL, Coombs RB, Polivy J, Herman CP. Weight gain after smoking cessation in women: the impact of dieting status. *Int J Eat Disord*. 1998; 24: 53-64.
34. Whitlock EP, Vogt TM, Hollis JF, Lichtenstein E. Does gender affect response to a brief clinic-based smoking intervention? *Am J Prev Med*. 1997; 13: 159-166.
35. Niaura R, Abrams DB. Stopping smoking: a hazard for people with a history of major depression? *Lancet*. 2001; 357: 1900-1901.
36. Steinberg JL, Cherek DR. Menstrual cycle and cigarette smoking behavior. *Addict Behav*. 1989; 14: 173-179.
37. Mello NK, Mendelson JH, Palmieri SL. Cigarette smoking by women: interactions with alcohol use. *Psychopharmacology (Berl)*. 1987; 93: 8-15.
38. O'Hara P, Portser SA, Anderson BP. The influence of menstrual cycle changes on the tobacco withdrawal syndrome in women. *Addict Behav*. 1989; 14: 595-600.
39. Pomerleau CS, Teuscher F, Goeters S, Pomerleau OF. Effects of nicotine abstinence and menstrual phase on task performance. *Addict Behav*. 1994; 19: 357-362.
40. Allen SS, Hatsukami D, Christianson D, Nelson D. Symptomatology and energy intake during the menstrual cycle in smoking women. *J Subst Abuse*. 1996; 8: 303-319.
41. Franklin TR, Ehrman R, Lynch KG, Harper D, Sciortino N, O'Brien CP, et al. Menstrual cycle phase at quit date predicts smoking status in an NRT treatment trial: a retrospective analysis. *J Womens Health (Larchmt)*. 2008; 17: 287-292.
42. Qurishi R, Sonneborn C, de Jong-Arts M, de Jong C. Premenstrual syndrome and self-medication with opioids. *J Addict Med*. 2013; 7: 79-82.
43. Carpenter MJ, Saladin ME, Leinbach AS, Larowe SD, Upadhyaya HP. Menstrual phase effects on smoking cessation: a pilot feasibility study. *J Womens Health (Larchmt)*. 2008; 17: 293-301.
44. Weinberger AH, Smith PH, Allen SS, Cosgrove KP, Saladin ME, Gray KM, et al. Systematic and meta-analytic review of research examining the impact of menstrual cycle phase and ovarian hormones on smoking and cessation. *Nicotine & tobacco research: official journal of the Society for Research on Nicotine and Tobacco*. 2015; 17: 407-421.