Can Lifestyle Influence the Risk of High Nicotine Dependence?

Zhongbo Chen

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Xuechan Yu

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Hongying Ma

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Jie Chen

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Hui Chen

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Qidong Zhuang

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Panfeng Fu

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Yiming Yu (✉ fyyuyiming@nbu.edu.cn)

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

<https://orcid.org/0000-0003-3035-5649>

Zaichun Deng

Affiliated Hospital of Medical School Ningbo University and Ningbo City Third Hospital

Research

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Abstract

Background: Nicotine dependence (ND) is a maladaptive pattern of tobacco smoking with withdrawal symptoms like other drug addictive disorders. It is very common in clinic that smokers always have different degree of nicotine dependence with same amount of tobacco consumption. Lifestyle may influence cigarettes daily consumption or smoke state. So it is critical to prove the influence of healthy or unhealthy lifestyles in high nicotine dependence smokers. This study aimed to identify behavioral correlates to high ND.

Methods: 343 patients who went to clinic for smoking cessation were recruited. Participants completed a demographic questionnaire. The extent of Nicotine dependence was determined by Fagerstrom Test for Nicotine Dependence (FTND).

Results: High ND patients (FTND>5) showed significant life style compared with mild and moderate ND patients (FTND<5) is significantly ($\chi^2=36.98$, P value=0.002). There is no single lifestyle index can significantly distinguish high ND from mild and moderate ND. However, combined behaviors of caffeine drink and mental activities after dinner contribute to the risk of high ND (OR:1.939, 95%CI:1.154-3.258, P value=0.012). In addition, combined index of (sleep time < 8 hours, caffeine drink and mental activities after dinner) each significantly distinguished patients of high ND from patients of mild and moderate ND. with high nicotine dependence (OR:2.208, 95%CI:1.032-4.737, P value=0.042).

Conclusion: Interact effects of mental activities after dinner and caffeine drink will increase the risk of high nicotine dependence. Sleep less than 8 hours with behaviors of mental activities after dinner and caffeine drink also have the same effect.

Introduction

Tobacco smoking is a preventable human behavior and has been identified to play critical role in the pathogenesis of various malignant cancers(1) and as well as pulmonary diseases, such as chronic obstructive pulmonary disease (COPD)(2). Nicotine dependence (ND) is a maladaptive pattern of tobacco smoking with withdrawal symptoms like other drug addictive disorders and it has already been defined by the Diagnosis and Statistical Manual of Mental Disorder—edition IV (DSM-IV)(3). Previous studies have shown that different lifestyle is closely related to smoke state change and cigarettes consumption(4). Caffeine withdrawal increase difficulties in quitting smoking(5). Alcohol and nicotine dependence are likely to co-occur in the same person, which is the reason of lower likelihood of smoking cessation(6, 7). People with healthy life habits, including exercise and enough time of sleep, may have less cigarettes daily consumption and lower nicotine dependence (8–11). Moreover, it is very common in clinic that smokers always have different degree of nicotine dependence with same amount of tobacco consumption. Therefore, we considered that whether some relationship between lifestyle and high nicotine dependence. However, so far there is no evidence showing unhealthy factors increased the risk of

high ND, vice versa. We sought to figure out the relationship between lifestyle and ND by a designed survey which recorded healthy and unhealthy life behaviors as medical history.

Methods And Procedures

A survey designed by our group members recorded patients' lifestyles from April 2010 to January 2020 in The Affiliated Hospital of Medical School of Ningbo University. Three hundred and forty three patients were recruited and complete the survey. All research subjects provide informed consent, and survey designation was approved by the Ethics Committee of the Affiliated Hospital of Medical school of Ningbo University (Ningbo, China). Informed consent contained from all patients before finish the survey. All methods were carried out in accordance with NCCN Clinical Practice Guidelines in Oncology of Smoking Cessation(12).

Survey design

Clinical characteristics and life behaviors

(1)Demographic (age, gender, BMI) data were recorded as clinical characteristics. (2) Healthy lifestyles was identified as following: athletics(exercise more than 3 times a week and each time more than 30 minutes(8, 9);sleep time ≥ 8 hours; take afternoon nap; often eat fruits. (3) Unhealthy lifestyles include: sleep time < 8 hours; alcohol consumption; caffeine drink; mental activities after dinner before sleep(13) (including gambling, overtime work, play video games, studying or other mental thinking activities).

Measurement of nicotine dependence

Nicotine dependence was measured by Fagerstrom Test for Nicotine Dependence (FTND)(14, 15). FTND score > 5 was regarded as high nicotine dependence. FTND score ≤ 5 was considered as mild and moderate nicotine dependence.

Statistical analysis

The information and results questionnaire for 343 patients were included in the statistics. t -test and mean $\pm$ Standard deviation(SD) were used in age, BMI. Gender distribution and life behaviors distribution in two groups(FTND ≤ 5 and FTND > 5) were calculated by chi-square analysis. All independent or interaction effects of behaviors were analyzed by multiple logistic-regression. These analysis were calculated by IBM SPSS Statistics 21.0 and P value < 0.05 was considered as statistical difference.

Results

Demographics of the cohort are shown in Table 1, there were no differences in age, gender and BMI between the two groups. However, healthy and unhealthy lifestyles were differently distributed in the two groups (Table 2) ($\chi^2 = 36.98$, P value = 0.002), indicating that each behavior of athletics, sleep, sleep time ≥ 8 h, fruits consumption didn't decrease the risk of high ND no matter independently or combined

(Table 3). Results in Table 4 showed that caffeine drink combined with mental activities after dinner increase the risk of high nicotine dependence (OR:1.939, 95%CI:1.154,3.258, *P* value = 0.012). Three unhealthy interaction behaviors (sleep time < 8 hours, caffeine drink and mental activities after dinner) are associated with high nicotine dependence (OR:2.208, 95%CI:1.032,4.737, *P* value = 0.042).

Discussion

Nicotine dependence is a maladaptive pattern of tobacco smoking with withdrawal symptoms like other drug addictive disorders. Many life behaviors may change cigarettes daily consumption or smoke state (4). People with healthy behaviors has lower nicotine dependence ,such as exercising, sleep enough time(8, 16). Previous studies demonstrate that unhealthy lifestyles ,including sleep duration (10, 16), caffeine drink consumption(5, 17), alcohol dependence(6, 7), mental activities (gambling(18, 19), play video games(20), overtime working(21)) increase cigarettes consumption and turn ex-smokers or non-smokers into smokers. However, smokers with several different lifestyles is common in their daily life and there are few studies investigate the influence of combined lifestyles on high nicotine dependence. To our knowledge, our research is the first to study revealing the relationship between healthy or unhealthy combined lifestyles and the risk of high ND. Importantly, we revealed that interaction of mental activities after dinner, caffeine drink and sleep time less than 8 hours greatly increased the risk of high ND.

During night without smoking, decrease of nicotine level can recover nicotinic-acetylcholine receptors. It may contribute to development of withdrawal symptoms in the morning when craving for cigarettes(22). Sleep duration further decreases positive mood and increases negative mood(10).Dopamine caused by the calming effect of nicotine relieve this bad mood(23).Therefore, smokers with high nicotine dependence will considered the first few cigarettes as the most pleasurable of the day. We can also understand sleep duration may increase the risk of high nicotine dependence.

Mental activities after dinner(13) (including gambling, overtime work, play video games, studying or other mental thinking activities) and smoking may be related to environment factor, such as colleagues, classmates, gamblers and video game patters. Moreover, tobacco was used to make dopamine to get rid of anxious and cope with stress to focus attention in these situations(24–26).Furthermore, coffee or caffeine drink is also the choice for dealing with tiredness in that some low-cost addictive substance are available anywhere and anytime. The prevalence of drinking caffeine beverage and smoking together will happen during mental activities after dinner or morning without enough sleep time. Caffeine withdrawal symptoms increased difficulties in smoking cessation(17).So,synergistic effects of mental activities after dinner, caffeine drink, sleep duration increase the risk of high nicotine dependence.

Our data proved that healthy lifestyles can't help decrease the risk of high ND. This result is different than previous studies that smokers with exercises have lower nicotine dependence and lower tobacco consumption (8, 9).The main reason of differences is that we chose all range of age smokers with exercise more than 3 times a week and each time more than 30 minutes. This inclusion criteria can be wildly used in all high nicotine dependent smokers. And we also proved that afternoon snap didn't

decrease the risk of high nicotine dependence. Short breaks, such as a nap, relieve stress and reduce brain fatigue during workdays. Some smokers who need nicotine for getting rid of tiredness will decrease cigarettes consumption in that enough rest help brains to focus attention. There are few studies showed the relationship between nap with nicotine dependence. Therefore, we draw a suggestion that smokers who come to clinic for cessation help with high nicotine dependence should fully consider individualized treatment no matter with healthy or unhealthy lifestyles instead of avoiding unhealthy life behaviors or developing healthy lifestyles only.

In the future, standards of unhealthy life behaviors, such and cups of caffeine drink and the sort of mental activities can obviously increase nicotine dependence in smokers. Healthy life behaviors, such as nap, should be more investigated the mechanism underlying nicotine dependence.

Conclusion

Interact effects of mental activities after dinner and caffeine drink will increase the risk of high nicotine dependence. Sleep less than 8 hours with mental activities after dinner and caffeine drink also have the same effect. Avoiding these factors may decrease likelihood for high nicotine addiction and may help increase possibility for smoking cessation. Smokes should decrease mental activities at night, caffeine drink will be take less in the meanwhile. Enough rest also makes brain relax which decrease anxious and stress. All these factors' correction may help decrease risk of high nicotine dependence. Individualized treatment for smokers should fully consider both healthy and unhealthy lifestyles.

Declarations

Competing interests

The authors declare that they have no competing interests.

Ethical approval

Our study and survey designation approved by the Ethics Committee of the Affiliated Hospital of Medical school of Ningbo University (NBU-2020-080, Ningbo, China). Informed consent was obtained from all patients before conducted the survey.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

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Data availability Statement

Our data generated and analyzed during the study are available from the corresponding authors in the future research on reasonable request.

Authors' contributions

Zhongbo Chen conducted the research. Zhongbo Chen and Xuechan Yu analyzed and calculated data and wrote the first draft of manuscript together. All authors read and approved the final manuscript.

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References

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. *Ca-Cancer J Clin*. 2019;69(1):7-34.
2. Willemse BW, Postma DS, Timens W, ten Hacken NH. The impact of smoking cessation on respiratory symptoms, lung function, airway hyperresponsiveness and inflammation. *Eur Respir J*. 2004;23(3):464-76.
3. Robins LN, Helzer JE, Croughan J, Ratcliff KS. National Institute of Mental Health Diagnostic Interview Schedule. Its history, characteristics, and validity. *Arch Gen Psychiatry*. 1981;38(4):381-9.
4. Strine TW, Okoro CA, Chapman DP, Balluz LS, Ford ES, Ajani UA, et al. Health-related quality of life and health risk behaviors among smokers. *Am J Prev Med*. 2005;28(2):182-7.
5. Swanson JA, Lee JW, Hopp JW. Caffeine and nicotine: a review of their joint use and possible interactive effects in tobacco withdrawal. *Addict Behav*. 1994;19(3):229-56.
6. Falk DE, Yi H-y, Hiller-Sturmhofel S. An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol research & health : the journal of the National Institute on Alcohol Abuse and Alcoholism*. 2006;29(3):162-71.
7. Breslau N, Peterson E, Schultz L, Andreski P, Chilcoat H. Are smokers with alcohol disorders less likely to quit? *Am J Public Health*. 1996;86(7):985-90.
8. Audrain-McGovern J, Rodriguez D, Moss HB. Smoking progression and physical activity. *Cancer Epidemiol Biomarkers Prev*. 2003;12(11 Pt 1):1121-9.

9. Loprinzi PD, Walker JF. Nicotine Dependence, Physical Activity, and Sedentary Behavior among Adult Smokers. *N Am J Med Sci.* 2015;7(3):94-9.
10. Hamidovic A, de Wit H. Sleep deprivation increases cigarette smoking. *Pharmacol Biochem Be.* 2009;93(3):263-9.
11. Fucito LM, Redeker NS, Ball SA, Toll BA, Ikomi JT, Carroll KM. Integrating a Behavioural Sleep Intervention into Smoking Cessation Treatment for Smokers with Insomnia: A Randomised Pilot Study. *J Smok Cessat.* 2014;9(1):31-8.
12. Shields PG, Herbst RS, Arenberg D, Benowitz NL, Bierut L, Luckart JB, et al. Smoking Cessation, Version 1.2016, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw.* 2016;14(11):1430-68.
13. Yu X, Yu Y, Ma H, Chen Z, Deng Z. Mental activities after dinner increase cigarettes consumption. *Sci Rep.* 2021;11(1):2405.
14. Payne TJ, Smith PO, McCracken LM, McSherry WC, Antony MM. Assessing nicotine dependence: a comparison of the Fagerstrom Tolerance Questionnaire (FTQ) with the Fagerstrom Test for Nicotine Dependence (FTND) in a clinical sample. *Addict Behav.* 1994;19(3):307-17.
15. Ray R, Schnoll RA, Lerman C. Nicotine dependence: biology, behavior, and treatment. *Annu Rev Med.* 2009;60:247-60.
16. Cohrs S, Rodenbeck A, Riemann D, Szagun B, Jaehne A, Brinkmeyer J, et al. Impaired sleep quality and sleep duration in smokers-results from the German Multicenter Study on Nicotine Dependence. *Addict Biol.* 2014;19(3):486-96.
17. Tanda G, Goldberg SR. Alteration of the behavioral effects of nicotine by chronic caffeine exposure. *Pharmacol Biochem Behav.* 2000;66(1):47-64.
18. Grant JE, Potenza MN. Tobacco use and pathological gambling. *Ann Clin Psychiatry.* 2005;17(4):237-41.
19. McGrath DS, Barrett SP. The comorbidity of tobacco smoking and gambling: a review of the literature. *Drug Alcohol Rev.* 2009;28(6):676-81.
20. Raiff BR, Jarvis BP, Rapoza D. Prevalence of video game use, cigarette smoking, and acceptability of a video game-based smoking cessation intervention among online adults. *Nicotine Tob Res.* 2012;14(12):1453-7.
21. Angrave D, Charlwood A, Wooden M. Working time and cigarette smoking: evidence from Australia and the United Kingdom. *Soc Sci Med.* 2014;112:72-9.
22. Dani JA, Heinemann S. Molecular and cellular aspects of nicotine abuse. *Neuron.* 1996;16(5):905-8.
23. Gilbert DG. Paradoxical tranquilizing and emotion-reducing effects of nicotine. *Psychol Bull.* 1979;86(4):643-61.
24. Gray JA, Young AM, Joseph MH. Dopamine's role. *Science.* 1997;278(5343):1548-9.
25. DeWitt EEJ. Neuroeconomics: A Formal Test of Dopamine's Role in Reinforcement Learning. *Curr Biol.* 2014;24(8):R321-R4.

26. Grant JE, Desai RA, Potenza MN. Relationship of nicotine dependence, subsyndromal and pathological gambling, and other psychiatric disorders: data from the National Epidemiologic Survey on Alcohol and Related Conditions. J Clin Psychiatry. 2009;70(3):334-43.

Tables

Table 1
Clinical characteristics in two groups

Clinical characteristics in two groups			
	FTND ≤ 5 (n = 151)	FTND>5 (n = 192)	Pvalue
Age,years			
Mean ± SD	42.60 ± 11.01	43.13 ± 11.06	0.664
Gender,n			
Male	141	176	0.682
Female	10	16	
BMI,Kg/m ²			
Mean ± SD	23.47 ± 2.72	23.64 ± 7.72	0.796

Table 2
Healthy and unhealthy lifestyles distribution in two groups

	χ^2	Pvalue
FTND ≤ 5	22.13	0.139
FTND > 5	36.98	0.002*
* P < 0.05 was considered as statistical significance.		

Table 3
The relationship between healthy lifestyles and high nicotine dependence

	OR(95%CI)	P value
athletics	0.820 (0.521–1.291)	0.392
sleep time $\geq$ 8h	0.943 (0.641–1.447)	0.787
afternoon nap	1.081 (0.684–1.708)	0.74
fruits	0.683 (0.415–1.124)	0.133
athletics + sleep time $\geq$ 8h	0.779 (0.444–1.336)	0.384
athletics + afternoon nap	1.072 (0.596–1.928)	0.818
athletics + fruits	0.576 (0.298–1.111)	0.1
sleep time $\geq$ 8h + afternoon nap	1.118 (0.603–2.075)	0.723
sleep time $\geq$ 8h + fruits	0.927 (0.497–1.729)	0.811
afternoon nap + fruits	1.079 (0.480–2.422)	0.855
athletics + sleep time $\geq$ 8h + fruits	0.772 (0.337–1.771)	0.542
athletics + sleep time $\geq$ 8h + afternoon nap	0.924 (0.402–2.126)	0.853
athletics + fruits + afternoon nap	1.012 (0.368–2.782)	0.982
afternoon nap + fruits + sleep time $\geq$ 8h	1.105 (0.344–3.553)	0.867
athletics + sleep time $\geq$ 8h + fruits + afternoon nap	0.983 (0.259–3.724)	0.979

Table 4
The relationship between unhealthy lifestyles and high nicotine dependence

	OR(95%CI)	P value
sleep time<8h	1.061 (0.691–1.628)	0.787
alcohol consumption	0.748 (0.425–1.318)	0.315
caffeine drink	0.869 (0.566–1.336)	0.523
mental activities after dinner	1.475 (0.956–2.275)	0.079
sleep time<8h + alcohol consumption	1.236 (0.561–2.725)	0.599
sleep time<8h + coffein drink	1.011 (0.622–1.645)	0.964
sleep time<8h + mental activities after dinner	1.142 (0.671–1.945)	0.624
alcohol consumption + caffeine drink	0.675 (0.338–1.349)	0.266
alcohol consumption + mental activities after dinner	0.481 (0.202–1.144)	0.098
caffeine drink + mental activities after dinner	1.939 (1.154–3.258)	0.012*
sleep time<8h + alcohol consumption + caffeine drink	1.494 (0.581–3.843)	0.405
sleep time<8h + alcohol consumption + mental activities after dinner	0.914 (0.301–2.780)	0.875
sleep time<8h + caffeine drink + mental activities after dinner	2.208 (1.032–4.737)	0.042*
alcohol consumption + caffeine drink + mental activities after dinner	0.676 (0.240–1.909)	0.46
sleep time<8h + alcohol consumption + caffeine drink + mental activities after dinner	1.591 (0.391–6.470)	0.516
* $P<0.05$ was considered as statistical significance.		