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Review Article

Nicotine dependence and role of pharmacist in nicotine addiction control.

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ABSTRACT:

There are about one billion smokers in the world and death toll due to smoking is almost six million people a year. The tobacco use is increasing specially in the third world countries. By 2020, death will increase to more than 70% of smokers in some developing countries. Continuous tobacco use can cause tolerance and dependence. Tobacco dependence is the main cause of morbidity and mortality among smokers. Nicotine dependence is assumed to be present if tolerance, withdrawal and compulsive desire to consume tobacco are existing. It is well documented that environmental and genetic factors influence the possibility of nicotine addiction. Thus, actions are needed at different levels to avoid the health hazards induced by tobacco smoking.

Governments have to play a vital role in smoking control. People at large needs to be involved in the fight against smoking. Within the health-sector, health professionals as physicians and pharmacists have a leading role to play because of their knowledge about the dangerous of smoking and its treatment in general. Community pharmacist is one of the most accessible health care professional to the public and can fulfil fundamental role in public health as key providers of tobacco cessation and prevention services. In addition, pharmacists have a significant knowledge of nicotine withdrawal symptoms, drugs used in smoking cessation and with special training can be involved in the treatment programs. Moreover, media campaigns (pharmacy and non-pharmacy groups) are needed to encourage smoking cessation and discourage smoking initiation. However, with any tobacco-use prevention program, it should always be remembered that long time is needed before success becomes effective and apparent.

Keywords: smoking cessation, nicotine, tobacco dependence, addiction, pharmacist.

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INTRODUCTION

Cigarette smoke contains more than 4,000 substances, include 43 known carcinogenic agents and 400 other toxins [1, 2]. Nicotine is the main alkaloid of the tobacco plant. The usual smoker takes almost two mg nicotine per cigarette. Worldwide, there has been an increase in smoking and hence in tobacco-associated diseases and deaths. Nicotine is quickly absorbed when inhaled and crosses the blood brain barrier very rapidly. Nicotine is metabolized by the cytochrome CYP2A6 and CYP2B6 isoenzymes to the major metabolite cotinine [3]. This review article will provide a brief description about the mechanisms involved in the actions of nicotine including its potentials of producing tolerance and dependence. It will also discuss the role of pharmacist in nicotine addiction control.

MECHANISMS INVOLVED IN THE ACTIONS OF NICOTINE

It is well known that nicotine produces its actions on different biological systems either through a direct effect as an agonist on nicotinic cholinergic receptors, or indirectly through other mediators. Nicotine stimulates the release of some mediators, including noradrenaline (NA), acetylcholine (Ach), dopamine (DA), serotonin (5-HT) and γ -aminobutyric acid (GABA) [4]. In low doses, nicotine increases cholinergic activity and enhances the flow of NA, causing neuronal

excitation [4]. As a reward system, the dopaminergic system is primarily influenced by nicotine. The intense brain effects of cigarette use are suggested to be due to a decrease in the enzymes responsible for the metabolism of DA (monoamine oxidase A & B, MAO-A & -B), this would produce a higher DA levels. DA signals a pleasurable experience and is critical for the reinforcing effects of nicotine and other drugs of abuse [3]. Moreover, nicotine produces several other effects on the mood, including increased sensation of pleasure, CNS stimulation and anxiolytic effect [5]. These effects are believed to be the mechanisms responsible for the addictive nature of nicotine by activating certain reward pathways “the circuitry within the brain that regulates feeling of pleasure and euphoria” [3]. Interestingly, nicotine is more addictive than cocaine and heroin [6]. Furthermore, in the continuous presence of nicotine, up-regulation of nicotine receptors occurs in the brain. This finding is supported by nicotine receptors density, which was found to be high in cerebral areas of smokers [7, 8].

Before affecting other organs, smoking mainly causes damage to the respiratory tract where almost half of smoking-related harmful effects unfold. A high proportion of these harmful effects (e.g. lung cancer and



obstructive pulmonary diseases) have fatal outcomes.

RISK FACTORS FOR NICOTINE DEPENDENCE

Environmental risk factors are common characteristics in person surroundings that increase their chance to become nicotine dependent [9]. Some smokers may be predisposed to dependence through the effects of gene responsible for metabolizing nicotine (see above) which metabolizes nicotine to cotinine [3, 10]. Genetic factors appear to be less important than environmental factors in development of nicotine dependence. Thus, smokers with normal CYP2A6 pattern may respond well to nicotine replacement therapy (see below). It should be mentioned that different patterns of smoking can be identified among cigarette smokers. Some smoke one cigarette at regular intervals throughout the day; others smoke by preference during the hours of morning or evening; or smoke in phases (e.g. at weekends or at social events). Some smokers even get up during night to smoke.

CLINICAL USES OF NICOTINE AND ITS DEPENDENCE THERAPY

Research reports have shown that the risk for Parkinson or Alzheimer diseases might be twice for non-smokers than for smokers [11, 12]. However, these results do not legitimize the use of nicotine. An official clinical use of nicotine is in treating nicotine dependence to abolish smoking with its hazards to health. Nicotine is also used to help adults suffering from autosomal dominant nocturnal frontal lobe epilepsy [13]. On the other hand, the therapeutic use of nicotine as appetite-control

and to promote weight loss is controversial and is supported by ex-smokers claim to put on weight after quitting. However, certain studies suggest that nicotine prevents weight gain [14].

Generally, nicotine use over a long time is highly addictive. Among the smokers, more than two-thirds say they would like to quit and one-third try to quit but only 3% of smokers succeed. Some highly addicted smokers are only able to stop for just few hours and some smokers will make repeated attempts with a period of abstain followed by relapse [15].

Therapeutically, there are two complementary methods of intervention to assist smoking cessation. First is motivation (support and advice) and second is drug treatment. This means that motivation is designed to increase smoker's commitment to quitting and the use of drugs to help attenuating craving effect of the withdrawal. Generally, there are two approaches to the management of nicotine dependence. First approach is delivered on a large scale as educational or self-help materials and brief routine interventions by health care professionals [16]. Second approach depends on individual intervention based on traditional model of intensive expert-delivered treatments to smokers either individually or in groups. The greater the degree of contact between smoker and therapy provider in these interventions, the greater the achieved efficacy. The most commonly employed method recommended by the World Health Organization (WHO) involves the use of



nicotine products as nicotine replacement therapy (NRT), while the antidepressant bupropion was approved as an aid to smoking cessation [17]. Products of NRT (nicotine transdermal patch, nasal spray, inhaler, chewing gum, sublingual tablets and lozenges) are intended to deal with the withdrawal symptoms and craving to nicotine [18, 19]. Drug therapy is essential as about 15% of all smokers are heavily dependent on nicotine and tobacco cessation is generally achieved with a medical help [15, 20, 21].

HEALTH PROFESSIONALS AND NICOTINE DEPENDENCE

Health professionals are the leading players in tobacco control. The role and image of the health professionals are vital in promoting tobacco free lifestyles. One of the major objectives is to decrease smoking prevalence. They can educate people by giving advice, guidance and answer to the questions related to tobacco use and effects. Health professionals can act as policy-makers and as a reference for the media to educate the public about the dangerous of tobacco. However, certain barriers to health professionals involvement in tobacco control do exist specifically lack of knowledge and skills about tobacco control. The other barrier is continued tobacco consumption among health professionals themselves [22]. However, a proof indicates that effective and efficient mode of providing smoking quitting material to smokers is by contact with health care providers [23].

ROLE OF PHARMACIST IN NICOTINE DEPENDENCE

Pharmacist, is one of the health professionals and has a key advantage to play in helping smokers 'kick the habit'. Community pharmacist is one of the most accessible health care professional to the public and can fulfil fundamental role in public health as key providers of tobacco cessation and prevention services. In addition, pharmacists have a significant knowledge of nicotine withdrawal symptoms, drugs used in smoking cessation and with special training can be involved in the treatment programs. Pharmacists who participate in this protocol must complete ongoing continuing education and training focused on smoking cessation [24]. Pharmacists should be counselling the smokers about the proper information as to the dangerous of smoking and advice the smoker about the appropriate drugs present in pharmacies. Pharmacist advice or counsel alone can double smoking cessation rates [24]. Smoker education for smokers who wish to quit should be given during the initial visit and revisited over the course of a year during follow up visits [25]. Advice should include counter-conditions such as waiting an additional five minutes before lighting up, smoking a cigarette only half way, and/or reducing smoking by one cigarette per day every other day [24]. Instructions should also include suggestions about stimulus control, as removing visual cause and staying away situations that make them want to smoke (e.g. smokers encouraged to remove ashtrays from home and workplace). Counselling should begin with early elementary school



children. Most studies concentrate on behavior of children in school years because it is during this period the children show an increasing desire to gain exposure with tobacco, alcohol and illegal drugs. Pharmacist should be participating in tobacco control activities, together with others by making advised campaign “No tobacco day 31 May” and “GIVE UP FOR GOOD” program (a serious of smoking cessation counselling sessions by specially trained pharmacists) [23]. Moreover, pharmacist and other health professionals should have a role with government and community in primary prevention in order to decrease the number of smokers. This can be achieved by an increase in tobacco duty (price of cigarette), ban on the sale of cigarettes to young people under 18 years, visible symbolic health warning on tobacco packaging, and comprehensive bans on all advertising for tobacco products. Pharmacist-led interventions for smoking cessation have previously been shown to be feasible and efficacious in hospital outpatient and community pharmacy settings [26]. Finally, it can be suggested that hospital pharmacists and other health care providers in hospitals have a major role for smoking cessation support. This is done by promoting hospital policies that support and provide tobacco dependence services in terms of educational resources and help. Their role can be more significant by establishing a unit for nicotine quitting inside the hospitals. This unit includes group of professionals with each one has a specific role in smoking cessation. This “promotion unit” should include reception, supervisor room for advising and counselling.

Moreover, the doctor room should be equipped for examining the weight, height, pressure of smokers and lungs functionality [27].

TOBACCO CONSUMPTION IN LIBYA

To the best of my knowledge, no previous data regarding tobacco consumption in Libya (clinically or behaviourally) was published. Table 1 shows personal unpublished data of behavioural characteristics and nicotine dependence among a sample of Libyan smokers using Fagerstrom test for nicotine dependence. This survey was aimed firstly to get some information about Libyan smoking initiation and next to implement prevention program. According to data presented in Table 1, it is obvious that < 20 year-old group is an increasing segment of the smoking population in Libya and the pattern of tobacco-use behavior indicates a high degree of nicotine dependence with a high percentage of heavy smokers. Hence, the main goal of the Libyan authorities should be directed towards preventing children to start smoking (primary prevention) and to implement a national directive program on tobacco control.

Accordingly, the local national committee of anti-smoking (Libya) has suggested that regulations and measures on smoking are strongly needed and should be implanted as soon as possible. The recommendations included ban on advertising for tobacco, effective primary and secondary prevention measures, ban on the sale of cigarette to young people and recognition of nicotine as an addictive substance. Of course, the primary



goal of tobacco regulation is to reduce smoking-related diseases and the general harm to the society arising from smoking. Tobacco regulation should has three important objectives: to stop people from starting smoking, to help people to stop smoking (or to at least substantially reduce their tobacco consumption) and to protect non-smokers from the risks of passive smoking. Currently, these are the major goals of the National Committee of Anti-smoking in Libya.

Table 1: Smoking behavior of Libyan male smokers (personal data)

Parameters	Responses
Age (years)	< 20 = 19.66%, 20 – 40 = 45.65% and > 40 = 34.78%
Duration of smoking (years)	1 – 5 = 15.22%, 5 – 10 = 19.66% and > 10 = 60.86%
Influence of social factors	Family = 20.65%, friends = 32.61% and others = 2.17%
Reasons for smoking	Curiosity = 18.5% and manhood feeling = 15.21%
No. of cigarettes per day	< 10 = 28.26%, 11 – 20 = 32.61% and > 20 = 39.13%
The first cigarette after wake up (min.)	< 5 = 23.91%, 5 – 30 = 30.44%, 31 – 60 = 17 and > 60 = 28.26%
Difficulty to stop smoking in certain places	Yes = 32.60% No = 67.40%
Which cigarettes could the smokers to give up	The first one in the morning = 65.22% Any other one = 34.78%
Smoke more after wake up than the rest of the day	Yes = 45.65% No = 54.35%
Readiness of quit smoking during sickness	Yes = 23.90% No = 76.10%
The knowledge of smokers about the risk of smoking	Yes = 89.13% No = 10.87%
Knowledge about drugs that help in smoking cessation	Yes = 23.90% No = 76.10%
Taken coffee or drugs during the	Yes = 72.83%



smoking time	No = 27.17%
Times successfully quit for six months or more	0 = 54.35%, 1 = 15.21%, 2 = 11.95%, 3 = 9.80%, 4 = 2.17% and 5 = 6.52%
Factors that attribute the smoker's success in quitting	Self-decision = 13.45%, nicotine replacement = 5.43%, support psychotherapy = 0%, support group = 16.30%, others = 10.86%
Reasons for not quitting smoking	Habit = 32.60%, stress = 21.73%, nothing to do = 16.30%, no reason exist = 10.90%, friends are continuous smoking = 18.47%

CONFLICT OF INTEREST

The author declares that he has no conflict of interest.

REFERENCES

- [1] Green DR, Rodgman A. Tobacco chemist's research conference. A half-century of advances in analytical methodology of tobacco and its products. *Recent Advances in Tobacco Science*. 1996;22:131-304.
- [2] Hoffmann D, Hoffmann I. The changing cigarette, 1950-1995. *Journal of Toxicology and Environmental Health*. 1997;50:307-64.
- [3] Zevin S, Gourlay SG, Benowitz NL. Clinical Pharmacology of nicotine. *Clinical Dermatology*. 1998;16:557-64.
- [4] Benowitz NL. Nicotine addiction. *The New England Journal of Medicine*. 2010;362:2295-303.
- [5] Benowitz NL, Porchet H, Sheiner L, Jacob P. Nicotine absorption and cardiovascular effects with smokeless tobacco use: comparison with cigarette and nicotine gum. *Clinical Pharmacology and Therapeutics*. 1988;44:23-8.

[6] De Biasi M, Dani JA. Reward, addiction, withdrawal to nicotine. *Annual Review of Neuroscience*. 2011;34:105-30.

[7] Govind AP, Vezina P, Green WN. Nicotine-induced upregulation of nicotinic receptors: underlying mechanisms and relevance to nicotine. *Biochemical Pharmacology*. 2009;78:756-65.

[8] Rose JE, Mulchin AG, Lokitz ST, Turkington TG, Heoskovic J, Behm FM, Garg S, Garg PK. Kinetics of brain nicotine accumulation in dependent and nondependent smokers assessed with PET and cigarettes containing ¹¹C-nicotine. *Proceedings of the National Academy of Science*. 2010;107: 5190-5.

[9] Nestler EJ. Genes and addiction. *Nature Genetics*. 2000;26:227-81.

[10] Lesov-Schlaggar CN, Pergadia ML, Khroyan TV, Swan GE. Genetics of nicotine dependence and pharmacotherapy. *Biochemical Pharmacology*. 2008;75: 178-95.

[11] Reitz C, Mayeux R. Alzheimer's disease: epidemiology, diagnostic criteria, risk factors and biomarkers. *Biochemical Pharmacology*. 2014;88(4):640-51.

[12] Ritz B, Lee PC, Lassen CF, Arah OA. Parkinson disease and smoking revisited:



Ease of quitting is an early sign of the disease. *Neurology*. 2014;83:1396-402.

[13] Willoughby JO, Pope KJ, Eaton V. Nicotine as an antiepileptic agent in ADNFLE: an on of on study. *Epilepsia*. 2003;44:1238-40.

[14] Perkins KA. Weight gain following smoking cessation. *Journal of Consulting of Clinical Psychology*. 1993;61:768-77.

[15] Shiffman S, Scharf DM, Shadel WG, Gwaltney CJ, Dang Q, Paton SM, Clark DB. Analyzing milestones in smoking cessation: illustration in a nicotine patch trial in adult smokers. *Journal of Clinical and Consulting Psychology*. 2006;74:276-85.

[16] Sheeran P, Orbell S. Self-schemas and the theory of planned behavior. *European Journal of Social Psychology*. 2000;30:533-50.

[17] Haustein KO. Pharmacotherapy of nicotine dependence. *International Journal of Clinical Pharmacology and Therapeutics*. 2000;38:273-90.

[18] Tang JL, Law M, Wald N. How effective is nicotine replacement therapy in helping people to stop smoking? *British Medical Journal*. 1994;308: 21-6.

[19] Silagy C, Mant D, Fowler G, Lodge M. Meta-analysis on efficacy of nicotine replacement therapies in smoking cessation. *Lancet*. 1994;343:139-42.

[20] Read DO. Preventing adolescent nicotine addiction: what can one do?. *American*

Academy of Physician Assistants. 1993;6:703-10.

[21] Rose JE, Salley A, Behm FM, Bates JE, Westman EC. Reinforcing effects of nicotine and non-nicotine components of cigarette smoke. *Psychopharmacology*. 2010;210:1-12.

[22] Hammond EC. Smoking in relation to the death rates of one million men and women. *Journal National Cancer Institute Monographs*. 1966;19:127-204.

[23] Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking; 50 years' observations on male British doctors. *British Medical Journal*. 2004;328:1519-28.

[24] Weissfeld JL, Holloway JL. Treatment for cigarettes smoking in a department of veterans affairs outpatient clinic. *International Archives of Medicine*. 1991;151:973-77.

[25] Thomas D, Abramson MJ, Bonevski B, Poole S, Weeks GR, Dooley MJ, George J. A pharmacist-led system-change smoking cessation intervention for smokers (GIVE UP FOR GOOD): study protocol for a randomized controlled trail. *Trials*. 2013;14:148-60.

[26] Dent LA, Harris KJ, Noonan CW. Tobacco interventions delivered by pharmacists: a summary and systematic review. *Pharmacotherapy*. 2007;27:1040-51.

[27] Kenderick JS, Merritt RK. Women and smoking: an updated for the 1990s. *American Journal of Obstetrics and Gynecology*. 1996;175: 528-35.



ملخص باللغة العربية
الاعتماد على النيكوتين ودور الصيدلي في السيطرة على إدمان النيكوتين.

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هناك ما يقرب من مليار مدخن في العالم، وعدد الوفيات ما يقرب من ستة ملايين شخص في السنة. بحلول عام 2020، معدل الموت نتيجة التدخين سيرتفع إلى أكثر من 70٪ في بعض البلدان النامية. عالمياً استخدام التبغ مرتفع ويتفاوت من بلد إلى آخر. إدمان التبغ يمنع أي انخفاض في معدلات الاعتلال والوفيات. ويعتبر الاعتماد على النيكوتين موجود إذا كانت هناك أعراض انسحاب عند التوقف عن التدخين أو الرغبة القهرية لاستهلاك التبغ مهما كانت الظروف. أن العوامل البيئية والوراثية التي تسبب الإدمان على النيكوتين موثقة ومعروفة. وبالتالي، لا بد من اتخاذ إجراءات عاجلة وسريعة لتجنب حدوث ذلك. كما يتعين على الحكومات والمسؤولين لعب دور حيوي في السيطرة على التدخين. كما أنه لا بد أن تكون هناك مشاركة فعالة من المجتمع ككل في مكافحة التدخين.

داخل المجتمع؛ المهنيون الصحيون كالأطباء والصيدلة لهم دور قيادي لأنهم يمارسون مهنتهم في القطاع الصحي بشكل خاص. الصيدلة في وضع مثالي باعتبارهم أحد العاملين في مجال الرعاية الصحية وفي تناول الجميع لأداء دور أساسي في الصحة العامة وتقديم الدعم والوقاية في خدمات الإقلاع عن التدخين. الصيدلة لديهم معرفة كبيرة بأعراض انسحاب النيكوتين، وجرعات الأدوية وصيغها المستخدمة في علاج الإقلاع عن التدخين. الصيدلة لديهم الفرصة لتقديم المشورة للمدخنين للتوقف وبعض الصيدلة مع تدريب خاص يكونون قادرين على توفير العلاج للمدخنين.

كما أن الحملات الإعلامية (الصيدلة وغير الصيدلة) لتشجيع الإقلاع عن التدخين وتثبيط بدء التدخين يمكن أن تكون مفيدة وفعالة. ومع أي برنامج للوقاية من تعاطي التبغ، يجب دائماً أن نتذكر أن هناك حاجة لوقت طويل قبل أن يصبح البرنامج فعالاً ومؤثراً.

كلمات البحث: الإقلاع عن التدخين، النيكوتين والاعتماد على التبغ والإدمان، الصيدلي.

