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# Nicotine Dependence Diagnosis Methods

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**Abstract**

Tobacco use is the leading preventable cause of premature death and diseases in the world. Nicotine is the causal agent for the addiction of people to tobacco. To reduce the mortality and morbidity caused by tobacco use the only way out is to make people free from this monstrous addiction. The goal of this work is compilation of different diagnostic methods available to help people in the diagnosis of their level of addiction to nicotine. Various diagnostic methods included are Fagerstrom Test for Nicotine Dependence (FTND) and Heaviness of Smoking (HSI), Features of Diagnostic and Statistical Manual-IV, Features of the International Statistical Classification and Related Health, The Tobacco Dependence Screener (TDS), The Cigarette Dependence Scale (CDS), The Nicotine Dependence Syndrome Scale (NDSS), Wisconsin Inventory of Smoking Dependence Motives (WISDM), The Fagerstrom Test for Nicotine Dependence-Smokeless Tobacco (FTND-ST). These questionnaires are simple, easy to answer and assess. A number of smokers try to quit and fail in their attempt in lack of proper strategic planning. With the use of these questionnaires and by assessing their addiction level one can successfully plan for their quit attempt and benefit with it in a positive way.

**Key Words:**

Tobacco, addiction, cigarettes, diagnostic methods.History:

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## 1. Introduction

Tobacco addiction is a universal health care problem. “Addiction is a disease” Professor Carlton Erickson, Neurobiological researcher and “Assessment is the key” Professor Norman Hoffmann, President Evince Clinical Assessments. The World Health Organization estimates that around five million people die prematurely from tobacco related disease each year, and that

this number will increase to 10 million by 2020. Seventy percent of these deaths will occur among people in the developing world [1]. Tobacco addiction is caused and sustained by use of nicotine present in it. When individuals inhale cigarette smoke, either directly or secondhand, they are inhaling more than 7,000 chemicals: hundreds of these are hazardous, and at least 69 are known to cause cancer. The chemicals are rapidly absorbed by cells in the body and produce disease-causing cellular changes [2]. The essence of drug addiction is loss of control of drug use. Molecular biology studies suggest that the α4β2 nicotinic acetylcholine receptor subtype is the main receptor mediating nicotine dependence. Nicotine acts on these brain nicotinic cholinergic receptors to facilitate neurotransmitter release (dopamine and others), producing pleasure, stimulation, and mood modulation. Neuroadaptation develops with repeated exposure to nicotine, resulting in tolerance to many of the effects of nicotine [1]. Cigarette smoking produces a rapid distribution of nicotine to the brain, with drug levels peaking within 10 seconds of inhalation [3]. The acute effects of nicotine dissipate in a few minutes, as do the associated feelings of reward, which causes the smoker to continue dosing to maintain the drug's pleasurable effects and prevent withdrawal. A recent study showed that the nicotine received in just a few puffs of a cigarette can drive a person to continue smoking. A typical smoker will take 10 puffs on a cigarette over a period of 5 minutes that the cigarette is lit [4]. Researchers found that the amount of nicotine contained in just one puff of a cigarette can occupy about 30% of the brain's most common type of nicotine receptors, while three puffs can occupy about 70%. When nearly all of the receptors are occupied (as a result of smoking at least 2 ½ cigarettes), the smoker becomes satiated for a time. Soon, however, this level of satiation wears off, driving smokers to continue smoking throughout the day to satisfy their cigarette cravings [5].

## 2. Nicotine dependence diagnosis

Nicotine addiction is a chronic relapsing condition, with most relapse occurring in the first 8 days and only 3 to 5% of self-quitters achieving prolonged abstinence for 6 to 12 months after a given quit attempt [6]. Tobacco dependence syndrome is in the World Health Organization International Classification of Diseases and is a recognized psychiatric illness by the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Health Disorders (fourth revision text revised) (International Statistical Classification of Disease and Related Health Problems, 2007; Diagnostic and statistical manual of mental health disorders, 1994)[7-8]. It has been referred to as 'the most prevalent, most deadly, most costly, yet most treatable of all substance dependence" [9] however, it is often overlooked by the mental health professions [10]. Several methods have been developed so far to diagnose nicotine addiction in any individual. These methods also help us to know the extent of addiction of the person to be diagnosed. Diagnostic method are based on list of questions to be asked to the subject and based on their answers scoring is done to evaluate their level of dependence to nicotine.

Nicotine dependence can be diagnosed by a number of methods. Some of the diagnostic methods such as Fagerstrom Test for Nicotine Dependence (FTND) and Heaviness of Smoking (HSI) (Table 1), Features of Diagnostic and Statistical Manual-IV (Table 2), Features of the International Statistical

Classification and Related Health (Table 3), The Tobacco Dependence Screener (TDS) (Table 4), The Cigarette Dependence Scale (CDS) (Table 5), The Nicotine Dependence Syndrome Scale (NDSS) (Table 6), Wisconsin Inventory of Smoking Dependence Motives (WISDM) (Table 7), The Fagerstrom Test for Nicotine Dependence-Smokeless Tobacco (FTND-ST) (Table 8) are given along with their method of assessment.

**Table: 1. Fagerström Test for Nicotine Dependence (FTND) and Heaviness of Smoking (HSI)*** (IARC Handbooks of cancer prevention, 2007) [11]

| S.No. | Questions | Answers | Score |
|---|---|---|---|
| 1. | How soon after you wake up do you smoke your first cigarette? | Within 5 minutes<br>6-30 minutes<br>31-60 minutes<br>After 60 minutes | 3<br>2<br>1<br>0 |
| 2. | Do you find it difficult to refrain from smoking in places where it is forbidden (e.g. in church, at the library, cinema, etc.)? | Yes<br>No | 1<br>0 |
| 3. | Which cigarette would you hate to give up? | The first one in the morning<br>All the others | 1<br>0 |
| 4. | How many cigarettes/day do you smoke? | 10 or less<br>11-20<br>21-30<br>31 or more | 0<br>1<br>2<br>3 |
| 5. | Do you smoke more frequently during the first hours after waking than during the rest of the day? | Yes<br>No | 1<br>0 |
| 6. | Do you smoke if you are so ill you are in bed most of the day? | Yes<br>No | 1<br>0 |

* The Heaviness of Smoking Index (HSI) consists of FTND Item 1 and FTND Item 4, using the same response scales and calculating the total score using the sum of the scores on those two items.
Total score = Sum of all questions

**Table: 2. Features of Diagnostic and Statistical Manual-IV** (DSM-IV) (IARC Handbooks of cancer prevention, 2007)

Substance Dependence that are Targeted by Structured Diagnostic Interviews
A maladaptive pattern of substance use, leading to clinically significant impairment or distress as manifested by three (or more) of the following occurring at any time in the same 12-month period:

| S. No. | Features |
|---|---|
| 1. | Tolerance, as defined by either of the following:<br>a. A need for markedly increased amounts of the substance to achieve intoxication or desired effect.<br>b. Markedly diminished effect with continued use of the same amount of substance. |
| 2. | Withdrawal, as manifested by either of the following: |

| | |
|---|---|
| | a. The characteristic withdrawal syndrome for the substance<br>b. The same (or a closely related) substance is taken to relieve or avoid withdrawal symptoms. |
| 3. | The substance is often taken in larger amounts or over a longer period than was intended. |
| 4. | There is a persistent desire or unsuccessful efforts to cut down or control substance use. |
| 5. | A great deal of time is spent in activities necessary to obtain the substance (e.g. visiting multiple doctors or driving long distances), use the substance (e.g. chain smoking), or recover from its effects. |
| 6. | Important social, occupational, or recreational activities are given up or reduced because of substance use. |
| 7. | The substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance (e.g. current cocaine use despite recognition of cocaine-induced depression, or continued drinking despite recognition that an ulcer was made worse by alcohol consumption). |

**Table: 3. Features of the International Statistical Classification and Related Health** (IARC Handbooks of cancer prevention, 2007) [11]

Problems-10 (ICD-10) Substance Dependence that are Targeted by Structured Diagnostic **Interviews**, three or more of the following manifestations should have occurred together for at least one month, or if persisting for periods of less than one month, should have occurred together repeatedly within a 12-month period:

| S. No. | Features |
|---|---|
| 1. | A strong desire or sense of compulsion to take the substance. |
| 2. | Impaired capacity to control substance-taking behaviour in terms of onset, termination or level of use, as evidenced by: the substance being often taken in larger amounts or over longer periods of time than intended, or any unsuccessful effort or persistent desire to cut down or control substance use. |
| 3. | A physiological withdrawal state when substance use is reduced or ceased, as evidenced by the characteristic withdrawal syndrome for the substance, or use of the same (or closely related) substance with the intention of relieving or avoiding withdrawal symptoms. |
| 4. | Evidence of tolerance to the effects of the substance, such that there is a need for markedly increased amounts of the substance to achieve intoxication or desired effect, or that there is a markedly diminished effect with continued use of the same amount of the substance. |
| 5. | Preoccupation with substance use, as manifest by: important alternative pleasures or interests being given up or reduced because of substance use, or a great deal of time |

| | |
|---|---|
| | being spent in activities necessary to obtain the substance, take the substance, or recover from its effects. |
| 6. | Persisting with substance use despite clear evidence of harmful consequences as evidenced by continued use when the person was actually aware of the nature and extent of harm. |

**Table: 4. The Tobacco Dependence Screener** (TDS)* (IARC Handbooks of cancer prevention, 2007) [11]

Please answer the following questions either yes or no:

| S. No. | Questions |
|---|---|
| 1. | Have you often had periods of days when you smoked a lot more than you than you intended to? |
| 2. | Have you ever tried to quit or cut down on tobacco and found you could not? |
| 3. | Did you crave tobacco after you quit or cut down on it? |
| 4. | Did you have any of the following problems when you quit or cut down on tobacco: irritation, nervousness, restless, trouble concentrating, headache, drowsiness, upset stomach, heart slow down, increased appetite or body weight, handshakes, or depression? |
| 5. | Did you ever start using tobacco again to keep from having such problems? |
| 6. | Have you ever continued to smoke when you had a serious illness that you knew made it unwise to use tobacco? |
| 7. | Have you ever continued to use tobacco after you knew that it caused you health problems? |
| 8. | Did you continue to use tobacco after you knew that it caused you mental problems? |
| 9. | Have you ever felt like you were dependent on tobacco? |
| 10. | Have you given up work or social activities so you could use tobacco? |

* To get the total score for the TDS, add up all the points by giving each “yes” response one point, and each “no” response zero points.

**Table: 5. The Cigarette Dependence Scale** (CDS) (IARC Handbooks of cancer prevention, 2007)

Please rate your addiction to cigarettes on a scale of 0 to 100:†

| S. No. | Questions | Answers | Score |
|---|---|---|---|
| 1. | a. I am NOT addicted to cigarettes at all = 0<br>b. I am extremely addicted to cigarettes =100 | 0-20<br>21-40<br>41-60<br>61-80<br>81-100 | 1<br>2<br>3<br>4<br>5 |
| 2. | On average, how many cigarettes do you smoke per day? | 0-5<br>6-10 | 1<br>2 |

| | | | |
|---|---|---|---|
| | | 11-20<br>21-29<br>30+ | 3<br>4<br>5 |
| 3. | Usually, how soon after waking up do you smoke your first cigarette? | 0-5 minutes<br>6-15 minutes<br>16-30 minutes<br>31-60 minutes<br>61+ minutes | 5<br>4<br>3<br>2<br>1 |
| 4. | For you, quitting smoking for good would be: | Impossible<br>Very difficult<br>Fairly difficult<br>Fairly easy<br>Very easy | 5<br>4<br>3<br>2<br>1 |
| Please indicate whether you agree with each of the following statements: | | Totally disagree<br>Somewhat disagree<br>Neither agree nor disagree<br>Somewhat agree<br>Fully agree | 1<br>2<br>3<br>4<br>5 |
| 5. | After a few hours without smoking I feel an irresistible urge to smoke. | | |
| 6. | The idea of not having any cigarettes causes me stress. | | |
| 7. | Before going out, I always make sure that I have cigarettes with me. | | |
| 8. | I am a prisoner of cigarettes. | | |
| 9. | I smoke too much. | | |
| 10. | Sometimes I drop everything to go out and buy cigarettes | | |
| 11. | I smoke all the time. | | |
| 12. | I smoke despite the risks to my health. | | |

The CDS total scores are sums of all of the relevant 5 or 12 items.† Items included in the CDS-5.

**Table: 6. The Nicotine Dependence Syndrome Scale** (NDSS) (IARC Handbooks of cancer prevention, 2007)

Circle the number that indicates how well each of the following statements describes you:

1 – Not at all true
2 – Somewhat true
3 – Moderately true
4 – Very true
5 – Extremely true

| S. No. | Questions |
|---|---|
| 1. | After not smoking for while, I need to smoke to relieve feelings of restlessness and irritability. |

| | |
|---|---|
| 2. | Whenever I go without a smoke for a few hours, I experience craving. |
| 3. | After not smoking for a while, I need to smoke in order to keep myself from experiencing any discomfort. |
| 4. | When I'm really craving a cigarette, it feels like I'm in the grip of some unknown force that I cannot control. |
| 5. | I feel a sense of control over my smoking. I can "take it or leave it" at any time. |
| 6. | I tend to avoid restaurants that don't allow smoking, even if I would otherwise enjoy the food. |
| 7. | Sometimes I decline offers to visit with my non-smoking friends because I know that I'll feel uncomfortable if I smoke |
| 8. | Even if traveling a long distance, I'd rather not travel by airplane because I wouldn't be allowed to smoke. |
| 9. | Since the time when I became a regular smoker, the amount I smoke has either stayed the same or has decreased somewhat. |
| 10. | Compared to when I first started smoking, I need to smoke a lot more now in order to get what I want out of it. |
| 11. | Compared to when I first started smoking, I can smoke much, much more now before I start to feel nauseated or ill. |
| 12. | It's hard to estimate how many cigarettes I smoke per day because the number often changes. |
| 13. | My smoking pattern is very irregular throughout the day. It is not unusual for me to smoke many cigarettes in an hour, then not have another one until hours later. |
| 14. | The number of cigarettes I smoke per day is often influenced by other factors – how I'm feeling, what I'm doing, etc. |
| 15. | I smoke at different rates in different situations. |
| 16. | My smoking is not much affected by other things. I smoke about the same amount whether I'm relaxing or working, happy or sad, alone or with others, etc. |
| 17. | My cigarette smoking is fairly regular throughout the day. |
| 18. | I smoke consistently and regularly throughout the day. |
| 19. | I smoke about the same amount on weekends as on weekdays. |

Scoring for the NDSS involves multiplying the item score by a factor loading score and then summing the factor-corrected scores for each subscale and for the total scale. See Shiffman et al. (2004) for the factor loadings.

**Table: 7. Wisconsin Inventory of Smoking Dependence Motives** (WISDM) (IARC Handbooks of cancer prevention, 2007)

| | |
|---|---|
| Below are a series of statements about cigarette smoking. Please rate your level of agreement for each, using the following scale: | 3<br>4<br>5<br>6 |
| 1 = Not true of me at all<br>2 | 7 = extremely true of me |

| S. No. | Questions |
|---|---|
| 1. | I enjoy the taste of cigarettes most of the time. |
| 2. | Smoking keeps me from gaining weight. |
| 3. | Smoking makes a good mood better. |
| 4. | If I always smoke in a certain place it is hard to be there and not smoke. |
| 5. | I often smoke without thinking about it. |
| 6. | Cigarettes control me. |
| 7. | Smoking cigarettes improves my mood. |
| 8. | Smoking makes me feel content. |
| 9. | I usually want to smoke right after I wake up. |
| 10. | Very few things give me pleasure each day like cigarettes. |
| 11. | It's hard to ignore an urge to smoke. |
| 12. | The flavor of a cigarette is pleasing. |
| 13. | I smoke when I really need to concentrate. |
| 14. | I can only go a couple hours between cigarettes. |
| 15. | I frequently smoke to keep my mind focused. |
| 16. | I rely upon smoking to control my hunger and eating. |
| 17. | My life is full of reminders to smoke. |
| 18. | Smoking helps me feel better in seconds. |
| 19. | I smoke without deciding to. |
| 20. | Cigarettes keep me company, like a close friend. |
| 21. | Few things would be able to replace smoking in my life. |
| 22. | I'm around smokers much of the time. |
| | |
| 23. | There are particular sights and smells that trigger strong urges to smoke. |
| 24. | Smoking helps me stay focused. |
| 25. | Smoking helps me deal with stress. |
| 26. | I frequently light cigarettes without thinking about it. |
| 27. | Most of my daily cigarettes taste good. |
| 28. | Sometimes I feel like cigarettes rule my life. |
| 29. | I frequently crave cigarettes. |
| 30. | Most of the people I spend time with are smokers |
| 31. | Weight control is a major reason why I smoke. |
| 32. | I usually feel much better after a cigarette. |
| 33. | Some of the cigarettes I smoke taste great. |
| 34. | I'm really hooked on cigarettes. |
| 35. | Smoking is the fastest way to reward myself. |
| 36. | Sometimes I feel like cigarettes are my best friends. |

| | |
|---|---|
| 37. | My urges to smoke keep getting stronger if I don't smoke. |
| 38. | I would continue smoking, even if it meant I could spend less time on my hobbies and other interests. |
| 39. | My concentration is improved after smoking a cigarette. |
| 40. | Seeing someone smoke makes me really want a cigarette. |
| 41. | I find myself reaching for cigarettes without thinking about it. |
| 42. | I crave cigarettes at certain times of the day. |
| 43. | I would feel alone without my cigarettes. |
| 44. | A lot of my friends or family smoke. |
| 45. | Smoking brings me a lot of pressure. |
| 46. | Cigarettes are about the only thing that can give me a lift when I need it. |
| 47. | Other smokers would consider me a heavy smoker. |
| 48. | I feel a strong bond with my cigarettes. |
| 49. | It would take a pretty serious medical problem to make me quit smoking. |
| 50. | When I haven't been able to smoke for a few hours, the craving gets intolerable. |
| 51. | When I do certain things, I know I'm going to smoke. |
| 52. | Most of my friends and acquaintances smoke. |
| 53. | I love the feeling of inhaling the smoke into my mouth. |
| 54. | I smoke within the first 30 minutes of awakening in the morning. |
| 55. | Sometimes I'm not aware that I am smoking. |
| 56. | I'm worried that if I quit smoking I'll gain weight. |
| 57. | Smoking helps me think better. |
| 58. | Smoking really helps me feel better if I've been feeling down. |
| 59. | Some things are very hard to do without smoking. |
| 60. | Smoking makes me feel good. |
| 61. | Smoking keeps me from overeating. |
| 62. | My smoking is out of control. |
| 63. | I consider myself a heavy smoker. |
| 64. | Even when I feel good, smoking helps me feel better. |
| 65. | I reach for cigarettes when I feel irritable. |
| 66. | I enjoy the sensations of a long, slow exhalation of smoke. |
| 67. | Giving up cigarettes would be like losing a good friend. |
| 68. | Smoking is the easiest way to give myself a lift. |

WISDM Subscale Scores = Mean of all subscale items
WISDM Total Score = Sum of all the subscale means
WISDM Subscale Items
Affiliative Attachment #20, 36, 43, 48, 67
Automaticity #5, 19, 26, 41, 55
Loss of Control #6, 28, 34, 62
Behavioral Choice/Melioration #10, 21, 35, 38, 46, 49, 68

Cognitive Enhancement #13, 15, 24, 39, 57
Craving #11, 29, 37, 50
Cue exposure/Associative Process #4, 17, 23, 40, 42, 51, 59
Negative Reinforcement #7, 18, 25, 32, 58, 65
Positive Reinforcement #3, 8, 45, 60, 64
Social/Environmental Goals #22, 30, 44, 52
Taste/Sensory Process #1, 12, 27, 33, 53, 66
Tolerance #9, 14, 47, 54, 63
Weight Control #2, 16, 31, 56, 61

**Table: 8. The Fagerstrom Test for Nicotine Dependence-Smokeless Tobacco** (FTND-ST)
(IARC Handbooks of cancer prevention, 2007)

| S. No. | Questions | Answers | Score |
|---|---|---|---|
| 1. | How soon after you wake up to do you place your first dip? | Within 5 min<br>6–30 min<br>31–60 min<br>After 60 min | 3<br>2<br>1<br>0 |
| 2. | How often do you intentionally swallow tobacco juice? | Always<br>Sometimes<br>Never | 2<br>1<br>0 |
| 3. | Which chew would you hate to give up most? | The first one in the morning<br>Any other | 1<br>0 |
| 4. | How many cans/pouches per week do you use? | More than 3<br>2–3<br>1 | 2<br>1<br>0 |
| 5. | Do you chew more frequently during the first hours after awakening than during the rest of the day? | Yes<br>No | 1<br>0 |
| 6. | Do you chew if you are so ill that you are in bed most of the day? | Yes<br>No | 1<br>0 |

## 3. Conclusion

Most smokers who are aware of the dangers of tobacco want to quit, but quitting without assistance is difficult because nicotine is highly addictive. Although most who quit eventually do so without intervention, but assistance greatly increases quit rates [12]. It would be of great help if smoker before an attempt to quit identifies their level of dependence by the help of different diagnostic methods available so that it would be easier to know which intervention can be used to aid in their quit attempt to achieve successful quitting.

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