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Mini Review

Fagerstrom Test: A Tool for Assessing Risk of Subclinical Cardiovascular Disease in Nicotine Users

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ABSTRACT

The research paper titled "Fagerstrom Test: Evaluating subclinical cardiovascular risk in nicotine dependents" delves into the association between nicotine addiction and the likelihood of developing subclinical cardiovascular issues. This investigation utilizes the Fagerstrom Test for Nicotine Dependence (FTND), a widely recognized tool for gauging the severity of nicotine addiction, where higher scores reflect more intense dependency. Given the significant public health issue posed by cardiovascular disease and the known risks associated with smoking, the review critically examines existing studies on how nicotine affects cardiovascular health, the predictive capacity of the Fagerstrom score for cardiovascular events, and the broader consequences for those who use nicotine and their healthcare providers. A pivotal finding of this review is the potential link between nicotine dependency, as determined by the FTND, and an elevated risk of subclinical cardiovascular diseases. However, it's noted that nicotine may not be the only factor contributing to cardiovascular harm, as other elements in traditional cigarettes could also be influential. The study underscores the necessity of considering nicotine dependence in cardiovascular risk assessments for smokers and stresses the urgency for more comprehensive research to fully grasp the connection between nicotine addiction and cardiovascular health.

Keywords: Fagerstrom test; Subclinical cardiovascular disease; Nicotine; Atherosclerosis; Mortality

INTRODUCTION

Cardiovascular Diseases (CVDs) stand as a predominant cause of global health issues, leading to significant morbidity and mortality. An early sign of these diseases, subclinical cardiovascular disease, represents an essential marker for the onset of atherosclerosis, where early detection is key to preventing its progression to full-blown CVD [1,2]. Among the various risk factors, nicotine consumption, especially through smoking, is notably detrimental. It triggers pharmacological responses that can hasten the onset of cardiovascular incidents and speed up the atherosclerotic process [3,4]

The Fagerstrom Test for Nicotine Dependence (FTND) is recognized as a reliable measure for gauging physical addiction to nicotine [5]. His scale offers a measurable way to assess nicotine dependency, which is pivotal in understanding its cardiovascular impact. Nonetheless, the link between nicotine dependency, as indicated by the FTND, and the risk for subclinical cardiovascular disease remains somewhat elusive [6].

Considering the profound public health impact of CVDs and the widespread prevalence of nicotine use, delving deeper into this connection is vital. This review focuses on exploring the relationship between nicotine dependence, as evaluated by the FTND, and the risk for subclinical cardiovascular disease. It will delve into the literature on nicotine's cardiovascular effects, the predictive value of the Fagerstrom score for cardiovascular outcomes, and the potential repercussions for nicotine users and healthcare practitioners [7].

The objectives of this review are to:

1. Provide a comprehensive overview of the current understanding of the relationship between nicotine dependence and subclinical cardiovascular disease.

2. Evaluate the utility of the FTND as a tool for assessing the risk of subclinical cardiovascular disease in nicotine users.

3. Identify gaps in the current knowledge and suggest directions for future research.

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By achieving these objectives, this review aims to contribute to the body of knowledge in this field and potentially inform clinical practice and public health strategies.

LITERATURE REVIEW

Fagerstrom test: An overview

The Fagerstrom Test for Nicotine Dependence is a benchmark tool used to measure physical addiction to nicotine. Developed by Karl-Olov Fagerstrom and later refined by Todd Heatherton and colleagues in 1991 [8]. It offers a graded assessment of nicotine dependence related to cigarette smoking. The test comprises six questions that evaluate cigarette use frequency, compulsion to smoke, and overall dependency.

Scoring the FTND involves a mix of binary and multiple-choice questions, with a total possible score ranging from 0 to 10. A higher score indicates a stronger physical dependence on nicotine. Clinically, the FTND is akin to measuring blood pressure for hypertension diagnosis, offering insights into the severity of tobacco addiction as shown in Figure 1 [8].

Fagerstrom Test for Nicotine Dependence

	PLEASE TICK (✓) ONE BOX FOR EACH QUESTION	
How soon after waking do you smoke your first cigarette?	Within 5 minutes ☐ 3 5-30 minutes ☐ 2 31-60 minutes ☐ 1	
Do you find it difficult to refrain from smoking in places where it is forbidden? e.g. Church, Library, etc.	Yes ☐ 1 No ☐ 0	
Which cigarette would you hate to give up?	The first in the morning ☐ 1 Any other ☐ 0	
How many cigarettes a day do you smoke?	10 or less ☐ 0 11 – 20 ☐ 1 21 – 30 ☐ 2 31 or more ☐ 3	
Do you smoke more frequently in the morning?	Yes ☐ 1 No ☐ 0	
Do you smoke even if you are sick in bed most of the day?	Yes ☐ 1 No ☐ 0	
	Total Score	
SCORE	1- 2 = low dependence 3-4 = low to mod dependence	5 - 7= moderate dependence 8 + = high dependence

Figure 1: Scoring the Fagerstrom test for nicotine dependence.

The test's reliability and validity have been scrutinized. It shows moderate test-retest reliability, with scores ranging from 0.56 to 0.92, and has exhibited solid construct validity [9]. Despite its widespread use, the FTND may have limitations due to questionable psychometric properties [10].

Presently, the FTND is utilized in various settings, both clinical and research, for screening nicotine dependence and aiding in treatment planning and outcome prediction [8]. It has also been instrumental in studies exploring nicotine dependence's link to diseases like Chronic Obstructive Pulmonary Disease (COPD) [11].

Nicotine use and cardiovascular risk

Nicotine, mainly through smoking, is closely linked to an elevated risk of CVDs. According to the World Health Organization (WHO), tobacco-induced heart disease is responsible for one-fifth of all heart disease deaths, with smokers facing a higher risk of acute cardiovascular events at an earlier age than non-smokers [12].

Nicotine impacts cardiovascular health in multiple ways: It increases cardiac output by raising heart rate and myocardial contractility [3]. Prompts acute spikes in blood pressure and heart rate, and can lead to inflammation, altered lipid metabolism, and a hypercoagulable state, all contributing to atherosclerosis [13]. Furthermore, nicotine use can result in a hypercoagulable state, inflammation, and changes in lipid metabolism, all of which contribute to the development of atherosclerosis.

Epidemiological studies highlight the cardiovascular dangers of nicotine use. For instance, cigarette smoking in the U.S. is linked to about 140,000 premature CVD-related deaths annually [14]. Even short-term smoking can increase heart rate, blood pressure, and aortic stiffness [13].

Subclinical cardiovascular alterations are also observed in nicotine users. Research indicates a dose-dependent association between smoking intensity and inflammation, with biomarkers like hsCRP, IL-6, and fibrinogen showing significant correlations [15]. Additionally, chronic e-cigarette users have shown marked impairments in coronary microvascular endothelial function, surpassing those in traditional cigarette users as shown in Figure 2 [16].

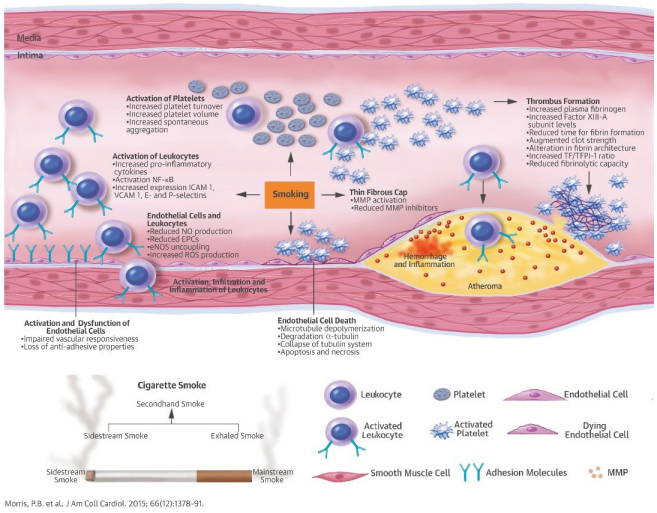

Figure 2: Exposure to cigarette smoke and secondhand smoke leads to harmful effects [17].

In essence, nicotine use, primarily *via* smoking, significantly escalates cardiovascular disease risk. This risk stems from various physiological changes, including increased heart rate, blood pressure, inflammation, changes in lipid metabolism, and blood coagulation, potentially leading to subclinical cardiovascular changes and eventually manifesting as overt CVD.

Application of the Fagerstrom test in cardiovascular risk assessment

The utilization of the Fagerstrom Test for Nicotine Dependence (FTND) in determining cardiovascular risk has been the subject of numerous studies. These investigations have revealed a link between FTND scores and indicators of cardiovascular disease. For example, a notable study identified a moderate yet significant correlation between FTND scores and inflammatory markers, such as high-sensitivity C-reactive Protein (hsCRP), Interleukin 6 (IL-6), and fibrinogen [18]. Additionally, research has shown that Fagerstrom scores can predict smoking behavior six months post-hospitalization for acute myocardial infarction, highlighting its relevance in cardiovascular risk evaluation [7].

However, the direct comparison of the FTND with other cardiovascular risk assessment tools, particularly regarding its predictive accuracy for cardiovascular events, remains unexplored

[19]. Most existing studies have concentrated on the correlation between FTND scores and specific cardiovascular risk factors or markers, rather than its effectiveness in forecasting cardiovascular incidents. Further investigations are necessary to establish the FTND's value in cardiovascular risk assessment, especially in comparison with other recognized tools like the Framingham Risk Score (FRS), the Systematic Coronary Risk Evaluation (SCORE), and the Progetto cuore model [19].

In examining the relationship between nicotine dependence and Cardiovascular Disease (CVD), the FTND has shown potential as an indicator of subclinical cardiovascular disease in those dependent on nicotine. Research has linked nicotine dependency, as measured by the FTND, to a higher risk of atherosclerosis in long-term smokers and to the development of carotid artery stenosis [20].

Nonetheless, employing the FTND in this context comes with certain limitations. The test primarily evaluates physical nicotine dependence and does not fully encompass the behavioral, cognitive, and social elements of smoking addiction. Also, its applicability to individuals using both traditional and electronic cigarettes is questionable [21].

Despite these challenges, the FTND is a crucial tool for measuring nicotine dependence and understanding its implications for cardiovascular health. Future research could integrate the FTND with other cardiovascular risk assessment tools, such as the Framingham Risk Score (FRS) and the Systematic Coronary Risk Evaluation (SCORE) [22]. Additionally, future studies could investigate the effects of smoking cessation on FTND scores and subsequent changes in cardiovascular risk [6]. This could provide valuable insights into the role of nicotine dependence in cardiovascular disease and inform strategies for prevention and treatment.

Clinical implications and future directions

In the domain of cardiovascular medicine, where the dynamic between lifestyle factors and disease pathophysiology is pivotal, incorporating tools such as the Fagerstrom Test for Nicotine Dependence (FTND) carries significant clinical implications and offers promising avenues for future advancements [19]. Firstly, employing FTND in the assessment and management of cardiovascular health in nicotine users signifies a crucial stride towards comprehensive patient care. By utilizing FTND, healthcare providers can gain invaluable insights into the severity of nicotine addiction, enabling more precise risk stratification and personalized management strategies tailored to individual patient circumstances. This nuanced comprehension of nicotine dependence empowers clinicians to pinpoint high-risk patients who may benefit from intensified interventions aimed at smoking cessation, thereby mitigating the substantial cardiovascular risks linked with tobacco use [13]. Moreover, embedding FTND into routine clinical practice has the potential to revolutionize the standard of care for cardiovascular patients with a history of nicotine use. By integrating FTND into routine screening protocols, healthcare providers can proactively identify patients at risk of cardiovascular disease due to nicotine dependence and instigate timely interventions to address modifiable risk factors. This proactive approach not only facilitates early detection and intervention but also fosters a culture of preventive medicine, ultimately contributing to improved cardiovascular outcomes and reduced disease burden [3].

However, despite the promising implications of FTND in cardiovascular risk assessment and management, there remain notable research gaps and opportunities for future exploration. One such avenue pertains to refining and validating risk assessment tools that integrate FTND with traditional cardiovascular risk factors [7]. Developing comprehensive risk prediction models that incorporate both established risk factors and measures of nicotine dependence could enhance risk stratification accuracy and inform more targeted interventions in clinical practice. Additionally, longitudinal studies are warranted to elucidate the long-term cardiovascular consequences of varying degrees of nicotine dependence as assessed by FTND [8]. By clarifying the dose-response relationship between nicotine addiction severity and cardiovascular risk, healthcare providers can refine risk assessment strategies and tailor treatment recommendations to suit individual patient needs. Furthermore, there is an urgent need for the development of innovative approaches to smoking cessation interventions customized specifically to the requirements of cardiovascular patients [5]. By leveraging technology, behavioral interventions, and pharmacotherapy, healthcare providers can optimize smoking cessation outcomes and minimize the cardiovascular risks associated with continued tobacco use. Integrating FTND into cardiovascular practice carries immense potential for enhancing risk assessment, guiding personalized management strategies, and ultimately improving the cardiovascular health outcomes of nicotine users. However, further research and innovation are imperative to fully realize the clinical benefits of FTND and address existing gaps in risk assessment and management approaches [10].

CONCLUSION

The Fagerstrom Test for Nicotine Dependence (FTND) has proven to be a useful measure in assessing the link between nicotine dependency and Cardiovascular Disease (CVD). While it is effective in predicting subclinical cardiovascular conditions in nicotine users, it's important to acknowledge its focus on physical dependency and limited applicability for dual users of traditional and electronic cigarettes. The FTND's integration with other cardiovascular risk assessment tools and further examination of its predictive capacity for cardiovascular outcomes could yield valuable information about nicotine's role in cardiovascular health. This knowledge is essential for shaping clinical practices and public health policies aimed at mitigating CVD risks among nicotine users.

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