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ORIGINAL RESEARCH

Nicotine Replacement Therapy vs. Cognitive-Behavioral Therapy for Smoking Cessation in Low-Income Populations: A Comparative Effectiveness Study

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Abstract

Background: Smoking is a leading cause of preventable death worldwide, and low-income populations are disproportionately affected by smoking-related illnesses. Effective smoking cessation interventions are critical to reducing the burden of smoking-related diseases in these populations.

Methods: A comparative effectiveness study was conducted to compare the effectiveness of nicotine replacement therapy (NRT) and cognitive-behavioral therapy (CBT) for smoking cessation in low-income populations. Participants were randomly assigned to receive either NRT or CBT, and smoking abstinence was measured at 1 week, 3 months, and 6 months.

Results: The results showed that CBT was more effective than NRT in promoting long-term smoking abstinence in low-income populations. At 6 months, the quit rate was significantly higher in the CBT group compared to the NRT group. Additionally, CBT was found to be more effective in reducing nicotine withdrawal symptoms and improving quality of life.

Conclusion: This study provides evidence that CBT is a more effective approach than NRT for smoking cessation in low-income populations. The findings have important implications for the development of smoking cessation interventions that are tailored to the unique needs and circumstances of this population.

Keywords: Smoking cessation, low-income populations, nicotine replacement therapy, cognitive-behavioral therapy

Introduction

Smoking is a leading cause of preventable death worldwide, accounting for more than 7 million deaths annually [1]. Low-income populations are disproportionately affected by smoking-related illnesses, with higher smoking prevalence rates and lower quit rates compared to higher-income populations [2]. Smoking cessation interventions are critical to reducing the burden of smoking-related diseases, and nicotine replacement therapy (NRT) and cognitive-behavioral therapy (CBT) are two commonly used approaches.

NRT, which involves the use of nicotine-containing products to reduce withdrawal symptoms, has been shown to be effective in increasing quit rates [3]. CBT, on the other hand, focuses on identifying and changing negative thought patterns and behaviors associated with smoking [4]. While both NRT and CBT have been studied extensively in smoking cessation, few studies have compared their effectiveness in low-income populations.

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Low-income populations face unique barriers to smoking cessation, including limited access to healthcare services, lower levels of education, and higher levels of stress [5-6]. These barriers can make it more challenging for individuals from low-income backgrounds to quit smoking, highlighting the need for tailored interventions that address their specific needs.
Despite the importance of smoking cessation in low-income populations, there is a lack of comparative effectiveness research on NRT and CBT in this population. This study aims to address this knowledge gap by comparing the effectiveness of NRT and CBT for smoking cessation in low-income populations.The primary aim of this study is to compare the effectiveness of NRT and CBT for smoking cessation in low-income populations. The secondary objectives are to examine the factors that influence the effectiveness of each intervention and to explore the cost-effectiveness of each approach.

Materials and methods

Study Design

This study was a comparative effectiveness study, with a randomized controlled trial design. Participants were randomly assigned to either an NRT group or a CBT group.

Recruitment and Eligibility

Participants were recruited from community health centers and local non-profit organizations serving low-income populations. Eligible participants were adults aged 18-65, with a smoking history of at least one year, and a motivation to quit smoking.

Sample Size Estimation

The sample size was calculated based on a power analysis, using a two-sided alpha level of 0.05 and a power of 0.80. Assuming a smoking abstinence rate of 20% in the NRT group and 30% in the CBT group, we estimated that a sample size of 264 participants (132 cases and 132 controls) would be required to detect a statistically significant difference between the two groups.

Interventions

The NRT group received a standardized NRT regimen, consisting of nicotine gum and counseling on proper use. The CBT group received a standardized CBT program, consisting of eight weekly sessions focused on identifying and changing negative thought patterns and behaviors associated with smoking.

Outcome Measures

The primary outcome measure was biochemically confirmed smoking abstinence at six months. Secondary outcome measures included self-reported smoking abstinence, nicotine withdrawal symptoms, and quality of life.

Results

The demographic assessment table revealed that the participants in both the NRT and CBT groups were similar in terms of age, with a mean age of 42.1 and 43.5 years, respectively (Table 1). The majority of participants in both groups were male, with 60.6% in the NRT group and 55.3% in the CBT group. The level of education was also similar between the two groups, with a mean of 11.4 and 12.1 years of education, respectively. However, there was a significant difference in income between the two groups, with the CBT group having a higher mean income of $18,000 compared to $15,000 in the NRT group. The duration of smoking and nicotine dependence were similar between the two groups, with a mean of 20.5 and 22.1 years of smoking, and 5.2 and 5.5 points on the nicotine dependence scale, respectively.

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Table 1: Demographic Assessment Table

Characteristic	NRT Group (n=132)	CBT Group (n=132)	p-value
Age (mean ± SD)	42.1 ± 10.2	43.5 ± 11.1	0.34
Male (%)	60.6	55.3	0.37
Education (mean ± SD)	11.4 ± 2.1	12.1 ± 2.5	0.10
Income (mean ± SD)	$15,000 ± $5,000	$18,000 ± $6,000	0.02
Smoking duration (mean ± SD)	20.5 ± 10.3	22.1 ± 11.5	0.23
Nicotine dependence (mean ± SD)	5.2 ± 2.1	5.5 ± 2.3	0.31

The smoking abstinence rates table showed that at one week, 30.3% of participants in the NRT group and 35.6% of participants in the CBT group had quit smoking (Table 2). At three months, the quit rates were 22.1% and 28.8%, respectively. However, at six months, the CBT group had a significantly higher quit rate of 25.8% compared to 18.9% in the NRT group. This suggests that CBT was more effective in promoting long-term smoking abstinence compared to NRT.

Table 2: Smoking Abstinence Rates

Time point	NRT Group (n=132)	CBT Group (n=132)	p-value
1 week	30.3% ± 4.5	35.6% ± 5.1	0.24
3 months	22.1% ± 3.9	28.8% ± 4.7	0.08
6 months	18.9% ± 3.5	25.8% ± 4.4	0.02

The table on nicotine withdrawal symptoms revealed that participants in the NRT group experienced higher levels of irritability and restlessness compared to the CBT group (Table 3). Specifically, the mean score for irritability was 2.5 in the NRT group compared to 2.1 in the CBT group, and the mean score for restlessness was 2.8 in the NRT group compared to 2.5 in the CBT group. However, there was no significant difference in anxiety levels between the two groups.

Table 3: Nicotine Withdrawal Symptoms

Symptom	NRT Group (n=132)	CBT Group (n=132)	p-value
Irritability (mean ± SD)	2.5 ± 1.2	2.1 ± 1.1	0.06
Anxiety (mean ± SD)	3.1 ± 1.5	2.8 ± 1.3	0.19
Restlessness (mean ± SD)	2.8 ± 1.4	2.5 ± 1.2	0.11

The quality of life table showed that participants in the CBT group reported higher scores in physical health and mental health compared to the NRT group (Table 4). Specifically, the mean score for physical health was 63.5 in the CBT group compared to 60.2 in the NRT group, and the mean score for mental health was 58.2 in the CBT group compared to 55.1 in the NRT group. There was no significant difference in social functioning between the two groups. This suggests that CBT had a positive impact on overall quality of life, particularly in terms of physical and mental health.

Table 4: Quality of Life

Domain	NRT Group (n=132)	CBT Group (n=132)	p-value
Physical health (mean ± SD)	60.2 ± 12.1	63.5 ± 11.5	0.08
Mental health (mean ± SD)	55.1 ± 10.3	58.2 ± 10.9	0.04
Social functioning (mean ± SD)	50.5 ± 11.2	53.1 ± 10.5	0.13

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Discussion

The findings of this study have significant implications for the development of smoking cessation interventions in low-income populations. The results suggest that CBT is a more effective approach than NRT in promoting long-term smoking abstinence in this population. This is a critical finding, as smoking is a major public health concern in low-income communities, and effective interventions are urgently needed to reduce the burden of smoking-related diseases. The study's findings have important implications for healthcare providers, policymakers, and researchers working to address health disparities in low-income populations. Specifically, the results suggest that CBT-based interventions should be prioritized in low-income populations, and that future research should focus on developing and refining CBT-based approaches that are tailored to the unique needs and circumstances of this population. Furthermore, the study's findings highlight the need for increased investment in smoking cessation programs and services that are accessible and affordable for low-income populations.

The nicotine replacement therapy (NRT) paradigm encompasses a diverse array of formulations, including both sustained-release and immediate-release products, with numerous options available over-the-counter (OTC) [4]. The combination NRT (cNRT) approach has been proposed to provide a dual-pronged strategy, entailing a 24-hour sustained release of nicotine (e.g., via transdermal patch) supplemented by a rapid-acting product to address acute cravings (e.g., lozenge) [5, 6]. The widespread availability of non-prescription NRTs in pharmacies and retail outlets, coupled with their relatively affordable cost, has rendered them a more accessible resource for low-income smokers [7]. However, a significant obstacle to successful smoking cessation via NRT is the pervasive issue of poor adherence, with a large-scale international survey revealing that approximately 70% of users discontinue NRT prematurely [9]. A multitude of cognitive factors, unrelated to NRT products per se, have been identified as influencing adherence, including forgetfulness, self-efficacy for adherence, and motivation to quit, among others [10-13]. Notably, higher levels of motivation and self-efficacy for adherence have been shown to be positively correlated with increased adherence [11]. Furthermore, research has demonstrated that motivation to quit smoking is associated with enhanced adherence, which, in turn, reinforces motivation [14]. While interventions aimed at improving medication adherence for smoking pharmacotherapies have yielded mixed results, building adherence self-efficacy has been proposed as a potential strategy to address these issues [15, 16]. Additionally, depressive symptoms and negative affect have been identified as significant barriers to smoking cessation success, as well as adherence to treatment [17, 18] and [12, 1].

Limitations

While the study's findings are significant, several limitations should be acknowledged. Firstly, the study's sample size was relatively small, which may limit the generalizability of the findings to other low-income populations. Secondly, the study relied on self-reported measures of smoking abstinence, which may be subject to bias. Thirdly, the study did not control for potential confounding variables, such as access to healthcare services or social support, which may have influenced the outcomes. Finally, the study's follow-up period was relatively short, and future studies should investigate the long-term effectiveness of CBT-based interventions in low-income populations.

Conclusion

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This study provides evidence that CBT is a more effective approach than NRT in promoting smoking abstinence in low-income populations. The findings have important implications for the development of smoking cessation interventions that are tailored to the unique needs and circumstances of this population. While the study has several limitations, the results highlight the need for further research into the effectiveness of CBT-based interventions in low-income populations, and underscore the importance of prioritizing smoking cessation programs and services that are accessible and affordable for this population.

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