Are Chronic Low Back Pain Patients Who Smoke at Greater Risk for Suicide Ideation?

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ABSTRACT

Objectives. There is significant psychiatric literature indicating that smoking is associated with all forms of suicidality, including suicide ideation. The goal of this study was to determine if smoking is associated with suicide ideation in chronic low back pain (CLBP) patients.

Design. CLBP patients identified themselves as either current smokers (N = 81) or nonsmokers (N = 140) and completed a number of evaluation instruments, which included the Beck Depression Inventory (BDI) and the Coping Strategies Questionnaire (CSQ). BDI question number 9 was utilized to define CLBP with suicide ideation and subsequently, in addition, items number 3 and number 6 from the CSQ were added to the BDI item number 9 in order to fully capture CLBP with suicide ideation. Utilizing this expanded definition of suicide ideation (BDI plus CSQ), CLBP smokers were compared with CLBP nonsmokers for the frequency of suicide ideation. Regression analysis was utilized to investigate the CLBP smoking suicide ideation group. Finally, we investigated whether heavy use of alcohol and coffee impacted on CLBP heavy smokers in terms of increasing suicide ideation risk.

Setting. CLBP patients were recruited from a pain facility.

Results. CLBP smokers were more likely to complain of suicide ideation, and this relationship correlated with the number of cigarettes smoked per day. Seventy-eight percent of the CLBP smokers were classified correctly in terms of the presence of suicide ideation in chronic low back pain (CLBP) patients.

Conclusions. CLBP smokers appear to be at greater risk for suicide ideation than nonsmoking CLBP patients. The risk of suicide ideation is even greater if the CLBP patient is a heavy smoker and has problems with alcohol.

Key Words. Chronic Pain; Smoking; Suicide Ideation

Introduction

There is significant evidence in the psychiatric and epidemiology literature that smoking is associated with all forms of suicidality. This
Smoking and Suicide Ideation

has been demonstrated for suicide attempts with matched controls [1–5]. One study has also demonstrated that current smoking status predicts future suicide acts after a major depressive episode [6]. Finally, controlling for the confounding effects of depression and substance use disorders on this association, Breslau et al. [7] have recently demonstrated that current daily smoking, but not past smoking, predicted the subsequent occurrence of suicidal thoughts or attempts. Similar evidence for this association appears in studies that have addressed suicide completion. Here, four case control studies [8–11] have found a greater prevalence of current smokers within the suicide completers vs controls. In addition, four prospective studies [12–16] have also demonstrated a greater preponderance of suicide completions within smokers vs nonsmokers. Although the above data appear compelling, it is to be noted that there is some dissenting prospective suicide completion literature [17,18]. In prospective studies where multivariate analysis is utilized, the smoking/suicidality association disappears and is explained better by other variables [19,20].

Although this literature appears contradictory, there is significant evidence that smoking status may be associated with suicidality. As such, we wished to investigate this association in chronic low back pain (CLBP) patients in reference to suicide ideation. It is to be noted that although it is now generally accepted that chronic pain is associated with all forms of suicidality [21,22], including suicide completion [23,24] where it appears to be greater than in the general population [23], there is very little data on factors associated with suicide ideation in CLBP patients [21]. The objectives of this study were then to answer the following questions: 1) Is the prevalence of suicide ideation greater in CLBP patients who smoke vs CLBP nonsmokers? 2) Which variables are associated with CLBP smokers with suicide ideation? This study is presented below.

Methods

Between March 1991 and March 1993, over 1,000 consecutive chronic pain patients (CPPs) were admitted to the University of Miami Comprehensive Pain Center and screened for selection for a National Institute on Disability and Rehabilitation Research grant study. Because this grant study dealt with prediction of return to employment postpain facility treatment, each selected CPP received a detailed assessment at admission and posttreatment follow-up. CPP inclusion criteria for the grant study were the following: 1) candidate for employment posttreatment (not a student, not a housewife by profession, not retired, not receiving social security disability, not accepted for social security disability); 2) age range 19–62 years; 3) CLBP (greater than 6 months duration) as a presenting problem; 4) able to read English; 5) not requiring surgery for low back pain at the time of admission; and 6) willing to sign the informed consent form for participation in this grant study.

After signing the consent form (informed consent for use of their data in a research project approved by the local institutional review board), the CLBP patients completed a series of baseline demographic questionnaires and psychological inventories. These included the following: 1) Demographic information including a smoking question. The smoking question was worded as follows: “How many cigarettes do you currently smoke per day?” (circle) none, less than one-fourth pack, one-fourth to one-half pack, one-half to one pack, one to one-and-half packs, one and one-half to two packs, and greater than two packs. 2) A visual analog scale (VAS) utilizing the question “What has been your average pain over the last 24 hours?” 3) Perception of disability was measured with the Pain Disability Index [22] and the Sickness Impact Profile [23]. Both of these tools [22,23] have been demonstrated to be reliable and valid in CPPs. 4) Functional status was measured with the Sickness Impact Profile [23] and the Functional Assessment Questionnaire [24]. Both of these tools [23,24] have been determined to be reliable and valid. 5) Depression and anxiety were measured by the Beck Depression Inventory (BDI) [25] and the State-Trait Anxiety Inventory [26]. Both [25,26] of these tools have been shown to be reliable and valid. 6) Coping strategies to cope with pain were measured with the Coping Strategies Questionnaire (CSQ) [27], which has been demonstrated to be reliable and valid [27]. 7) In addition, each CLBP patient received a psychiatric diagnostic interview by a senior psychiatrist utilizing Diagnostic and Statistical Manual-III-Revised flow sheets and criteria.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences software (SPSS, Inc., Chicago, IL). Frequency and descriptive statistics were calculated to check all relevant characteristics of the data. Patients classified themselves as either smokers (N = 81) or nonsmokers (N = 140). The
smoker/nonsmoker classification was used as the independent variable for subsequent analyses to determine the relationship between smoking status and whether the patient had any suicidal thoughts. Initially, we determined suicidality by the subject’s response to item number 9 on the BDI [25], which has four items: (0) “I don’t have thoughts of killing myself”; (1) “I have thoughts of killing myself but would not carry them out”; (2) “I would like to kill myself”; (3) “I would kill myself if I had the chance.” For the purpose of the analysis, this question was dichotomized as follows: item number 0 only vs items number 1 plus number 2 plus number 3. This research approach for identifying suicidality in CPPs has previously been utilized by Fisher et al. [28] in CPPs. We identified 23 smokers with suicide ideation and 31 nonsmokers with suicide ideation by this method.

There are indications from recent psychiatric research that BDI item number 9 does not tap all aspects of the continuum of suicide ideation. It appears that passive wishes for death may be much more common than active suicide ideation [29–31]. Wishes for death are characterized by such thoughts as, “life is not worth living,” “I feel like I can’t go on,” etc. [29–31]. In this grant study, we had also administered the CSQ [27]. This questionnaire contains the items “I feel like life is not worth living” (number 3) and “I feel like I can’t go on” (number 6). We therefore expanded our BDI definition of suicidality by adding the two items to the BDI suicidality items. This expanded our pool of suicidal CLBP smokers and CLBP nonsmokers to 37 and 42, respectively. It is also to be noted that the concept of an expanded definition of suicide ideation has also been utilized previously in the pain literature [32,33]. Here items indicative of passive suicide ideation from the brief symptom inventory [32] and the structured clinical interview for suicide history in chronic pain [33] were utilized.

We then compared the CLBP smoking suicidal group to the CLBP smoking nonsuicidal group by t-test and \( \chi^2 \) for available clinical, demographic, and contextual variables. Next, a logistic regression analysis was conducted, utilizing significant variables from the previous analyses. Here, only variables significant at \( P < 0.01 \) were utilized in the logistic regression. Suicidality was the dependent variable coded as “1” for suicide ideation and coded as “0” for no suicide ideation. We had previously determined that drinking a number of cups of coffee per day and a diagnosis of current alcohol abuse/dependence were associated with smoking status in this sample of CLBP patients on logistic regression [34]. Previously, Tanskanen et al. [16] had investigated the relationship between joint heavy use of alcohol, cigarettes, and coffee, and the risk of suicide in a Finnish general population (\( N = 36,689 \)). They determined that the adjusted relative risk of suicide increased linearly with increasing levels of joint heavy use of alcohol, cigarettes, and coffee. We therefore applied his methodology to our CPP sample defining heavy cigarette use as over one pack per day, three or more cups of coffee per day, and an alcohol abuse/dependence diagnosis. Utilizing a stepwise approach, we calculated and compared the relative risk of suicide ideation among 1) our CLBP smokers, 2) CLBP heavy smokers (patients who self-reported smoking one pack or more of cigarettes per day) who are also heavy coffee drinkers, (patients who self-report drinking three or more cups of coffee per day), 3) CLBP heavy smokers with a diagnosis of alcohol abuse or dependence, and 4) CLBP heavy smokers who were also heavy coffee drinkers with a diagnosis of alcohol abuse or dependence.

Results

This sample consisted of 58% (\( N = 128 \)) male and 42% (\( N = 93 \)) female with a mean age of 41.1 (standard deviation [SD] = 10.0, range = 19 to 62 years). The ethnic distribution was 164 (74.2%) White, non-Hispanic; 18 (8.1%) Black, non-Hispanic; 19 (8.6%) Hispanic; and 20 (9.1%) of unknown racial origin. The sample of CLBP smokers consisted of 63% (\( N = 51 \)) males and 37% (\( N = 30 \)) females. The average age of the CLBP smokers was 40.6 years (\( SD = 9.7; \) range = 19 to 59 years). The ethnic breakdown consisted of 85% (\( N = 69 \)) White, non-Hispanic; 7.5% (\( N = 6 \)) Black, non-Hispanic; and 7.5% (\( N = 6 \)) of unknown racial origin. None of the Hispanics were smokers. The exact frequency distribution for number of packs of cigarettes smoked for the sample can be found in a previous publication on this CLBP sample [34]. Approximately 37% of the subjects entering the grant study classified themselves as smokers, while 15.4% were heavy smokers (greater than one pack per day).

When only utilizing BDI item number 9 in comparing CLBP smokers with CLBP nonsmokers for suicidality, there was no statistical difference between the two groups (\( \chi^2 = 0.27 \) [1], \( P = 0.61 \)). However, when comparing CLBP smokers and CLBP nonsmokers utilizing the
expanded definition of suicidality (BDI item number 9 plus CSQ’s two questions), smoking was related to suicidality ($\chi^2 = 5.3 \ [1], P = 0.02$). Here, 30.2% ($N = 42$) of the CLBP nonsmokers reported suicidality vs 45.7% ($N = 37$) of the CLBP smokers. In addition, now the number of cigarettes smoked was correlated with suicidality (Kendall’s tau $b = 13$, $P = 0.03$).

CLBP smokers with suicide ideation were found to be more likely to suffer from major depression ($\chi^2 = 21.4 \ [1], P < 0.001$) and alcohol abuse/dependence ($\chi^2 = 4.0 \ [1], P < 0.05$) than CLBP smokers without suicide ideation. In addition, CLBP smokers with suicide ideation were more likely to have significantly more dysfunctional scores on the BDI ($t = 5.6 \ [77], P < 0.001$), Functional Assessment Questionnaire ($t = 2.9 \ [68], P < 0.01$), Pain Disability Index ($t = 3.5 \ [71], P < 0.001$), and Trait Anxiety Score ($t = 4.9 \ [79], P < 0.001$). No other variables differentiated CLBP smokers with suicide ideation from CLBP smokers without suicide ideation.

Table 1 presents the results of the logistic regression analysis, which only utilized significant variables with a $P$ value of 0.01 or less. The model classified 78% of the smokers correctly at the final step. The BDI, the Functional Assessment Questionnaire total score, and having a diagnosis of major depressive disorder were significant and retained in the final model. The odds ratio of 1.1 and 0.96 show little change in the likelihood of suicide ideation on the basis of a one-unit change in the BDI and Functional Assessment Questionnaire total score variables, but having a diagnosis of major depression increases the likelihood of suicide ideation by almost six times (odds ratio = 5.9). Other variables were insignificant and were not retained in the final model.

Table 2 presents the relative risk of suicide ideation according to the BDI plus CSQ definition of suicide ideation for all CLBP cigarette smokers, CLBP heavy cigarette smokers with heavy coffee use, CLBP heavy cigarette smokers with alcohol use, and CLBP heavy cigarette smokers with alcohol and heavy coffee use. Here, among CLBP smokers ($N = 81$), 23 reported suicide ideation. Among CLBP heavy smokers and heavy coffee users ($N = 27$), seven had suicide ideation. Among CLBP heavy smokers with an alcohol-related diagnosis ($N = 20$), 10 had suicide ideation. Of those CLBP heavy smokers with an alcohol diagnosis and heavy coffee use ($N = 6$), two reported suicide ideation. The relative risk of suicide ideation with CLBP heavy smokers who combine heavy use of

### Table 1

<table>
<thead>
<tr>
<th>Step</th>
<th>$\chi^2$ (df)</th>
<th>$%$ of Cases Predicted Correctly by the Model</th>
<th>Nagelkerke $R^2$</th>
<th>Major depressive disorder</th>
<th>Functional Assessment Questionnaire total score</th>
<th>BDI total score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13.0 (1)</td>
<td>49</td>
<td>0.23</td>
<td>1.77</td>
<td>5.23</td>
<td>1.1</td>
</tr>
<tr>
<td>2</td>
<td>8.6 (1)*</td>
<td>75</td>
<td>0.36</td>
<td>-0.04</td>
<td>11.1</td>
<td>0.96</td>
</tr>
<tr>
<td>3</td>
<td>7.0 (1)*</td>
<td>78</td>
<td>0.48</td>
<td>0.10</td>
<td>6.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>

* $P < 0.001$.

BDI = Beck Depression Inventory; $df$ = degree of freedom.
coffee and/or have an alcohol diagnosis was not significantly greater than that for smoking only. CLBP smokers were 10% more likely to have suicide ideation than CLBP heavy smokers who drink more than three cups of coffee per day. CLBP smokers were 43% less likely to have suicide ideation than CLBP heavy smokers with an alcohol diagnosis. CLBP smokers were also 15% less likely to have suicide ideation than CLBP heavy smokers who drink more than three cups of coffee per day and have an alcohol diagnosis.

**Discussion**

Because there is a wide body of psychiatric literature that links suicide and smoking status (Introduction), we were surprised that we could not demonstrate an association between suicide ideation and smoking status as defined by the BDI number 9 item and smoking. However, the BDI number 9 item definition of suicide ideation may be limited in scope (Methods). As such, when we expanded the definition, we were able to demonstrate an association between suicide ideation and smoking status. Thus, our results are supported by, and support, the psychiatric literature presented in the Introduction. Our results also speak about issues relating to the use of the BDI item number 9 as the only item utilized to identify patients with suicide ideation. Future CPP studies utilizing BDI item number 9 may wish to carefully consider how this item will be interpreted.

We were able to classify a large percentage (78%) of the smokers with suicide ideation correctly based on three variables: major depression, Functional Assessment Questionnaire total score, and BDI total score. These results are not surprising as previous research has noted that CPPs with suicide ideation report more depressive symptoms [35,36], higher Zung Depression Inventory scores [37], and pain-related functional interference [35]. These results are supported by, and in turn support, our data. However, some of these studies indicate that suicide ideation is related to higher pain scores [35,37,38], while others do not [36]. We were unable to demonstrate this association for CLBP smokers, and the reasons for this are not presently clear. Similarly, one of these studies reported an association between anxiety and suicide ideation [36]. We were also not able to demonstrate this association for CLBP smokers.

As indicated earlier, the relative risk of suicide ideation within smokers is increased by combining heavy smoking with alcohol, but not with coffee. These results partially support previous literature where it was found that the risk of suicide completion increases linearly with joint heavy use of cigarettes, alcohol, and coffee [16]. It is not clear why we did not demonstrate this association for coffee. We have previously demonstrated that smoking status is associated with numbers of cups of coffee per day in CLBP patients [34]. Coffee drinking has recently been shown to enhance the analgesic effect of cigarette smoking [39]. Thus, the issue of whether smoking when combined with heavy coffee use in CPPs is associated with increased suicide ideation needs further study.

What are the clinical implications of these results? First, recently it has become clear that CPPs demonstrate more suicide ideation than that found in the general population [40]. As such, inquiries in reference to this issue should always be made during the evaluation process. Second, suicide ideation in CLBP smokers is greater than that of the CLBP nonsmokers if one uses an expanded definition of suicide ideation. Thus, heavy smokers appear at particular risk for suicide ideation. As such, they should be evaluated carefully.

<table>
<thead>
<tr>
<th>Categories of Smoking and Joint Heavy Use</th>
<th>Total CLBP Patients</th>
<th>Total with Suicide Ideation</th>
<th>Percentage Rate</th>
<th>Relative risk of Suicidal Ideation (95% CI)</th>
<th>(df), P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cigarette smokers</td>
<td>81</td>
<td>23</td>
<td>28.4</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Heavy cigarette smokers with heavy coffee*</td>
<td>27</td>
<td>7</td>
<td>25.9</td>
<td>1.097 (0.376, 3.198)</td>
<td>0.03 (1), 0.87</td>
</tr>
<tr>
<td>Heavy cigarette smokers with alcohol*</td>
<td>20</td>
<td>10</td>
<td>50</td>
<td>0.568 (0.195, 1.652)</td>
<td>1.08 (1), 0.30</td>
</tr>
<tr>
<td>Heavy cigarette smokers with alcohol and heavy coffee*</td>
<td>6</td>
<td>2</td>
<td>33.3</td>
<td>0.853 (0.125, 5.825)</td>
<td>0.03 (1), 0.87</td>
</tr>
</tbody>
</table>

* Criteria for selection: alcohol abuse/dependence diagnosis, more than one pack of cigarettes/day, and three or more cups of coffee/day.
CLBP = chronic low back pain; CI = class interval; df = degree of freedom.
in reference to this issue. Fifth, CLBP smokers with suicide ideation should be carefully evaluated for significant depression and functional impairment. Sixth, heavy smokers with significant alcohol use appear to be at particular risk for suicide ideation. CLBP patients with this combination of variables should be evaluated very carefully for suicide ideation. The final clinical issue relates to whether pain clinicians should attempt to help CLBP patients quit smoking and how aggressive these efforts should be. It appears that there is significant post-mortem evidence that chronic smoking may eventually impair serotonin function causing resultant serotonin depletion and thus trigger depression-enhancing predisposition to suicidal behavior [41]. This position is supported by our findings of increased suicide ideation in relation to the number of cigarettes smoked per day. Recent studies have demonstrated that CPPs who smoke wish to quit [42] and that smoking status in CPPs affects treatment outcome [43]. As such, efforts should be made to help CPPs who smoke quit, especially those with suicide ideation.

Are there any confounders to the results of this study? It is to be noted that this study was performed on a highly selected CLBP population. These CLBP patients were referred to a tertiary facility, and they had to have low back pain and had to be employable to enter the study. Through this selection process, a large percentage of these CPPs would be blue-collar workers, and thus smokers [34]. As noted, this has resulted in a relatively young mean age for our patient sample (41.1 years). This selection process for our smoking/nonsmoking CLBP population makes it difficult to compare our population with that of other CPP populations. As such, caution should be utilized in generalizing our results to other chronic pain populations. The other major potential confounder relates to the expanded definition of suicide ideation utilized in this study. As this expanded concept was developed in human immunodeficiency virus, geriatric, and terminal populations, it is unclear if it can be applied in a similar manner to a chronic pain population. The final potential confounder relates to the reliability and validity of self-reported cigarette use as self-report measures were utilized in this study. Recent research evidence indicates, however, that self-report smoking measures, as validated by urinary or saliva cotinine tests, are highly reliable in adolescents [44] and adults [45]. Thus, we do not believe that this issue served as a confounder in this study.

Conclusions

CLBP patients who smoke appear to be at greater risk for suicide ideation than nonsmoking CLBP patients. The risk for suicide ideation is even greater if the CLBP patient is a heavy smoker and has problems with alcohol.

References

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