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Association of Depressive Symptomatology with Problem Alcohol Use in Rural Head and Neck Cancer Patients at Diagnosis

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Abstract

Purpose: Problem alcohol use is a risk factor for the development of head and neck cancer (HNC) and continued use is associated with poor outcomes; depressive symptoms may be associated with this behavior.

Design: Exploratory cross-sectional study examined depressive symptoms as a correlate of self-reported problem alcohol use at diagnosis.

Sample/Methods: Multivariable linear regression examined depressive symptoms as a correlate of problem alcohol use in a sample of rural HNC patients (N =249).

Findings: Over half (55.2%) of rural patients with potentially problem alcohol use exhibited mild to moderate depressive symptomatology. Regression models controlling for age, cancer site, stage, sex, tobacco use, and treatment modality indicated that depressive symptoms at diagnosis were associated with self-reported problem alcohol use scores at diagnosis (ß=.186, sr^2=.031, p<.01). Follow-up subgroup analyses demonstrated that depressive symptoms at diagnosis were significantly associated with self-reported problem alcohol use in male patients, those with advanced stage disease, and of older age.

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Conclusions/Implications: HNC patients should be screened for alcohol use and depression at diagnosis. Access to behavioral health treatment and/or referral options may be lacking in rural areas thus additional ways of connecting rural patients to specialty care should be explored. These may include telehealth and multimodal interventions to address complex behavioral health cases. Additional research in important patient subgroups such as older patients and those presenting with advanced disease is also warranted.

Keywords

alcohol consumption; cancer survivorship; depressive symptoms; head and neck cancer; rural health

Introduction

Approximately 53,000 Americans develop head and neck cancer (HNC) annually [1], which is defined as cancer of the oral cavity, pharynx (nasopharynx, oropharynx, hypopharynx), larynx, nasal cavity, paranasal sinus, and/or salivary glands [2]. Treatment for HNC typically consists of surgery, radiation, and chemotherapy, or some combination thereof [2] and may result in side effects including difficulties with swallowing, breathing, eating and speech, and can lead to disruption of essential daily functions, psychological distress, and diminished health-related quality of life (HRQOL) [3].

There are numerous etiologic factors in the development of HNC, of which problem alcohol use is a well-established one; continued use at and after diagnosis is also associated with numerous poor outcomes including cancer recurrence, decreased survival, significant physical comorbidities, and depression and reduced HNC-specific HRQOL [4–9]. Estimates suggest that upwards of thirty percent of HNC patients demonstrate problem alcohol use and a significant number continue to exhibit this behavior into the survivorship period [10–13]. For example, McCarter and colleagues [10] reported that 31% of HNC patients beginning treatment scored positive for hazardous drinking as indicated by the Alcohol Use Disorders Identification Test—Consumption (AUDIT-C). Moreover, almost half of the sample (47%) indicated that they were not thinking about reducing their alcohol consumption in the near future.

Previous research suggests that individuals residing in rural areas may be more likely to demonstrate problem alcohol use. Studies utilizing national data have shown that rural residents, as compared to those living in urban areas, have similar if not higher rates of problem use, including alcohol use disorder [14–17]. For example, Weaver and colleagues examined rural-urban differences in health behaviors among US cancer survivors using National Health Interview Survey data. They reported that even though alcohol consumption was lower in rural than urban survivors, rates of heavy drinking were similar across groups (approximately 5–6%) [17]. Borders and Booth analyzed National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) data and similarly found that rural residents in the general population were more likely to abstain from alcohol, but among drinkers, there were significantly greater rates of risky use (i.e., exceeding daily limits; 40.0%) and current alcohol use disorder (15.1%) when compared to suburban drinkers (34.5% and 11.6%,

respectively). Rural and urban residents had similar rates of risky use and current alcohol use disorder, however.

Whether similar or somewhat worse when compared to urban patients, rates of problem use are high in rural areas. As such, problem drinking behavior in patients with HNC must be considered within the rural context. Because access to cancer and other supportive care is different in rural areas, the functional impact of problem use may be different for those residing in rural areas [18]. Rural areas have demonstrated provider shortages spanning primary and specialty care, including mental and behavioral health [19,20] which may result in reduced contact with the healthcare system and identification and treatment of problem use considerably more difficult [18]. Moreover, because some types of HNC are increasing faster in rural areas [21], studies of mental and behavioral factors relevant to treatment and survivorship of rural patients are important.

Depression and alcohol use often co-occur which has been demonstrated in previous studies of HNC patents [13]. Research indicates that many individuals may use alcohol to self-medicate or cope during times of stress [22]. A diagnosis of cancer is a high stress event which may exacerbate existing behavior, particularly for rural individuals who may have fewer treatment options or be less likely to access those that do exist [23]. As noted above, excessive alcohol use over time is a cause of HNC, so continuing this habit—possibly as a means to self-medicate—may explain some of the continued use documented in patients with HNC.

Taken together, further study of problem alcohol use in HNC patients, particularly those residing in rural areas, is needed. To date, there is scant knowledge regarding rates of alcohol use in rural HNC patients nor much information regarding psychosocial correlates of the behavior. This general recognition has resulted in calls for increased research into alcohol use in cancer patients [10,24] and studies of psychosocial correlates of this behavior are therefore warranted. A recent study examining problem alcohol use from the same parent study described below found that rural patients, compared to their urban counterparts, were more likely to report problem drinking behavior which had implications for HRQOL [9]. These results led to the present investigation of psychosocial factors in rural patients which may be related to this behavior. Thus, the present exploratory cross-sectional study sought to examine depressive symptomatology—which has been shown to be associated with alcohol use in HNC patients and may exacerbate the behavior [13,25]—as a correlate of self-reported problem alcohol use at diagnosis in rural HNC patients. Studies which provide better understanding of problem alcohol use in rural HNC patients, including rates and psychosocial correlates of use, may help inform efforts to identify and connect such patients to care who may disproportionately suffer from limited access, particularly at a time when treatment and follow-up care and support services are vitally important.

Methods

Participants & Procedure

This article describes a substudy of a larger longitudinal study which recruited participants around the time of HNC diagnosis who were ≥ 18 years with upper aerodigestive tract

carcinomas from the Department of Otolaryngology's head and neck oncology clinic at The University of Iowa Hospitals and Clinics (UIHC). The parent study, named the Outcomes Assessment Project (OAP), recruited over 75% of all eligible patients diagnosed with HNC seen at UIHC from November 1998 through October 2013. This period of time includes the sample of patients described below. The OAP study collected information about patients' site and stage of cancer, comorbidities, treatment, survival outcome, demographics (age, race, sex), and other clinical and psychosocial characteristics via self-report or abstracted from the patient's medical record, as appropriate. Patients were approached for study participation in clinic at a regularly scheduled appointment around the time of diagnosis at which point all patients were consented in writing if interested. Demographic, disease, and treatment information were also collected at this time. The present study examines depressive symptomatology as a correlate of problem alcohol use in rural HNC patients at diagnosis and includes patients who completed measures of depression and problem alcohol use at diagnosis. All procedures were approved by The University of Iowa's IRB (#199412746).

Measurement of Key Variables

Problem Alcohol Use.—The Short Michigan Alcoholism Screening Test (SMAST) was used to capture self-reported problem alcohol use and was designed to be used as a screening tool to detect problem drinking and alcohol use disorder [26]. It has been used in numerous patient populations, including previous studies of HNC patients [27] and has adequate reliability and validity [28]. Items include, "*Do you feel that you are a normal drinker*?", "*Are you able to stop drinking when you want to?*" Items are presented in yes/no format, with scores ranging from 0–13. A score of 2 suggests possible alcohol abuse and a score of 3 or higher suggests probable alcohol abuse [26,28]. For the purposes of these analyses, scores were treated continuously in multivariable linear regression and both cut-off scores are reported in descriptive analyses given the exploratory nature of this study. The SMAST was collected at study enrollment, which coincides with the time of diagnosis, for those patients indicating current or previous use of alcohol. Cronbach's alpha in this sample was .78, which is consistent with previous reports of this measure [28].

Depressive Symptomatology.—The Beck Depression Inventory (BDI) was used to assess self-reported depressive symptomatology in the present study. The BDI is well-validated and has been used in numerous patient populations for several decades, including both nonclinical and clinical samples and those with HNC [29,30]. The BDI consists of 21 items scored 0–3, each assessing a unique category of depressive symptoms. Cutoff scores have been established which suggest minimal (0–9), mild (10–18), moderate (19–29), and severe (30–63) depression [29]. Cronbach's alpha in this sample was .87.

Rurality.—The US Department of Agriculture's Rural Urban Commuting Area (RUCA) codes were used to determine rurality of patients in the present sample. RUCA utilizes a 10-point classification system and includes primary commuting flow and secondary commuting flow scores, based on the 2010 census data. Categorization C from the University of Washington's Rural Health Research Center two-category classification system [31] was

utilized in this study. Rural codes were 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6.

Statistical Analyses

Multivariable linear regression analysis was used to examine a key behavioral correlate of SMAST scores at diagnosis—depressive symptomatology—controlling for age, cancer site (oral cavity, oropharynx, hypopharynx, larynx, else/unknown), cancer stage, sex, treatment modality, and tobacco use, which were abstracted from the medical record with the exception of tobacco use which was self-reported. Three separate follow-up subgroup analyses examined this association using multivariable linear regression controlling for the same set of covariates (less the respective grouping variable) by (1) age which was grouped as ≤ 65 and 66+, (2) disease severity at diagnosis grouped according to early (stage 0–2) or advanced (stage 3–4), and (3) sex (male/female). Analyses were conducted using SPSS, version 26. Results were considered statistically significant if $p<.05$.

Results

Table 1 summarizes the demographic and clinical characteristics of the study sample (N=249). The mean age was 60.7 (SD = 12.3), the majority of patients were diagnosed with advanced disease stage (ie, 3 or 4; 55.4%), the most common site was oral cavity (37.8%), and the most common treatment modality was combination therapy (43.9%). The mean SMAST score was 2.09 (2.92; range = 0–13) and 39.8% of rural patients scored 2 or 3+ which are scores suggestive of problem alcohol use. Using the more conservative cut-off score of 3+, 24.9% reported problematic use. The mean BDI score was 8.45 (SD = 7.60; range=0–46), which falls within the range suggesting minimal depressive symptomatology overall; of note, a considerable number (28.1%) of rural patients scored within the mild symptom range, 4.8% within the moderate range, and 2.0% within the severe range. The percentage of patients scoring 2+ or 3+ on the SMAST by BDI cut-off score is as follows: For those scoring 2+ on the SMAST (n=99), 37.4% reported mild depressive symptomatology, 11.1% reported moderate depressive symptomatology, and 4.0% reported severe depressive symptomatology. For those scoring 3+ (n=67) which represents a more conservative threshold for classifying problem drinking, 43.3% reported mild, 11.9% reported moderate, and 4.5% reported severe depressive symptomatology.

Multivariable linear regression analyses predicting SMAST scores at diagnosis adjusted for age, cancer site, cancer stage, sex, tobacco use, and treatment modality are presented in Table 2 (also including the unstandardized beta coefficients and standard errors). In addition to tobacco use (ß = .226, $sr^2 = .044$, $p<.01$), depressive symptoms at diagnosis significantly predicted higher SMAST scores at diagnosis in rural patients (ß = .186, $sr^2 = .031$, $p<.01$). Follow-up subgroup analyses examining this association by age, disease severity at diagnosis, and sex, respectively, were also conducted and presented in Table 3 (also including the unstandardized beta coefficients and standard errors). In terms of age, for patients 66+ (n=89), depressive symptoms at diagnosis were significantly associated with SMAST scores at diagnosis with considerable effect size (ß = .567, $sr^2 = .295$, $p<.001$). For those patients aged 65 or less (n=158), depressive symptoms at diagnosis were not

significantly associated with SMAST scores at diagnosis (ß = .093, sr^2 = .006, p=.35). Regarding disease severity, depressive symptoms at diagnosis were only associated with higher SMAST scores at diagnosis in those with advanced stage disease at presentation, representing stages 3–4 (n=138; ß = .211, sr^2 = .038, p=.04). For those with early stage disease (n=96), depressive symptoms at diagnosis were not associated with higher SMAST scores at diagnosis (ß = .162, sr^2 = .019, p=.23). Lastly, regression analyses looking at the association of depressive symptoms at diagnosis with higher SMAST scores at diagnosis by sex found that depressive symptoms were significantly associated with SMAST scores in males (n=160; ß = .220, sr^2 =.046, p=.02) but not females (n=89; ß = .161, sr^2 = .017, p=.25).

Discussion

The present exploratory study examining depressive symptomatology at diagnosis as a correlate of self-reported problem alcohol use at diagnosis in rural HNC patients found that there was a considerable number of patients reporting potentially problematic drinking and also reporting at least mild to moderate depressive symptomatology. This is not unexpected given previously reported rates of drinking and depressive symptomatology in HNC patients [10,13,25]. The present data align with other studies estimating approximately 30 percent of HNC patients exhibit problem alcohol use. These results also suggest that age, disease severity at presentation, and sex are important considerations. In this sample, a significant association between depressive symptoms at diagnosis and SMAST scores at diagnosis was found, controlling for important covariates, in those aged 66+, those with advanced disease stage, and males. Previous studies of older adults have demonstrated that problem alcohol use is an issue and may be exacerbated by depression [32,33]; similarly, disease severity is associated with depression in patients with HNC [34]. And in one study of nearly three thousand community-residing older adults, it was found that the association between unhealthy alcohol use and elevated depressive symptoms was only significant in males, but not females, in regression analyses [35]. The authors suggest males may be more likely to use alcohol as a means of self-medication during times of depression. These potential moderators of the depression-alcohol relationship deserve further research in HNC.

As there are few studies of rural HNC patients, it is important to not only describe rates of alcohol use in this population because of research suggesting that alcohol use may be pronounced in rural areas, but also to study factors that may exacerbate the behavior. The presence of problem drinking at diagnosis is by itself important because of the connection of continued drinking with cancer recurrence and negative HNC-specific HRQOL outcomes [4–9], but its importance is heightened in the presence of comorbid depression. In particular, the impact of subclinical depressive symptomatology in the context of alcohol use warrants consideration in rural patients who may suffer from limited access to mental and behavioral health services [19,20]. Even mild to moderate depressive symptomatology has been shown to be associated with deficits in HNC-specific HRQOL [36] so the possible impact of such symptoms in some patients should not be overlooked. This is particularly salient in HNC as this population experiences depression at rates higher than other cancer groups, ranging from 15%−50% [34]. Moreover, the time around completion of treatment may be associated with increased depression and worsening HRQOL and so may be a target for heightened

awareness and subsequent intervention [34,37,38]. It is possible that mild to moderate depression may exacerbate problem drinking behavior at multiple points in the survivorship trajectory as the two behaviors often co-occur [39]. The present results demonstrating that over 50% of potentially problem drinkers in this sample reported, at least, mild to moderate depressive symptoms and over 15% demonstrating moderate to severe underscores this possibility.

The results of this study also further support the need to screen HNC patients for problem alcohol use at diagnosis and counsel regarding the deleterious effects of continued drinking during treatment and beyond. Because HNC patients may also experience meaningful depressive symptomatology, mental health screening should also be incorporated into care during this time, as per evidence-based guidelines regarding the management of depression in cancer [40]. Multiple brief screening tools are available which may be incorporated into the clinic workflow—such as the AUDIT-C, CAGE questionnaire for alcohol use, and the PHQ-2/9—to assess the need for further evaluation or referral for problem alcohol use, depression, or both. Multimodal interventions for complex behavioral health cases, such as those with concomitant alcohol and depression issues, could also be relevant dependent on the individual patient's needs. Interventions addressing multiple concerns have been tested with some success, including in those with HNC [13,41], but there is to date little research in the HNC population. Research examining intervention efficacy and feasible implementation in rural settings, whether in clinic or in conjunction with outside services, is needed. Because social support is also sometimes limited and/or difficult to access for rural individuals [42], and lack thereof is associated with poor HRQOL outcomes in HNC patients [43], the potential role of informal supports and use of paraprofessionals in such interventions should be investigated for HNC patients residing in rural areas.

Consideration should also be given to the existence of nearby or otherwise accessible treatment options if specialty treatment referral is in order. Previous studies have reported associations between distance to care and poor outcomes in patients with cancer, such as worse prognosis and HRQOL [44]. Similarly, previous research in numerous chronic disease populations has suggested that the presence of factors such as distance and otherwise poor access to care may in part explain why patients in rural settings face a so-called "rural disadvantage", making connections to care especially important [45–47]. Opportunities to connect rural patients to mental and behavioral health services via telehealth should be explored as the recent expansion of telehealth due to the COVID-19 pandemic may allow for increased access to services that were not possible only a few months ago.

The present cross-sectional exploratory study had a fairly large sample and high accrual rate of eligible patients but is limited in several ways. First, the study sample was majority White (i.e., over 90%) and included patients from one healthcare system in the Midwest, making generalizability an issue. Second, the present study only examined problem alcohol use and depressive symptomatology at one time point—diagnosis—even though the larger parent study was prospective in its design. Third, the SMAST has been used in numerous studies, including previous studies of HNC, but there are other measures which may better capture problem drinking behavior such as the 10-item AUDIT. Finally, information about

corresponding diagnoses of alcohol use disorder or other indication of problematic use could not be obtained to corroborate patient self-report of this behavior.

In conclusion, the results of this exploratory study demonstrate that alcohol use at diagnosis is an issue of concern in rural HNC patients as nearly 40% indicated having potentially problem use, many of which also reported mild to moderate depressive symptomatology. The implications and impact of associated depressive symptoms should be considered in this context and represents an avenue for future research, particularly as it relates to access to care and utilization as recent research suggests that mental health comorbidities are associated with utilization in patients with HNC independent of other key factors [48]. Research regarding important subgroups of HNC patients, such as older patients and those presenting with advanced disease are also warranted. The exploration of these issues could facilitate opportunities for improved access to needed care during the periods of treatment and survivorship, ensuring multiple critical needs are met over the survivorship trajectory and may advance efforts toward optimal care coordination, which is also an area for future research. Because of increasing rates of HNC in rural areas and a known lack of mental and behavioral health services for rural residents, future research examining the present issues at diagnosis and beyond are important.

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Table 1.

Patient, disease, and treatment characteristics at diagnosis

	Rural N = 249
Sex	
Male	160 (64.3%)
Female	89 (35.7%)
Age	
Mean (SD); range	60.7 (12.3); 25–93
Race	
White	235 (94.4%)
Black	3 (1.2%)
Other	11 (4.4%)
Stage	
Early (0–2)	96 (38.6%)
Advanced (3–4)	138 (55.4%)
Not stageable/unknown	15 (6.0%)
Site	
Oral cavity	94 (37.8%)
Oropharynx	51 (20.5%)
Hypopharynx	9 (3.6%)
Larynx	58 (23.3%)
Else/unknown	37 (14.8%)
Treatment	
Surgery only	89 (35.7%)
Chemotherapy only	0 (0%)
Radiotherapy only	30 (12.0%)
Combination	109 (43.9%)
Other/unknown	21 (8.4%)
SMAST score (Mean/SD); range	2.09 (2.92); 0–13
0–1	150 (60.2%)
2	37 (14.9%)
3+	62 (24.9%)
Smoking Status	
Current	74 (29.7%)
Previous	117 (47.0%)
Never	58 (23.3%)
BDI score (Mean/SD); range	8.45 (7.60); 0–46
Minimal (0–9)	162 (65.1%)
Mild (10–18)	70 (28.1%)
Moderate (19–29)	12 (4.8%)
Severe (30+)	5 (2.0%)

Note: T-tests and chi-square test used as appropriate; BDI = Beck Depression Inventory; SMAST = Short Michigan Alcoholism Screening Test

Table 2.

Multivariable regression analysis predicting SMAST score at diagnosis

Variable	Unstandardized Beta Coefficient (Standard Error)	Standardized Beta Coefficient	sr^2	p-value
Age	.023 (.016)	.101	.010	.14
Depressive symptoms	.520 (.198)	**.186**	**.031**	**<.01**
Sex	.639 (.424)	.106	.010	.13
Site	.149 (.131)	.077	.006	.26
Stage	.076 (.182)	.029	.001	.68
Tobacco use	.893 (.283)	**.226**	**.044**	**<.01**
Treatment Modality	.081 (.080)	.071	.005	.31

Note. N = 249. Analysis adjusted for age, cancer site, cancer stage, sex, tobacco use, and treatment modality; sr^2 = squared semi-partial correlation; SMAST = Short Michigan Alcoholism Screening Test.

Table 3.

Multivariable regression analyses by subgroup for depressive symptoms predicting SMAST score at diagnosis

Subgroup	Unstandardized Beta Coefficient for Depressive Symptoms (Standard Error)	Standardized Beta Coefficient for Depressive Symptoms	sr^2	p-value
Age				
66+	**.458 (.087)**	**.567**	**.295**	**<.001**
≤65	.053 (.057)	.093	.006	.35
Disease Severity (Stage)				
Early (0–2)	.068 (.057)	.162	.019	.23
Advanced (3–4)	**.144 (.068)**	**.211**	**.038**	**.04**
Sex				
Male	**.167 (.069)**	**.220**	**.046**	**.02**
Female	.071 (.062)	.161	.017	.25

Note. Analyses adjusted for age, cancer site, cancer stage, sex, tobacco use, and treatment modality, less the respective grouping variable (coefficients not shown); sr^2 = squared semi-partial correlation; SMAST = Short Michigan Alcoholism Screening Test.