6-29-2022

Presentation and Outcomes of Otolaryngologic Surgeries in Patients With Mental Illness History

Zaid Al-Qurayshi

Monica Rossi-Meyer

Mohamed A. Shama

Amy M. Williams
Henry Ford Health, AWilli50@hfhs.org

Rodrigo Bayon

See next page for additional authors

Recommended Citation

Al-Qurayshi Z, Rossi-Meyer M, Shama MA, Williams AM, Bayon R, and Kandil E. Presentation and Outcomes of Otolaryngologic Surgeries in Patients With Mental Illness History. Ann Otol Rhinol Laryngol 2022.

Original Article

Presentation and Outcomes of Otolaryngologic Surgeries in Patients With Mental Illness History

Annals of Otology, Rhinology & Laryngology
1–8

DOI: 10.1177/00034894221105975
journals.sagepub.com/home/aor
SAGE

Zaid Al-Qurayshi, MBChB, MPH[1*], Monica Rossi-Meyer, MD[1*], Mohamed A. Shama, MD, MRCS, EBSQ[2], Amy M. Williams, PhD[3], Rodrigo Bayon, MD[1], and Emad Kandil, MD, MBA[2]

Abstract

Background: Describe the epidemiology and characteristics of patients with a history of mental illness undergoing otolaryngologic procedures.

Methods: A retrospective cross-sectional analysis utilizing the Nationwide Readmissions Database, 2010 to 2015. The study sample included adult (≥18 years) patients undergoing otolaryngologic procedures.

Results: A total of 146 182 patients were included, 18.3% with mental illness history. The prevalence of patients who required otolaryngologic surgeries with history of mental illness increased significantly from 14.9% in 2010 to 25.0% in 2015 ($P < .001$). Mental illness diagnoses included: depression (6.9%), anxiety (5.8%), alcohol dependence (4.2%), substance dependence (2.9%), bipolar disorder (1.4%), memory disorders (1.2%), delusional disorders (0.6%), self-harm (0.1%). Patients with a history of mental illness were more likely to be <65 years, female, and have multiple comorbidities ($P < .05$ each). Patients with history of mental illness had a higher risk of complications [OR:1.59, 95% CI:1.50,1.69, $P < .001$].

Conclusions: Patients with a history of mental illness are increasingly encountered in otolaryngology service. This study provides an epidemiological perspective that warrants increasing clinical investigation of this subpopulation.

Keywords

psychiatric history, depression, anxiety, suicide, alcohol dependence, substance dependence, schizophrenia, head and neck cancer, surgery, complications, epidemiology, health service cost

Introduction

According to the National Institute of Mental Health (NIMH)[1], nearly 1 in 5 adults live with a mental illness in the United States. The NIMH uses 2 broad categories to describe mental illness: Any Mental Illness (AMI), and Serious Mental Illness (SMI). SMI describes a subset of AMI that produces serious functional impairment interfering with 1 or more major life activities.[1] In 2019, an estimated 51.5 million American adults were diagnosed with AMI.[1] The prevalence of AMI was higher among women (24.5%) and young adults aged 18 to 25 years (29.4%).[1] However, less than half of adults with AMI received mental health services.[1] Similar trend was also observed in patients with SMI.[1]

The Center for Disease and Control (CDC) reports that on average, adults living with serious mental illness have a life expectancy 25 years shorter than mentally healthy adults.[2] Major depressive disorder, schizophrenia, and bipolar disorder have all been associated with medical causes of death that are often up to 3 times the rate found in the general population.[2] Druss et al[3] have suggested patient, physician, and system factors contribute to the observed higher morbidity and mortality among patients with SMI. Patient factors associated with SMI include motivation, impaired communication skills, fearfulness, social instability, unemployment, and incarceration.[3] Meanwhile, commonly identified provider

[1]Department of Otolaryngology – Head & Neck Surgery, University of Iowa Hospitals and Clinics, Iowa City, IA, USA
[2]Department of Surgery, Tulane University School of Medicine, New Orleans, LA, USA
[3]Department of Otolaryngology – Head & Neck Surgery, Henry Ford Health System, Detroit, MI, USA

*Both authors contributed equally to the study.

Corresponding Author:
Emad Kandil, MD, MBA, FACS, Department of Surgery, Tulane School of Medicine, 1430 Tulane Ave, SL-22, New Orleans, LA 70112, USA.
Email: ekandil@tulane.edu

and system factors affecting patients with SMI involve providers' attitude toward and comfort level with SMI population, difficulty with coordination of care, fragmentation between mental health and general health care, and stigma.[3] As a result of the multifactorial risks associated with increased morbidity and mortality among patients with SMI, patients living with mental illness represent a vulnerable surgical population.[3]

Unfortunately, there is a paucity of information about the prevalence of psychiatric conditions encountered on the Otolaryngology service and the associations between a history of mental illness and the treatment of Otolaryngologic diseases. The aim of this study is to provide an epidemiological perspective through a description of the demographic and clinical characteristics of patients with a history of mental illness diagnoses who underwent otolaryngologic procedures and the associated outcomes in the United States.

Methods

This study is a retrospective cross-sectional analysis utilizing the Nationwide Readmissions Database (NRD) for the years 2010 to 2015.[4] The NRD is a part of the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality.[4] The NRD is designed to support analyses of national readmission rates for all payers and the uninsured.[4] The database includes discharge data from 27 geographically dispersed states, accounting for 57.8% of the total U.S. resident population and 56.6% of all U.S. hospitalizations.[4] Additionally, the database allows for a weighted analysis to provide a better estimation of national outcomes.[4] The NRD tracks patients across the sampled hospitals within a calendar year for any readmission.[4] This database addresses a large gap in health care data—the lack of nationally representative information on hospital readmissions for all ages.[4] The NRD consists of publicly available de-identified data that does not meet the criteria of human subject research and thus does not meet the criteria of review by the University of Iowa Institutional Review Board.

The main objective of the study is to examine the demographic and clinical characteristics of patients who underwent otolaryngologic procedures in relation to the absence or presence of past psychiatric history. The study population included adult patients (≥18 years old) who underwent otolaryngologic surgeries as a primary admission procedure (Appendix A), further classified based on the site of surgery. Patients with a history of mental illness diagnosis were identified by using Clinical Classification Software (CCS). CCS is a software developed by HCUP that groups international classification of diseases, ninth edition (ICD-9) codes into meaningful clinical categories, more information is available on the HCUP website.[4] The following clinical categories were used to define a history of mental illness: (i) depression, (ii) anxiety, (iii) alcohol dependence, (iv) other substance dependence, (v) bipolar disorder, (vi) dementia and memory disorders, and (vii) schizophrenia and delusional disorders. The study sample was examined for completeness of all study parameters, patients with missing values for the study parameters were excluded.

Outcomes of interest included: (i) postoperative complications as previously defined,[5] (ii) blood transfusion, (iii) tracheostomy, (iv) readmission within 30 days postoperatively, (v) inpatient mortality risk within 30 days postoperatively, (vi) total length of hospital stay in days, and (vii) cost of health services provided during the admission—the database includes hospital charges associated with each admission as well as cost-to-charge ratio determined for each hospital that allows conversion of charges values to cost values, all cost values were adjusted for the inflation rate to reflect 2018 U.S. dollar value using Bureau of Labor Statistics inflation calculator.[4,6]

Demographic and clinical parameters that were assessed for their association with a history of mental illness included: (i) age, (ii) gender, (iii) modified Charlson Comorbidity Index Score (CCIS), classified into: 0, 1, ≥2,[7] (iv) history of head and neck cancer and the site of cancer if present, (v) burn as the reason for admission, (vi) trauma as the reason for admission, (vii) neck dissection, and (viii) location and type of hospital as coded in the database into metropolitan non-teaching, metropolitan teaching, and non-metropolitan.[4]

Statistical Analysis

Statistical analysis used weighted data to reflect national estimates. The records' weights are available in the NRD and calculated based on the stratification variables that were used in the sampling methodology.[4]

Chi-square tests were used to determine the association between each of the study parameters and the outcomes of interest. Parameters with a significant association with the outcomes were considered possible confounders and were included in multivariate logistic regression models. Multivariate logistic regression models were used to calculate the Odds Ratio (OR) and 95% Confidence Interval (95% CI). Multivariate linear regression models were used to compare means of LOS and cost of health services while controlling for confounders. The likelihood ratio was used to test for model fitness. Collinearity between independent variables in the multivariate model was tested, conditioned index >30 was further investigated for possible collinearity. The significance level was set as ($\alpha = .05$). All data analyses were performed using SAS 9.4 for Windows (SAS Institute Inc., Cary, NC, USA).

Results

A total of 146 182 patients were included (Table 1). The mean age of the study population was 48.46 (SD = 0.13 years), and 52% were female. The most common performed procedure

Table 1. Descriptive Statistics of the Study Population. National Readmission Database, 2010 to 2015.

		Psychiatric history (%)		
	Sample population, (%) (N = 146 182)	Not present (n = 119 952)	Present (n = 26 230)	P[a]
Age (y)				
18 < 65	77.85	77.60	78.97	
≥65	22.15	22.40	21.03	<0.001
Gender				
Male	47.80	47.25	50.25	
Female	52.20	52.75	49.75	<0.001
CCIS				
0	61.05	62.51	54.51	
1	25.37	24.98	27.08	
≥2	13.58	12.50	18.41	<0.001
Overweight				
No	89.85	90.39	87.42	
Yes	10.15	9.61	12.58	<0.001
Current tobacco use				
No	84.31	87.34	70.80	
Yes	15.69	12.66	29.20	<0.001
Head and neck cancer				
Not reported	86.74	86.49	87.85	
Reported	13.26	13.51	12.15	<0.001
Burn admission				
Not reported	99.77	99.82	99.54	
Reported	0.23	0.18	0.46	<0.001

The significance of a is Chi-square test.

was thyroid surgery (26.57%), and 68.12% of the study population were managed in teaching hospitals (Table 1).

Of the study sample, 26 230 (18.31%) patients had a history of mental illness. The prevalence of patients with mental illness who required otolaryngologic surgeries increased significantly from 14.85% in 2010 to 24.99% in 2015 ($P < .001$) (Figure 1). The prevalence of psychiatric conditions by type included: depression (6.9%), anxiety (5.8%), alcohol dependence (4.2%), substance dependence (2.9%), bipolar disorder (1.4%), dementia and memory disorders (1.2%), schizophrenia and delusional disorders (0.6%), suicide attempts and self-harm (0.1%) (Figure 2). For the multivariate models reported below the likelihood ratio was statistically significant ($P < .001$) for a well-fitted models. Additionally, the test for collinearity did not demonstrate a condition index >30 interpreted as low likelihood of collinearity. Patients with a mental illness history were more likely to be <65 years old, female, overweight, smoker, and/or have multiple comorbidities ($P < .05$ each) (Table 2). Patients who are admitted because of trauma or burn were twice as likely to have a mental illness history [OR: 2.73, 95% CI: (2.59, 2.87), $P < .001$] and [OR: 2.36, 95% CI: (1.80, 3.09), $P < .001$], respectively. Patients admitted for management of head and neck cancers were less likely to have a mental illness history (16.78% vs

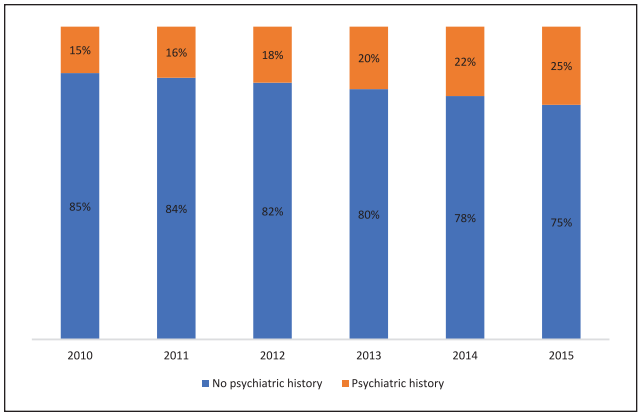

Figure 1. Percentage of patients with psychiatric history who underwent otolaryngologic procedure throughout the study period. $P < .001$

18.55%, $P < .001$). Additionally, patients with a mental illness history were more likely to be managed in teaching hospitals ($P < .001$). The most common site of performed procedures in patients with a history of mental illness was significantly different from that of patients with without this history. Most performed procedures by site included: mandible/maxillofacial bone (23.66%), mouth (19.71%),

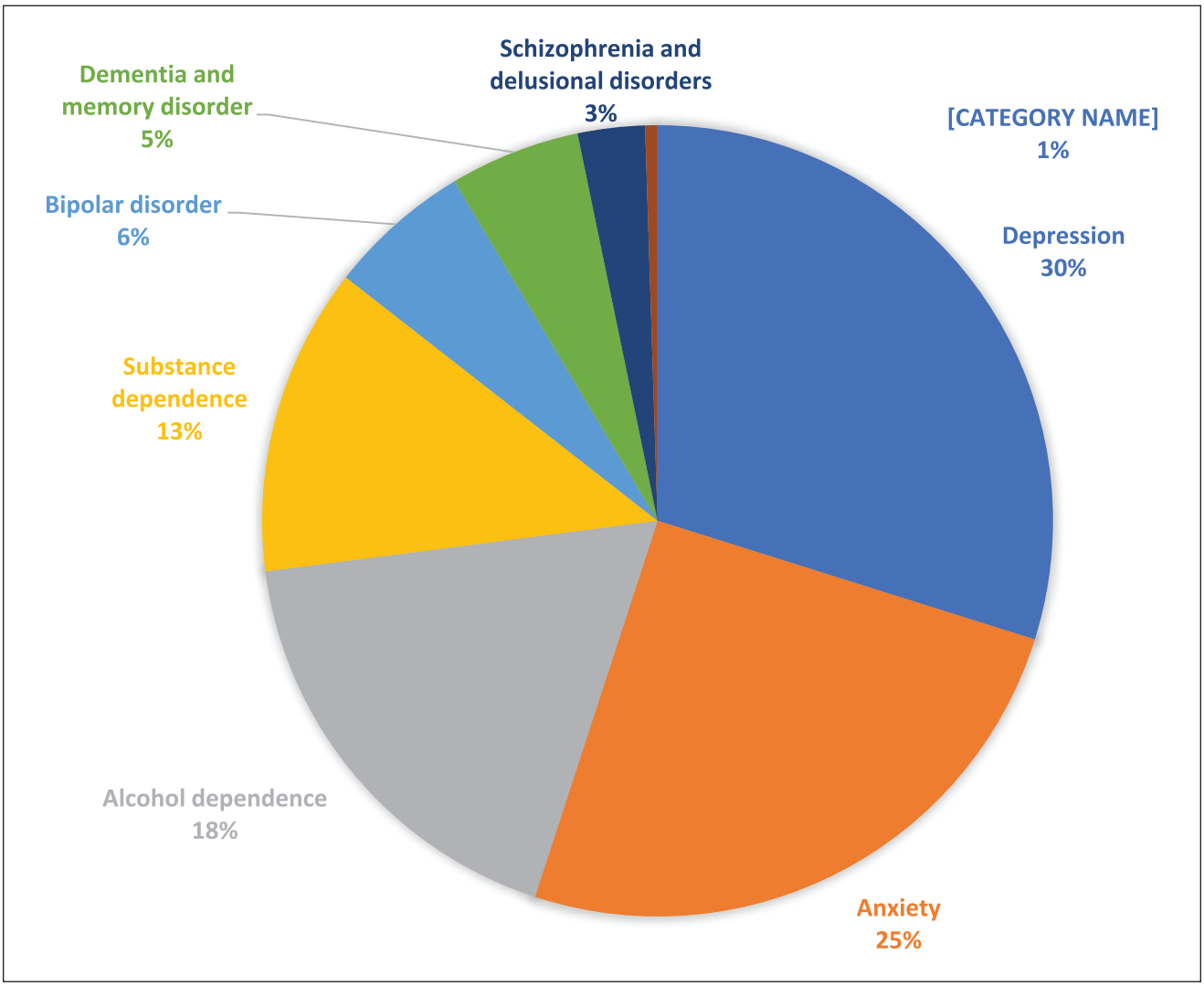

Figure 2. Type of psychiatric conditions in patients who underwent otolaryngologic procedures.

thyroid (19.15%), nose/sinuses (12.55%), pharynx/larynx (11.57%), parathyroid (5.10%), ear (4.42%), salivary glands/ducts (3.84%) (Table 1). The distribution of types of head and neck cancer was also different in relation to history of mental illness (Figure 3). Patients with mental illness history had a higher prevalence of cancer of the oral cavity (34.16% vs 22.14%) and larynx (7.09% vs 4.87%). While patients without a mental illness history had a higher prevalence of thyroid (53.18% vs 39.99%) and salivary cancers (6.88% vs 4.96%) ($P < .001$).

Patients with a history of mental illness had a higher risk of postoperative complications (18.15% vs 9.07%, $P < .001$), blood transfusion (3.28% vs 1.54%, $P < .001$), and tracheostomy (11.79% vs 6.03%, $P < .001$) (Table 3). Management of patients with a history of mental illness was associated with a longer hospital stay by 1.07 ± 0.10 day on average and a higher cost by $\$2325.12 \pm 37.14$ on average. There was no significant difference in terms of mortality and readmission risk.

Discussion

The current study provides an epidemiological perspective regarding patients with a history of mental illness encountered by otolaryngology service. The prevalence of mental illnesses in the study population was 18.3%, which is consistent with the prevalence of any mental illness (AMI) amongst adults in the United States population (18.9%).[1] Similarly, the prevalence of AMI in the United States is most common amongst young adults aged 18 to 25 years and women, which is consistent with this study's findings.[1] These similarities with national data aid the generalizability of the current study sample and the associated outcomes reported here.

Table 2. Characteristics of Patients with Psychiatric History who Underwent Otolaryngologic Procedures.

Factor	% Psychiatric history	OR[a]	95% CI	*P*
Age (y)				
18 < 65	18.58	1.05	1.01, 1.10	.021
≥65	17.39	*Reference*		
Gender				
Male	19.25	*Reference*		
Female	17.45	1.25	1.20, 1.30	<.001
CCIS				
0	16.35	*Reference*		
1	19.55	1.57	1.51, 1.64	<.001
≥2	24.82	2.38	2.24, 2.52	<.001
Overweight				
No	17.82	*Reference*		
Yes	22.69	1.37	1.30, 1.44	<.001
Current tobacco use				
No	15.38	*Reference*		
Yes	34.09	2.62	2.50, 2.74	<.001
Head and neck cancer				
Not reported	18.55	*Reference*		
Reported	16.78	0.74	0.69, 0.78	<.001
Burn admission				
Not reported	18.27	*Reference*		
Reported	35.97	2.36	1.80, 3.09	<.001
Trauma admission				
Not reported	15.46	*Reference*		
Reported	31.38	2.73	2.59, 2.87	<.001
Hospital type				
Metropolitan non-teaching	16.68	*Reference*		
Metropolitan teaching	19.09	1.09	1.04, 1.14	<.001
Non-metropolitan hospital	16.57	0.98	0.88, 1.10	.77

Abbreviations: OR, adjusted odds ratio; CI, confidence interval; CCIS, Charlson comorbidity index score.
[a]The model includes all the above factors.

The current study demonstrated that patients with a history of mental illness undergoing otolaryngologic procedures were more likely to be overweight, smoke tobacco, and/or have multiple comorbidities which is consistent with the national demographics of patients with mental illness.[1] Obesity, metabolic syndrome, diabetes, cardiovascular disease, and infectious diseases such as HIV and hepatitis have an increased incidence amongst patients with severe mental illnesses.[8] Compared to the general population, patients with depression have nearly 2 times the prevalence of cardiovascular disease and, similarly, patients with bipolar disorder have an increased risk of cardiovascular disease and circulatory system deaths.[8] Diabetes and obesity are additional risk factors for cardiovascular disease, and the prevalence of these illnesses has increased in the general population as well as in patients with mental illness.[8] Fagiolini et al[9] found that 40% of patients with bipolar disorder met the diagnostic criteria for metabolic syndrome. It has been hypothesized that the symptoms associated with mental illness or the medications used to treat these disorders—increased appetite, reduced energy expenditure, lower ability to care for oneself—likely contribute to the prevalence of obesity and metabolic syndrome in patients with mental illness.[8] Disorders related to obesity, such as obstructive sleep apnea, may also negatively affect the primary mental illness.[8] The medical risk factors contributing to increased morbidity and mortality amongst patients with mental illness are often modifiable.

Patients with serious mental illness (SMI) are more likely to have health behaviors that contribute to poor health. Smoking is a known, significant risk factor for increased mortality as the World Health Association estimates half of the long-term smokers will die from tobacco use.[10] According to the National Institute of Mental Health (NIMH), smoking is more common in individuals with mental illness, especially those with anxiety, depression, and schizophrenia.[10] The75% of individuals with either substance use disorders or mental illness smoke cigarettes as compared with 23% of the general population.[11] Tobacco use is a known risk factor for the development of head and neck cancer, and it is important to recognize the increased consumption and attitudes

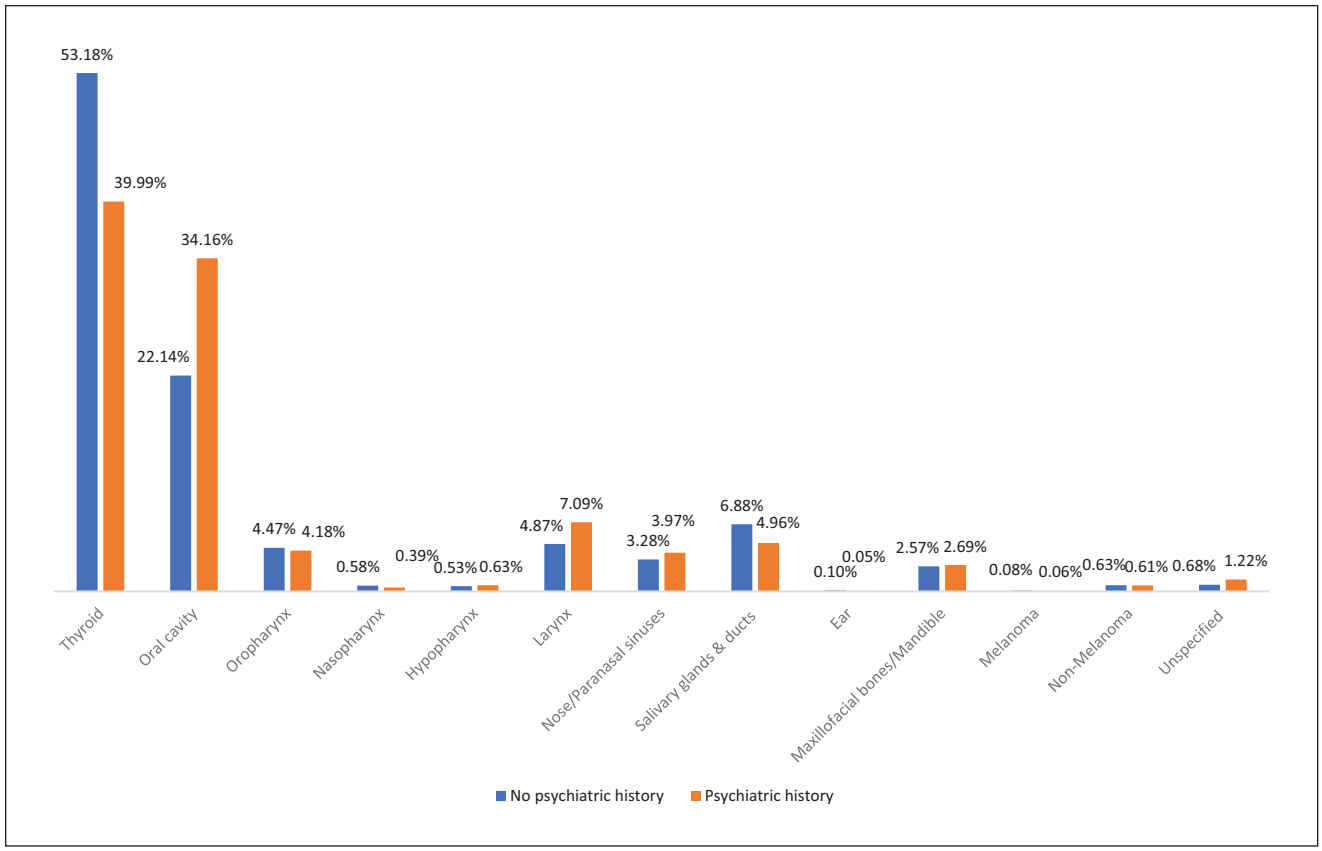

Figure 3. Type of head and neck cancer in relation to psychiatric history.

Table 3. Risk of selected postoperative outcomes in relation to psychiatric history.

Outcome	Psychiatric history	% outcome	OR[a]	95% CI	*P*
Postoperative complications	No	9.07	*Reference*		
	Yes	18.15	1.60	1.51, 1.70	<.001
Blood transfusion	No	1.54	*Reference*		
	Yes	3.28	1.36	1.22, 1.52	<.001
Performance of tracheostomy	No	6.03	*Reference*		
	Yes	11.79	1.47	1.35, 1.61	<.001
Postoperative readmission within 30 d	No	0.25	*Reference*		
	Yes	0.41	0.82	0.61, 1.09	.17
Postoperative death within 30 d	No	0.98	*Reference*		
	Yes	1.41	0.96	0.80, 1.14	.60
		Mean (SEM)	*P*[b]		
Length of stay (d)	No	5.66 (0.08)	*Reference*		
	Yes	6.73 (0.12)	<0.001		
Cost ($)	No	23 879.00 (33.57)	*Reference*		
	Yes	26 204.00 (45.25)	<0.001		

Abbreviations: OR, adjusted odds ratio; CI, confidence interval; SEM, standard error of the mean.
[a]Logistic regression models included: age (not included in the readmission model), gender, charlson comorbidity index score, weight (Not included in the blood transfusion and readmission models), tobacco use (Not included in the blood transfusion model), cancer status (Not included in the complications and blood transfusion model), burn, trauma, site surgery, neck dissection, and hospital teaching type.
[b]Linear regression model includes: age, gender, Charlson comorbidity index score, weight, tobacco use, cancer status, burn, trauma, site surgery, neck dissection, and hospital teaching type.

toward cigarette use in the SMI population. The NIMH report also estimates that 19% of U.S. adults with mental illness have a concomitant substance use disorder.[10] Accidents, suicide, and aggressive actions are known to be increased among persons with co-occurring substance use disorders and are a known risk factor for premature death.[2] This could explain the finding that patients with mental illness who underwent an Otolaryngologic procedure were more likely to be admitted because of a trauma or burn injury and less likely due to cancer ($P < .001$ each).

Despite the increased prevalence of comorbidities in patients with mental illness, previous studies have shown that patients with SMI rarely seek general medical care.[12,13] Furthermore, when patients do seek medical care, difficulties with social skills and the stigma associated with mental illness may affect the quality of care they receive.[14] Researchers have identified several trends supporting the poor quality of medical services provided to the SMI population. Firstly, patients with SMI have higher use of somatic emergency services and less routine use of preventative services with observed worse diabetes care.[13,15-17] Additionally, during medical hospitalization, patients with schizophrenia were found to be twice as likely to develop hospital-acquired infections, postoperative deep vein thrombosis, and postoperative sepsis.[18] Mental illness has also been found to affect patients' treatment decisions, especially in the oncologic setting.[19] Informed consent in patients with mental illnesses remains one of the challenges in many clinical conditions, especially head and neck cancer. Rates of depression in patients with head and neck cancer range from 15% to 50%, and oncology patients with comorbid depression tend to take more treatment breaks than those without depression.[19] The suicide rate for patients with head and neck cancer is up to 4 times the rate seen in the general public.[20]

Analysis of patients undergoing otolaryngologic procedures identified that patients with a history of mental illness had a higher risk of postoperative complications, including an increased need for blood transfusion and tracheostomy. In a previous study, patients with head and neck cancer who abused alcohol and developed alcohol withdrawal symptoms post-operatively had significant increases in their length of hospitalization and hospital-related costs.[21] Additionally, these patients were more likely to have advanced comorbidity, undergo major surgical procedures, and require home health or skilled nursing on discharge.[21] Lee et al[22] examined the comorbid mental illness in surgical patients and found correlations with adverse postoperative outcomes after a variety of general surgical procedures. According to their analysis, 41.5% of their study population had a diagnosis of depression, anxiety, post-traumatic stress disorder (PTSD), and substance abuse disorder and these were associated with a higher rate of ER visits and readmissions in the group with mental illness compared with the control group.[22] They hypothesized that their findings were the result of patients with mental illness being less likely to comply with postoperative instructions and exhibiting a tendency to delay seeking medical care.[22] Research has also suggested that perioperative care in patients with mental illness can be further complicated by systemic effects of psychotic disorders, such as autonomic nerve dysfunction, impaired thermoregulation, and potential interactions between antipsychotic medications and anesthetic, and analgesic agents and regimens.[23] The interplay between mental and physical health should therefore be viewed as codependent and it is important to acknowledge their effect on medical and surgical outcomes.

This study has multiple limitations. The NRD is an administrative database that lacks detailed clinical information such as the severity of the psychiatric conditions and their management, as well as whether the mental illness was co-occurring at the time of otolaryngologic intervention. Additionally, the study design is a retrospective cross-sectional which prevents establishing causality. The otolaryngologic procedures also lack details, and there is no information regarding diagnostic tests performed. However, the NRD is a nationally representative data that make it suitable for measuring epidemiological outcomes and associated burden on the health system in terms of overall morbidities, length of hospital stay, and cost of health services.

Conclusions

The current study provides an epidemiological perspective regarding patients with a history of mental illness who underwent otolaryngologic surgeries. Patients with a history of mental illness are increasingly encountered by Otolaryngologists. Patients with mental illness are more likely to present with non-oncologic conditions and more likely to experience postoperative complications. The study does not have clinical information to explain the increased risk of complications and the associated burden on the health system. There is a paucity of research that investigated the clinical course of patients with psychiatric diseases in Otolaryngology. This study demonstrated patients with a history of mental illness present with a distinct clinical profile and they are increasingly representing a substantial proportion of patients encountered in otolaryngology service. Further investigation utilizing more clinically detailed data is highly warranted.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Appendix A. International Classification of Diseases, Ninth Revision (ICD-9) codes used to identify the site of the primary procedure.

Site	Code
Thyroid/Parathyroid	"062," "063," "064," "066," "067," "068"
Ear	"180," "182,"183," "184," "185," "186," "187" "189," "190," "191," "192," "192," "193," "194," "195," "196," "199," "200," "201," "202," "203," "204," "205," "206," "207," "208," "209"
Nose/Paranasal sinuses	"210," "211," "213," "214," "215," "216," "217," "218," "219," "220," "222," "223," "224," "225," "226," "227," "229"
Mouth/Tonsil	"251," "252," "253," "254," "255," "259," "270," "271," "273," "275," "276," "277," "279," "280," "282," "283," "284," "285," "286," "287," "289"
Salivary glands and ducts	"260," "262," "262," "263," "264," "269"
Pharynx/Larynx	"290," "292," "293," "294," "294," "295," "299," "290," "292," "293," "294," "294," "295," "299," "310," "311," "312," "313," "316"
Maxillofacial bones/Mandible	"760," "762," "763," "764," "765," "766," "767," "769"

ORCID iD

Zaid Al-Qurayshi https://orcid.org/0000-0002-3534-7253

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