

Original Research Article

Depression and factors impacting quality of life among adults with asthma presence in Nevada

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ABSTRACT

Background: Asthma, a chronic, non-communicable disease has been shown to negatively affect mental health and quality of life among adults. Annually approximately 8% of adult Nevadans report current asthma symptoms and 12.6% report having a lifetime diagnosis. The purpose of this study was to evaluate the association between asthma and depression and explore quality of life factors affecting adult Nevadans with asthma.

Methods: Using behavioral risk factor surveillance system (BRFSS) data, this study evaluated the association between self-reported asthma and depression in Nevada using weighted multiple logistic regression. BRFSS asthma call-back survey (ACBS) data were used to determine the frequency and extent of quality of life factors affecting a sub-sample of respondents with asthma.

Results: After adjustment, adult Nevadans with current asthma were 3.22 times as likely (95% CI: 2.26-4.58) to be depressed compared to those without asthma. Adult Nevadans with lifetime asthma were 2.6 times as likely (95% CI: 1.88-3.61) to be depressed compared to those without lifetime asthma. ACBS respondents indicated depression (38%), activity limitations (40%), sleep disturbance (26%), missing work or activities (31%), cost-related challenges (20%), healthcare usage (33%), environmental trigger exposure (96%) and severe asthma as indicated by use of oral corticosteroids (5%). The most significant correlations were found between depression, missing work/activities, activity limitation, emergency room /urgent care visits, oral corticosteroid use and reporting cost as a barrier.

Conclusions: Asthma presence is associated with depression and negatively affects quality of life among adult Nevadans. A public health approach including education and outreach is critical to reduce the impact of asthma on mental health and quality of life.

Keywords: Respiratory disease, Mental health, Asthma trigger, Adult asthma, Wellbeing, Asthma attack

INTRODUCTION

Asthma is a non-communicable chronic respiratory disease of the lungs, which may be caused by an immune response to the substance in the lungs or environmental triggers (National heart, lung and blood institute, 2020). According to the centers for disease control and prevention (CDC), there are 19,223,248 adults with diagnosed asthma in the United States (US), 7.7% of the

population, with the highest rates among women and Puerto Ricans.⁶ Nevada has a dry, arid environment with high heat in the Southern part of the state, where the majority of the population resides. Both high heat and dryness can trigger asthma.¹ According to the BRFSS (2018), 8% of adult Nevadans report a current asthma diagnosis, with 12.6% reporting a diagnosis at some point in their life, with the highest rates among women and black non-Hispanic individuals.⁷ While adult asthma rates

are higher in Nevada than in the US, there have been a relatively small number of studies focused on adult asthma in Nevada.

The relationship between asthma and depression is well documented, though the author's knowledge has not been evaluated in the literature in Nevada. According to the substance abuse and mental health service (2018), 17.3 million adults in the US experienced one or more significant episodes of depression, 7.1% of the population.¹³ After adjusting for confounding factors, a meta-analysis of prospective cohort studies found a strong association between depression and adult-onset asthma. Therefore, it was concluded that depression is a significant risk factor for asthma, but more research was needed to understand the reverse relationship.¹⁰

Beyond this association, underlying factors may contribute to depression and reduce the quality of life among those living with asthma. A systematic review of literature including 43 studies from across the globe, found an association between asthma and lower quality of life.²⁷ The quality of life could be used as a tool to support the monitoring of asthma symptoms as a reduction in symptoms may cause a better-perceived quality of life.²⁶ Asthma-related quality of life factors for adults include work, social, physical and emotional health, which may be impacted by symptoms, emotions, the environment and physical activity limitations.¹⁴ Additional risk factors for asthma can lower the quality of life, including depression, activity limitation, sleep disturbance, missed work, cost-related challenges, healthcare usage, interactions with environmental asthma triggers and the use of oral corticosteroids.^{1,4,11,15,24,27} Unfortunately, there has been a lack of studies identifying which risk factors cause a more significant burden among those living with asthma.

The purpose of this study was to explore the association between self-reported asthma and depression among adult Nevadans and evaluate the presence and extent of crucial quality of life indicators impacting a subset of adult Nevadans living with asthma. This study addressed the association between self-reported asthma and depression upon adjustment for relevant covariates. In addition, the underlying quality of life factors contributing to comorbid depression among those living with asthma including depression, activity limitation, sleep disturbance, missed workdays, cost, healthcare utilization, asthma triggers, and asthma severity, was explored.

METHODS

Study sample

The BRFSS was a telephone survey that incorporated a random sampling of individuals and the administration of a standardized self-reported questionnaire. To help create a representative dataset for each state and the nation, the CDC weighed the data for selection probability, the bias

of non-response or non-coverage and demographics.⁸ Data from the BRFSS core questionnaire were used in the first part of this study. States had the option to administer the ACBS to those who indicate on the core BRFSS questionnaire that they have diagnosed asthma and were willing to be called back. During the second call, each respondent was asked more detailed asthma-related questions. Nevada ACBS data were used in the second part of the study for a descriptive sub-analysis. The 2017 data were utilized for this study, as this was the most current year available for both the BRFSS core questionnaire and ACBS data.

In Nevada, after exclusions, 375 individuals (10%) who completed the 2017 core BRFSS questionnaire indicated current asthma, with 3,369 reporting they had not been told they had current asthma. Additionally, 516 people (13.7%) stated lifetime asthma, while 3,237 responded that they have never been told they have asthma.⁹ Of this group, 178 individuals who reported lifetime asthma completed the ACBS in Nevada.

Statistical analysis

For the first part of this study, the CDC BRFSS web enabled analysis tool (WEAT) was utilized to produce weighted models for the association between asthma and self-reported depression. The WEAT allowed for statistical analysis while weighting data to reflect the nature of the probability sampling. A multiple logistic regression model was created with the binary independent variable of asthma presence as the main predictor for depression (presence or absence). The model was developed first for current asthma and subsequently for lifetime asthma.

A block approach was employed to understand the independent contribution of demographic (age, sex and education level), behavioral (physical activity, tobacco use and alcohol use) and comorbid disease factors (obesity).³⁰ The inclusion of relevant covariates was based on previous studies that indicated an association between these variables and depression.^{3,21} The models were run independently by block to understand the contribution towards the dependent variable.³⁰ Significant variables from each block were then used to create a final adjusted model.

In the second part of this study, ACBS data were evaluated using frequency tables to identify the impact and distribution of quality of life measures present for this population. These included depression, environmental asthma triggers, activity limitation, sleep disturbance, missed workdays, cost-related challenges, healthcare utilization and severe asthma as indicated using an oral corticosteroid.

We assessed the correlation between the quality of life measures and risk factors from the ACBS data. When asked, only those who indicated current asthma

symptoms were included and respondents who indicated they did not know the answer or did not complete the question were excluded. Correlations were calculated between the quality of life indicators, including depression, activity limitation, sleep disturbance, missed work, healthcare use and asthma severity with asthma trigger exposure. A single continuous variable representing the total number of asthma trigger exposures per person was created and used for analyses (Table 4). Because the quality of life measures contained binary, ordinal and continuous variables, we used the point-biserial coefficient, Kendall's tau coefficient and Pearson correlation coefficient, respectively, to evaluate their associations with the continuous asthma trigger variable. The final sample size for the sub-analysis was 80 after exclusions. Data management and analyses were performed using SPSS version 26 (IBM Corp., Armonk, NY). The significance level was set to 0.05.

RESULTS

The relationship between asthma and depression measures among adults in Nevada

Within the 2017 BRFSS population in Nevada, the majority were over the age of 65. They were most likely to report being female, having some post-high school education and being employed. Over half of this population reported being White, non-Hispanic, followed by Hispanic. Table 1 provides an overview of this demographic information.

Table 2 represents the final adjusted model for current asthma and depression. After adjustment for relevant covariates, those with current asthma were 3.22 times as likely (95% CI: 2.26-4.58) to be depressed compared to those without current asthma. Other factors in the model significantly associated with depression included female sex, obesity, current smoking and alcohol use (Table 2).

Table 3 displays the final adjusted model for lifetime asthma and depression. Based on the adjusted model, those with lifetime asthma were 2.6 times more likely (95% CI: 1.88-3.61) to be depressed when compared to those without a lifetime asthma diagnosis. In addition, female sex, current smoking, and obesity were significantly associated with self-reported depression in the model.

Quality of life factors affecting adult Nevadans with asthma

Within the ACBS population, 142 (79.78%) respondents reported active asthma status, with asymptomatic (inactive) asthma reported by 36 (20.22%). Participant mean age was 57.43. Fifty-two were employed full-time (29.21%), 15 were employed part-time (8.43%) and 111 were not employed (62.36%). Sex, educational attainment and race were not available in the ACBS sub-sample data provided.

Table 1: Demographics of adult Nevadans from the 2017 BRFSS.

Variables	N (%)*
Age (in years)	
18-24	228 (11.3)
25-34	401 (18.1)
35-44	420 (17.3)
45-54	565 (17)
55-64	746 (16.1)
65+	1,404 (20.2)
Sex	
Male	1,667 (49.8)
Female	2,097 (50.2)
Educational attainment	
Less than high school	314 (15.3)
High school or GED	926 (29.3)
Some post-high school	1,277 (34.6)
College+	1,233 (20.9)
Race	
White, non-Hispanic	2,668 (53.5)
Black, non-Hispanic	176 (8.5)
Hispanic	576 (24.8)
American Indian or Alaska Native, non-Hispanic	59 (1.3)
Asian, non-Hispanic	107 (8.6)
Native Hawaiian or other Pacific Islander, non-Hispanic	26 (0.8)
Other races, non-Hispanic	34 (0.6)
Multiracial, non-Hispanic	118 (1.9)
Employment status	
Employed	1,397 (48)
Self-employed	328 (8.9)
No work less than year	74 (2.5)
No work more than year	87 (2.6)
Homemaker	209 (7.6)
Student	95 (4.9)
Retired	1,309 (20.3)
Unable to work	234 (5.4)

*unweighted n, weighted %.

Of the ACBS sample, 38.20% (n=68) of individuals surveyed indicated depression and 40.45% (n=72) of respondents indicated having at least some level of activity limitation due to their asthma in the past 30 days. Forty-six respondents (25.84%) reported having one or more days or nights during which it was difficult for them to sleep due to their asthma symptoms in the past 30 days, with a mean of 5.54 days or nights (SD=9.3) reported among those with current asthma. Fifty five respondents (30.90%) indicated missing one or more days of work or activities due to their asthma in the past 12 months, with a mean of 14.1 days (SD=45.5) for those with current asthma.

Table 2: The association between adults with current asthma and depression in Nevada, 2017.

Variables	Odds ratio	95% CI	P value
Asthma			
Yes	3.22	(2.26-4.58)	<0.0001
No*	1.00	(1.00-1.00)	-
Sex			
Female	1.79	(1.34-2.39)	<0.0001
Male*	1.00	(1.00-1.00)	-
Tobacco use			
Current smoker	2.17	(1.58-2.97)	<0.0001
Former smoker or never smoked*	1.00	(1.00-1.00)	-
Alcohol use			
Yes	1.72	(1.01-2.94)	0.0471
No*	1.00	(1.00-1.00)	-
Obesity			
Obese	1.60	(1.12-2.28)	0.0094
Overweight	1.11	(0.78-1.59)	0.5638
Underweight	0.82	(0.28-2.44)	0.7212
Normal weight*	1.00	(1.00-1.00)	-

*Reference variable.

Table 3: The association between adults with lifetime asthma and depression in Nevada.

Variables	Odds ratio	95% CI	P value
Asthma			
Yes	2.60	(1.88-3.61)	<0.0001
No*	1.00	(1.00-1.00)	-
Sex			
Female	1.78	(1.32-2.40)	0.0001
Male*	1.00	(1.00-1.00)	-
Physical activity			
Met aerobic guidelines only	1.06	(0.70-1.60)	0.7818
Met strengthening guidelines only	1.65	(0.96-2.85)	0.0723
Did not meet either guideline	1.38	(0.94-2.03)	0.1036
Met both guidelines*	1.00	(1.00-1.00)	-
Tobacco use			
Current smoker	2.12	(1.52-2.97)	<0.0001
Former smoker or never smoked*	1.00	(1.00-1.00)	-
Obesity			
Obese	1.67	(1.16-2.41)	0.0063
Overweight	1.19	(0.82-1.72)	0.3463
Underweight	0.89	(0.31-2.53)	0.8200
Normal weight*	1.00	(1.00-1.00)	-

*Reference variable.

Table 4: Asthma call-back survey home environmental trigger frequency among adult Nevadans with asthma.

Questions	Yes (%)	No (%)	Don't know (%)
	N (%)	N (%)	N (%)
Is an air cleaner or purifier regularly used inside your home?	43 (24.16)	133 (74.72)	2 (1.12)
In the past 30 days, has anyone seen or smelled mold or a musty odour inside your home? Do not include mold on food.	11 (6.18%)	167 (93.82)	0 (0.00)
Does your household have pets such as dogs, cats,	120 (67.42)	58 (32.58)	0 (0.00)

Continued.

Questions	Yes (%)	No (%)	Don't know (%)
hamsters, birds or other feathered or furry pets that spend time indoors?			
Are pets allowed in your bedroom?	106 (59.60) [†]	72 (40.45) [‡]	0 (0.00)
In the past 30 days, has anyone seen a cockroach inside your home?	12 (6.74)	166 (93.26)	0 (0.00)
In the past 30 days, has anyone seen mice or rats inside your home? Do not include mice or rats kept as pets.	9 (5.06)	169 (94.94)	0 (0.00)
Is a wood burning fireplace or wood burning stove used in your home?	28 (15.73)	150 (84.27)	0 (0.00)
In the past week, has anyone smoked inside your home?	24 (13.48)	154 (86.52)	0 (0.00)
Do you use a mattress cover that is made especially for controlling dust mites?	63 (35.39)	112 (62.92)	3 (1.69)
Do you use a pillow cover that is made especially for controlling dust mites?	50 (28.09)	125 (70.22)	3 (1.69)

[†]Includes answer yes and answer some are/some aren't; [‡]58 respondents have no pets and are included in the no category.

Table 5: Correlations between quality of life and environmental trigger variables; p values were shown in parentheses.

Quality of life variable	Environmental trigger exposure
Depression	Mann-Whitney U test (U)=732, p=0.663
Activity limitation	U=655.5, p=0.208
Sleep disturbances	-0.12 (0.305)
Missed work/activities	-0.01 (0.929)
Routine checkups	-0.11 (0.316)
Emergency room or urgent care visits	-0.04 (0.745)
Urgent healthcare visits	-0.01 (0.926)
Hospital stays	0.07 (0.524)
Oral corticosteroid use	U=339, p=0.402

Significant correlation (p<.05).

Thirty five respondents (19.66%) indicated cost as a burden in the past 12 months and were unable to see a primary care doctor (n=15, 8.43%), specialist (n=10, 5.62%) or buy asthma medication (n=26, 14.61%) due to the cost. Only nine respondents (5.06%) reported using oral corticosteroids, indicating severe asthma.

Within the surveyed population, 32.58% (n=58) of ACBS participants indicated healthcare usage due to asthma in the past 12 months including routine check-ups (44.38%, n=79), emergency room or urgent care visits (13.48%, n=24), urgent treatment (15.73%, n=28) and hospital stays (2.81%, n=5). Respondents with current asthma reported a mean of 6.67 asthma checkups (SD=13.7), a mean of 1.46 emergency room or urgent care center visits (SD=6.0), a mean of 2.48 urgent treatment visits (SD=9.4) and a mean of 0.44 hospital stays (SD=3.2).

Table 6: Correlations of quality of life and cost barrier variables; p values were shown in parentheses.

Cost barrier quality of life*	Primary care visit	Specialist visit	Medication
Depression	0.33 (0.003)	0.35 (0.001)	0.08 (0.447)
Activity limitation	-0.05 (0.666)	-0.06 (0.562)	-0.20 (0.061)
Sleep disturbances	-0.05 (0.680)	-0.02 (0.850)	-0.15 (0.172)
Missed work/activities	-0.04 (0.716)	-0.03 (-0.814)	-0.23 (0.035)
Routine checkups	0.05 (0.634)	0.07 (0.531)	0.01 (0.955)
Emergency room or urgent care visits	0.00 (0.937)	0.02 (0.831)	-0.19 (0.081)
Urgent healthcare visits	0.03 (0.782)	0.05 (0.645)	-0.18 (0.101)
Hospital stays	0.04 (0.724)	0.04 (0.701)	-0.17 (0.135)
Oral corticosteroid use	-0.38 (0.001)	-0.34 (0.002)	-0.47 (<0.001)

*Phi coefficients were calculated between depression and cost-barrier measures; Kendall's tau coefficients were calculated between activity limitation and cost-barrier measures; point-biserial coefficients were calculated between the other quality of life variables and cost-barrier measures.

Of the 178 ACBS respondents, 171 (96.07%) reported exposure to at least one environmental trigger, and 144 (80.90%) reported exposure to three or more environmental triggers. Respondents reported 3.84 exposures on average (SD=1.7) and indicated the use of preventive measures including an air cleaner or purifier, mattress cover or pillow cover, a mean of 0.88 times (SD=1.0). Table 4 outlines the prevalence of environmental triggers within the homes of Nevadans with asthma who participated in the ACBS.

Correlations between the quality of life variables identified above with the environmental trigger quality of life variable are included in Table 5. None of these correlations were found to be significant.

Correlations between the quality of life variables with the cost-related quality of life risk factors are included in Table 6. Depression was significantly correlated with reporting cost as a barrier to seeing both primary care doctors and specialists. Missing work or activities was significantly and inversely correlated with finding cost as a barrier to affording medications. Finally, oral corticosteroid use was inversely correlated with reporting cost as a barrier to seeing a primary care doctor or specialist or affording medication.

DISCUSSION

The significant findings within Nevada for the association between asthma and depression were consistent with those found in the literature for other geographies Brunner et al 2014, Gao et al 2015. The higher rates of depression among adults with asthma in Nevada and the high level of depression reported by those with asthma on the ACBS (38%) had profound public health implications. A better understanding of this relationship can guide the development of effective treatments and improved health and mental health outcomes. Depression screening can be incorporated into asthma treatment to ensure that if depression was present, it can also be treated simultaneously. This would address depression and improve the efficacy of asthma treatment because depression may lead to poor asthma control and low medication adherence, increasing symptoms and lowering the quality of life.³

All quality of life variables explored were present among adult Nevadans with asthma and the literature discussed that the presence of these factors reduced the quality of life for those with asthma.^{2,4,11,15,23,24,27} Our assessments of these variables revealed the potential reasons that this population experienced the quality of life challenges. In addition, these variables may contribute as underlying factors to the higher rates of depression seen among this group. However, more research was needed in this area among an adequately powered sample of representative individuals.

The high level of activity limitation (40.45%) among adults with asthma in Nevada was notable. The association between depression and obesity negatively impacting the quality of life had been previously documented.²⁷ Activity limitations may further exacerbate the high level of depression already seen among those with asthma.

Avoiding environmental asthma triggers may help decrease exacerbations and increase the quality of life, yet a high proportion of adult Nevadans with asthma were exposed to triggers.²³ Exposure to select environmental triggers could be reduced through educational campaigns and preventive conversations with health care providers. This could indirectly reduce asthma attacks, improve individual quality of life and reduce healthcare use, costs and missed workdays. In this study, on average, respondents reported using less than one of the items that prevented triggers such as air purifiers, mattress covers and pillow covers; hence education about these options could increase rates of use and avoid exposure.

The most common environmental trigger reported in the ACBS was having a pet in the home (67.42%). Education about the effect of having a pet in the home and having a pet in the bedroom could reduce exposure to these triggers and improve respiratory health. Additionally, campaigns such as those focused on smoking cessation could help reduce smoking rates, lowering exposure inside homes (currently reported at 13.48% on the ACBS) and improving overall health and wellness for those with asthma. This study did not have a significant correlation between the quality of life variables and the environmental trigger exposure variable. The literature indicated that trigger exposure lowered the quality of life so that it may do so differently from the variables explored for this analysis. More research was needed to understand the contribution of unique triggers and the effects of quality of life.

Significant correlations were found between select quality of life measures available among surveyed respondents and cost-related factors. Depression was significantly positively correlated with reporting cost as a barrier to seeing a primary care doctor and specialist. Those unable to seek care for their asthma may have more negative feelings about their circumstances or asthma presence, contributing to underlying depression. Cost-related challenges may negatively impact the quality of life among those with depression. This could be addressed briefly during healthcare visits to help patients manage costs and improve treatment compliance.

Oral corticosteroid use was significantly negatively correlated with reporting cost as a barrier to seeing a primary care doctor and specialist and reporting cost as a barrier to affording medication. Oral corticosteroids such as prednisone were relatively inexpensive compared to other asthma medications like inhalers, which may help explain this relationship. Missing work and activities

were negatively correlated with reporting cost as a barrier to affording medications and activity limitation and emergency room or urgent care visits were approaching negative significance. Those who missed work and activities, experience activity limitations and visited the emergency room or urgent care center due to their asthma may have more severe asthma, causing these disruptions to daily life. Using medications such as oral corticosteroids may mean that medication cost was less burdensome than some other groups. Policies such as Nevada senate bill 262, which increased transparency in asthma drug prices, could help in reducing costs for other types of asthma medications and help improve quality of life, given the prevalence of those with asthma in Nevada who reported cost-related challenges on the ACBS.²⁰

Limitations for this study included the cross-sectional design of the BRFSS and ACBS and a relatively small ACBS sample size with possible selection bias. In addition, the BRFSS sample was older on average than the ACBS sample, possibly indicating survivorship bias. Finally, measures were self-reported based on what healthcare providers had told respondents. However, studies have shown a strong correlation between the BRFSS survey and these triggers and improve respiratory health. Additionally, campaigns such as those focused on smoking cessation could help reduce smoking rates, lowering exposure inside homes (currently reported at 13.48% on the ACBS) and improving overall health and wellness for those with asthma. This study did not have a significant correlation between the quality of life variables and the environmental trigger exposure variable. The literature indicated that trigger exposure lowered the quality of life so that it may do so differently from the variables explored for this analysis. More research was needed to understand the contribution of unique triggers and the effects of quality of life.

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CONCLUSION

Based on the results from this study, future research should include work on the temporal nature of the association between asthma and depression and understanding how to target unique quality of life challenges among populations with and without asthma.

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