The Relationship Between Post-Traumatic Stress Disorder and Gastrointestinal Disease in United States Military Veterans

KELSEY KENT, PHD, PMHNP, CNE

Disclosures

The speaker has no conflicts of interest to disclose.

Learning Outcomes

To enhance nurses' knowledge of co-occurring post-traumatic stress disorder and gastrointestinal diseases

To advance research that will lead to improved treatment of co-occurring PTSD and GI disease.

Background

There is an established relationship between functional GI diseases such as Irritable Bowel Syndrome (IBS) and mental health diagnoses of depression and anxiety. Research is still exploring whether that relationship stretches to include post-traumatic stress disorder (PTSD).

In the Danish population, researchers found that among those with PTSD, risk of any GI disease was 25%, with PTSD having the strongest association with peptic ulcer (Gradus, Farkus, Svensson, Ehrenstein, Lash, & Sorensen, 2017).

Twenty percent of Veterans who had served in Iraq and Afghanistan had a gastrointestinal disease. Veterans with a mental health diagnosis were twice as likely to be diagnosed with gastrointestinal disease (Maguen, Madden, Cohen, Bertenthal & Seal, 2014)

Background: The Brain-Gut Connection

The brain-gut axis is a well-established communication link between the enteric nervous system (ENS) and the central nervous system (CNS). Several factors are known to influence this system, including the stress response of the hypothalamic-pituitary-adrenal axis, the presence of corticotrophin releasing factor (CRF), and the presence of gut microbial (Bonaz & Bernstein, 2013).

CRF

- CRF, a hormone released during stress, increases colonic motility and induces fecal excretion
- Elevated levels of CRF have been found in the thalamus of rats experiencing extreme stress
- In humans, research has demonstrated increased influence from the thalamus to the middle/inferior frontal gyrus and insula in cases of PTSD (Zhang, Chen, Long, Cui, & Chen, 2016), which may offer further explanation for the connection between PTSD and gastrointestinal symptoms.

Gut Microbiota

- Gut microbiota has been shown to influence the amygdala in the brain, which plays a major role in emotional regulation and social behavior. This has led some to suggest the microbiota as a potential target for manipulating the amygdala, and thereby treating psychiatric illnesses such as PTSD (Cowan, Hoban, Ventura-Silva, Dinan, Clark, & Cryan, 2017).

Rationale for the Study

The Gap: The literature indicates a relationship between GI symptoms and both stress and anxiety; but there is a gap in the research on the relationship between GI disease and PTSD

- The current state of the science does not identify whether the presence of PTSD is a predictor for GI disease.
- Conversely, the current research also does not examine whether the presence of GI disease is a predictor for a diagnosis of PTSD.

Significance: This study is significant, because exploring GI Disease as a potential predictor of PTSD fulfills the National Institute of Mental Health's Aim to "identify mechanisms that confer vulnerability to psychiatric illness," (NIMH, 2018).

Specific Aims:

- Specific Aim 1: To determine the frequency with which GI Disease and PTSD are diagnosed co-morbidities
- Specific Aim 2: To determine if a diagnosis of GI Disease accompanies a diagnosis of PTSD
- Specific Aim 3: To determine if a diagnosis of PTSD accompanies a diagnosis of a GI Disease

The Study

The Population

- United States military Veterans treated outpatient by the Veterans Health Administration from 1999-2019

Sample Inclusion Criteria:

- Diagnosed with PTSD or GI disease based on ICD-9 or ICD-10 codes
- GI disease will include only diseases with greater than 500,000 annual ambulatory care visits in the United States, to include: peptic ulcer disease, gastroesophageal reflux disease, functional dyspepsia, diverticular disease, inflammatory bowel disease, ulcerative colitis, Crohn's disease, irritable bowel syndrome, and the symptoms of constipation, and nausea/vomiting

Data Collected

- Demographic Data: Gender, ethnicity, age at time of encounter, and period of service
- Presence or absence of PTSD diagnosis
- Presence or absence of GI disease diagnosis

Sample Size

- From 2000-2019, VHA treated a total of 13,669,058 Veterans, approximately 14 million if including 1999 (estimated due to transition from paper to computerized records in 1999)
- 6,352,586 participants were identified as having PTSD or GI disease and were included in this study

Results

	In Veterans with PTSD, likelihood that they will also have the indicated GI Disease
GERD	1.50
Peptic Ulcer Disease	1.36
Functional Dyspepsia	1.80
Crohn's Disease	1.15
Ulcerative Colitis	1.03
Diverticular Disease	1.30
IBS	2.73
Constipation	1.50
Nausea/Vomiting	2.69

	In Veterans with GI Disease, likelihood that they will also have PTSD
GERD	1.44
Peptic Ulcer Disease	1.29
Functional Dyspepsia	1.71
Crohn's Disease	1.09
Ulcerative Colitis	.99
Diverticular Disease	1.29
IBS	2.61
Constipation	1.44
Nausea/Vomiting	2.57

Breaking down the results: Functional Dyspepsia

Year	Rate of FD Among Veterans with PTSD	Rate of FD Among All Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	1.94%	1.01%	1.92	<.0001	1567.17
2003	1.66%	.88%	1.87	<.0001	1724.83
2006	1.33%	.77%	1.73	<.0001	1431.38
2009	1.17%	.66%	1.73	<.0001	2028.28
2012	1.13%	.57%	1.98	<.0001	3086.51
2015	0.76%	.45%	1.69	<.0001	1696.18
2018	0.44%	.26%	1.69	<.0001	1086.29

Year	Rate of PTSD Among Veterans with FD	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	8.42%	4.40%	1.91	<.0001	1612.55
2003	9.14%	4.85%	1.88	<.0001	1719.20
2006	11.06%	6.46%	1.71	<.0001	1482.70
2009	15.31%	8.66%	1.77	<.0001	2168.84
2012	17.81%	10.29%	1.73	<.0001	2179.80
2015	20.62%	12.36%	1.67	<.0001	1852.31
2018	23.28%	18.39%	1.27	<.0001	269.27

Breaking down the results: Gastroesophageal Reflux Disease (GERD)

Year	Rate of GERD Among Veterans with PTSD	Rate of GERD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	13.33%	7.61%	1.75	<.0001	8486.39
2003	17.89%	11.69%	1.53	<.0001	9185.64
2006	19.61%	13.34%	1.47	<.0001	12009.15
2009	20.00%	13.78%	1.45	<.0001	16510.45
2012	23.26%	13.84%	1.68	<.0001	41804.24
2015	20.15%	14.26%	1.41	<.0001	22658.22
2018	19.71%	14.41%	1.37	<.0001	20518.95

Year	Rate of PTSD Among Veterans with GERD	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	7.71%	4.40%	1.75	<.0001	8219.42
2003	7.42%	4.85%	1.53	<.0001	8532.47
2006	9.50%	6.46%	1.47	<.0001	11110.81
2009	12.58%	8.66%	1.45	<.0001	15621.97
2012	15.14%	10.29%	1.47	<.0001	21999.18
2015	17.47%	12.36%	1.41	<.0001	22249.86
2018	18.87%	18.39%	1.02	<.0001	146.37

Breaking down the results: Peptic Ulcer Disease

Year	Rate of PUD Among Veterans with PTSD	Rate of PUD Among All Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	1.89%	1.26%	1.5	<.0001	639.89
2003	1.31%	.94%	1.39	<.0001	367.44
2006	1.04%	.76%	1.37	<.0001	374.76
2009	0.77%	.60%	1.28	<.0001	257.32
2012	0.69%	.46%	1.5	<.0001	655.42
2015	0.40%	.32%	1.25	<.0001	147.39
2018	0.12%	.10%	1.2	<.0001	35.56

Year	Rate of PTSD Among Veterans with PUD	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	6.60%	4.40%	1.5	<.0001	600.48
2003	6.76%	4.85%	1.39	<.0001	377.72
2006	8.87%	6.46%	1.37	<.0001	397.56
2009	11.18%	8.66%	1.29	<.0001	280.58
2012	13.49%	10.29%	1.31	<.0001	319.11
2015	15.49%	12.36%	1.25	<.0001	185.31
2018	16.34%	18.39%	.89	<.0001	18.53

Breaking down the results: Crohn's Disease

Year	Rate of Crohn's Among Veterans with PTSD	Rate of Crohn's Among All Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	0.22%	.17%	1.29	<.0001	21.94
2003	0.22%	.20%	1.1	<.0001	7.44
2006	0.23%	.21%	1.1	<.0001	8.89
2009	0.25%	.23%	1.09	<.0001	11.70
2012	0.32%	.24%	1.33	<.0001	136.23
2015	0.28%	.26%	1.08	<.0001	10.77
2018	0.29%	.27%	1.07	<.0001	12.35

Year	Rate of PTSD Among Veterans with Crohn's	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	5.65%	4.40%	1.28	<.0001	25.83
2003	5.49%	4.85%	1.13	<.0001	9.09
2006	7.04%	6.46%	1.09	<.0001	6.57
2009	9.62%	8.66%	1.11	<.0001	28.54
2012	11.74%	10.29%	1.14	<.0001	34.35
2015	13.32%	12.36%	1.08	<.0001	14.34
2018	15.03%	18.39%	0.82	<.0001	130.68

Breaking down the results: Ulcerative Colitis

Year	Rate of Ulcerative Colitis Among Veterans with PTSD	Rate of Ulcerative Colitis Among All Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	0.27%	.24%	1.13	<.0001	5.03
2003	0.28%	.28%	1.0	<.0001	0.10
2006	0.28%	.28%	1.0	<.0001	0.00078
2009	0.29%	.35%	0.83	<.0001	55.10
2012	0.35%	.31%	1.13	<.0001	25.81
2015	0.38%	.37%	1.03	<.0001	2.53
2018	0.51%	.46%	1.11	<.0001	55.77

Year	Rate of PTSD Among Veterans with Ulcerative Colitis	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	4.84%	4.40%	1.1	<.0001	4.55
2003	4.97%	4.85%	1.02	<.0001	94.19
2006	6.42%	6.46%	0.99	<.0001	0.04
2009	8.52%	8.66%	0.98	<.0001	0.41
2012	10.22%	10.29%	0.99	<.0001	0.10
2015	12.81%	12.36%	1.04	<.0001	4.35
2018	15.43%	18.39%	0.84	<.0001	175.25

Breaking down the results: Diverticular Disease

Year	Rate of Diverticular Disease Among Veterans with PTSD	Rate of Diverticular Disease Among All Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	2.30%	1.79%	1.28	<.0001	268.16
2003	2.94%	2.19%	1.34	<.0001	641.81
2006	3.18%	2.38%	1.34	<.0001	977.77
2009	3.20%	2.46%	1.30	<.0001	1151.47
2012	3.13%	2.39%	1.31	<.0001	1315.94
2015	2.84%	2.37%	1.20	<.0001	753.94
2018	2.41%	1.79%	1.35	<.0001	1973.20

Year	Rate of PTSD in Veterans with Diverticular Disease	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	5.67%	4.40%	1.29	<.0001	282.41
2003	6.48%	4.85%	1.34	<.0001	644.21
2006	9.96%	6.46%	1.54	<.0001	2280.00
2009	11.28%	8.66%	1.30	<.0001	1246.05
2012	11.78%	10.29%	1.45	<.0001	360.17
2015	14.83%	12.36%	1.20	<.0001	855.55
2018	15.98%	18.39%	0.89	<.0001	524.41

Breaking down the results: Irritable Bowel Syndrome (IBS)

Year	Rate of IBS Among Veterans with PTSD	Rate of IBS Among All Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	1.39%	.46%	3.02	<.0001	3473.95
2003	1.36%	.48%	2.83	<.0001	4027.52
2006	1.42%	.54%	2.63	<.0001	5083.98
2009	1.49%	.58%	2.57	<.0001	7244.25
2012	1.93%	.64%	3.02	<.0001	14768.56
2015	1.98%	.77%	2.57	<.0001	15211.03
2018	2.38%	.96%	2.48	<.0001	19093.10

Year	Rate of PTSD Among Veterans with IBS	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	13.61%	4.40%	3.09	<.0001	3762.94
2003	13.82%	4.85%	2.85	<.0001	4242.55
2006	17.10%	6.46%	2.65	<.0001	5485.60
2009	22.31%	8.66%	2.58	<.0001	7952.93
2012	27.14%	10.29%	2.64	<.0001	12313.76
2015	31.72%	12.36%	2.57	<.0001	17226.02
2018	34.39%	18.39%	1.87	<.0001	10631.85

Breaking down the results: Constipation

Year	Rate of Constipation Among Veterans with PTSD	Rate of Constipation Among All Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	0.00%	0.00%	1.0	<.0001	N/A
2003	2.29%	1.44%	1.59	<.0001	1260.79
2006	2.58%	1.71%	1.51	<.0001	1573.78
2009	2.85%	1.90%	1.50	<.0001	2429.53
2012	3.49%	2.02%	1.73	<.0001	6099.88
2015	2.44%	1.68%	1.45	<.0001	2796.38
2018	0.27%	0.16%	1.69	<.0001	641.97

Year	Rate of PTSD Among Veterans with Constipation	Rate of PTSD Among all Veterans	Ratio	P value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	5.48%	4.40%	1.25	<.0001	0.40
2003	7.72%	4.85%	1.59	<.0001	1309.52
2006	9.71%	6.46%	1.50	<.0001	1635.86
2009	12.96%	8.66%	1.50	<.0001	2595.37
2012	15.56%	10.29%	1.51	<.0001	3787.93
2015	17.93%	12.36%	1.45	<.0001	95337.52
2018	23.59%	18.39%	1.28	<.0001	183.61

Breaking down the results: Nausea/Vomiting

Year	Rate of N/V Among Veterans with PTSD	Rate of N/V Among All Veterans	Ratio	P Value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	8.38%	3.03%	2.77	<.0001	17737.76
2003	9.37%	3.24%	2.89	<.0001	29552.79
2006	9.92%	3.63%	2.73	<.0001	39916.48
2009	10.75%	4.02%	2.67	<.0001	59488.29
2012	12.47%	4.26%	2.93	<.0001	92859.36
2015	9.92%	4.14%	2.40	<.0001	67380.93
2018	2.90%	1.19%	2.44	<.0001	22506.60

Year	Rate of PTSD in Veterans with N/V	Rate of PTSD in all Veterans	Ratio	P Value of chi square	Goodness-of-fit tests: Critical Value 3.84
2000	12.19%	4.40%	2.77	<.0001	18058.88
2003	14.01%	4.85%	2.89	<.0001	30013.28
2006	17.63%	6.46%	2.73	<.0001	40997.65
2009	23.20%	8.66%	2.68	<.0001	57238.51
2012	26.39%	10.29%	2.56	<.0001	74555.60
2015	29.67%	12.36%	2.40	<.0001	73964.59
2018	36.36%	18.39%	1.98	<.0001	15486.70

Results: Secondary Mental Illness

Condition	Rate of Depression	Rate of Anxiety
PTSD	69.25%	52.18%
GERD	37.07%	28.56%
Peptic ulcer disease	41.18%	31.39%
Functional dyspepsia	43.97%	35.64%
Crohn's disease	39.60%	30.86%
Ulcerative colitis	37.50%	29.29%
Diverticular disease	33.14%	24.75%
IBS	53.83%	47.77%
Constipation	42.55%	32.31%
Nausea/vomiting	41.46%	31.28%

Gould and others found in their study that Veterans do not have increased rates of depression and anxiety over non-veterans. They identified the rate of depression in Veterans as 11% and the rate of anxiety in Veterans as 9.9% (Gould, Rideaux, Spira, & Beaudreau, 2015).
SAMHSA – 7.1% of US adults had a major depressive episode in 2017 (2020)
NIMH – 5.7% lifetime prevalence of GAD in US (2020)

Results: Secondary Mental Illness

Co-Occurring Conditions	Rate of Depression	Rate of Anxiety
PTSD & GERD	78.54%	61.94%
PTSD & Peptic Ulcer Disease	79.81%	63.69%
PTSD & Functional Dyspepsia	92.78%	67.76%
PTSD & Crohn's Disease	81.43%	65.69%
PTSD & Ulcerative Colitis	79.71%	65.69%
PTSD & Diverticular Disease	77.92%	59.38%
PTSD & IBS	82.68%	71.64%
PTSD & Constipation	83.20%	66.83%
PTSD & Nausea/Vomiting	81.56%	65.00%

Recommendations for Practice

Nurses should be aware of the frequent clinical presentation of PTSD, GI disease, and secondary depression or anxiety.

Primary care is the optimal location to screen for all conditions and refer to specialist care as appropriate. Nurses working in mental health or gastroenterology can also improve screenings of these co-occurring conditions in high-risk patients.

APRNs should consider the impact on the GI system when prescribing psychotropic medications.

Recommendations for Practice: Case Example

36-year-old male Veteran w/ dx of PTSD, depression, and IBS

- Failed multiple antidepressant medications due to worsening of IBS symptoms
- Treatment plan included:
  - Probiotic twice daily, to include lactobacillus strain, for IBS and anxiety (Dale, Rassmussen, Asiller, & Lied, 2019; Huang, Ning, Yang, Jia, Fang, Xu, & Tan, 2017; Liu, Walsh, & Sheehan, 2019)
  - Lithium orotate 5mg daily for suicidal ideation (Prousky, 2017)
  - One hour of high intensity exercise daily for depression (Balchin, Linde, Blackhurst, Rauch, & Schonbachler, 2016)
- Results:
  - Per Veteran, "I feel 80% better."
  - Significant improvements in PCL and PHQ9 scores
  - Probiotic alone reduced bowel movements from 10-12 daily to 6-8 daily
  - Sustained improvement at 6 months

Recommendations for Research

A similar study should be performed with a smaller sample size but with data on those with depression and anxiety who do not have PTSD. A multilevel correlation between PTSD, depression, anxiety, and GI disease should be performed, with access to population-level data, in order to control for potential confounding variables in mental health diagnosis.

Previous research identifying depression and anxiety as correlating with GI disease should be reviewed and potentially repeated to account for PTSD as a possible confounding variable.

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