

## BACKGROUND

- Gulf War Illness (GWI) is a chronic poorly understood illness that impacts one-third of Veterans who were deployed to the 1990-1991 Gulf War (GW). Symptoms of GWI include fatigue, pain, cognitive dysfunction, gastrointestinal distress, respiratory and skin problems (Figure 1).
- Gulf War Veterans report greater psychiatric symptoms<sup>1</sup> than non-deployed Gulf War Veterans and greater physical limitations<sup>2</sup> than non-Gulf War Veterans.
- Micronutrients levels may play a role in psychiatric outcomes such as vitamin D3 and vitamin B124 being linked to depression and mental health symptoms.
- Given the high prevalence of mood and mental health symptoms in Gulf War Veterans along with limitations in physical function, we examined the relation between serum micronutrient levels and psychiatric outcomes and physical function in Gulf War Veterans with Gulf War Illness.

## OBJECTIVE

The purpose of this analysis is to examine the relation between psychiatric outcomes, physical limitations and vitamin D and B concentration in Gulf War Veterans with Gulf War Illness.

## METHODS

- Veterans deployed to the Persian Gulf during the 1990-1991 Gulf War are recruited.
- We use the Modified Kansas GWI definition to classify GWI. To meet GWI criteria, Veterans must report multiple mild or at least one moderate-to-severe symptom in three of the six domains: fatigue and sleep problems, pain, neurological/cognitive/mood symptoms, gastrointestinal, respiratory, and skin symptoms (Figure 1).
- Veterans completed web-based questionnaires via Qualtrics<sup>SM</sup>:
  - Modified Kansas questionnaire<sup>5</sup>: to determine GWI status
  - Short-form 36 (SF)<sup>6</sup>: to determine physical function scores
- Veterans completed mood and mental health assessments in a one-on-one interview:
  - Becks Depression Index (BDI): is a 21-question validated self-report inventory for VA Central IRB measuring the severity of depression. Range 0-63.<sup>7</sup>
  - Becks Anxiety Index (BAI): is a 21-item self-report inventory for measuring the severity of clinical anxiety. Range 0-63.<sup>8</sup>
  - Center for Epidemiologic Studies Depression Scale (CESD-R): A 20-item validated self-report inventory for screening for depression.<sup>9</sup> Score <16 indicates no clinical depression.
- Vitamin D, 25-OH, TOTAL, IA (reference range 30-100 ng/mL), Vitamin B12 (reference range 200-1100 pg/mL) and Folate (reference range 2-20 ng/mL) was collected by ExamOne and analyzed by Quest Diagnostics, Inc.
- Data was analyzed using Descriptive Statistics and Pearson's Correlation.

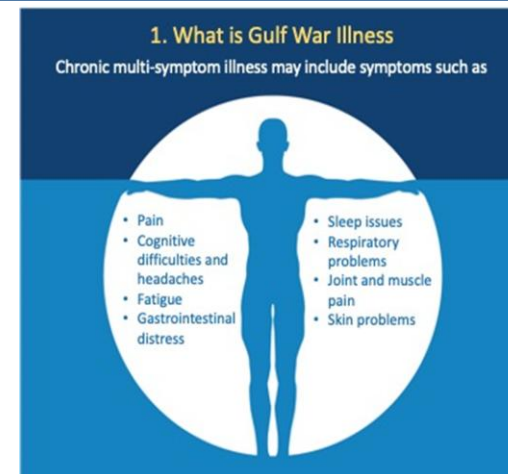


Figure 1: What is Gulf War Illness?

## RESULTS

TABLE 1. Screening Characteristics

	Gulf War Veteran
N (M/F)	50/10
Age (years)	59 ± 5
BMI (kg/m <sup>2</sup> )	33 ± 4

Values are presented as mean ± SD.  
BMI, body mass index

TABLE 2. Micronutrient Panel

	Gulf War Veteran
Vitamin D (ng/mL)	38.2 ± 15.5
Vitamin B12 (pg/mL)	571.56 ± 300.52
Folate (ng/mL)	14.6 ± 6.6

Values are presented as mean ± SD.

TABLE 3. Questionnaire Scores

	Gulf War Veteran
SF-36 Physical Function	56 ± 23
Becks Depression Index	18 ± 14
Becks Anxiety Index	16 ± 1
CESD-R	20 ± 16

Values are presented as mean ± SD.

TABLE 4. Pearson's Correlations

	Vitamin D (ng/mL)	Vitamin B12 (pg/mL)	Folate (ng/mL)
SF-36 Physical Function	0.005	-0.12	.011
Becks Depression Index	-0.16	0.14	-0.23
Becks Anxiety Index	-0.07	0.20	-0.26
CESD-R	-0.13	0.06	-0.34*

\*P<0.05

## RESULTS

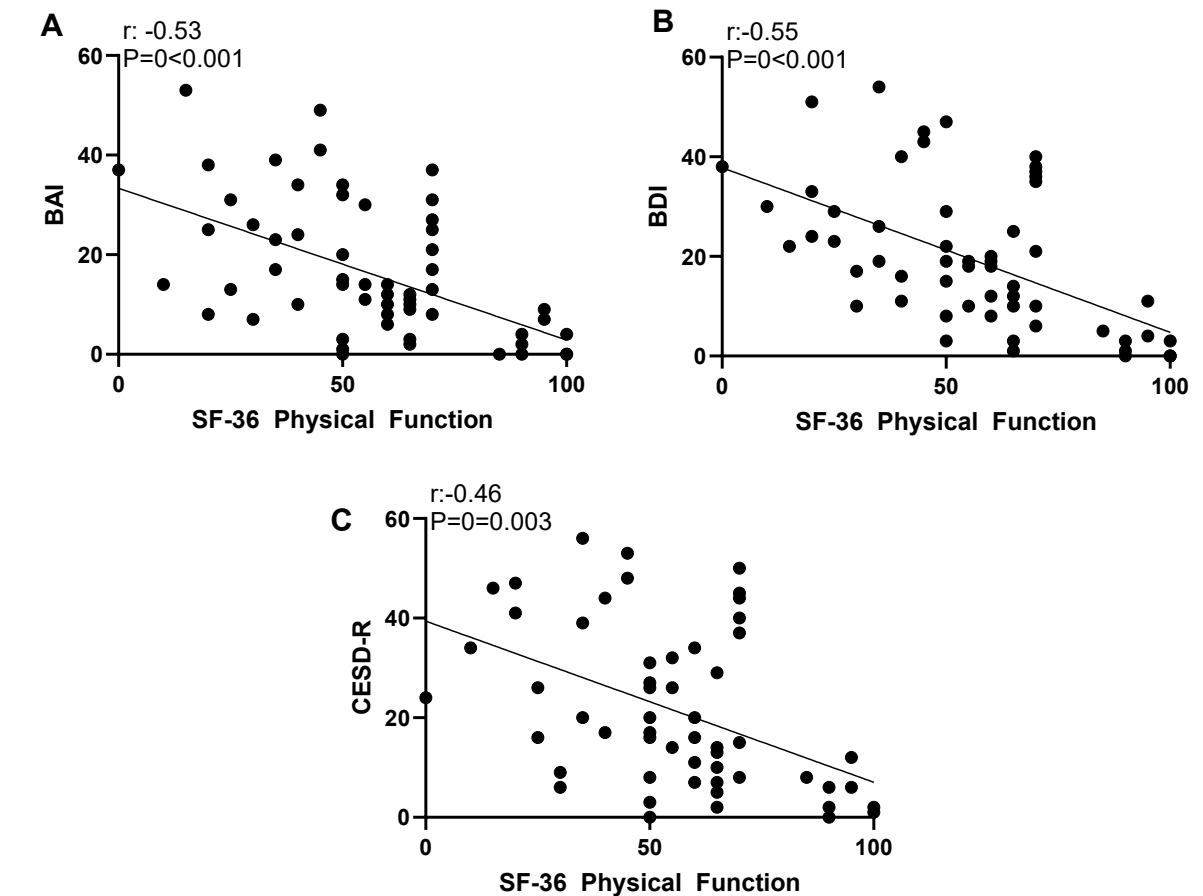


FIGURE 2: A. Those with greater physical function had lower depressive scores (measured with BDI). B. Those with greater physical function had lower anxiety scores (measured with BAI). C. Those with greater physical function had lower depression scores (measured with CESD-R).

## CONCLUSION

- Gulf War Veterans with GWI that had lower folate levels had greater depressive symptoms measured by the CESD-R.
- There was no relation with vitamin D or vitamin B12 and self-reported mood and mental health symptoms as measured by the BDI, BAI and CESD-R.
- Similar to previous findings, we found that those who had greater physical function scores had lower self-report depressive and anxiety scores.
- Evaluating modifiable health behaviors including nutrition and physical functioning, are crucial for Veterans' care, as Gulf War Illness can significantly impact their well-being.

## REFERENCES

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