Low Vitamin D Status and Suicide:  
A Case-Control Study of Active Duty Military Service Members

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KEY POINTS FROM THIS ARTICLE:

1) “Considering that epidemiological studies show that suicide rates in many countries are highest in the spring when vitamin D status is lowest, and that low vitamin D status can affect brain function, we sought to evaluate if a low level of 25-hydroxyvitamin D [25(OH)D] could be a predisposing factor for suicide.”

2) “This is the first study to examine the relationship between vitamin D status and suicide risk.”

3) Vitamin D {25(OH)D} levels were measured in serum samples drawn within 24 months of the suicide. Each verified suicide case (n = 495) was matched to a control (n = 495) by rank, age and sex.

4) “More than 30% of all subjects had 25(OH)D values below 20 ng/mL.”

5) “Risk estimates indicated that subjects in the lowest octile of season-adjusted 25(OH)D (<15.5 ng/mL) had the highest risk of suicide, with subjects in the subsequent higher octiles showing approximately the same level of decreased risk [by about 51%].”

6) “Low vitamin D status is common in active duty service members. The lowest 25(OH)D levels are associated with an increased risk for suicide.”

7) “Among the United States military, suicide has become a critical issue. The increased risk of suicide in areas with less sun exposure, and during the spring when 25-hydroxyvitamin D [25(OH)D] levels are at their lowest, suggests that some seasonally determined factor could increase the risk for suicide.”

8) More than 90% of vitamin D is produced by the effect of sunlight.

9) “25(OH)D is 1-α-hydroxylated in the brain and other tissues [primarily the kidney] to produce an active form, 1,25-dihydroxyvitamin D, which serves as the ligand for vitamin D receptors found in both the cell membrane and nucleus.”

10) Optimal brain function might require a threshold level of 25(OH)D.
11) Vitamin D influences brain function. “Transcription of more than 1,000 genes is known to be under the control of vitamin D, potentially contributing to neurotrophic and neuroprotective effects which could influence suicidal behavior. These transcriptional effects are mediated by nuclear vitamin D receptors (VDR) found in many areas of the brain.”

12) These variables were found not to be a significant suicide risk:
   - Experiences during deployment (i.e., danger of being killed, witnessing death, or engaged in direct combat)
   - Feeling detached
   - Feeling down
   - Feeling depressed
   - Having thoughts about hurting oneself
   - Feeling loss of control
   - Experiencing nightmares
   - Being constantly on guard
   - Intention to seek help for mental health related problems
   - Receiving a referral for mental health treatment

13) “We found that the risk for suicide was increased in the lowest octile of 25(OH)D levels, all the members of which had seasonally adjusted levels of 25(OH)D below 20 ng/mL.”

14) “Vitamin D deficiency is often defined as a level of 25(OH)D below 20 ng/ml, a level not always associated with clinically evident symptoms, but rather with histological evidence of osteomalacia.”

15) “Our finding that more than 30% of active duty personnel had 25(OH)D levels below 20 ng/ml is cause for concern.”

16) Low vitamin D status has been associated with reduced cognitive performance, psychotic-like symptoms, and the subsequent development of depression. Depressive illness is a major risk factor for suicide.

17) Vitamin D deficiency may increase brain inflammatory cytokines, which can reduce serotonergic activity, and which have been associated with suicide.

18) “Military service requirements for protective clothing and night time operations may reduce the opportunity for normal sunlight exposure.”

19) “In a recent study, 25(OH)D levels fell in new recruits after eight weeks of combat training in South Carolina, even though it was summer.”

20) This study shows that many military service members have inadequate levels of 25(OH)D levels.
21) Eliminating vitamin D deficiency in the military may reduce stress fractures and might also have the additional benefit of reducing the risk of suicide.

22) “Studies are urgently needed to develop an appropriate strategy to insure that service members do not suffer ill effects from a preventable deficiency of vitamin D.”

23) “Our findings are observational in character, and hence do not establish a causal role for vitamin D deficiency and suicide. It is possible that sunlight may exert beneficial effects that are independent of vitamin D, as suggested by the fact that light therapy can reduce suicidal ideation in patients with seasonal affective disorder.”