Sleep disturbances among Swedish soldiers after military service abroad

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ABSTRACT

Aims Since 1956, more than 100,000 Swedish soldiers have served abroad on various international missions. The aim of this paper was to determine whether there was a connection between military service abroad and sleep disorders among Swedish soldiers.

Methods The prevalence of sleep disturbances among 1,080 veterans from Kosovo and Afghanistan was compared with almost 27,000 Swedes from a general population sample, using propensity score matching and logistic regression. The sleep disturbances studied were habitual snoring, difficulty inducing sleep (DIS), difficulty maintaining sleep (DMS), early morning awakenings (EMA), and excessive daytime sleepiness (EDS). Insomnia was defined as having at least one of DIS, DMS, or EMA. The covariates used in the matching and adjustments were age, gender, smoking habits, BMI, education, ever having had asthma, moist snuff, and exercise habits.

Results The veterans had a significantly lower prevalence of insomnia (26.2% versus 30.4%) and EDS (22.7% versus 29.4%) compared with a matched group from the reference population, using propensity score matching. Analyses with logistic regression showed that belonging to the military population was related to a lower risk of having DMS (adjusted OR (95% CI) 0.77 (0.64–0.91)), insomnia (OR 0.82 (0.71–0.95)), and EDS (OR 0.74 (0.63–0.86)), whereas no significant difference was found for snoring, DIS, and EMA.

Conclusion Swedish veterans have fewer problems with insomnia and daytime sleepiness than the general Swedish population. The explanation of our findings may be the selection processes involved in becoming a soldier and when sampling personnel for military assignments abroad.
Methodology

Population

The cases in the study population consisted of soldiers and officers who had completed at least one period of military service abroad. Of these, the vast majority (96%) had served either in Afghanistan or in Kosovo. The units were KS13 to KS16, which served in Kosovo from December 2005 to April 2008, and FS15 to FS17, which served in Afghanistan from April 2008 to December 2009. The Swedish Armed Forces Headquarters released the names and addresses of the study participants. The randomization of the soldiers that would be approached and asked to participate was made by the institution’s research administrator to avoid bias. Letters containing information and instructions on how to take part in the study were sent out to the sampled addresses. A reminder in the form of a postcard was sent to the sampled population. Information, as well as a link to the study, was posted on the Fredsbaskrarna (a Swedish veteran organization) Facebook page and in their magazine Fredsbaskern (The Peace Beret).

The data were collected using a web-based system (Webropol, Helsinki, Finland).

Among those eligible for the investigation, 24 subjects were living under a protected identity or had emigrated. One was killed in action, and one had died of natural causes. Thirty-one subjects actively declined to participate. A total of 1080 (56%) were willing to take part in the study. The results were compared with a group of individuals based on a general population of almost 27,000 participants living in Stockholm, Gothenburg, Umeå, or Uppsala who participated in the Global Asthma and Allergy European Network (GA2LEN) study (10).

Questionnaire

The questionnaire consisted of two parts; a copy of the GA2LEN study questionnaire (10) and a part with a more military-focused inquiry. The GA2LEN study is a study in which data on respiratory disease and allergies have been collected from different centres in Europe. Questions of importance to this study were smoking habits, height, weight, date of birth, date of answering the questionnaire, gender, educational level, sleep disturbances, moist snuff, and exercise.

The military part of the questionnaire contained several questions about the participants’ assignments abroad, such as the number of missions abroad, the country of the assignment, whether the participant was deployed in a staff position or spent more of the time serving in the field, and whether the participant spent a considerable time in vehicles—the last-mentioned was important due to the risk of IEDs while travelling in vehicles.

The study was examined and approved by the regional ethics committee in Uppsala (Dnr 2011/344).

Sleep disturbances

Habitual snoring was defined as reported loud and disturbing snoring at least three nights a week (11). Difficulty inducing sleep (DMS) was defined as waking up several times during the night at least three nights a week. Early morning awakenings (EMA) were defined as waking up early in the morning and being unable to go back to sleep at least three nights a week. Insomnia was defined as at least one of DMS, EMA, or EMA (12). Excessive daytime sleepiness (EDS) was defined as having problems with feeling drowsy or sleepy during the daytime at least three days a week (13).

Other variables

Current smoking was defined as an affirmative answer to both ‘Have you smoked one or more cigarettes a day for more than 1 year?’ and ‘Have you smoked at all during the last month?’. An ex-smoker was a person who had stopped smoking at least 1 month ago.

A person who currently used smokeless tobacco gave positive answers to ‘Have you used moist snuff daily for more than 6 months?’ and ‘Do you use moist snuff now?’. A history of asthma was defined as answering yes to the question: ‘Have you ever had asthma?’. Body mass index (BMI) was calculated using self-reported weight and height.

Physical exercise was defined as a physical activity which resulted in sweating or breathlessness, and was divided into three groups: less than twice a week, two to three times a week, and more than three times a week (10).

The different levels of education were also divided into three groups; no university education, university education less than 3 years, and university education 3 years or more.

Statistical calculations

All analyses were performed using STATA software, version intercooled STATA 12 (Stata Corporation, College Station, TX, USA). The prevalence of sleep disturbances was calculated in both groups before and after matching. Every soldier was matched to one person from the reference group. The matching was made with propensity score matching using the psmatch2 command in STATA. One-to-one matching was used, and the covariates used in the matching were age, gender, smoking habits, BMI, education, moist snuff, and exercise habits. Secondary analyses with binomial logistic regression were also made. Chi-square and t test were used in univariate analyses of unmatched data. A p value of <0.05 was considered statistically significant.

Results

The demographic characteristics of both the study population and the control group are shown in Table I. The military population differed from the control group in several respects; they were mostly male, younger, and were less likely to have a history of asthma. They were more likely not to be smokers but used oral tobacco to a greater extent. The veterans exercised more often but at the same time had a higher mean BMI. The military population also had a higher
The prevalence of sleep disturbances in the non-matched and matched populations is presented in Table 2. After propensity score matching, we found that the military population had significantly less insomnia and excessive daytime sleepiness compared with the reference group, whereas no difference was found for habitual snoring, DIS, DMS, and EMA.

Military population

Of those who had taken part in military service abroad, 687 (64.2%) had been in Afghanistan. The prevalence of sleep disturbances in those who had been in Kosovo and Afghanistan was compared in Table 4. There was a trend towards fewer sleep disturbances for those who had been in Afghanistan, but these associations became statistically non-significant after adjustment for potential confounders. No association was found between the number of missions abroad and sleep disturbances.

In those who had been in Afghanistan, we looked at different aspects of their service. Participants who spent a lot of time in vehicles had a higher prevalence of DIS (15.0% versus 8.7%, \( p = 0.04 \)) and a lower prevalence of habitual snoring (13.0% versus 20.4%, \( p = 0.02 \)). No significant differences were found between those who had been in Kosovo and those who had been in Afghanistan.

Table 1. Characteristics of the population before adjustment (% and mean ± SD).

| Characteristic                  | Military (n = 1080) | Control (n = 26,723) | \( p \) value |
|---------------------------------|---------------------|----------------------|--------------|
| Men                             | 89.4                | 45.3                 | <0.0001      |
| Age (per 10 years)              | 36.1 ± 9.9          | 43.8 ± 16.1          | <0.0001      |
| BMI (per 5 units)               | 25.6 ± 3.4          | 24.8 ± 4.4           | <0.0001      |
| Ever having had asthma          | 12.6                | 10.1                 | 0.01         |
| Smoking history                 |                     |                      |              |
| Never                           | 79.0                | 60.6                 |              |
| Ex                              | 14.1                | 25.4                 |              |
| Current                         | 6.9                 | 14.0                 |              |
| Oral tobacco (moist snuff)      | 27.5                | 10.8                 | <0.0001      |
| Educational level               |                     |                      | <0.0001      |
| No university education         | 33.4                | 50.1                 |              |
| University less than 3 years    | 30.7                | 14.0                 |              |
| University 3 years or more      | 35.8                | 35.9                 |              |
| Physical exercise               |                     |                      | <0.0001      |
| Less than twice a week          | 24.6                | 49.3                 |              |
| Two to three times a week       | 40.9                | 32.5                 |              |
| More than three times a week    | 34.6                | 18.2                 |              |

Table 2. Prevalence of sleep disturbances (at least three times a week) before and after propensity score matching* (%).

|                          | Military (n = 1080) | Controls (n = 26,723) | After matching |
|--------------------------|---------------------|-----------------------|---------------|
| Snoring                  | 16.3                | 16.1                  | 16.3          | 14.0 | 0.50 |
| Difficulty inducing sleep| 13.1                | 13.3                  | 13.1          | 11.0 | 0.86 |
| Difficulty maintaining sleep| 15.5              | 27.6                  | 15.6          | 18.5 | 0.11 |
| Early morning awakenings  | 8.7                 | 14.3                  | 8.7           | 11.2 | 0.08 |
| Insomnia                  | 26.2                | 37.3                  | 26.2          | 30.4 | 0.047 |
| Excessive daytime sleepiness| 22.7               | 29.4                  | 22.7          | 27.9 | 0.01 |

*Matched for age, gender, ever having had asthma, body mass index, smoking, oral tobacco, educational level, and physical activity level.

Table 3. Determinants of sleep disturbances. Adjusted odds ratio (95% confidence interval), i.e. for the whole group, veterans, and control group, except in military service abroad.

|                          | Snoring       | DIS           | DMS           | EMA           | Insomnia      | EDS           |
|--------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Military assignment      | 1.0 (0.83–1.19)| 1.10 (0.91–1.34) | 0.77 (0.64–0.91) | 0.89 (0.71–1.11) | 0.82 (0.71–0.95) | 0.74 (0.63–0.86) |
| Women                    | 0.49 (0.45–0.53)| 1.46 (1.35–1.58) | 1.53 (1.44–1.62) | 1.32 (1.23–1.43) | 1.46 (1.38–1.54) | 1.37 (1.30–1.46) |
| Age (per 10 years)       | 1.25 (1.23–1.29)| 0.91 (0.88–0.93) | 1.29 (1.26–1.31) | 1.25 (1.22–1.28) | 1.18 (1.15–1.19) | 0.77 (0.76–0.79) |
| BMI (per 5 units)        | 1.73 (1.66–1.80)| 1.13 (1.09–1.18) | 1.12 (1.09–1.16) | 1.13 (1.09–1.18) | 1.15 (1.08–1.15) | 1.17 (1.14–1.21) |
| Ever having had asthma   | 1.28 (1.15–1.41)| 1.46 (1.34–1.63) | 1.29 (1.19–1.41) | 1.50 (1.36–1.66) | 1.37 (1.27–1.48) | 1.47 (1.36–1.59) |
| Smoking history          |               |               |               |               |               |               |
| Never                    | 1             | 1             | 1             | 1             | 1             | 1             |
| Ex                       | 1.39 (1.27–1.51)| 1.28 (1.17–1.41) | 1.34 (1.25–1.43) | 1.32 (1.21–1.43) | 1.33 (1.25–1.42) | 1.27 (1.19–1.37) |
| Current                  | 1.92 (1.73–2.12)| 2.14 (1.94–2.36) | 1.12 (1.03–1.22) | 1.31 (1.18–1.46) | 1.32 (1.22–1.43) | 1.43 (1.32–1.55) |
| Oral tobacco (moist snuff)| 1.28 (1.15–1.41)| 1.65 (1.48–1.83) | 0.74 (0.67–0.82) | 0.81 (0.72–0.92) | 1.02 (0.94–1.11) | 1.11 (1.02–1.22) |
| Educational level        |               |               |               |               |               |               |
| No university education  | 1             | 1             | 1             | 1             | 1             | 1             |
| University less than 3 years | 0.99 (0.89–1.10)| 0.82 (0.73–0.90) | 1.00 (0.92–1.09) | 0.82 (0.73–0.91) | 0.96 (0.89–1.04) | 1.02 (0.94–1.11) |
| University 3 years or more | 0.93 (0.86–1.01)| 0.73 (0.67–0.80) | 1.07 (1.00–1.14) | 0.80 (0.74–0.87) | 0.95 (0.90–1.01) | 1.03 (0.97–1.10) |
| Physical exercise        |               |               |               |               |               |               |
| Less than twice a week   | 1             | 1             | 1             | 1             | 1             | 1             |
| Two to three times a week | 0.81 (0.75–0.88)| 0.82 (0.76–0.90) | 0.86 (0.80–0.92) | 0.86 (0.80–0.94) | 0.86 (0.81–0.92) | 0.76 (0.71–0.81) |
| More than three times a week| 0.74 (0.66–0.81)| 0.97 (0.88–1.07) | 0.99 (0.92–1.07) | 1.00 (0.90–1.10) | 0.99 (0.92–1.06) | 0.78 (0.72–0.84) |

Adjusted for all the variables in the table and a history of asthma.

DIS = difficulty inducing sleep; DMS = difficulty maintaining sleep; EDS = excessive daytime sleepiness; EMA = early morning awakenings.
Table 3. Prevalence of sleep disturbances (at least three times a week) in subjects who had been assigned to Kosovo and Afghanistan (%) and adjusted odds ratios for having sleep disturbances after having been assigned to Afghanistan compared with assignment to Kosovo.a,b

| Sleep Disturbance                  | Kosovo (n = 369) | Afghanistan (n = 371) | Odds ratio (95% CI) | p value after adjustment |
|-----------------------------------|------------------|-----------------------|---------------------|--------------------------|
| Snoring                           | 19.0             | 13.5                  | 0.82 (0.53–1.26)    | 0.36                     |
| Difficulty inducing sleep         | 11.6             | 11.6                  | 1.01 (0.63–1.63)    | 0.96                     |
| Difficulty maintaining sleep      | 18.8             | 12.9                  | 0.76 (0.50–1.16)    | 0.20                     |
| Early morning awakenings          | 9.0              | 8.4                   | 0.99 (0.58–1.70)    | 0.98                     |
| Insomnia                          | 28.7             | 22.6                  | 0.81 (0.58–1.44)    | 0.23                     |
| Excessive daytime sleepiness      | 24.8             | 22.4                  | 1.01 (0.70–1.45)    | 0.97                     |

aMatched for age, gender, ever having had asthma, body mass index, smoking, oral tobacco, educational level, and physical activity level.
bParticipants who had been on missions to both Kosovo and Afghanistan were omitted from this analysis.

We had no data on the extent to which the Swedish veterans had been involved in combat, which is unfortunate, as combat has been shown to increase the risk of sleeping disturbances (2). Even if the individual veterans had not been involved in combat, the missions in Afghanistan in particular must be regarded as high-risk missions, due to the high IED threat. High-risk missions double the risk of sleeping problems (3), but once again this did not agree with our findings for the Swedish veterans. Another weakness is the lack of questions related to problems with depression, anxiety, or post-traumatic stress syndrome. The choice of control group may also not be ideal. The optimal control group would probably have been soldiers not serving abroad. The validity of our results is therefore dependent on whether or not we managed to account for confounders. It was therefore important that the association between fewer problems with insomnia and EDS in the military population was found when using both propensity score matching and logistic regression. Another strength of our study is that it is fairly large and that we used well-established questions on sleep disturbances that have been used in several international studies (10,13). The order of the questions was also the same in both the military and the control group.

Our conclusion is that Swedish veterans sleep better and experience less daytime sleepiness than the general Swedish population.

The explanation of our findings may be the selection processes involved in becoming a soldier and when sampling personnel for military assignments abroad. Another explanation may be that the Swedish soldiers were much less likely to have taken part in combat than, for example, US veterans. The risk involved in the missions studied in this investigation was therefore lower than in the studies showing an increased prevalence of sleep disturbances among veterans.

Acknowledgements

We acknowledge the contribution from the Swedish GA2LEN centres that provided us with a control group. We also acknowledge the support given by Annica Waleij at FOI.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Funding information

The Swedish GA2LEN study was carried out as part of the GA2LEN survey and follow-up, and was supported by the EU FP6 project GA2LEN (EU contract no. FOOD-CT-2004-506378), the Centre for Allergy Research at Karolinska Institutet, the Swedish Heart Lung Foundation, the Swedish Heart and Lung Association, and the Swedish Asthma and Allergy Association.

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