

Asthma and Psychiatric Disorders in Male Army Recruits and Soldiers

Raffi Lev-Tzion MD^{1,3}, Tal Friedman MD³, Tzippy Shochat MSc³, Eliyahu Gazala MD MPH^{2,3} and Yonit Wohl MD³

¹Division of Pediatrics, Soroka University Hospital and ²Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer Sheva, Israel

³Medical Corps, Israel Defense Forces, Israel

Key words: asthma, psychiatric disorders, army, stress, personality disorders, reactive adjustment disorder, dyspnea-fear theory of panic

Abstract

Background: Numerous studies have shown an association between asthma and mental disorders. While elevated rates of asthma have been noted among psychiatric patients with anxiety disorders and post-traumatic stress disorder, several studies have found elevated rates of mental disorders among asthma patients. Such studies, however, have generally relied upon questionnaires and assessment by non-specialist physicians to diagnose mental disorders and asthma.

Objectives: To examine a possible association between asthma and psychiatric diagnoses in Israeli military recruits and soldiers.

Methods: In this cross-sectional study we compared the prevalence of mental diagnoses in asthmatic recruits and soldiers with that in non-asthmatic recruits and soldiers. A total of 195,903 recruits and soldiers were examined by Israel Defense Forces recruiting offices and fitness boards. Diagnoses of asthma were based on a pulmonologist's diagnosis, including spirometry at rest and exercise testing as indicated; diagnoses of mental disorders were based on examination by a psychiatrist.

Results: The prevalence of asthma was found to be 7.8% (current) and 9.8% (lifetime). The prevalence of mental disorders was 13.4%. Current asthma was associated with an increased likelihood of any mental disorder (OR = 1.20, 95% CI = 1.15–1.26), and specifically with mood and anxiety disorders (1.31, 1.19–1.46), introvert personality disorders (1.20, 1.12–1.28) and adjustment disorder (1.43, 1.26–1.62). Lifetime asthma was associated with an increased likelihood of the same disorders, but the association was not as powerful.

Conclusions: The results validate the previously documented association between asthma and mental disorders, using a sample of unprecedented size and improved methodology. A multidisciplinary approach to asthma that incorporates mental health professionals in the treatment of poorly controlled asthma and perhaps of asthma in general is recommended.

IMAJ 2007;9:361–364

Numerous studies have shown an association between asthma and mental disorders. On the one hand, elevated rates of asthma have been noted among psychiatric patients with anxiety disorders and post-traumatic stress disorder [1]. On the other hand, several studies have found elevated rates of mental disorders among asthma patients of various ages. Ortega and co-workers [2] found higher rates of social phobia, separation anxiety disorder, and overanxious disorder among youths with asthma compared to youths without asthma and youths with other chronic medical illnesses. Goodwin et al. [3-5] recently published a number of studies examining the

relationship between asthma and mental disorders among adults. In two studies dealing with populations seeking primary care [4,5], the investigators used psychiatric questionnaires (PRIME-MD PHQ in an American population and GHS-MHS in a German population) to diagnose common mental disorders, and a physician's examination or medical records to obtain asthma diagnoses. The American study, whose sample consisted of randomly chosen adult patients from a general medical practice waiting room, found an increased likelihood of panic attack and suicidal ideation among asthmatics. The German study, whose sample consisted of a random sampling of adults from population registries in Germany, also found asthma to be associated with a number of mental disorders, including anxiety disorders, phobias, panic attacks/disorder, somatoform disorder and bipolar disorder.

In Israel, all 17 year old Israeli nationals are required by law to appear at the Israel Defense Forces recruiting office for medical examination; the recruited soldiers are closely followed during their service, with ready access to specialist care and records of all diagnoses made by military fitness boards. Thus, the population of military recruits provides an extremely large sample of individuals whose diagnoses of asthma and mental disease have been made by specialists. This contrasts with previous studies that relied on numerous diagnostic methods, including self-report diagnoses [3,6,7], mental health questionnaires [3,4], examination by non-pulmonologists, and medical records to diagnose asthma. In addition, the military environment tends to be both physically and mentally stressful for recruits, a fact that has implications for mental disease as well as asthma. Our aim was to determine possible associations between asthma and psychiatric diagnoses in Israeli military recruits and soldiers.

Patients and Methods

We included in the current study all male recruits to the Israel Defense Forces during the course of the study period (the length of which cannot be disclosed due to IDF security constraints). Female recruits were excluded because of their slightly different medical assessment process, which would harbor different confounding factors. A total of 195,903 male subjects were examined during the study period. We obtained diagnoses of asthma and mental disorders from the IDF database, including all diagnoses made during the study period. We defined two separate diagnostic phases:

- Recruits were diagnosed in the recruiting office or in an

IDF = Israel Defense Forces

affiliated clinic as part of the initial army fitness determination, a screening process (described below) aimed at diagnosing all significant illnesses.

- Soldiers who developed asthma or mental illness after the initial recruit examination were diagnosed in army or army-affiliated clinics; this process was activated in response to specific patient complaints, as all soldiers had already been screened in phase 1 as new recruits.

Asthma [8]

A medical history was obtained from the family physicians of most recruits. In addition, the subjects were asked specifically whether they had ever been diagnosed as having asthma, and whether they had ever suffered from recurrent wheezing, exercise-induced cough or wheezing, or nocturnal cough. The possibility of asthma in the past or present, as indicated by a positive history of asthma from the family physician or a positive reply to any of these questions, resulted in referral to a pulmonologist for a second examination. Subjects were instructed not to take any asthma medication on the day of the second examination. This examination included a further detailed history, physical examination, and spirometry at rest. All subjects, except those with overt clinical signs and spirometric evidence of severe airway obstruction, also underwent exercise testing. The exercise test comprised 6 minutes of treadmill running at a speed of 5 km/hour at an incline of 10° while breathing room air (22°C, 50% relative humidity). Pulmonary function was measured 5 and 10 minutes after exercise to determine the percentage of fall in forced expiratory function in the first second.

Recruits with no evidence of past and/or present asthma were not assigned to a disease category. Recruits with past asthma were assigned to disease category A, which is defined as asthma in total clinical remission for at least 3 years with normal spirometry ($FEV_1 > 80\%$ of predicted) and normal exercise testing (fall in FEV_1 of less than 10%). Recruits with present asthma were assigned to disease categories B-F, based on asthma severity; the last two categories label the recruit as unfit for service.

Psychiatric disorders

As previously mentioned, medical history was obtained from the family physicians of most recruits; all recruits were additionally subjected to a semi-structured medical interview and physical examination by a military physician, as well as a psychotechnic interview by a trained examiner. Suspicion of psychopathology that arose at any of these stages resulted in referral to a psychiatrist. Subjects with a history of adjustment difficulties underwent an intermediary stage of screening by an army mental health officer (psychologist or social worker), who also referred recruits with suspected psychopathology to a psychiatrist. Psychiatric examination resulted in one of two conclusions: no psychiatric diagnosis, or a psychiatric diagnosis and army fitness category, in accordance with severity of illness.

With regard to psychiatric disease categories, we used the IDF categories of mental illness, which are largely based on ICD-10

and DSM-IV categories, with the exception of personality disorders, which consist of specific traditional disorders as well as two large clusters: "Introvert Personality Disorders" and "Extrovert Personality Disorders." These will be defined below. For the purpose of the study, we examined most of the IDF mental illness categories, according to the following list:

- Psychotic Disorders
- Mood and Anxiety Disorders
- Major Affective Disorders
- Somatoform Disorders
- Eating Disorders
- Introvert Personality Disorders: Avoidant, Dependent, Obsessive-Compulsive, Schizoid, Not Otherwise Specified
- Extrovert Personality Disorders: Narcissistic, Histrionic, Borderline
- Disocial/Antisocial/Impulse Control Disorder
- Schizotypal or Paranoid Personality Disorder
- Reactive Adjustment Disorder

It should be emphasized here that the vast majority of army-diagnosed mental illnesses were included, but a number of diagnoses with potential confounding factors were not included, most notably: organic mental disorders post-traumatic stress disorder, and enuresis nocturna.

Statistical analysis

The prevalence of asthma and the above mental disorders was determined from the IDF database. The prevalence of mental disorders was compared between asthmatic recruits and soldiers and non-asthmatic recruits and soldiers; and the group of asthmatics was further broken down into two groups: present and past asthma. Associations were computed using the chi-square test; P values < 0.05 were considered to be significant. In addition, odds ratio was calculated for the significant associations. Statistical analysis was carried out with the SAS software package.

Results

Prevalence

The prevalence of asthma was found to be 7.8% (current) and 9.8% (lifetime), which is somewhat lower than previous prevalence rates in Israel [9], but fairly similar to American rates [10]. The prevalence of mental disorders was 13.4%. The prevalence of the various asthma severity categories is summarized in Table 1, and of the various psychiatric diagnoses in Table 2.

Association between asthma and mental disorders

Current active asthma was associated with an increased likelihood of any mental disorder (OR = 1.20, 95% CI = 1.15–1.26), and specifically with mood and anxiety disorders (1.31, 1.19–1.46), introvert personality disorders (1.20, 1.12–1.28) and adjustment disorder (1.43, 1.26–1.62).

Lifetime asthma was associated with an increased likelihood of

OR = odds ratio

CI = confidence interval

Table 1. Asthma prevalence in recruits and soldiers by severity category

Asthma severity category	N (%)
No asthma	176,692 (90.2%)
A: Clinical remission of > 3 yrs	3,952 (2.0%)
B: Rare and mild attacks of dyspnea with normal spirometry and exercise testing	7,181 (3.7%)
C: Mild asthma with mildly impaired spirometry or mild-moderate airway hyper-reactivity	6,749 (3.5%)
D: Active asthma with frequent attacks, moderately impaired spirometry or severe airway hyper-reactivity	1,323 (0.7%)
E: Severe asthma during initial therapeutic trial	0 (0)
F: Severe asthma unresponsive to therapy, severely impaired spirometry or history of near-fatal asthma	6 (0)
Total	19,211 (9.8%)

The precise definitions of asthma fitness categories have since been altered; the study uses the definitions that were valid during the study period

Table 2. Prevalence of psychiatric disorders in recruits and soldiers

Diagnosis	N (%)
No psychiatric disorder	169,621 (86.6%)
Psychotic disorders	354 (0.2%)
Mood and anxiety disorders	4,278 (2.2%)
Major affective disorders	355 (0.2%)
Somatoform disorders	130 (0.07%)
Eating disorders	49 (0.03%)
Introvert personality disorders	11,084 (5.7%)
Extrovert personality disorders	9,031 (4.6%)
Disocial/Antisocial/Impulse control disorder	721 (0.4%)
Schizotypal or paranoid personality disorder	65 (0.03%)
Reactive adjustment disorder	2,599 (1.3%)
Total	26,282 (13.4%)

Table 3. Psychiatric disorders (rates and odds ratios) among army recruits and soldiers

Mental disorders	No asthma (n=176,692)	Lifetime asthma (n=19,211)			No current asthma (n=156,723)	Current asthma (n=12,898)			P	95% CI
		OR	95% CI	OR		95% CI				
Any psychiatric disorder	13.3	14.7	1.12	1.08–1.17	13.2	15.5	1.20	< 0.0001	1.15–1.26	
Psychotic disorder	0.2	0.2	NS	NS	0.2	0.2	NS	NS	NS	
Mood and anxiety disorder	2.1	2.6	1.22	1.11–1.34	2.1	2.8	1.31	< 0.0001	1.19–1.46	
Major affective disorder	0.2	0.2	NS	NS	0.2	0.2	NS	NS	NS	
Somatoform disorder	0.1	0.1	NS	NS	0.1	0.1	NS	NS	NS	
Eating disorder	0.02	0.03	NS	NS	0.02	0.04	NS	NS	NS	
Introvert personality disorder	5.6	6.1	1.10	1.04–1.17	5.6	6.6	1.20	0.002	1.12–1.28	
Extrovert personality disorder	4.6	4.8	NS	NS	4.6	5.0	1.09	NS	1.01–1.17	
Disocial/Antisocial/Impulse control disorder	0.4	0.3	NS	NS	0.4	0.3	0.70	NS	0.50–0.96	
Schizotypal/Paranoid personality disorder	0.03	0.03	NS	NS	0.03	0.03	NS	NS	NS	
Reactive adjustment disorder	1.3	1.7	1.36	1.21–1.53	1.3	1.8	1.43	< 0.0001	1.26–1.61	

the same disorders, but the association was weaker, as follows: any mental disorder (OR = 1.12, 95% CI = 1.08–1.17), mood and anxiety disorders (1.22, 1.11–1.34), introvert personality disorders (1.10, 1.04–1.17) and adjustment disorder (1.36, 1.21–1.53) [Table 3].

Discussion

The data presented are consistent with previous findings, which suggested an association between asthma and a spectrum of mental disorders, primarily affective and anxiety disorders. Although the associations are not extremely strong (odds ratios in positive associations all less than 2.0), the current study has a number of important strengths. The major advantage is the improved methodology of assessment (use of specialists and objective spirometry exams) and an extremely large sample size. In addition, the current study extends the previous data to include personality disorders and reactive adjustment disorder. We believe that the military context provides another advantage to the current study: it examines not only the baseline mental pathology of 17 year old males, but also exposes latent mental disease in subjects who develop adjustment disorder or decompensation of well-compensated and undiagnosed personality traits when exposed to the stress of army conscription or service.

Before discussing possible reasons for the association and the clinical application of these findings, the incidence of psychiatric disorders found in our study (13.4%) must be emphasized. Questionnaire-based studies of the prevalence of mental disorders in children and adolescents in Britain, Canada and Switzerland found similar figures [11–13]. Regarding military populations, the prevalence is highly variable. Although prevalence rates are unavailable for the United States Army, the percentage of the military population that annually receives services for mental disorders is 6% [14]. The obvious difference between the two armies is the fact that service in the Israel Defense Forces is compulsory, while the U.S. military is a volunteer force. Thus, the current study includes the results of the examination of all conscripted males – including those ultimately found to be unfit for service. A more relevant comparison, then, would be a comparison with a country in which

military service is compulsory. In Norway, for example, a questionnaire-based study found that 48% of army conscripts suffer from mental disease [15]. Considering the fact that the Israeli military engages in constant combat activity and thus service is expected to be much more stressful than Norwegian peacetime service, our figure of 13.4% appears to be remarkably low.

Numerous explanations have been proposed for the association between asthma and mental disorders. The consistent association of asthma with anxiety disorders and panic attacks/panic disorder

has led to the dyspnea-fear theory of panic, which holds that in a subgroup of panic patients a non-pathological pulmonary obstructive component may induce dyspnea, dyspneic fear and, ultimately, panic. It is possible that the presence of a chronic stressful and potentially life-threatening disease such as asthma may increase worry and anxiety. In addition, asthmatics are likely to experience greater fear in the context of panic attack-perceived dyspnea than are non-asthmatic patients [16].

The association between asthma and introvert personality disorder and a reactive adjustment disorder is consistent with studies linking shyness and behavioral inhibition with a higher incidence of hay fever in subjects and their families [17]. It is possible that certain chronic illnesses cause, over time, patterns of socially avoidant behavior and general difficulty in adjusting to stressful situations. Alternatively, external environmental or genetic factors may cause increased susceptibility to both asthma and mental disorder. The authors of a Finnish study examining the relationship between atopic disorders and depression in a large sample of monozygotic and dizygotic twin pairs estimated that 64% of the association was due to shared familial vulnerability [18].

Conclusions

In this study we validated the previously documented association between asthma and mental disorders using pulmonologist-diagnosed asthma and psychiatrist-diagnosed mental disorders to examine a sample of unprecedented size. Although the strength of the associations in our study does not appear to indicate a need for special psychiatric screening of all asthmatics, our findings may indicate an elevated vulnerability to certain psychiatric disorders among asthma patients. The result could be an elevated index of suspicion for mental disease when confronted with hints of such pathology, or perhaps a multidisciplinary approach to asthma that incorporates mental health professionals in the treatment of poorly controlled asthma. The association between psychological disorders and fatal or near-fatal asthma should also be noted here [19-21]. Although it has yet to be conclusively proven that psychological disorders cause elevated risk of fatal or near-fatal asthma attacks [22], the association shown in numerous studies along with the findings of the current study should prompt physicians to seek such pathology and treat it when found in asthma patients, as an adjunct to the conventional therapies implemented in order to prevent asthma attacks and fatalities. Although the implications of our findings in the military setting are beyond the scope of this discussion, they deserve careful consideration and should not be overlooked.

References

1. Koltek M, Wilkes TC, Atkinson M. The prevalence of posttraumatic stress disorder in an adolescent inpatient unit. *Can J Psychiatry* 1998;43:64-8.
2. Ortega AN, Huertas SE, Canino G, Ramirez R, Rubio-Stipec M. Childhood asthma, chronic illness, and psychiatric disorders. *J Nerv Ment Dis* 2002;190:275-81.
3. Goodwin RD, Pine DS. Respiratory disease and panic attacks among adults in the United States. *Chest* 2002;122:645-50.
4. Goodwin RD, Olfson M, Shea S, et al. Asthma and mental disorders in primary care. *Gen Hosp Psychiatry* 2003;25:479-83.
5. Goodwin RD, Jacobi F, Thefeld W. Mental disorders and asthma in the community. *Arch Gen Psychiatry* 2003;60:1125-30.
6. Carr RE. Panic disorder and asthma: causes, effects and research implications. *J Psychosom Res* 1998;44:43-52.
7. Yellowlees PM, Alpers JH, Bowden JJ, Bryant GD, Ruffin RE. Psychiatric morbidity in patients with chronic airflow obstruction. *Med J Aust* 1987;146:305-7.
8. Katz I, Moshe S, Sosna J, Baum GL, Fink G, Shemer J. The occurrence, recrudescence, and worsening of asthma in a population of young adults: impact of varying type of occupation. *Chest* 1999;116:614-18.
9. Shohat T, Golan G, Tamir R, et al. Prevalence of asthma in 13-14 yr-old schoolchildren across Israel. *Eur Respir J* 2000;15:725-9.
10. Self-reported asthma prevalence among adults - US, 2000. *MMWR Morb Mortal Wkly Rep* 2001;50:682.
11. Ford T, Goodman R, Meltzer H. The British child and adolescent mental health survey 1999: the prevalence of DSM-IV disorders. *J Am Acad Child Adolesc Psychiatry* 2003;42:1203-11.
12. Romano E, Tremblay RE, Vitaro F, Zoccolillo M, Pagani L. Prevalence of psychiatric diagnoses and the role of perceived impairment: findings from an adolescent community sample. *J Child Psychol Psychiatry* 2001;42:451-61.
13. Steinhausen HC, Metzke CW, Meier M, Kannenberg R. Prevalence of child and adolescent psychiatric disorders: the Zurich epidemiological study. *Acta Psychiatr Scand* 1998;98:262-71.
14. Hoge CW, Lesikar SE, Guerara R, et al. Mental disorders among US military personnel in the 1990s: association with high levels of health care utilization and early military attrition. *Am J Psychiatry* 2002;159:1576-83.
15. Schei E. A strengthening experience? Mental distress during military service. A study of Norwegian army conscripts. *Soc Psychiatry Psychiatr Epidemiol* 1994;29:40-5.
16. Ley R. Pulmonary function and dyspnea/suffocation theory of panic. *J Behav Ther Exp Psychiatry* 1998;29:1-11.
17. Bell IR, Jasnoski ML, Kagan J, King DS. Is allergic rhinitis more frequent in young adults with extreme shyness? A preliminary survey. *Psychosom Med* 1990;52:517-25.
18. Wamboldt MZ, Hewitt JK, Schmitz S, et al. Familial association between allergic disorders and depression in adult Finnish twins. *Am J Med Genet* 2000;96:146-53.
19. Campbell DA, Gluyas PA, Latimer KM, et al. Psychiatric and medical features of near fatal asthma. *Thorax* 1995;50:254-9.
20. Mohan G, Harrison BD, Badminton RM, Mildenhall S, Wareham NJ. A confidential enquiry into deaths caused by asthma in an English health region: implications for general practice. *Br J Gen Pract* 1996;46:529-32.
21. Kolbe J, Fergusson W, Vamos M, Garrel J. Case-control study of severe life-threatening asthma in adults: psychological factors. *Thorax* 2002;57:317-22.
22. Alvarez GG, Fitzgerald JM. A systematic review of the psychological risk factors associated with near fatal asthma or fatal asthma. *Respiration* 2007;74:228-36.

Correspondence: Dr. R. Lev-Tzion, Dept. of Pediatrics D, Soroka University Hospital, P.O. Box 151, Beer Sheva 84101, Israel.
Phone: (972-8) 640-0179
Fax: (972-8) 640-0736
email: shirafi@netvision.net.il