

Asthma in the military. An evaluation of asthma morbidity and the standard of care at an Australian Defence Force establishment ¹

by
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The 6 RAAF Hospital Morbidity Study (1993-94).¹ was designed to document the morbidity of a population of service personnel by analysing the presenting problems of 1,807 consecutive consultations.

The study generated some interest in morbidity in the Australian Defence Force (ADF) and it was decided to ascertain the impact of a common medical problem on service personnel and to evaluate the standard of medical care provided in relation to that condition.

Asthma was selected for the following reasons:

- It is a significant health problem, occurring in 8% of the Australian adult population² and results in much time lost from work, hospital admissions and a number of deaths in the Australian community each year.
- Despite careful recruitment screening, it was a common cause for presentation at the Outpatients Department at 6 RAAF Hospital.¹
- A 'gold standard' - the Asthma Management Plan (AMP),³ has been established so it is possible to ascertain the standard of care provided at a Defence Force establishment in comparison to that recommended by the AMP.

Asthma in the Military

An exacerbation of asthma may occur at a time of physical or psychological stress- conditions common in a military environment, and as such, has long been a reason for rejection for military service.

The U.S. Navy directs that any candidate with asthma after their 12th birthday should be rejected.⁴ The British Army will not accept any applicant who required treatment for asthma or wheezy bronchitis in the previous four years.⁵ Candidates with a history of wheezing at an earlier age are assessed by a respiratory physician and if a bronchial challenge test is positive, they are rejected.

The Australian Defence Force, in their Recruit Medical Procedures document,⁶ requires that any applicant with a history of asthma in the last three years be rejected. Those wishing to train as aircrew, divers or submariners must be symptom-free and off medication for three years. In addition, an assessment from a respiratory physician is mandatory. For spray painters and aircraft life support fitters, a history of asthma disqualifies, irrespective of the symptom-free period. Pain stated that in doubtful cases, in the interest of all concerned, the bias should be for rejection.⁷

Aims of Study

The aims of the study were to:

1. Determine the degree of morbidity experienced by ADF members with asthma, what factors precipitate an attack, the degree of incapacity experienced and the effect of asthma on their deployability.

2. Evaluate the quality of patient education, by inquiring about the patients' understanding of asthma, its pathophysiology and medications they have been prescribed.
3. Ascertain the degree of asthma control achieved as revealed by current respiratory function tests, patients' assessment of their condition, emergency visits, sick leave granted and hospital admissions relating to asthma.
4. Review documentation in the medical history relating to asthma.

Method

Approval was first obtained from the Australian Defence Medical Ethics Committee.

A letter was then written to all general practitioners working at 6 RAAF Hospital asking them to invite their asthmatic patients to join the study. It was stressed that this exercise was to be undertaken to ascertain the severity of asthma in the ADF and evaluate management with a view to optimising quality of care. The letter was accompanied by a Plain Language Statement for distribution to patients. In addition, doctors were urged to emphasise that all matters discussed with the assessor would remain confidential and that no entry would be made on the medical documents. In all but one case-patients accepted the invitation.

Participating patients presented to the author and all agreed to sign a consent form. They were then asked to complete a 25 part questionnaire, the questions being based on the Asthma Management Handbook.⁸ The assessor was on hand to clarify any question.

At the interview, respiratory function tests, both before and after bronchodilatation with salbutamol, were performed in accordance with recommendations of Pierce and Johns.⁹

The medical documents were examined. As there is no time restraints on ADF doctors, it is to be expected that notes should be full and comprehensive.

The following information was extracted for the preceding 12 month period:

- number of visits concerning asthma;
- record of peak flow or respiratory function tests;
- documentation of a personalized asthma management plan;
- work absences or hospitalization for asthma; and
- specialist assessment for asthma at some previous time and whether a provocative challenge had been performed.

It is conceded that members may have felt that if they were truthful regarding their asthma their careers could be jeopardised. The Plain Language Statement explained that all information provided is confidential and that no entry would be made on the medical documents. These points were reinforced at interview.

The results were collated and analysed. Confidence Intervals for proportions were calculated using the Exact Method. Where indicated, percentage response and values were also derived.

In order to quantify the results, acceptable answers to the six questions in which scoring was possible were constructed using the AMP handbook and standard respiratory medicine texts. Marks were awarded according to the degree of accuracy of the answers provided.

Questions so quantified were:

- what do you understand by the term asthma?
- what do you think happens in an asthma attack?
- what is the value of peak flow meter?
- how do you manage an attack?

- what are the actions of drugs used in asthma?
- when do you take your drugs?

Results of Survey Questionnaire

There were ten females and thirty-six males in the study, which is consistent with the patient population of 75% males on the Base. The ages ranged from 18-55 years. The results were collated and analysed.

Unlike community practice, co-morbidity was low. Only 15 patients required non-asthma medications and of these, eight took treatment for the related condition of hay fever.

Demographic Aspects

Family History

Thirty nine percent reported a family history of first degree relatives with asthma. In three cases, the members were adopted and were unaware of their parents' health.

There is no support to the premise that a positive family history leads to early diagnosis ($p=1.00$).

It was thought that a positive family history may result in a better understanding of the disease; however, the results were similar in both groups ($p=1.00$).

Age of Onset

Age (Years)	Percentage of Patients
0-10	13 (5-26)
11-20	17 (7-31)
21-30	37 (23-52)
31-40	24 (13-39)
41 -	7 (1-18)
Unknown	2

Table1: Age of onset of asthma symptoms. ¹

Interval (Years)	Percentage of Patients
Less than 1	63 (48-73)
1-2	4 (1-15)
2-5	9 (2-21)
6-10	13 (5-26)
11-14	2 (0-12)
15-20	2 (0-12)
Greater than 20	7 (1-18)

Table 2: Time to diagnosis from onset of symptoms

The mean age of onset of asthma in this group was 24.8 years (median=27). 61% were first noted to have asthma between the ages of 21 and 40 years (Table 1). 63% were diagnosed within one year of onset of symptoms (Table 2).

Atopy

Twenty-seven patients reported a history of hay fever, various allergies or eczema, with hay fever (allergic rhinitis) being the most common problem (Table 3). Some patients had more than one complaint.

Complaint	No.	Percentage of Patients
Hay Fever	26	57 (81-100)
Allergy	9	20 (17-54)
Eczema	4	9 (4-34)

Table 3: Associated atopic complaints

Associated Morbidity

- Non-asthma medications – apart from seven patients frequently prescribed antihistamines, only eight others were taking regular medication, three of whom were using lipid-lowering drugs.
- Nasal symptoms – forty-six per cent complained of persisting nasal symptoms of which the majority identified high fever as their major concern.

Precipitating Factors

The major trigger factors precipitating an asthma attack were exercise and weather change (Table 4).

Precipitating Factor	Percentage of Patients
Exercise	61 (45-75)
Weather change	57 (41-71)
Exposure to irritants	35 (21-50)
Pollens	28 (16-43)
Respiratory Infections	26 (14-41)
Dust Mites	17 (8-31)
Exposure to chemicals	15 (6-29)
Emotion	13 (5-26)
Food additives	11 (3-24)
Gastric reflux	9 (2-21)
Animals	7 (1-18)
Foods	7 (1-18)
Drugs	2 (0-12)

Table 4: Precipitating factors

Significance of Smoking

Only seven patients (15%, CI 6-29) were currently smoking. All but one smoker described two or more symptoms. Five stated that symptoms occurred only occasionally, one experienced symptom each day and one on most days.

Presenting Symptoms

Eleven patients (24%, CI 13-39), experienced only one symptom of asthma, 26 (56%), complained of two, and only nine (20%), reported more than two symptoms. The two principal symptoms were shortness of breath and wheeze (Table 5).

Symptom	Percentage
Short of breath	63 (48-77)
Wheeze	63 (48-77)
Chest tightness	41 (27-57)
Cough	28 (16-43)

Table 5: Presenting symptoms

Severity of Asthma

Thirty-seven patients (80%) thought their asthma was mild, and only two considered it severe (Table 6).

Severity Change

Twenty-six patients (56%), considered their asthma unchanged in the past two years. 22% thought it had worsened and the same number that it had improved.

Severity	Percentage of patients
Mild	80 (66-94)

Mild-moderate	7 (1-18)
Moderate	9 (2-21)
Severe	4 (1-15)

Table 6: Patient's assessment of the overall severity of their asthma

Limiting Activity

It is interesting that only 27 patients (59%), stated that asthma reduced their exercise tolerance.

Work Absence in the Last 12 Months

Only four members lost any time from work due to asthma. This comprised 4,7,8,15 days. The overall average sick leave taken by the group was 0.81 days per year. The cohort compared favourably with the Base average of 1.67 days lost through sickness.

Frequency of Symptoms

Frequency	Percentage of patients
Never	0 (0)
Occasionally (mild)	83 (69-92)
Most days	13 (5-26)
Every day (sever)	4 (1-15)

Table 7: Frequency of symptoms

Emergency Room Visits

Only five patients (11%), had attended an emergency facility for treatment of their asthma in the last 12 months. All but one had mild asthma with infrequent symptoms

Duration of Attack Post Beta Agonist.

Self-administration of beta-agonist in an attack provided symptomatic improvement within 30 minutes in 24 patients (52%). A further 13% did not receive relief until one hour of the first symptoms; whilst in the remaining 34% symptoms lasted for one hour. However, in only eight patients, did symptoms persist more than two hours (Table 8).

Duration	Percentage of patients
0-15 m	39 (25-55)
15-30 m	13 (25-26)
30-60 m	13 (25-26)
1-2 hr	11 (4-24)
2 -24hr	9 (2-21)
>24hr	9 (2-21)
Till nebulized salbutamol	2 (0-12)
No attack 4 yrs.	2 (0-12)
No B-agonist, attack 30m	2 (0-12)

Table 8: Duration of attack post-B-agonist

Management of Asthma Prevention

Influenza Vaccine

Nine patients (19%), received influenza vaccine in the 12 months prior to the survey. This included all patients in the moderate and severe categories.

Drugs used routinely in the prevention of asthma

Consistent with the mild nature of asthma in the ADF, it was found that 10 patients (22%) did not consider it necessary to use prophylactic medication. Inhaled corticosteroids (ICS), were used on a regular basis by 25 patients (54%), whilst nine used salbutamol either alone or in combination with res.

Drugs used prior to a known provocative stimulus (such as exercise)

Fifteen patients used salbutamol for this purpose and one an antihistamine.

Relief

Drugs used to relieve an attack

All patients reported their medications were effective in arresting an acute attack. In four cases, drugs were unnecessary in 1997.

All patients used inhaled short-acting beta-agonists and in two cases this was supplemented by res. Fifty-two per cent said their symptoms were relieved in 30 minutes of using a beta-agonist. One member inhaled cromoglycate whilst one severe asthmatic required daily prednisolone.

In patients where management was suboptimal; that is, did not conform with the AMP Guidelines, 29% responded to treatment within 30 minutes of the outset of an attack.

Other measures used in an acute attack and their effectiveness.

As is the case in many chronic diseases, alternative therapies are popular with asthmatics, but their effectiveness is difficult to evaluate due to the placebo effect. Twelve patients employed non-prescribed measures. Anxiety plays a major role in an asthmatic attack and four patients found rest beneficial, whilst another four attempted to control their breathing. Three reported that steam was helpful. This is to be expected as dry air irritates the bronchial mucosa and in some cases precipitates an attack. It is interesting that one member found relief by applying oil prescribed by a naturopath to his chest. Another member said his asthma improved after learning to play the trumpet. In the 12 patients who employed self-initiated measures, all declared that they were effective.

Appropriateness of Medication

In accordance with current recommendations, no patient has prescribed theophylline preparations. In only one case had prednisolone been given. All other cases were managed with ICS and beta-agonists either alone or in combination apart from one patient who used cromoglycate and another, a combination of beta-agonist and an antihistamine.

With respect to comorbidity, no patients were prescribed drugs that enhanced bronchial constriction or hyperreactivity such as beta-blockers, aspirin or NSAIDs.

Monitoring Lung Function

The AMP states that in patients with a forced expiratory volume in one second (FEV1) of less than 80% of the predicted value and in those where the initial measurement increases by 15% after bronchodilatation, intensive medication is indicated to reduce airways inflammation and reverse obstruction.

Using these criteria at the time of assessment, it was noted that five patients had suboptimal FEV1s and in three cases FEV1 increased by more than 15% after salbutamol. In the remaining 83%, spirometry was acceptable.

Audit of Medical Documents

Attendance

This revealed that all patients were seen in 1997 but two did not attend regarding their asthma. Respiratory function tests (RFTs) or peak flow meter (PFM) readings were recorded for 35 patients. The number of visits related to asthma ranged from 0 (2) to greater than 3 (7) with a mean of 2.0

Attendance was mainly for resupply of drugs.

Record of an asthma management plan

In this respect, the audit showed some shortcomings in management. Only 74% had been given a personalized plan and no patient had a written plan. The doctor who treated the greatest number of asthmatic patients stated that the majority had mild disease and therefore a written plan was not necessary.

Referral to a consultant physician or allergist

A specialist opinion was obtained in 32 cases (70%), 26 of which were from a respiratory physician. Methacholine challenge was used in 18 of these patients to ascertain if bronchial hyper-reactivity was present.

Respiratory function tests

During the previous 12 months, RFTs or PFM readings were recorded for only 35 of 44 patients (80 % of those who attended for management of their asthma).

Asthma Management Plan

In no case was an asthma management plan recorded in the history.

Assessment of Patient's Management of their Attack

Using the AMP Guidelines, management was assessed as appropriate in 28 patients (61% CI 45-75), barely adequate in 17 (37%), and inadequate in one. Of the 18 not using drugs correctly, more than half (10), had a good understanding of their drugs' actions. There was no significant difference in duration of an attack between those who managed their asthma appropriately and the group where it was barely adequate (p=0.748).

Effectiveness of Patient Education

Patient review

Attendances ranged from 0- 10 in the 12-month period. The mean was 2.0 and the median 2.4 visits for asthma management. The two patients that did not attend for their asthma stated that they were untroubled during the period under study. The two who considered their asthma to be severe attended five and seven times in the 12-month period. All cases seen seven or more times (four cases), had been assessed by a respiratory physician.

Knowledge of asthma

Eighty-two per cent of patients displayed an acceptable understanding of asthma and its pathophysiology.

Understanding value of peak flow measurements

It was disturbing to find that only 55% (CI 31-78), who possessed a Peak Flow meter (PF), fully understood the value of a PF measurement and four had no idea at all. There was, however, no statistical difference between the group with a meter (n=18), and the total cohort (p=0.139).

Has the inhaler technique been explained?

All members stated that the use of the inhaler had been explained by their pharmacist and in some cases checked by the doctor.

Understanding use of medications

- Preventives - of the 35 who used preventive medications, only 34% (CI 15-42) fully understood how their drugs worked and 45% had no understanding at all.
- Relievers 59% had a good understanding but 11% had no idea of the action of beta-agonists.

Do the same patients score badly on all assessments?

Information was extracted on the 10 patients who when questioned about their understanding of asthma clearly failed. Their scores in knowledge of the actions of preventive and reliever drugs, the value of the PFM, and their management of an attack were examined. Six of the ten failed two or more questions and two of these six failed three questions.

Discussion

Family History

The role of family history in the etiology of an individual's asthma remains unclear. It has long been known that asthma and atopy run in families. Most studies have found a family history in between 40-60% of cases.¹⁰ The findings in this study are comparable.

There was no relationship between knowledge of asthma and a positive family history, similarly, a family history of asthma did not lead to an early diagnosis.

Age of Onset

It was observed that the majority of patients (61%), were not diagnosed with asthma until over 21 years. This in contrast to most other studies which report that half the cases develop before the age of 10 years.¹¹

The late-onset recorded here may be due to several factors. It may indeed be late-onset asthma, be due to late diagnosis, or the applicant presenting to recruiting in the "window period" (10- 16 years, when asthma is often dormant. In addition, it is probable that many with early-onset asthma either do not apply to join the defence forces or are rejected at recruiting.⁶ As it is common knowledge that a history of asthma may lead to rejection, it is probable that a number of applicants fail to disclose this aspect of their history. All this leads to a sampling bias and therefore no conclusion can be reached in this respect.

Atopy

Atopy is considered by some authorities to be the only established risk factor for asthma,¹² and is certainly one of the most important. Most asthma is associated with atopy but in susceptible individuals, exposure levels that induce atopy and asthma are different. The findings in this study are consistent with those of Juniper,¹³ who also comments that hay fever has a greater impact on quality of life than mild to moderate asthma.

Avoiding allergens has long been recognised as an important preventive measure. Stimuli identified by subjects in this study include cats, tobacco smoke and house dust. One patient described moderately severe asthma when based at Butterworth, Malaysia, where humidity is high and the house contained mouldy carpet. His asthma was dramatically reduced when he returned to Melbourne to a home with polished floors and opening windows. It is, however, possible that other factors were responsible for the improvement in his asthma such as psychological considerations, work environment and diet.

A recent Australian children's survey¹⁴ found 80% of asthmatics had symptoms due to atopic disease. The low prevalence in our study (59%), may reflect the selection process, whereby many of the more severe cases were rejected.

Associated Morbidity

Fifteen subjects received regular medication of whom eight were taking antihistamines. Periodic medical examinations (PME) are a requirement of the ADF and as these include a fasting blood examination for lipids, it might be expected that hyperlipidaemia is identified more commonly than in the general population. Three patients were receiving therapy for this problem. In another five cases there was unrelated comorbidity requiring drugs.

Precipitating Factors

As seen in most studies, exercise and weather change were the principal factors leading to an asthma attack.

Significance of Smoking

In this study, smoking was associated with more symptoms than experienced by the non-smoker group, but otherwise, smoking was not associated with greater morbidity.

It is reported that 25% of 15-year-old Australians smoke every day.¹⁵ The low number of smokers observed in this study (15%), may reflect a smaller number of smokers in the ADF compared with the community. One factor that could serve as a deterrent to smoking, is the ADF policy that members who fail to pass their annual fitness test face discharge from the services.

Presenting Symptoms

Symptomatically asthma is often described as a triad of wheeze, dyspnoea and cough, the first being the sine qua non. In 'typical asthma' all three are present. In this study 83% of subjects complained of two or more symptoms with shortness of breath and wheeze occurring most commonly, whilst recurring cough was reported in only 28%. Similar results are noted in some other studies.

A persistent cough was reported by 13% of patients. In the past this was often attributed to respiratory infection. It is probable that cold air is responsible for coughing in most asthmatics but gastroesophageal reflux appeared to be a factor in two of the cases studied.

Severity of Asthma

An impression of the severity of asthma in the ADF can be gained by considering a number of factors. These include:

- Severity change. Patients were asked whether they had noticed any change in the severity of their asthma in the previous two years. As this is a relatively short time in the natural history of the disease, no change was expected. One factor that does influence symptoms and severity is the uniqueness of the military environment whereby troops are often transferred interstate every few years. We have found that many asthmatics have few or no symptoms at (say) Darwin but are troubled at Wagga or Laverton. Undoubtedly, such a change in symptomatology is multi-factorial and may involve climate, vegetation, housing, work stresses or other factors.
- Limitation of activity. Exercise stimulates bronchial secretions and bronchospasm in many asthmatics. It is interesting that only 59% stated that symptoms limited their exercise tolerance. This contrasts with Ander's findings,¹⁶ that exercise-induced asthma occurs in 70-80% of asthmatics. The low figure in the ADF study group may be due to the relatively high use of corticosteroids coupled with the low severity of the disease.
- Patient's assessment of their overall severity. In this study, 80% of patients regarded their asthma as mild and only 4% as severe. This is in contrast with Abdulwodud's community study,¹⁷ in which he reported that 32% considered their asthma was severe.
- Attendance related to asthma. Overall, patients attended for management of their asthma 2.0 times in the previous 12 months. This was mainly for resupply of their medications and supports the premise of mild disease in this cohort.
- Work absence. The finding that only four members lost time in the previous 12 months is lower than that reported in many other studies. It may be due to members of the ADF requiring a medical certificate before taking sick leave, the vigilance of the medical officers in caring for their patients, the relatively mild disease seen in ADF personnel or a combination of these factors.
- Frequency of symptoms. The observation that 38 patients reported that symptoms occurred infrequently reflects the mild nature of the disease in the ADF. This contrasts with other community studies where it is reported that many patients complained of symptoms on most days.¹⁸

- Waking short of breath or requiring Emergency Room (ER) visits. The small number of patient who wakes short of breath more than once a week (4%), and the few patients requiring ER visits (11%). Illustrate the mild nature of the disease and the good control obtained.
- Referral to Consultant Physician or Allergist. This is thought to be higher than in most community studies and is a result of the exacting employment standards in the ADF which preclude patients with asthma from certain occupations or limit their deployability.
- Respiratory function. As previously noted, respiratory function was acceptable in 83% of cases when tested by the assessor. Whilst this result is not optimal, it is consistent with the patients own assessment in which 80% consider their asthma to be mild.

In summary, asthma was found to be a mild disease in the ADF. A statement supported by the above findings that include quantifying lung function through the use of supervised respiratory function tests.

The Effectiveness of Patient Education

Knowledge of Asthma

Eight two per cent of patients were found to have a satisfactory understanding. Some of the remainder had mild disease and may not have received comprehensive instructions. Others might not have regarded their condition to be sufficiently serious to merit learning about asthma.

Understanding Peak Flow Measurements

One may ask why only 39% were prescribed a PFM? Discussion with doctors taking part in the survey revealed that they did not consider a PFM necessary in mild disease. In one Australian study,¹⁹ 19% had a PFM: whilst in another,²⁰ only 5% had a meter. Perhaps the higher number in the ADF reflects the availability of meters free of charge.

Inhaler technique

The results (100% affirmative response), reflect credit on the pharmacist. At best, the inhaler is an inefficient device for delivering a metered dose. If inadequate instruction is given resulting in poor technique, the inhaler can be a grossly inadequate delivery device.

Understanding medications

It was observed that only 34% fully understood how their preventive medication worked and 45% had no idea at all.

With respect to reliever drugs, the results are again disappointing, 41% had an inadequate understanding. This included 11% who had no understanding at all.

Whilst it should be borne in mind that the concept of action of an anti-inflammatory drug is not as easy to understand as that of a bronchodilator, these figures give rise to some concern. They suggest that in this respect doctor and pharmacist education techniques could be improved.

Management of an attack

Although it must be conceded that the investigator's assessment of each patient's management is somewhat subjective, the low figure of 65% of patients reporting relief in 60 minutes suggests that more care could be given to explaining an appropriate management strategy.

Of patients whose management was deemed sub-optimal, 57% responded in 30 minutes. This suggests that as generally accepted, beta-agonists are very effective in terminating an attack even if the drug is not delivered as directed.

In summary, patient education presents a mixed picture. Whilst the disease and its process were well explained and the correct use of the inhaler understood by all members, the mode of action of drugs, particularly

preventives, was inadequate. This aspect of education needs to be addressed. In addition, more care needs to be given to explaining how to respond to the onset of asthma symptoms.

Audit of Medical Documents

The amount of detail recorded in the medical documents was extremely variable.

The few visits regarding asthma reflect the mild nature of the disease in the ADF together with the degree of control achieved. There was a paucity of detail concerning management including drugs prescribed. No patient had a plan recorded and in the 12 months under review respiratory function was noted in only 80% of histories.

Referral to a respiratory physician

This is thought to be higher than in most community studies and is the result of the exacting employment standards in the ADF which preclude patients with asthma from certain occupations or limits their deployability.

Conclusion

In conclusion, the study found that asthma in the ADF is a mild disease. This may be due to careful screening at recruitment and effective management of the disease by service doctors.

Treatment methods at 6 RAAF Hospital were in accordance with the recommendations of the Thoracic Society of Australia and New Zealand's Asthma Management Plan 1996.

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