Asthma in the Army: A Retrospective Study and Review of the Natural History of Asthma and its Implications for Recruitment

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SUMMARY: In an attempt to define the problem of asthma in the British Army and to relate it to recruiting policy, records were obtained for all discharges from the Army and all admissions to hospital for 48 hours or more with a principle diagnosis of asthma over four years. There were approximately 50 medical discharges from asthma per year, representing about 1 in 3400 of the held strength of the Army and 6.3% of the discharges from all medical causes. The average number of non-effective days before discharge was about 20 and those discharged were generally young (57% aged 20 years or less), of short service (47% less than 2 years service) and of low rank (86% privates, apprentices or juniors). Three hundred and fifty two individuals were admitted to hospital on 415 occasions in 4 years, of whom 82 were eventually discharged from the service for medical reasons. Average non-effective days for this group was 11. There was only one death.

Of 108 discharged soldiers who were eventually shown to have a history of asthma in childhood (HAC), this was identified at recruit examination in only 43%. Before enlistment, only 20% were referred for consultant opinion and only 6% had exercise testing. 28% were probably current asthmatics on entry.

From available records, age of remission of childhood asthma was most commonly 10-14 years (64%). Relapse was commonest at age 17-21 years (76%) with 25% of relapses occurring at 18 years. Development of asthma for the first time during service occurred most commonly at 17-20 years (62%). Exercise testing was done in 113 of those discharged and was normal in 20% of these.

Review of the available literature on the natural history of childhood asthma in the context of current recruiting policy justifies a rough prediction that, of those accepted in remission in mid teens, 40% will be wheeze free in their late twenties, 25% will have suffered some wheeze that may have led to downgrading and even discharge and 35% will have been discharged because of asthma. It is recommended that candidates with a history of asthma should not be accepted before the age of 22 years.

Introduction

Asthma is a difficult subject. Like love¹ we think we know what it is, but precise definition eludes us. Attempts such as "short term variability in expiratory airflow resistance" have not been accepted internationally² because of the difficulty in quantifying them, ("How much variability?") and because some of the more severe asthmatics show very little variation. Similarly, it is very difficult to stratify asthma into grades of severity³ because of its irregular and intermittent nature; an asthmatic can be playing vigorous sport one day and the next finding difficulty walking on the flat.

From the military point of view, it is clear that service life is unsuitable for most asthmatics. Exercise, cold, stress, dust and cigarette smoke are common precipitants that are unavoidable. Unpredictable physical performance in a soldier is not conducive to the smooth functioning of a unit. Selection presents its own problems; military recruitment concentrates on the 16-18 year age group, the age at which many childhood asthmatics are in remission, but poised to relapse. Tests for airways obstruction are rarely positive during prolonged remissions, or indeed between attacks, so that assessment of the severity of an asthma history is based on the subjective impressions of a candidate who will see advantages in minimising it.

It is now generally recognised in the medical profession that 'wheezy bronchitis' in children is indistinguishable from asthma⁴, but teenagers may deny in good faith a history of asthma while admitting to 'bronchitis', 'wheeze' and 'chestiness' or even give the name 'hay fever' to typical asthma attacks. Some may deliberately conceal a history of asthma in order to be enlisted and a knowledgeable asthmatic could foil physical examination and even exercise testing by clandestine use of inhalers or systemic steroids.

Current regulations, introduced in April 1986, (JSP 346, 0420) call for rejection of candidates with asthma or wheezy bouts requiring treatment in the previous four years. Candidates with a history of earlier wheezing are to be assessed by a Service consultant and a positive exercise or bronchial lability test is sufficient reason for rejection, though testing is not mandatory. Almost all the subjects in this study were recruited under previous regulations, namely "... consultant opinion should usually be sought. Candidates judged to be asthmatic (liable to recurrent attacks) and those currently on long term therapy are to be assessed P8" (that is, unfit for service).

This study was undertaken to obtain epidemiological information on the size and pattern of the problem of asthma in the Army and to match it as far as possible

with current knowledge of the natural history of the condition.

Method

Data were obtained from the tri-service Medical Statistics branch of the Ministry of Defence at Stanmore. The TRIMEDS system was used to obtain listings, sorted in various ways, of medical discharges and bedded sickness events of 48 hours or more with a principle diagnosis of asthma (ICD code 493). For the discharges only, copies of the microfilmed entry Medical Examination Record (F Med 2) and the discharge Medical Board Record (F Med 23) were obtained through the CARMED computer-assisted retrieval system. Neither of these documents was available for 2 of the 201 persons discharged and F Med 2 was not available in 59 (29%). However there were sufficient documents for adequate analysis. This information was used to build up a partial epidemiological picture of asthma in the Army.

Results

Adequacy of documents

Of 199 sets of documents available, it was not possible even in retrospect to determine whether or not there was a past history of asthma in 31 (16%). From 47 of the records (24%) the age at which asthma began or recurred during service life could not be determined. Fourteen records gave this age without indicating whether it represented recurrence or onset for the first time. Of 60 patients with apparent adult onset, the age of onset could not be determined in two, and in 108 of those who had HAC, the age of remission was not stated in 28 (26%).

Asthma as a cause for medical discharge

Table 1 summarises the discharges over 4 years, which were reasonably constant and averaged 50 per year. Asthma caused 8% of discharges from all diseases and 6.3% of all medical causes. There was an average of 29 discharges per 100,000 total Army strength (including Gurkhas) per year, or 1 serviceman in 3400 per year.

Asthma as a cause of loss of manpower

Those discharged averaged 20 days non-effective before discharge. For those admitted to hospital (including some, but not all, of the discharged persons) the average total non-effective time was 11 days. Recorded manpower loss totalled 3919 days in 4 years. There was one death due to asthma in the period.

Sex and age

Only one of 201 persons discharged because of asthma was female and only 5% of the admissions to hospital involved servicewomen. (About 4% of serving personnel are female). Table 2 shows the age distribution of those discharged and the age-specific rates. Figure 1 shows this graphically and emphasises that 57% were aged 20 years or less and only 9.5% were 26 years or older. Figure 2 shows a slightly different pattern for hospital admissions; only 35% were 20 years or less and 35% were 26 years or over. This probably reflects a tendency to retain the more experienced serviceman, albeit in a lower medical category.

Fig 1 Age Distribution of Discharges due to Asthma 1983-6

Note. In all figures, numbers above the bars represent numbers in each group.

Table 1
Asthma as a Cause of Medical Discharge from the Army

Year	Discharges (asthma)	Discharges (diseases)	Discharges (all causes)	Asthma % of diseases	Asthma % of all causes
1983	35	409	513	8.6	6.8
1984	56	571	710	9.8	7.9
1985	57	774	1015	7.4	5.6
1986	53	744	947	7.1	5.6
TOTAL	201	2498	3185	8.0	6.3

Table 2
Discharges by Age 1983-86

Age (years)	Discharges (No.)	Discharges %	Strength (thousands)	Rate per 100,000 strength
≤17	27	13.4	37.8	7.14
18	34	16.9	34.8	9.77
19	29	14.4	41.7	6.95
20	25	12.4	46.0	5.43
21	12	6.0	43.7	2.75
22	13	6.5	42.0	3.10
23	18	9.0	41.0	4.40
24	11	5.5	37.7	2.92
25	13	6.5	34.5	3.77
≥26	19	9.5	285.2	6.66
	201	100	644.4	31.19

Notes: 1. Strengths rounded to the nearest thousand

2. Figures obtained from Stats (Manpower) and exclude Gurkhas (among whom there were no discharge due to asthma).

Fig 2 Age Distribution of Inpatient Events Due to Asthma 1983-86

Length of service and rank

Figure 3 shows that 60% of servicemen were discharged before reaching 3 years of service, 47% within 2 years, and 16% were discharged within the first 6 months. Many of these were probably current asthmatics on entry. Commensurate with the short service, discharged personnel were mostly of low rank, 86% being privates, apprentices or junior soldiers. Table 3 illustrates this and gives rates per 100,000 Army strength in the individual ranks.

Outcome of admissions to hospital

There were 415 admissions to hospital of 48 hrs or more, involving 352 patients of whom 38 were admitted on two occasions, 6 on three occasions and one each on

Fig 3 Length of Service Before Medical Discharge Due to Asthma

4, 5 and 7 occasions. There was one death and 39 were recommended for medical discharge immediately after admission. Including these, 82 were eventually medically discharged from the Army, 77 of them with a principle diagnosis of asthma. This leaves at least 269 (76%) who were admitted to hospital for treatment of asthma but were not obliged to leave the service because of it.

Table 3
Discharges by Rank 1983–86

Rank	No.	%	Strength	Rate Per 100,000 Strength
Junior	15	7.5)	29227	116.3
Apprentice	19	9.5)		
Private	138	68.7	234140	58.9
LCpl	19	9.5	96964	19.6
Cpl	4	2.0	99358	4.0
Sgt	0	—	60345	—
SSgt	1	0.5	31167	3.2
WO2	0	—	23708	—
WO1	0	—	8779	—
All Officers	5	2.5	65933	7.6
	201	100.0	649621	30.9

Notes: Strengths obtained as for Table 2, but not rounded.

Relation to history of asthma in childhood

Of 199 documented medical discharges, study of available records revealed a definite HAC in 108 (54%). Sixty (30%) were recorded as having no HAC and in 31 (16%) there was no mention of HAC, whether positive or negative. Of the 37 who, on review of all documents appeared to be current asthmatics on entry, 30 had HAC recorded, one was said to have had no childhood asthma and there was no record in the remaining six.

Ages of remission, relapse and onset

Of the 108 patients with definite HAC the age remission was recorded in 50 and the distribution these is given in Figure 4. Sixty-four percent remissions occurred between the ages of 10 and 14 years. The distribution of the age of relapse of those with HAC is given in Figure 5 and shows that 76% of relapses occurred between the ages of 17 and 21 years. The average age of relapse was 19.3 years and 25% of

Fig 4 Age of Remission in Childhood asthmatics

Fig 5 Age of Relapse of Childhood Asthma

relapses occurred at age 18 years. Figure 6 shows the ages of onset of asthma in 58 patients of the 60 who were recorded as not having had HAC. Sixty five percent of these began to have asthma between the ages of 17 and 21.

Detection of childhood asthma at recruit medical examination

Of 108 persons shown in retrospect to have been childhood asthmatics, only 43% were detected at recruit examination. Some of the remainder may not have known that they had asthma, or their families and doctors may have used other terms. In several cases subsequent records showed that HAC had been deliberately concealed. Only 20% had consultant opinions entered on F Med 2 and only 6% had exercise testing, which was negative in all cases. Under the current regulations, possibly more would have been referred.

Current asthma on entry

Of 37 persons judged in retrospect to have been asthmatic on enlistment, there was a definite HAC in 30. Thus 37 of the total documented group of 199 were currently asthmatic on enlistment (19%) and of the "former" asthmatic group 30 of 108 (28%) were still actively asthmatic.

Exercise testing

Spirometry before and after exercise is not necessary for the diagnosis of most cases of asthma. Nonetheless 113 of the discharged soldiers underwent exercise testing, mostly shortly before discharge. Results are

given in Table 4. Using an upper limit of normal liability of 15%⁵ normal results were found in 20% of those tested.

Examination of potential recruits and potential officers

In the four months, April to July 1987, 62 candidates with HAC were reviewed at QEMH of whom 53 were male. Nine of the 62 were rejected (14.5%). A similar number is seen at the Cambridge Military Hospital, so that a rough annual estimate for Wales and the southern part of England is 370 reviewed and 320 accepted. We do not know how many eventually enter service, though Lynch-Blosse⁶ states that only 33% of serious applicants are enlisted and only 1 in 4 complete basic training. Reasons for withdrawal are largely non-medical.

Discussion

The cost of asthma to the Army can roughly be expressed as 50 medical discharges, 100 hospital admissions and 1000 non-effective days per year. Using the present methods, it is not possible to measure the cost in terms of downgrading, disability and non-effectiveness in those who are not admitted to hospital or discharged from the service, but experience in medical outpatients suggests that it may be considerable. In addition, the milder asthmatics may be managed entirely in unit medical centres. The findings of this paper are reflected in a study of medical wastage of recruits by Lynch-Blosse⁶ in which 11 recruits were discharged because of asthma in a year out of a total of 208 medical discharges. For comparison, knee pain led to 73 of the discharges and asthma constituted 11 out of 47 discharges under P quality (23%). Four out of the 11

Fig 6 Age of Onset in those without a History of Childhood Asthma

Table 4
Results of Exercise Vitalograph in 113 Discharged Personnel Tested

*Fall or lability index	No.	%	
Normal, unspecified	6	5.3)	19.5%
0-9.9%	11	9.7)	
10-14.9%	5	4.4)	
15-19.9%	15	13.3)	80.5%
20-24.9%	6	5.3)	
More than 25%	65	57.5)	
Abnormal, unspecified	5	4.4)	
	113	100	

*Fall index was used when lability index was not recorded and in three instances in which fall exceeded lability, probably due to an error in calculation or recording.

were considered to be instances of concealment by the recruit before entry and in the remaining 7 asthma was noted at pre-entry medical but thought to be 'worth a try'.

Asthma thus seems to be a significant cause of medical wastage among recruits and relatively young soldiers, and it becomes important to enquire if this could be reduced by stricter selection procedures. Some 30% of those discharged had no definite HAC and only one of these was currently asthmatic on entry. As shown by

Winfield and Carson⁷ exercise testing is unlikely to pick up asthmatics in remission. It may help exclude current asthmatics unless they confound the test by using medication. Increased bronchial reactivity to methacholine or histamine provocation may be present in asthmatics, but there is too much overlap with normals to be of much value in selection⁸. It is also time consuming and carries a risk of causing a severe asthmatic attack⁸. Undoubtedly careful and sympathetic history taking would reduce the number of current

asthmatics accepted and draw attention to a larger number of childhood asthmatics.

Applying the conclusions of Bonner⁹, we might define the ideal recruit from the point of view of a low risk of developing asthma. He, or rather she, would be a white, breast-fed female who comes from a non-atopic, non-smoking family, who has never experienced wheeze, asthma, eczema or hay fever and who does not smoke. It being impracticable to apply all these criteria, it seems reasonable to concentrate on past and present asthma and possibly other atopic features. Infantile eczema in particular seems to be associated with severe asthma, but there is no clear relationship to prognosis.¹⁰

The main issue, therefore, is whether candidates known to be in remission following childhood asthma should be accepted or rejected. Those in favour of rejection point to the expense incurred in training recruits who are forced to drop out at an early stage of their service career, the expense and manpower involved in consultant visits and exercise testing and the existence of a large pool of candidates who do not have HAC. Those in favour of more leniency recognise the character-building effect of overcoming the disability of asthma, the high level of motivation and even of athletic achievement in some asthmatics, the uncertainty of prognosis in any given individual and the possibility that a stricter policy may lead to a higher prevalence of concealment.

The published literature on the natural history of asthma, whilst not directed primarily to the question of military recruitment, can be used to develop an estimate of the likely prognosis of 16–18 year olds who are in remission following childhood asthma. The various studies define asthma in different ways, stratify patients into different groups, recruit subjects at different ages and from different sources (hospital, general practice, schools) and follow up for different lengths of time. It is therefore not feasible to work out an average prognosis from all the published literature. All agree that severe asthma in childhood is strongly correlated with a worse prognosis in adult life and that milder childhood asthmatics have a greater chance of being wheeze-free in adult life.

A series of studies from Melbourne, Australia^{4,11–14} has followed groups of children identified through schools at age 7 years up to the age of 28 years. For our present purposes, we are interested in their milder groups of asthmatics at the ages of 14, 18, 21 and 28 years. Those who fall into their two most severe groups at 21 and 28 years can be classified together as ‘worse asthmatics’ and it seems reasonable to deduce that they would be unsuitable for military service. ‘Mild asthmatics’ had not suffered wheeze in the three months before the specified birthday and those described as ‘wheeze free’ had been so for three years. Table 5 gives the outcome of the milder childhood asthmatics at ages 18, 21, and 28 years and is obtained by combining figures from different groups in the original papers. An important additional factor is that, although the percentages in the three categories were similar at age 21 years and age 28 years, considerable cross-over of individuals occurred during that period, so that about 30% moved to worse groups, and about 30% to less severe groups¹⁴. This means that, had the subjects been servicemen, a larger percentage would have risked downgrading or discharge at some time during their third decade.

Table 6 concentrates on the status at 28 years of groups A and B, combined for simplicity in Table 4, and includes also those classified as group C. These were more severe asthmatics at age 14; they had wheezed in the year before their 14th birthday, but less frequently than once per week. They are included here to show their worse prognosis and also because some childhood asthmatics of this severity could have remitted at age 14 and been recruited into the Army at age 16–18.

Also included in Table 6, are equivalent figures derived from Blair’s study^{15,16} of children identified in general practice in London and followed for 20 years. At the start of the study these had less than 3 attacks per year, attacks were clear in 1–3 days, required only bronchodilator therapy and did not cause absence from school. Again the two most severe groups, defined by Blair as ‘recurrent’ and ‘chronic’ have been combined as ‘severe’. Allowing for different definitions, it will be seen that the results are of the same order as found in

Table 5
Melbourne Studies
Status at 14 years: 5 episodes of wheeze or less (A)
or
More than 5 episodes, but wheeze free for 1 year + (B)

Status at Age:	Wheeze Free %	Mild Asthma %	Worse Asthma %
18 years ¹¹	83	17	<1
21 years ¹²	55	22	23
28 years ¹⁴	54	19	27

Table 6
Tabulation of Outcome Results

Status in childhood	Status at 28 yrs or in 3rd Decade		
	Wheeze Free %	Mild Asthma %	Severe Asthma %
MELBOURNE Group¹⁴			
A <5 episodes	52	24	24
B >5 episodes but free 1 year +	55	15	30
C Wheeze in last year but <1 per week	16	22	62
A + B	54	19	27
A + B + C	39	20	41
BLAIR¹⁵			
"Mild" asthma in childhood (See text for definition)	36	35	29

Melbourne groups A, B and C. The results of studies elsewhere can also be seen as broadly compatible¹⁷⁻²⁰.

To apply these results to the military situation, it is necessary to make allowance for the intensity of exercise required by Service life and the well known fact that civilians, by contrast, may not exercise sufficiently to know that they could suffer from exercise-induced asthma. The cross-over effect would also make the service dropout rate higher than civilian prognosis figures indicate, but on the other hand recruit selection procedures should help to exclude the more severe asthmatics and those who are currently asthmatics.

Conclusions

Taking these factors into account a reasonable prediction would be as follows. If 100 recruits with a history of childhood asthma were accepted into the Army under the present policy and followed up to their late twenties, assuming that none left the service for other reasons, 40 would be wheeze free, 25 would have experienced sufficient wheeze to risk downgrading and even medical discharge and 35 would have been discharged because of serious asthma. The majority of these discharges would have been in those under the age of 22 years and some 15-20 would have been during basic training.

Various opinions could be held as to whether this level of dropout is acceptable. Possible future attempts to reduce it might be preceded by a prospective study to determine the accuracy of the prediction, but a relatively long term study would be required and this would need a degree of continuity unusual in the Service. The policy could be changed on the basis of present evidence to exclude all candidates with a childhood asthma history. This would greatly reduce the cost and manpower involved in consultant referral and exercise testing.

The results of the retrospective study presented here, however, suggest that a reasonable compromise solution would be to reject teenage candidates with HAC but encourage them to apply again after their 22nd birthday if they had been free of wheeze for four years. They could then be accepted provided exercise testing showed normal liability. If associated with the rate of identification of HAC shown in this study (43%), this would avoid a minimum of about 9 discharges per year. However a higher rate of detection might be expected under the policy introduced in April 1986 and careful history taking associated with strict enforcement might reduce discharge due to asthma by as much as 40% to 30 discharges per year.

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