Prospective Study on the Morbidity Profile of Recruits over one year in three large Regimental Training Centres

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Abstract

Keeping in view the lack of prospective epidemiological data on the incidence of major causes of morbidity specifically among recruits, the present study was undertaken among recruits of three large regimental training centres in a particular cantonment. The study period extended over exactly one training year, from 01 July 2001 to 30 June 2002. Successive batches of recruits entering the training centres during this period were followed up prospectively for hospitalisation in the local military hospital, till they completed their training. The study revealed that the major causes of morbidity were chickenpox and training injuries, including stress fractures. The major causes of invalidments were injuries, pulmonary tuberculosis and mental disorders. The findings have been compared and certain recommendations for preventing / reducing the incidence of major causes of morbidity have been submitted.

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Introduction

The period of recruit training constitutes the most formative part of a soldier's life. It also marks a major transition in life, from protected family environment, usually rural, to a mentally and physically rigorous schedule, away from the cushion-support of the home. For the Indian Army, the recruit is an important person, since in his health, training and life style, lies our performance in tomorrow's battle.

The starting step in planning for the health care of recruits is to have scientific data as regards their health and morbidity profile. Preferably such data should be generated from prospective studies, following up successive batches of recruits as they enter the training centres, till the time they complete the training. Cross-sectional studies to work out the prevalence of some particular disease do not take us very far in this important function of planning.

Surprisingly, there is little data, if any, on the annual incidence, obtained in a prospective manner, as regards the major causes of morbidity among recruits. Annual incidence data as reflected every year in Annual Health Report of the Army [1] clubs the Junior Commissioned Officers (JCOs) and other ranks (OR) into a single category. Apparently, recruits are included in the large category of OR. The Annual Health Report thus gives hardly any specific information about the morbidity profile of recruits.

It was against this background that the present study was undertaken, with the objective of generating

prospective incidence data on the leading causes of morbidity among recruits, in three large regimental training centres.

Material and Methods

The present study was a community based, observational epidemiological study, on the lines of a prospective design. All the three regimental training centres in the station were selected for the study. The study started on 01 July 2001 and terminated on 30 Jun 2002. During this one training year, all recruits who were taken for training in the centre formed the material for the study. Epidemiological surveillance was maintained at the local military hospital, a large zonal hospital, regarding admission of recruits, on a daily basis. All recruits who were admitted to the hospital for any disease were observed, till the outcome, viz, discharge to unit, invalidment or death. Data on strength of recruits was obtained personally from each centre and has been used as denominator for calculating the rates. Test for significance in difference between proportions was used for statistical evaluation, as and when required.

Results

General description of the study population : The station where the study was undertaken (nick named "Juliet" Station) is located in Central India. It has got three large regimental training centres, located in an area of approximately 16 Sq Km, adjacent to each other. Centres 'A' and 'B' are infantry regimental centres while centre 'C' is a training centre for one of the supporting arms. The station is supplied with water from MES sources from deep bore-wells. Disposal of night soil is through septic tanks, there being no central sewage disposal system. Climatic conditions are generally moderate; however severe summers and winters occur for 1 month each.

Table 1

Major causes of hospital admissions among recruits according to the three different centres (rates per 1000 for period 01 July 2001 to 30 June 2002)

Diseases	Rates per 1000			
	Centre 'A'	Centre 'B'	Centre 'C'	Overall
Injuries non enemy action				
Stress fractures	14.38	16.69	8.30	12.66
Other training injuries	7.88	14.07	5.28	8.74
Heat exhaustion	1.37	1.64	0.25	1.00
Respiratory diseases				
Chicken pox	58.91	4.58	14.08	24.32
Pneumonia	2.40	2.29	2.52	2.41
Gastro intestinal infections				
Infectious hepatitis	1.37	0.33	0.75	0.80
Enteric fever	1.71	0.98	0.50	1.00
Vector borne diseases				
Malaria	1.37	1.31	1.26	1.31

Rainfall is moderate to heavy.

Morbidity profile : The details are presented in Table 1 and discussed as per the broad causes of morbidity as follows:

Injuries : The overall annual incidence of stress fractures was 12.66 per 1000 for all the three centres taken together. The incidence per 1000 for individual centres was 14.38, 16.69 and 8.30 for centres 'A', 'B' and 'C' respectively. The difference in proportions was significantly lower, statistically, for centre 'C' as compared to both centres 'A' and 'B' ($p < 0.01$). However, there was no significant difference between the rates in centres 'A' and 'B'. The overall incidence of training injuries, other than stress fractures, was 8.74 per 1000. This was significantly higher for centre 'B' (14.07/1000) as compared to centres 'A' (7.88) and 'C' (5.28) ($p < 0.05$). Large majority of training injuries were fractures and joint injuries of the lower extremities.

As regards adverse effect of environment related to training, the overall incidence of heat exhaustion was 1 per 1000. Between the centres, this was 1.37, 1.64 and 0.25 per 1000, for centres A, B and C. These incidence rates were statistically not different significantly. All the cases of heat exhaustion were related to Battle Physical Efficiency Test (BPET) and occurred during May and June only. Interestingly, all these cases collapsed during the last 200 to 300 metres, and gave a history of an undue extra effort during the last few hundred metres of the run.

Respiratory group of diseases : The two important causes of morbidity in this group were chickenpox and community acquired pneumonia. The overall incidence of chickenpox was 24.32 per 1000 and it showed a wide, as well as statistically significant ($p < 0.01$) differential between the centres, being highest in centre 'A' (58.91) followed by centre 'C' (14.08) and lowest in centre 'B' (4.58). The incidence showed a consistent rise between November and May. Between June to October, the frequency was low and of endemic nature. The differences in incidence of chickenpox in the three centres were clearly related to the differences in available

accommodation and level of overcrowding in the three centres. In this regard, it was further observed that centres 'A' and 'B' had five training companies each, while centre 'C' had four training regiments. The level of overcrowding was assessed in each of these training subunits, vis-a-vis the laid down standard of 5 sq m per person. It was observed that all the five training companies of centre 'B' had per capita floor area of more than 5 sq m, while only two out of the five companies of centre 'A' had the recommended per capita area of more than 5 sq m. Large majority of cases of chicken pox in centre 'A' occurred in those three companies which had per capita available area of less than 5 sq m.

Interestingly, however, though the incidence of chicken pox showed wide and significant difference between the three centres, which was related to the level of overcrowding, there was no difference in the incidence of community acquired pneumonia between the three centres, the same being 2.40, 2.29 and 2.52 per 1000 respectively for centres 'A', 'B' and 'C'.

Gastro intestinal infections : The incidence of gastro-intestinal infections was maintained at a low level. For infectious hepatitis, the overall incidence was 0.80 while for enteric fever the same was 1.00 per 1000. There were very minor non-significant differences between the centres as regards incidence of these infections.

Vector borne diseases : The overall incidence of malaria was fairly low, being 1.31 per 1000, with very minor, non significant difference between the three centres. There were no other cases of vector borne diseases, namely, dengue, other arboviral infections, filariasis and rickettsioses.

Invalidments : Invalidments among recruits fall into two broad categories viz, firstly, invalidments following second medical examination and, secondly, invalidments occurring as a result of diseases / injuries due to training or which manifest during training. The details of the latter are presented in Table 2. It was observed that the overall invalidment rate per 1000 was 4.79, 2.62 and 0.50 for centres 'A', 'B' and 'C' respectively. These differences were statistically significant between centres 'A' and 'C' and between 'B' and 'C' but not between centres 'A' and 'B'. The commonest causes of invalidment were fractures of bones of lower extremity, pulmonary tuberculosis, psychiatric diseases, and central nervous system (CNS) seizures, in that order.

Table 2

Causes of invalidments of recruits for diseases occurring due to training or manifesting during training for the period 01 July 2001 to 30 June 2002

Causes of invalidment	Invalidment rates/1000			
	Centre 'A'	Centre 'B'	Centre 'C'	Overall
Fractures of bones of lower extremities	1.03	1.64	0.25	0.90
Pulmonary tuberculosis	1.37	0.33	0.00	0.50
Psychiatric diseases	1.03	0.33	0.25	0.50
All other causes	1.37	0.33	0.0	0.50
Overall annual invalidment rate	4.79	2.62	0.50	2.41

Deaths : During the period of one training year under study, there was only one death among recruits. The same occurred in centre 'C' due to falciparum malaria leading to acute renal failure.

Discussion

In the present study, the overall annual incidence of stress fractures and training injuries, put together was 21.40 per 1000, which is quite close to 23.84 per 1000 among JCOs /OR for injuries non enemy action (accidents) for the year 1999 [1]. The antecedents of injuries non enemy action (accidents) may be quite different for JCOs / OR and recruits. For the former, it is mainly due to active service, for the latter it is hard and rigorous training. However, the overall rate seems to continue at well beyond 20 per 1000 per year.

The incidence of stress fractures has been found to be significantly higher in centre 'A' and 'B' as compared to centre 'C'. This was most probably due to the fact that the former two centres are infantry centres, while centre 'C' is from supporting arms. Irrespective of statistical significance, with an overall annual incidence of 12.66 per 1000, stress fractures do remain a cause of concern. There is a need to undertake field research to formulate preventive strategies addressing this issue.

A striking observation, however was the significantly higher incidence of injuries (other than stress fractures) in centre 'B', as compared to centre 'A'. This was despite the fact that both are Infantry Regimental Centres, following the same training curriculum, as well as located in the same general area, thus having the same type of terrain and physical environment. One of the reasons for this observed difference could be the vigour with which training is actually imparted, especially by junior level instructors. However, another reason which needs pondering is whether these differences could be due to racial or ethno-genetic differences between the recruits in the two different centres. As would be appreciated, training injuries are likely to be influenced, to a large extent, by differences in flexibility and fine reflexes among recruits, especially during the first one or two months of training. The hypothesis which thus arises from the present study is that there may be differences in the innate levels of flexibility and protective neuro-muscular reflexes between recruits from different ethnic / racial groups and geographical regions of our country. It is suggested that this hypothesis may be tested by further field and laboratory based studies, especially by specialists in Sports Medicine, Physiology and Epidemiology.

The annual incidence of chickenpox was observed to be 24.32 per 1000 which is much higher than observed by other studies on soldiers [2]. The incidence was

very high in centre 'A', followed by centre 'C' and quite low in centre 'B'. This was clearly due to overcrowding in these centres with corresponding gross reduction in available floor area per recruit. The overcrowding was due to massive increase in intake of recruits, often two to two and a half times the authorization, due to operational reasons. Centre 'B' could cope with the increased influx since they had some additional accommodation, the other two centres could not cope due to lack of additional accommodation. It is apparent that chickenpox, both endemic as well as of epidemic form, is likely to continue as an important source of wastage of training-time. Detailed administrative guidelines for preventive measures need to be issued. There is also another possibility which may explain the observed differences in the incidence of chickenpox, besides overcrowding, in that centres 'A' and 'B' were composed of recruits from ethno-geographically distinctly different regions of our country, while centre 'C' had mixed composition. It is possible that the (young adolescent) recruits from Northern and North-Western regions of our country may be more susceptible to chickenpox during adulthood, due to lack of natural immunity, which is otherwise acquired during childhood by a large majority of recruits from the plains. Further studies to assess the baseline levels of *Varicella zoster* antibody titres among recruits from various parts of our country may be able to shed further light on this hypothesis, thereby helping in identification of ethnic groups who are in higher need of vaccination against chickenpox.

Pneumonia (community acquired) was observed in the form of sporadic cases spread all over the year, in a frequency of 2.41 per thousand which is higher than the incidence rate of 1.43 per 1000 among JCOs / OR for 1999 [1]. The reason is apparently, the overcrowding in the training centres. However, the point which needs to be noted is that as long as community acquired pneumonia occurs in sporadic or low endemic frequency, as has been observed in the present study, the situation would be tolerable. However, epidemics of pneumonia are known to occur among military recruits in overcrowded conditions [3] and may cause substantial morbidity besides embarrassment. Moreover, the same overcrowded conditions are documented to place recruits at high risk of bacterial meningitis [4]. There is, therefore, a definite need to lay down clear cut instructions for prevention of droplet infections, suitably backed up with provision of adequate accommodation to cater to sudden influx of recruits during times of emergencies, in training centres.

The incidence of viral hepatitis and malaria among recruits, as observed in the present study, has been

substantially lower than the rates among JCOs/OR. Strict and methodical public health surveillance by medical authorities, coupled with a very positive inclination on the part of local commanders and quick reactivity on part of Military Engineering Services in the station of study have played a major role in this achievement. However, the incidence of enteric fever (1 per 1000) is marginally higher than 0.78 for JCOs / OR. Non availability of typhoid vaccine for recruits during past one year may have accounted for this small difference.

In the present study the three leading causes of invalidments were found to be injuries non enemy action, pulmonary tuberculosis and mental disorders. Interestingly, the same three causes remain the leading causes of invalidment among serving soldiers also [1]. However, the overall annual invalidment rate of 2.41 per 1000 among recruits as observed in the present study is clearly higher than 1 per 1000 among JCOs/OR [1]. The finding is explicable since the invalidments in the uninitiated recruits are likely to be much higher vis a vis the seasoned soldiers; moreover, a serving soldier can be retained in low medical category but the provision does not apply to recruits.

In conclusion, the present study has worked out the incidence of morbidity among recruits in a prospective epidemiological manner. It needs no emphasis that more replicate studies on these lines would need to be conducted, especially at those stations which have a number of training centres at the same location. Till then, preventive efforts need to be directed to develop clear policy and provisions for prevention of droplet infections, and to develop preventive procedures to reduce the incidence of stress fractures.

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