Sero-Epidemiological and Behavioural Survey of HIV, HBV and HCV amongst Indian Armed Forces Trainees

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Abstract

Background: Information on the emerging epidemics of Human immunodeficiency virus (HIV), Hepatitis B (HBV) and C (HCV) viruses in younger age groups in India is scanty due to paucity of representative, population based surveys and varied estimation methodology. This study was done to assess the point prevalence of HIV, HBV and HCV infections alongwith the epidemiological factors associated with these infections. Attitudes, beliefs and behaviour related to sexual and injecting drug practices, with a view to assess the need for introduction of screening program for the new entrants of the armed forces was also studied.

Methods: A multi-centric cross sectional serological and behavioural survey was carried out amongst newly enrolled trainees of the Armed Forces in 2004. The group was selected by multistage random sampling giving equal representation to all regions of India. Study subjects were interviewed using a pretested, validated questionnaire and screened for HIV, HBV and HCV infections by rapid tests. Standard confirmatory tests were carried out for trainees testing positive. Quality assurance measures were integral part of each activity. A database was created in MS Access and SPSS ver 11.0.1 was used for analysis.

Result: Out of the 23,000 trainees included in the study, 22666 (98.55%) were included in the analysis. The age, formal education and age at first sexual intercourse of participants ranged from 16-25 years (median 20), 8-17 years (median 10) and 12-25 years, respectively. Partial knowledge about routes of spread of HIV was highly prevalent but complete knowledge was extremely low. Per thousand point prevalence of HIV, HBV and HCV was 0.61 (95% CI, 0.34-10.3, poisson), 9.31 (8.1-10.65) and 4.44 (3.61-5.39), respectively. Clustering of HIV (4.56 per 1000, 2.19-8.38) and HCV (30.54 per 1000, 23.67-38.78) and a higher number of HCV as compared to HBV was found amongst trainees from northeast. A statistically significant association was found between history of injecting drug use (other than medical) and HCV ($p < 0.05$).

Conclusion: Self-exclusion for recruitment as military trainees might have resulted in underestimation of general population figures but results provide region wise estimates unavailable till now. Concerted efforts are required in the current HIV/AIDS program activities to bring about knowledge and behaviour change amongst teenagers and young adults.

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Key Words: Human immunodeficiency virus; Hepatitis B virus; Hepatitis C virus; Behavioural and sero-surveillance; Epidemiology

Introduction

At present the information available on the epidemiology of emerging epidemics of Human Immunodeficiency virus (HIV), Hepatitis B virus (HBV) and Hepatitis C virus (HCV) in younger age groups in India is inadequate due to paucity of representative surveys and varied estimation methods being used. Recent estimates for HIV show an overall prevalence of 0.36% among adult population, with a range of 0.27% to 0.47% [1]. Similarly for HBV, two independent reviews arrived at different figures (4.7% and < 2%) as the national average for carrier rate [2], whereas another researcher pegged the figure at 3% [3]. Published data from India for HCV suggests a carrier rate between 0.12% and 4.0% [4].

In India, the latest estimate for the HIV/AIDS infected adult population was 2.5 million (2-3.1 million) in 2006 [1]. While addressing the problem of HIV/AIDS, specific emphasis needs to be given not only to high risk groups like commercial sex workers and injecting drug users (IDU), but also to specific groups in general population like students, youth, migrant workers in urban and rural areas, women and children [5]. To respond promptly and effectively to the HIV/AIDS pandemic, complete and reliable information is needed about the attitudes, beliefs and practices of communities at risk, particularly about the sexual and drug-taking behaviours. Monitoring changes in behaviour and attitude is essential to maintaining appropriately-designed programs [6].

HBV infection is widespread in the country and there

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are wide variations in the prevalence rates according to age, gender, socioeconomic levels (*e.g.*, voluntary versus replacement versus professional blood donors), geography (southern versus northern India) and ethnic groups (tribal versus others) [7]. Similarly, HCV prevalence estimates show wide variation amongst general population and blood donors [8-10]. In the absence of active surveillance in conditions like HIV, HBV and HCV where the pre-morbid period of the infection is long and unpredictable, it becomes even more difficult to arrive at such estimates.

Thus behavioural data along with serological data collection was planned amongst newly enrolled trainees of the armed forces, who represent a large demographically well characterized subjects of the general population, to form the basis of effective policies and screening programs. The objectives were to assess the point prevalence of HIV, HBV and HCV infections, study the epidemiological factors, attitudes, beliefs and behaviour related to sexual and injecting drug practices associated with these infections.

Material and Methods

The reference population was non-high risk, similar age group general population of India. A multi-centric cross sectional survey was carried out in 25 training centres, selected by multistage random sampling, giving equal representation to all regions of India. Informed consent was obtained from all participants using standard guidelines issued by ICMR [11]. All the trainees at selected centres were administered a pretested, validated questionnaire and also screened for HIV, HBV and HCV infections by rapid tests. Standard confirmatory tests were carried out for those testing positive. Adequate pre test counselling was done before confirmatory test. Post test counselling was carried out for all positive cases. Anti-HCV antibodies, HBsAg and anti-HIV antibodies were detected in whole blood at the site of survey. Anti-HCV antibodies were detected using HCV rapid test device (ACON[®] HCV, Acon Biotech Hangzhou Co. Ltd. China), a membrane based immunoassay (third generation), (relative sensitivity > 99.5%, relative specificity > 99.3%). HBsAg was detected using a one step HBsAg test device (ACON[®] HBV, Acon Biotech Hangzhou Co. Ltd. China), (relative sensitivity > 99%, relative specificity > 99.7%). The HIV 1/2 O Tri-line rapid test device (ACON[®] HIV, Acon Biotech Hangzhou Co. Ltd. China), a membrane based immunoassay pre-coated with recombinant HIV1, HIV2 and HIV 1 Group O antigens (relative sensitivity > 99.9%, relative specificity > 99.7%) was used for detection of anti-HIV antibodies.

A repeat serum sample was aseptically obtained for all individuals testing positive for anti-HIV antibodies on the first whole blood sample, after post-test counselling. This was transported under cold chain to the reference laboratory, where confirmation of HIV status was carried out based on three tests (Enzyme Linked Immuno-Sorbent Assay /Rapid/Simple, E/R/S) as per NACO guidelines [12]. ELISA was carried

out using HIVASE 1 and 2 (a Direct Sandwich Enzyme Immunoassay Kit with recombinant HIV1 Envelope and HIV2 Envelope Antigens, General Biologicals Corp. Taiwan, ROC.). COMBAIDS –RS Advantage (a simple HIV1 and 2 Immunodot test kit, Span Diagnostics, Surat India, sensitivity 100%, specificity 100 % using recombinant proteins and synthetic peptides) and HIV TRI-DOT (a rapid visual test for the qualitative detection of antibodies to HIV1 and HIV2, Biomed Industries, Parwanoo, India, sensitivity 100%, specificity 100%) were the other two test formats used.

Quality assurance measures like training, supervision and appropriate feedback mechanisms were integral part of each activity during the study. For sample size, the prevalence of HIV infection in India was taken as 7 per 1000, with alpha 5% and chance error 15%. The sample size worked out to be 20000. However 23,000 subjects were included and 22,666 analyzed (98.55%). A database was created in MS Access and appropriate descriptive and analytical statistics applied using SPSS ver 11.0.1. All point estimates were calculated with 95% confidence intervals and appropriate statistical tests were carried out.

Results

A total of 22,666 trainees were included in the study out of 23,000 (response rate 98.55%), the non inclusion was due to incomplete information provided by the study subjects (1.31%) and refusal to be part of the study (0.14%). The demographic and other characteristics of those who refused or provided incomplete information were almost similar to those included in the final analysis ($p > 0.05$). The age, formal education and family income of participants ranged from 15-28 years (mean 19.75 ± 1.47), 8-19 years (mean 11.05 ± 1.53) and Rs 500-1,20,000 (median Rs 2850) respectively (Table 1). There was no statistically significant difference in prevalence of HIV, HBV and HCV in the categories of age, education and family income.

Per thousand point prevalence of HIV, HBV and HCV was 0.62 (95% CI, 0.34-1.04, poisson), 9.35 (8.14-10.70) and 4.46 (3.63-5.41) respectively (Table 2). The prevalence of all infections in seven North Eastern (NE) states was compared with the rest of the states and a statistically significant difference ($p = 0.000$) was found for all infections with higher prevalence in NE states.

A statistically significant association was found between prevalence of HIV and history of sexual exposure ($p = 0.001$), injecting drug use (other than medical) and HCV ($p = 0.003$), alcohol consumption and HIV ($p = 0.001$), alcohol consumption and HCV ($p = 0.025$) which is detailed in Table 3. History of IDU was much higher in NE states as compared to other states ($p = 0.007$). Table 4 shows the type of partner, amongst those who responded positively to history of sexual exposure ($n = 3422$) and its association with prevalence of infections. Statistically significant associations were found when the partner was a neighbour (HIV, $p = 0.027$), casual acquaintance (HIV, $p = 0.001$) or girl friend (HIV, $p = 0.010$; HCV, $p = 0.001$). Our study also showed a high proportion (39.06%) of study participants not using condom ever and 22.03% using it rarely.

The condom use and infections in various categories of condom users has been shown in Table 5.

Discussion

Our study prevalence of HIV was slightly higher than a similar study amongst armed forces trainees conducted

Table 1
Distribution of study participants as per age, education, religion and family Income

	Number (n)	Percentage
Age (Years)		
≤ 19	10161	44.8
19 – 21	10006	44.1
> 21	2342	10.3
No Information	157	0.7
Education (Number of years of completed education)		
≤ 10	7492	33.1
11 – 12	8004	35.3
13 – 15	609	2.7
> 15	139	0.6
No Information	6422	28.3
Religion		
Hindu	17760	78.4
Muslim	704	3.1
Sikh	2874	12.7
Christian	699	3.1
Buddhist	195	0.9
Others	69	0.3
No Information	365	1.6
Family Income (Rupees per Month)		
≤ 2000	7540	33.3
2001 – 3000	5092	22.5
3001 – 5000	4548	20.1
> 5000	3473	15.3
No Information	2013	8.9

Table 2
Prevalence of HIV, HBV and HCV amongst study participants

	N	Per 1000 (95% CI)
HIV	14	0.62 (0.34 - 1.04)
HBV	212	9.35 (8.14 - 10.70)
HCV	101	4.46 (3.63 - 5.41)

Table 3
Association of HIV, HBV and HCV with history of sexual exposure, injecting drug use and alcohol consumption

	n (%) (95%CI)	HIV n (%) p value	HBV n (%) p value	HCV n (%) p value
Positive history of sexual exposure	3422 (15.10) (14.63 – 15.57)	10 (0.3) 0.001*	41 (1.2) 0.083	17 (0.5) 0.443
Positive history of Inj drug use \$	400 (1.76) (1.60 – 1.94)	1 (0.25) 0.310	4 (1.0) 0.947	4 (1.0) 0.003*
Positive history of alcohol consumption before sexual intercourse@	370 (10.81) (9.79-11.90)	6 (1.6) 0.001*	4 (1.1) 0.838	4(1.1) 0.025*

*Statistically significant; \$ 844 (37.23%) did not remember; @ 370 out of 3422 who gave positive history of sexual exposure

in 1996-97 (0.62 vs 0.46 per 1000) showing an increase of 35% over a period of seven years amongst this largely rural group [13]. Amongst all potential entrants to United States military service who are screened for HIV, the figures show a gradual decline from 2.89 per 1000 in 1985 to 0.36 per 1000 in 2000 [14]. In a study in largely rural areas of Tamil Nadu [15] HIV prevalence was 1.8%. The hospital based studies have generally shown a higher prevalence e.g. a Varanasi hospital study [16], showed 3.17% overall prevalence with 6.42% in high risk group and 0.37% in low risk group. Amongst blood donors, the incidence of HIV was 0.44% in total blood donors, more (0.461%) in replacement donors as compared to voluntary (0.279%) donors [17]. The studies in general population are now challenging the current estimates based on sentinel and high risk group surveys. An Andhra Pradesh study [18], showed HIV prevalence as 1.72% with men at 1.74%, women at 1.70%, rural population at 1.64% and urban population at 1.89%. HIV prevalence in our study is much less than overall prevalence in the country due to the younger age group of study participants.

Our study prevalence of HBV and HCV are also lower than the estimates for general population. In Tamil Nadu prevalence of HBV infection was 5.3% (CI: 5.1-5.5). In community based studies on prevalence of HBsAg among children, it was 3.3% and 4.2% in Rajahmundry and Bangalore respectively [15]. A global pool of an estimated 170 million carriers of HCV is thought of acting as a reservoir of this infection in the world. Whereas the USA and Western Europe had four and five million carriers respectively, nine countries of the South East Asia Region accounted for 25 million carriers, 12 million in India alone [19].

In our study, HIV was associated with positive sexual history but this was not found for HBV and HCV pointing to a need for strengthening of HBV immunization. The infections due to injecting drug use pose a global problem with more than 60 countries with documented HIV infection amongst IDUs [20]. As

Table 4

Details of types of partner of study participants with history of sexual exposure (n=3422) and association with infections

Type of partner	n (%) (95% CI)	HIV p value	HBV p value	HCV p value
CSW	160 (4.68) (3.69 - 5.84)	1.000	1.000	0.322
Neighbour	614 (17.95) (16.10 - 19.93)	0.027*	0.431	0.252
Casual Acquaintance	158 (4.61) (3.63 - 5.77)	0.001*	0.563	1.000
Girlfriend	2126 (62.14) (59.69 - 64.53)	0.010*	0.244	0.001*
Boyfriend	89 (2.59) (1.87 - 3.50)	1.000	0.384	1.000
Wife	275 (8.03) (6.74 - 9.48)	1.000	0.193	0.495
Total	3422 (100%)			

CSW - Commercial sex worker; *Statistically significant

shown by other studies [21,22], our study also showed HIV and HCV infections associated with injectable drug use. Other factors associated with transmission of these infections include non use of condoms, type of partner, lack of knowledge regarding modes of spread of HIV, consumption of alcohol before sexual encounter and the reach of the HIV/AIDS Prevention and Control Program.

In a concentrated epidemic (less than 1 % prevalence in the general population but more than 5 % prevalence in high-risk groups), HIV may remain confined to circles of people with high risk behaviour either because of few links between those groups and the general population or infection not having spread to sufficient number of individuals to cause explosive growth. It may be just a matter of time before the epidemic becomes generalized. The combination of serological and behavioural data can produce a clearer picture of the epidemic [23,24].

There is an urgent requirement to plan and implement school based interventions. As seen in other countries, a behaviour change strategy utilizing interpersonal communication, health facilities, combination of campaigns approach and optimum utilization and strengthening of existing programmes needs to be implemented on priority.

Conclusion

Self-exclusion for recruitment as military trainees precludes us from generalizing these results to the states of their origin. Although HIV prevalence is still low at 0.62 per thousand, it has shown a 35% increase in a period of seven years when compared with a similar study carried out in 1996-97 [13]. Though the low prevalence would not warrant a screening programme at the entry level, it shows the need of monitoring the

Table 5

Use of condom during a sexual encounter and infections in various categories of users

	n (%) (95% CI)	HIV n (%)	HBV n (%)	HCV n (%)
Always	1102 (32.21) (30.43-34.13)	3 (0.4)	10 (1.2)	11 (1.3)
Usually	229 (6.7) (5.78-7.72)	2 (1.1)	2 (1.1)	0 (0.0)
Rarely	754 (22.03) (20.46-23.66)	5 (0.9)	8 (1.4)	3 (0.5)
Never	1337 (39.06) (37.20-40.95)	1 (0.5)	17 (1.6)	2 (0.2)

state of HIV prevalence for possible introduction of screening at a later period. The need for introduction of such a program for candidates from the North Eastern states needs to be examined. Results, however, show that more concerted efforts are required in the current HIV/AIDS program activities of India to bring about knowledge and behaviour change amongst teenagers and young adults. Targeted interventions aiming changes in knowledge, attitude and behaviour should be started immediately on arrival of trainees at training centres. A follow up of this cohort would provide estimates of incidence of these infections.

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Conflicts of Interest

None identified

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