EPIDEMIOLOGICAL STUDY OF ENTEROPATHOGENIC CARRIER STATE AMONG FOOD HANDLERS OF ARMED FORCES EATING ESTABLISHMENTS

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ABSTRACT

A cross-sectional epidemiological study was undertaken on a randomly selected sample of 308 food handlers working in different eating establishments of Indian Armed Forces in Pune. These included 101 Service personnel and 207 civilians. Stool samples were analysed for enteropathogens and epidemiological assessment of gastrointestinal disease occurrence in the military units of these food handlers was undertaken. The study revealed that 4 of the subjects were carriers of *salmonella typhimurium*, thus giving the prevalence as 1.3% (95% confidence interval 0.2% to 2.56%). No other enteropathogen except *salmonella typhimurium* was isolated. The positive carriers showed a typical "spatial - clustering" in that they were working in two geographically contiguous medical units.

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KEY WORDS : Carriers; Food-handlers; *Salmonella typhimurium*.

Introduction

Of all the basic necessities of life, food and water are, naturally, the most important ones. However quite often, the same indispensable items of life may become the vehicles of transmission of serious disease to the consumers. Food borne illnesses are of major public health concern, not only in the developing but also in the developed countries. Food - handling personnel play an important role in ensuring food safety throughout the chain i.e. production, processing, storage and preparation of food [1].

The magnitude of adverse effects of food insanitation becomes more outstanding in establishments where food is supplied to a large number of people, so that contamination of food is likely to effect a relatively greater number of people [2]. This has a direct implication for the Armed Forces where community cooking and feeding, in the form of "Langars" and messes are essential features of administrative structure, and hence carry all the risks inherent in such community feeding. Naturally, therefore, food borne diseases are one of the important health priority issues in the Indian Armed Forces [3]. Besides morbidity, mortality, human suffering, cost of treatment and wastage of man - days, there is yet one more facet of these diseases - even a small outbreak of food borne

illness in a military unit causes substantial embarrassment for the administration and impinges on the morale of troops.

Despite the overriding public health importance that has been accorded to food hygiene in the Armed Forces, there have been, surprisingly, very few studies which have evaluated the prevalence of transmissible enteropathogens among Armed forces food handlers [4] against this backdrop, the present study was undertaken to further explore this important area of public health.

Material and Methods

The present study was a cross-sectional, epidemiological design undertaken in Pune-Kirkee-Khadakvasla Cantonments. Keeping an expected parameter of 3%, with an acceptable 95% confidence interval of 1% to 5%, the minimum sample size worked out to 291 food handlers [5]. In fact a larger sample of 308 was selected by multistage random sampling as described by Yates [6]. These food handlers included 101 Service and 207 civilian personnel, drawn from 17 different military units. Morning stool samples were collected in sterile containers and transported within one hour to Department of Microbiology for bacteriological investigations. Samples of stool were inoculated to Selenite-F and alkaline peptone water and directly inoculated to a plate of MacConkey agar. After 6 hours and overnight incubation, subcultures were made from the enrichment media to MacConkey deoxycholate citrate agar (DCA) and thioglycollate bile salt agar (TCBS) media. All these plates were examined after overnight incubation, for the presence of possible pathogens. Suspected colonies were picked

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up and were identified by standard biochemical tests [7], the strains so identified were confirmed by use of antisera. Available medical records from the units were assessed for epidemiological evidence of gastrointestinal disease during past one year. All possible sources of supply of raw food material and water to the various study units were evaluated from public health point of view. Statistical procedures included calculation of the point estimates, their 95% confidence intervals (95% CI), tests for hypothesis by chi-square test, and calculation of odds ratio (OR) and 95% CI of OR.

Results

(a) Overall prevalence of enteropathogenic bacteria:-

It was observed that the prevalence of carrier state for enteropathogenic bacteria among food handlers was 4 out of 308, i.e., 1.3%, which was quite low. The exact value of 95% CI of this prevalence estimate was 0.20% to 2.56%.

(b) Types of enteropathogenic bacteria isolated:

All the four handlers so detected, were positive for only *Salmonella typhimurium*, no other enteropathogenic bacteria (viz, other species of *Salmonella*, *shigella*, spp, *Vibrio* spp) could be isolated.

(c) Service / civilian personnel differential in prevalence of carrier state of enteropathogenic bacteria:

The findings are presented in Table 1. It was observed that the carrier rate for enteropathogenic bacteria was 0.99% among service food handlers and only slightly higher (1.45%) among civilian food handlers of the Armed Forces eating establishment. Fisher's exact 'p' value was 0.99 and thus there was no significant difference between service personnel and civilian personnel as regards carrier state.

TABLE 1

Distribution of enteropathogenic prevalence according to service/civilian background

Enteropathogen carrier state	Service personnel No. (%)	Civilian personnel No. (%)	Total No. (%)
Positive	1 (0.99%)	3 (1.45%)	4 (1.3%)
Negative	100 (99.01%)	204 (98.55%)	304 (98.7%)
Total	101 (100%)	207 (100%)	308 (100%)

Odds ratio (R) = 0.68, 95% CI of OR = 0.03 to 7.43

Fisher's exact test 'p' value = 0.99 (not significant)

(d) Clustering of cases in space:

An interesting finding in the present study was that while the 308 food handlers were taken up from 17 different defence units located all over Pune - Kirkee - Khadakvasla cantonments, all the four handlers who were found positive for enteropathogenic carrier state belonged to two large units located in close proximity with each other. All the 3 positive civilian food handlers were from one of these large units while the one positive service food handler belonged to another large unit located in close proximity.

There was thus a clustering of cases in space. More interestingly, the common denominator that these four positive personnel shared with each other, and in which they were different from most of the food handlers who were found negative, was that these four persons were working as a food handlers in two very large, closely located Medical Units of the armed forces, though in different messes of these units. All the positive persons were asymp-

tomatic and healthy carriers.

TABLE 2

Statistical analysis of clustering in space of food handlers in medical units

Type of study units	No. of food handlers positive for salmonella	No. of food handlers negative for salmonella	Total
Two closely located medical units	4 (3.8%)	103 (96.2%)	107 (100%)
All other study units	nil (0%)	201 (100%)	201 (100%)
Total	4	304	308

Fisher's exact 'p' value = 0.014 (significant)

(e) Antibiotic sensitivity results:

Antibiotic sensitivity tests undertaken in the Department of Microbiology, using Mueller Hinton agar (MHA), plain (P) as well as using lysed blood (L), showed that isolates from the four handlers were sensitive to all antibiotics, viz. ampicillin, tetracycline, gentamicin, sulpha, streptomycin, trimethoprim, norfloxacin and chloramphenicol.

Discussion

The findings of the present study as regards overall prevalence of enteropathogenic carrier state commensurates well with a similar study done in Armed Forces eating establishments by Tilak and Bhalwar, in Delhi in 1993 [4] wherein they found the prevalence of carrier state of enteropathogenic bacteria among food handlers to be 1 out of 97 (1.03%). Even statistically, there is no difference between the findings of the present study and the above quoted study. ($Z = 0.22$, $p > 0.05$, not significant). Interestingly even in the earlier study of Tilak and Bhalwar [4], *S typhimurium* was again the only enteropathogenic bacteria that was detected though tests were undertaken for *Vibrio* sp, *Shigella* sp, *ETEC*, as well as for other species of *Salmonella*. Thus, the findings of the present study, in consistence with another study done earlier, indicate that a carrier rate of 1 to 1.3% of enteropathogenic bacteria among food handlers of the Armed Forces could be expected, and that *Salmonella typhimurium* is likely to be the only enteropathogenic bacteria that leads to carrier state among Armed Forces food handlers, at least during non-epidemic periods. Routine testing of food handlers for carrier state for enteropathogenic bacteria is therefore not likely to commensurate with the high cost and efforts involved therein. This is also in accordance with the recommendation of WHO in which routine screening of food handlers for enteropathogenic bacteria has been discouraged [8].

A peculiar geographical clustering of all the 4 carri-

ers in two adjoining defence units, and that too, both these units being large medical units is peculiar. The possibility that these positive cases might have been themselves infected as a result of consuming food contaminated with *S typhimurium* is also not tenable since the supply of food items to all military units in Pune is from common source (i.e. the Supply Depot) and no exclusively separate source of supply exists for any food item for these two units.

Moreover, there was no epidemiological indication of increased incidence of gastro-intestinal diseases with clinical presentation of salmonellosis in the two units in which these four positive food handlers were clustered, over the study period. If these food handlers did have a potential of transmitting salmonellosis through food, some epidemiological indication of increased frequency of salmonellosis like illness should have been apparent in the various messes of the two units where these two food handlers were employed.

This study, then opens up a few questions which need to be further explored. Firstly, why should there be a significant clustering, in medical units of food handlers who are carriers of *Salmonella*? Secondly, even if carriers of *Salmonella*, are these food handlers likely to play a significant role in outbreaks of *Salmo-*

nella food poisoning? It is suggested that further studies may be undertaken to address these issues, which may help in drawing public health conclusions as regards testing for carrier state among food handlers in the Armed Forces.

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