A Study of Attitude and Practices Towards Water Safety amongst Troops during Move

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ABSTRACT

Introduction: Water safety and subsequent water discipline is of paramount importance to troops of any army. Troops in India frequently suffer from water borne diseases because of the nature of their duty and the omnipresence of the causative organism in the environment. This is compounded by the large amount of movements undertaken by the troops. The study was undertaken to analyze water and food safety practices among troops while on move as well as to examine whether there are certain modifiable factors which are having a direct bearing on such practices.

Material and Methods: A retrospective study was carried out by self-administering a pretested questionnaire to troops reporting back from leave from eight randomly selected regiments, during a three-month period. Baseline data on was collected on their socio demographic parameters as also various types of movements, their attitude and practice of drinking water during journeys and also on food habits.

Results: Risky behavior of consuming water and food from unauthorized sources was seen in 10% and 7% respectively. Almost 35% did not carry water in-person and probably purchased pre-packaged water bottles en-route. One third of the study population encountered difficulty while refilling/ collecting water like long queues, irregular halts, non-stop journeys and unhygienic sources. Association of socio-demographic factors on the frequency of use of water sterilizing tablets brought out that the common perception that factors like education, marriage and higher service would make a person more mature and thus would adopt safer practice of use of water sterilizing formulations was established as incorrect in the study. While education does make a person more aware, and hence should have a positive outcome on the food and water discipline during travel; yet did not necessarily lead to better hygienic practices. Association of socio-demographic and travel factors on the water and food discipline also revealed facts which are contrary to popular belief.

Conclusion: Although the troops generally have high level of awareness on the hygiene and sanitation aspects, that did not necessarily result into practice of good food and water discipline during travel and more importantly was unrelated to socio-demographic factors like education, prolonged service and marriage.

Key words: Water discipline, Travel, Army troops, Risky behavior, Water sterilizing formulation, Association with Education, Service, Marriage

INTRODUCTION

Claude Bernard (the grandfather of physiology) called water as the *milieu intérieur*, an internal saline environment to bathe our cells. This special capability allows us to moderate our internal environment through homeostatic mechanisms and survive in the face of a wide variety of external stressors. Enhancing this capability to endure extreme environments is of particular importance to the Army, wherein any advantage to better exploit hostile conditions may be critical to mission success. Thus, water logistical planning and optimization of soldier osmo-regulation are in essence, tactical weapons. Relatively small derangements in hydration status can significantly impair mission performance. Water and hydration standards are just as relevant today as they were in World War II. We still have deaths in training from inadequate fluid consumption.

During the end of the last decade it was observed that there was a substantial increase in the incidence of Viral Hepatitis, Enteric Fever and gastrointestinal disorders in the armed forces in one of the forward sectors. Most of these cases were imported and seem to have been contacted while on move. Because of their nature of duty troops in this sector had to endure increased travel, thus exposing the troops to increased risk of contacting waterborne disease while on move. With this background, a study was under taken to evaluate the behavior and practices of troops while on move regarding the drinking water and food discipline as well as to study whether there are certain modifiable factors which are having a direct bearing on such practices.

MATERIAL AND METHODS

A retrospective study to analyze the attitude of troops regarding water and food discipline while on move and the various factors which effect such behavior was carried out among troops from a field location, from 08 randomly selected regiments, proceeding on leave during a three month period formed part of the study.

Size of sample: The sample size was calculated with an expected parameter estimate of 0.03 with a view to obtain 95% confidence interval and worst acceptable as 0.015. The

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optimum sample size to evaluate each item worked out to 500, thus making the sample size to be 2000 for the study which would be sufficient to shortlist the best one suited for troops on move.

Each individual was allocated an Accession Number to ensure single blinding. A pretested questionnaire was self-administered after they reported back from leave to collect data on

- Baseline data on their socio demographic and economic parameters
- The various types of movements, their attitude and practice of drinking water during journeys and also on food habits

RESULTS

Socio-demographic and travel pattern among troops

The important socio-demographic factors which were explored were age, duration of service, education and marital status, since these appeared to have a direct bearing on the behavior pattern being analyzed in the study. The socio demographic outline of the study population followed that of the armed forces, with majority (66.4%) being young in the age group of 26-35 years, sepoys forming major proportion of the study population (66.8%), belonging to 6-15 yrs service bracket (62%) and almost all having education qualification up to standard X or XII.

Some of patterns of movements while proceeding on leave were also perceived as relevant and could influence behavior of water and food discipline. These were modes of travel, duration, frequency and halts during travel. The travel pattern followed the common modes of travel in India with buses and train being equally preferred. Almost one third people used both the modes. Majority of travel was completed within 12 hrs (41%). Long distance travel (>2 days) was seen in 6.3% of cases. Frequent travelling was recorded in more than half the study population (56%), being in the field area. There was no regular pattern of halts during majority (63%) of the journeys.

Water and food discipline during travel

Various behaviors which were explored were categorized under three heads viz.,water drinking habits, food intake and use of water sterilizing tablets.

(a) Water drinking practices- Clean and hygienic source for drinking water was preferred by 90% of people. To this effect, some of the relevant habits were-

- Carriage of water in person- Majority of people carried water in-person (46%) probably since the travel duration was short (<12 hrs).
- Washing of water containers and collection of water- Almost all personnel were washing their water bottles before refill.

A large group of personnel (41%) experienced some difficulty or other while collecting water en-route. The most common complaint was unclean water in railway stations/ bus stops (34%). Other problems brought out were long queues (22%), Short duration of halts (18%) and nonstop journeys (16%). This is an important observation having direct bearing on the large number (35%) who were not carrying their own water. Cost of water was not an important factor- only 2% complained about water being costly.

(b) Food habits - Risky behavior of consuming water and food from unauthorized sources was seen in 10% and 7% respectively. Almost all (97%) gave history of handwashing of which 73% brought out that they used soap every time.

(b) Use of water sterilization- Only 129 out of the 2000 study population gave history of not having used any water sterilizing formulation (6.5%). However a large number were also found to be occasional users too (39%). These were the people who were inclined to buy pre-packed bottled water.

Association of socio-demographic and travel aspects on the frequency of use of water sterilizing tablets

(a) Socio demographic factors like *education, total service and marital status* were expected to have a bearing on the tendency of troops to use water sterilizing formulations (Table 1). Education seems to have a negative effect on the use of water sterilizing formulations. Persons with higher education seem to be using the formulations less frequently- a difference which was statistically highly significant. Similarly marital status also had a negative effect on the frequency of use- a statistically significant higher percentage of unmarried people were using the formulations than married people. However no association was found between service duration and the frequency of use of formulations.

(b) Some of the aspects of travel, like mode of travel and duration of journey which could effect the likelihood of use of water sterilizing tablets were studied. There was no difference observed for use of the formulations while using different modes of travel like train, bus, private vehicles and walking. However people who used multiple modes during the journey were using the formulations less often than a single mode of travel- this was statistically significant. Similarly a statistically significant association was noticed between duration of travel and tablet use. The frequency of tablet use was much higher when duration was short (< 12 hrs) compared to longer duration of travel. Higher frequency of tablet use was also noticed during very long journeys (travel duration > 48 hours).

Education				Service			Marriage	
	Ten+	Twelve+	Graduate	<5yrs	6-15yrs	>16yrs	Married	Unmarried
Users	899(94.3%)	907(91%)	50(78%)	329(94.3%)	1167(91.6%)	361(93%)	1571(93%)	290(90%)
Non users	51(5.7%)	82 (9%)	11 (22%)	20 (5.7%)	107 (8.4%)	27 (7%)	118 (7%)	33 (10%)
x2= 17.25, p < 0.01				x2= 3.09, p >0.05			x2=4.08, p <0 .05	

Table-1: Association of Social Factors with Usage of Water Sterilizing Tablets

Water/ Food Hygiene	Education			Service			Marriage	
	Ten +	Twelve +	Graduate	<5yrs	6-15yrs	>16yrs	Married	Unmarried
Carrying water	351 (71%)	386 (76%)	23 (12%)	195(79%)	487(76%)	116(63%)	100(68%)	658(25%)
	x2=5.95 p <0.05			x2=16.85, p<0.01			X^2=2.41, p > 0.05	
Washing bottles	414(84%)	417(82%)	24(77%)	50(25%)	87(14%)	43 (22%)	33(24.5%	156(17.5%)
	x2=1.24 p >0.05			x2=16.80, p<0.01			X^2=3.78, p <0.05	
Unhygienic Areas	9 (2.8%)	27(6.7%)	0	4(2.8%)	18(3.8%)	14(10.1%)	7(7 %)	37(5.7%)
	x2=7.63 p <0.05			x2=11.0, p<0.01			X^2=0.35, p >0.05	
Not hand-washing	129(13.7%)	156(16%)	13(15.5%)	45(13%)	98(8.4%)	58(15%)	37(12 %)	261(15.5%)
	x2=2.08 p >0.05			x2=16.15, p<0.01			X^2=2.48, p >0.05	
Not using soap	194(21%)	264(38%)	21(36.8%)	62(18.2%)	342(28%)	82(22%)	48(19.6%)	432(35.8%)
	x2=9.92 p <0.01			x2=15.28, p<0.01			X^2=13.21, p <0.01	
Use pre-packed food	259(28%)	232(25%)	35(42.2%)	100(29.2%)	345(28%)	79(20.3%)	132(43.6%	392(24%)
	x2=13.22 p <0.01			x2=9.15, p<0.01			X^2=49.72, p <0.01	
Unauthorize Vendors	30(3.3%)	82(8.7%)	0	33(9.7%)	56(4.6%)	27(7.1%)	19(6.27%)	94(5.75%)
	x2=30.32 p <0.01			x2=13.55, p<0.01			X^2=0.13, p >0.05	

Table-2: Association between Social Factorswith Water and Food Hygiene

	Road	Train	Mixed	
Always using WSP	405(55%)	300(51%)	269(46%)	X^2=9.63, p<0 .01
Safe Drinking water habits	599(80.7)	515(89%)	398(68.6%)	X^2=102.1, p<0.01
Occasional/ Never handwashing	86(11.6%)	112(18.6%)	91(15.6%)	X^2=12.92, p<0 .01
Occasional/ Never using soap	186(25.9%)	113(19.3%)	168(29.5%)	X^2=16.64, p<0.01
Carriage of Pre-packed food	195(27.8%)	163(27.2%)	143(25%)	X^2=1.33, p >0.05
Procurement from unauthorized local vendors	22(3.1%)	56(9.3%)	35(6.1%)	X^2=21.95, p<0.01

Table-3: Association between Modes of Travel with Water and Food Hygiene

Association of socio-demographic factors and travel aspects on the water and food discipline-

(a) Safe water and food discipline habits like carrying water in person, refilling *enroute*, washing of bottles during refill, preference for a hygienic source of water, frequency of handwashing, use of soap, carriage of prepacked food and consuming food from authorized sources were thought to be associated with certain socio-demographic factors like education, length of service, marriage and certain travel attributes like modes of travel and duration of journey. **(**Table 2)

(b) Safe drinking water practices and food discipline were associated with higher level of education. Hygienic practices like hand washing did not have any relation but on the contrary soap use was associated with lower level of education.

(c) Persons who are young in service (< 5 yrs) were found to be adopting safe practices for drinking water like carrying water in person, refilling *enroute*, preference for a hygienic source, as well as having better sense of hygiene like hand washing and soap use compared to higher service bracket people. However carrying prepacked food and avoiding food from local vendors was associated with higher service levels.

(d) Marriage of an individual also did not confer any additional benefit regarding hygiene habits, water and food discipline during travel- except for carrying prepacked food and soap use which was preferred significantly more by married people. Water and food discipline as well as hygiene habits was better maintained when people were using single mode of transport rather than mixed modes during their journey. (Table 3)

DISCUSSION

The socio-demographic outline of the study population matched that of the Indian army, whose habits of food and water intake during travel needed to be analyzed. The above mentioned travel pattern was also similar to what majority of our troops encounter while on move and need to be considered while studying water and food discipline.

Majority of people were carrying their own water (46%) during travel probably since the travel duration was short (<12 hrs). Another 35% were not carrying water in-person and were probably purchasing pre-packed water bottles en-route. The long duration of journey and multiple modes of travel was the probable cause. One third of the study population encountered difficulty while refilling/ collecting water like long queues, irregular halts, non-stop journeys and unhygienic sources. This is an important observation which has a direct bearing on the 35% of the people who are not carrying their own water. Cost was not an important cause for non procurement of water. This has also been pointed out by Chowdhury (1999) in Dhaka, Bangladesh where the slum dwellers were also willing to pay for safe drinking water.[1] Jalan et al (2003) documented in Delhi that willingness to pay for safe drinking water is highest for the higher educational level of female household member.[2] This has been corroborated by MirajulHaq, Usman Mustafa, and Iftikhar Ahmad in Abbotabad, Pakistan wherein it was found that education level has a direct bearing on the willingness to pay for safe drinking water.[3]

Sr No	Location	Authors/ workers	Year	Findings
1	Delhi	Jalan et al[2]	2003	Safe drinking water practice is higher for higher educational level
2	Abbotabad, Pakistan	MirajulHaq et al[3]	2009	Education level has a direct bearing on the safe drinking water practices
3	Kumasi, Ghana	ThildeRheinländer et al[6]	2008	Basic Hygiene practice like washing/ cleaning utensils/ washing raw vegetables/ quality of ingredients NOT considered important in road side food
4	Guatemalla	Barbara L. Herwaldt[7]	2000	Younger people showed more potentially risky exposures per day than older ones.
5	Finland	Leena Mattila et al[8]	2006	No correlation of age with unhygienic habits. Also dietary restraint impossible to follow during travel in most situations
6	US (Chinese American)	Nan LV & Katherine L Cason[9]	2004	Education, Marriage and Age positively associated with safe food and water discipline

Table-4: Results of Relevant Studies

In contrary to water habits, majority of people were consuming food *enroute*- mostly from authorized sources. Risky behavior of consuming water and food from unauthorized sources was seen in 10% and 7% people respectively. 3% were not washing hands during travel. Handwashing with soap is a simple but effective way of prevention of water borne diseases. Studies show that cases of diarrhoea were reduced by an average of 35% by the simple act of washing hands with soap and water.[4] Only 1% of study group were not using soap at all. Similar observations were also made by Indira Khurana and Ronit Sen while studying the behavioral approach in drinking water supply of rural India. Interventions for providing safe drinking water can become ineffective in the absence of improved sanitation. In order to provide access to safe water, introducing sound hygiene behaviour are of utmost importance. The ways and means by which water is collected also has an impact on its quality. It is essential to have a clean surrounding around the source to prevent contamination. Open drains and disposal of solid waste near sources of water may lead to presence of ammonia and coliform bacteria in the drinking water source.[5] In a study carried out in rural Bangladesh, Sonia Aftab, Enamul Haque and Zakir Hossain Khan documented that the most cited reasons for households not adopting safe drinking water practice were location far away from the residence (61%) followed by reasons like pollutants level not very high in drinking water source (22%) and not aware of the harmful health consequences contaminated water (13.3%).[6] Thilde Rheinländer et al in a study carried out in Urban Kumasi, Ghana on perceptions of street food safety found that although vendors and consumers demonstrated basic knowledge of food safety, they did not emphasize basic hygiene practices such as hand washing, cleaning of utensils, washing of raw vegetables and quality of ingredients as important. Instead, the four main food selection criteria identified were-- aesthetic appearance of food/food stand, appearance of the food vendor, interpersonal trust in the vendor, and customers often chose to prioritize price and accessibility of food—not putting much stress on food safety. Association of socio-demographic factors on the frequency of use of water sterilizing tablets brought out certain interesting facts. The common perception that factors like education, marriage and higher service would make a person more mature and thus would adopt safer practice of use of water sterilizing formulations was established as incorrect in the study. This could be due to the fact that it was easier for the lesser matured to be convinced about the benefits of the use of the formulations than those who were more mature and thus had fixed notions. While studying the travel aspects with frequency of tablet use the reason for limited use during multiple modes of travel could be because it became more cumbersome and time consuming. Similarly the reason for higher usage during shorter travel (<12 hrs) could be higher level of motivation and lesser amount of tablet use during short journeys. People undertaking very long journeys *(duration > 48 hours)* could probably be more cautious and planned their journeys in such a way that they were cautious about their water discipline.

Association of socio-demographic and travel factors on the water and food discipline also revealed facts which are contrary to popular belief. Thus while education does make a person more aware, and hence have a positive outcome on the food and water discipline during travel, but not necessarily lead to better hygienic practices. Persons who are young in service (< 5 yrs) were found to be adopting safe practices for drinking water like carrying water in person, refilling *enroute*, preference to a hygienic source, as well as having better sense of hygiene like hand washing and soap use when compared with higher service bracket people. However carrying prepacked food and avoiding food from local vendors was associated with higher service levels. Thus people with lesser age and service seem to be more aware of the hygiene practices and careful regarding water consumption compared to their senior colleagues. Barbara L. Herwaldt in a prospective study on peace corps volunteers in Guatemalla noticed that although younger participants (age < 30 years) were not at significantly increased risk for diarrheal illness, they recorded more potentially risky exposures per day than older persons did.[8] In another study done in Finland by Leena Mattila et al it was observed that though a large

percentage (45%) of the study population of 933 travellers, were indulging in risky food and water habits, there was no correlation of age with such habits. It was also concluded in the study that dietary self restraint was impossible to follow during travel in most situations.[9] Curtis participated in a major three-year study in India, Netherlands, UK and West Africa to learn what motivates good hygiene practices and found some interesting results. The study found that hygiene was a common value around the world and nobody liked dirt. People's hygienic practices have less to do with health than with social and aesthetic considerations.[4]

Salient of findings in some relevant studies carried in various socio demographic set up in India and abroad which corroborate with some of the findings in the present study are tabulated in Table 4.[2,3,7,8,9,10]

People travelling by train were more often carrying water in-person than other modes of transport. There was no consistent difference of food and water hygiene while performing the journey by road or train. However water and food discipline as well as hygiene habits was better maintained when people were using single mode of transport rather than mixed modes during their journey. This can be explained by the fact that the individual is usually unsettled and cannot pay adequate attention to these issues while switching over from one mode to other.

CONCLUSION

The study performed in field conditions, provided an ideal platform to study the water and food discipline during travel since both operational moves and travel during leave/ Temporary moves could be covered. Although our troops were having high level of awareness on the hygiene and sanitation aspects, that did not necessarily result into practice of good food and water discipline during travel and more importantly was unrelated to socio-demographic factors like education, prolonged service and marriage. One usually overlooks this basic safety of drinking water which unfortunately cannot always be ensured during travel. Getting people to change their habits represents a big task for health promoters

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