

Assessment of Morbidity Patterns and Occupational Hazards Among Food Handlers in Food Establishments in Tamilnadu, India

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DOI: 10.55489/njcm.150520243453

ABSTRACT

Background: Rapid urbanization has increased the intake of external (outside) foods, causing a surge in food-borne diseases. In the South-East Asian region of the World Health Organization, 150 million people fall ill with foodborne diseases every year, of which, 1.75 lakhs perish. Occupational hazards are of public health importance as they cause permanent disability, loss of livelihood, and morbidity.

Methodology: This cross-sectional study was conducted among 235 food handlers working in food establishments of a private educational institution in Tamil Nadu using a semi-structured pre-tested questionnaire. Descriptive statistics, odds ratio and one-way ANOVA were used. Occupational risk score was calculated. Data were analyzed using SPSS 22.0.

Results: The mean age of the food handlers was 30.7 (SD=10.3). Of the 235 participants, the majority were Males (86%). The commonest acute morbidity was Acid peptic disease (48.5%). Hypertension was reported in 26% of subjects. The most common occupational hazard was prickly heat (74.9% of the subjects). Work-related stress was reported by 72% of the food handlers. Physical hazards were high with a Mean value of 11.67 (SD=5.9)

Conclusion: Half the subjects reported Acid Peptic Disease as the most common morbidity. Burns at work and psycho-social issues were found at higher rates. Periodic deworming, vaccination against enteric organisms, routine examinations and ergonomically designed workplaces can prevent outbreaks and preserve workers' health.

Key-words: Food handlers, Morbidity pattern, Occupational hazards, Intestinal parasites, occupational risk score

ARTICLE INFO

Financial Support: None declared

Conflict of Interest: None declared

Received: 14-10-2023, **Accepted:** 05-02-2024, **Published:** 01-05-2024

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How to cite this article: Priyadharshini P, Logaraj M, Anantharaman VV. Assessment of Morbidity Patterns and Occupational Hazards Among Food Handlers in Food Establishments in Tamilnadu, India. Natl J Community Med 2024;15(5):363-369. DOI: 10.55489/njcm.150520243453

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www.njcmindia.com | pISSN: 0976-3325 | eISSN: 2229-6816 | Published by Medsci Publications

INTRODUCTION

"A 'Food handler' is anyone who handles packaged or unpackaged food directly as well as equipment & utensils used to prepare or serve food and/or surfaces that come into contact with food".¹ Following rapid urbanization, people migrate from rural to urban areas in search of opportunities, leading to increased consumption of food from the local eateries, hotels & other food establishments in the city. A large part of the urban population in India consumes food from small hotels and roadside eateries attributing to the easy access and reasonable cost of food. This can also be attributed to other factors such as liking outside food, more number of working women opting for 'ready to eat foods' and changing lifestyle patterns.

Foodborne diseases are the cause of illness and death worldwide. According to the World Health Organization, 1 out of 10 people fall sick from contaminated food every year.²

In the South-East Asian region of the World Health Organization, more than 150 million people fall ill to foodborne diseases every year out of which, 1.75 lakh perish. It also includes 60 million under-five children out of which 50,000 fall prey to foodborne diseases.³

In June 2019 alone, Tamilnadu reported 11,132 cases of acute diarrheal disease.⁴ The food-related hazards that cause illness can happen anywhere in the food chain from farm production to the household table.⁵

The food handler is expected to be in a state of complete physical health to prevent foodborne infections as microorganisms can be transferred passively from the food handler to food. This happens when the food handler suffers from a gastrointestinal infection or during his/her recovery (Convalescence). Organisms present in the body of food handlers can multiply to infective doses at optimum conditions and can come into contact with raw/cooked food, utensils or food preparation surfaces.^{6,7}

Cooks/ Food handlers working in commercial kitchens are one of the high-risk groups prone to occupational hazards, which can occur as a single event or due to repeated and multiple exposures to a single source. Food handlers working in high-temperature, humid and poorly ventilated environments for long hours making them prone to heat-related disorders, suffer from musculoskeletal disorders due to continuous, forceful, repetitive movements⁸ and are at the risk of burns from oven, stove, hot utensils and steam.⁹ They suffer from cuts, lacerations from knives and electric shock from appliances used.¹⁰

Though several studies highlight occupational hazards of food handlers, the psychosocial component of workplace hazards is addressed inadequately. Occupational hazards are of public health importance as they can cause permanent disability, loss of livelihood and morbidity which affects both the worker and his family. This educational institution feeds

thousands of students from various branches, staff and patients per day. So, it is important to check on the health status of food handlers to scrutinize food-borne outbreaks. This was also seen as an opportunity to provide health education and offer appropriate treatment for their medical conditions.

The study was carried out to assess the morbidity pattern and selected occupational hazards among food handlers.

METHODOLOGY

Study setting, design and study period: This cross-sectional study was carried out in a private educational institution located in Chengalpattu district, Tamilnadu, at a distance of about 40 Km from the nearest metropolitan city, Chennai. The study was approved by the Scientific and Institutional Ethics Committee and prior permission from the respective canteen and mess managers was sought before the commencement of the study. The study period was 3 months (December 2019 to February 2020).

Inclusion and exclusion criteria: Informed consent was obtained from the subjects. Food handlers handling packaged or unpackaged food, handling equipment and utensils used to prepare or serve food and those involved in cooking, cleaning, serving and transporting raw and cooked food were included in the study. Food handlers who denied consent to participate in the study and food handlers who were not present during the survey were excluded.

Sample size estimation: The sample size was calculated based on the study conducted in a tertiary care hospital (Sande S et al)¹¹ *Entamoeba histolytica* was found to be 16.7% in the stool parasitic estimates. So, keeping the prevalence (p) at 16.7 and allowable error (D) as 5, the sample size calculated using the formula $4pq/D^2$ was 223. Assuming a non-response rate of 5%, the final sample size arrived at was 235.

Data collection: The list of all food handlers working under various canteens and messes (food establishments) within the campus of the educational institution was made. There was a total of 630 food handlers in the Engineering and Medical canteens and messes. Since there was a discrepancy in the number of food handlers working in each establishment and the required sample size was 235, probability proportionate to size (PPS) was applied to include the number of participants from each establishment. Participants were included by simple random sampling. If a participant denied consent, the next participant on the list was included.

A pre-tested, semi-structured questionnaire that included details of the demographic details, habits, vaccination status and acute and chronic morbidities was used to collect data. The questionnaire also included 13 occupational hazards under the sections of Physical (5 questions), Chemical (1 question), Mechanical hazards (3 questions) and Psychosocial is-

sues (4 questions). As an adaptation of the methodology used by Lebni JY et al,¹² participants of our study were asked to rate their likely exposure to the specified occupational hazard on a 5-point Likert scale ranging from very low (1 point) to very high (5 points). The minimum and maximum scores which can be obtained are 13 and 65 respectively. The mean (SD) scores for each category of hazards (Physical, Chemical, mechanical and Psychosocial hazards) were calculated to identify the highest reported hazard. Also, the final mean occupational risk score of food handlers was calculated.

A general physical examination of all food handlers was done including anthropometric measurements. Blood Pressure measurements and estimation of Random blood glucose levels by Capillary blood glucose estimation were carried out by trained paramedical staff. Those participants with clinical signs and altered BP and blood glucose values were referred appropriately for medical care. Also, participants reporting any other health issue (including occupational health issues) were referred for adequate treatment.

Laboratory investigations: Blood for estimation of Haemoglobin levels was collected from the participants by trained laboratory personnel under aseptic precautions. Prior informed consent was obtained from the participants for collecting blood and stool samples. A sterile container was given to them during data collection and the stool samples were collected the next day (first-morning sample) for Stool ova and cyst examination. Clear instructions were given to the participants on collecting stool samples in a sterile way. Any history of consuming anti-helminthic drugs by the participants in the last 6 months was ruled out before collecting stool samples. The blood and stool samples were sent to the Central Laboratory of the institution for examination. Food handlers who were detected with intestinal parasites were followed up and treated with appropriate deworming measures.

Statistical analysis: The collected data were analysed using relevant descriptive and inferential statistical techniques using SPSS version 22. Age was expressed in mean and standard deviation. Mean duration of employment and Mean Occupational risk scores were calculated. The odds ratio was used to determine the strength of the association of occupational hazards & work nature of the participants. A one-way ANOVA computation was done for the duration of employment of food handlers and the various occupational hazards. Self-reported, present acute morbidities, chronic morbidities and intestinal parasitic estimates were expressed as frequencies and percentages. All statistical tests were considered statistically significant when two-sided $P < 0.05$.

Ethical considerations: Ethical approval was obtained and the study was approved by the Institutional Ethics Committee on March 24, 2019. (Ethics clearance Number: 1703/IEC/2019)

RESULTS

The mean age of the food handlers was 30.7 (SD=10.3), ranging between 18 and 64 years. The majority of the participants (109, 46.4%) belonged to the age group of 18–33 years. The proportion of males (202, 86%) was much higher than females (33, 14%). Concerning educational qualification of the subjects, the majority of the subjects (112, 47.7%) had high school education. Only 4 (1.7%) had a graduate degree. A larger proportion of food handlers 109 (46.4%) had an income ranging between Rs.10,000 to 15,000. Considering the Socioeconomic class of the subjects, a major part of them belonged to Class IV (Upper lower). Only one subject fell under Class II (Upper middle).

A larger proportion of the workforce was constituted by Assistant cooks (37.9%) followed by Servers/Waiters (37%). The mean duration of employment was 1.39 (SD=0.58) years and 66 % of the participants have worked for less than 5 years. [Table 1]

Out of the total 235 subjects, 86 (36.6%) admitted to smoking, 108 (46%) consumed alcohol and 138 (58.72%) admitted to having had mixed habits.

Table 1: Socio-demographic profile of Food handlers (N=235)

Variable	Participants (%)
Age	
18-33 years	109 (46.4)
34-49 years	86 (36.6)
50-65 years	40 (17)
Sex	
Male	202 (86)
Female	33 (14)
Educational Qualification	
Illiterate	3 (1.3)
Primary school	5 (2.1)
Middle school	72 (30.6)
High school	112 (47.7)
Higher Secondary	39 (16.6)
Graduate	4 (1.7)
Income	
Less than Rs. 10,000/ month	103 (43.8)
Rs. 10,001- 15,000/ month	109 (46.4)
More than Rs. 15,000/ month	23 (9.8)
Socio-economic class	
Upper middle (II)	1 (0.4)
Lower middle (III)	109 (46.4)
Upper lower (IV)	120 (51.1)
Lower (V)	5 (2.1)
Nature of work	
I) Food handlers working inside the kitchen:	
Head Cook	18 (7.7)
Assistant Cook	89 (37.9)
Vegetable cutter	38 (16.2)
II) Food handlers working outside the kitchen:	
Server/ Waiter	87 (37)
Dishwasher	3 (1.3)
Duration of employment	
Less than 5 years	155 (66)
5-10 years	70 (29.8)
More than 10 years	10 (4.2)

As for the vaccination status of food handlers, 16 subjects (6.8%) had been vaccinated with Tetanus Toxoid, 30 (12.8%) with Hepatitis A vaccine, 79 (33.6%) with Hepatitis B vaccine and 28 (11.9%) with Anti-typhoid vaccine. Only 28 food handlers (11.9%) were de-wormed in the last 6 months. Physical examination of subjects elicited the following signs: Pallor was a significant finding among 21 out of 202 Males and 21 out of 33 Females. 26 Males (11.1%) and 1 Female (0.4%) had pedal oedema and 3 Males (1.3%) had rashes.

Physical hazards like prickly heat, cuts and lacerations and workplace burns had ORs of 4.31, 3.34 and 2.04 respectively putting the food handlers at increased odds of suffering from the above-mentioned occupational hazards. The higher prevalence of prickly heat warrants an effective ventilation mechanism to ward off internal heat and indoor cooling

facilities like large fans and air conditioning systems. A few other conditions reported were fatigue, body aches and shoulder stiffness due to repeated, rotatory movements like stirring large containers, transporting heavy loads and varicose veins due to prolonged standing and long working hours. Psychosocial issues were the most reported among all occupational hazards. Work-related stress showed an OR of 4.3 and other issues like lack of recognition and lack of appreciation of skills were significant. [Table 2]

A one-way ANOVA examination comparing the occupational risk score and the mean duration of employment indicate noteworthy differences within (4866) and between (1864.8) groups. The calculated Mean Sum of Squares, particularly between groups (932.4), aligns with the initially observed patterns.

Table 2: Association of occupational hazards with work nature of food handlers (N=235)

Occupational hazard	Food handlers working inside the kitchen (n=145) (%)	Food handlers working Outside the kitchen (n=90) (%)	OR	95% CI	P-value
Physical, Chemical & Mechanical Occupational hazards					
Prickly heat					
Yes	124 (85.5)	52 (57.77)	4.31	2.31 to 6.05	<0.001*
No	21 (14.5)	38 (42.23)	Ref		
Heat cramps					
Yes	2 (1.37)	2 (2.22)	1.25	1.16 to 1.45	0.893
No	143 (98.63)	88 (97.78)	Ref		
Burns at work					
Yes	49 (33.7)	18 (20)	2.04	1.09 to 3.79	0.0242*
No	96 (66.3)	72 (80)	Ref		
Stiffness of shoulder & wrist					
Yes	37 (25.5)	26 (28.88)	1.96	1.59 to 2.34	0.075
No	108 (74.5)	64 (71.12)	Ref		
Slips & falls					
Yes	2 (1.37)	1 (1.11)	1.43	1.27 to 1.52	0.837
No	143 (98.63)	89 (98.89)	Ref		
Fatigue & body aches					
Yes	70 (48.27)	53 (58.88)	1.34	1.22 to 1.48	0.007*
No	75 (51.73)	37 (41.12)	Ref		
Varicose veins					
Yes	16 (11.03)	6 (6.66)	1.4	1.15 to 1.62	0.003*
No	129 (88.97)	84 (93.34)	Ref		
Cuts & lacerations					
Yes	116 (80)	49 (54.44)	3.34	1.87 to 5.98	<0.001*
No	29 (20)	41 (45.56)	Ref		
Allergic contact Dermatitis					
Yes	10 (6.89)	3 (3.33)	1.43	1.14 to 2.1	0.422
No	135 (93.11)	87 (96.67)	Ref		
Psychosocial issues					
Lack of recognition of skills					
Yes	62 (42.75)	53 (58.88)	4.64	3.28 to 5.90	0.351
No	83 (57.25)	37 (41.12)	Ref		
Lack of appreciation for good work					
Yes	53 (36.55)	61 (67.77)	2.3	1.9 to 3.4	0.123
No	92 (63.45)	29 (32.23)	Ref		
Poor personal & professional growth					
Yes	67 (46.20)	61 (67.77)	1.2	1.15 to 2.34	0.2
No	78 (53.80)	29 (32.23)	Ref		
Work-related stress					
Yes	109 (75.17)	62 (68.88)	4.3	3.7 to 5.6	0.002*
No	36 (24.83)	28 (31.12)	Ref		

*P value <0.05 is considered significant; OR – Odds Ratio; CI- Confidence Interval

Table 3: Mean ± SD values of occupational hazards

Occupational hazard	Items (out of 13)	Mean ± SD#
Physical	5	11.67 ± 5.99
Chemical (Contact Dermatitis)	1	2.67 ± 1.47
Mechanical	3	7.51 ± 3.89
Psycho-social	4	10.01 ± 5.18
Mean occupational risk score of food handler		31.87 ± 11.3

#SD= Standard deviation

Table 4: Observed frequencies of present acute and chronic morbidities among food handlers (N=235)

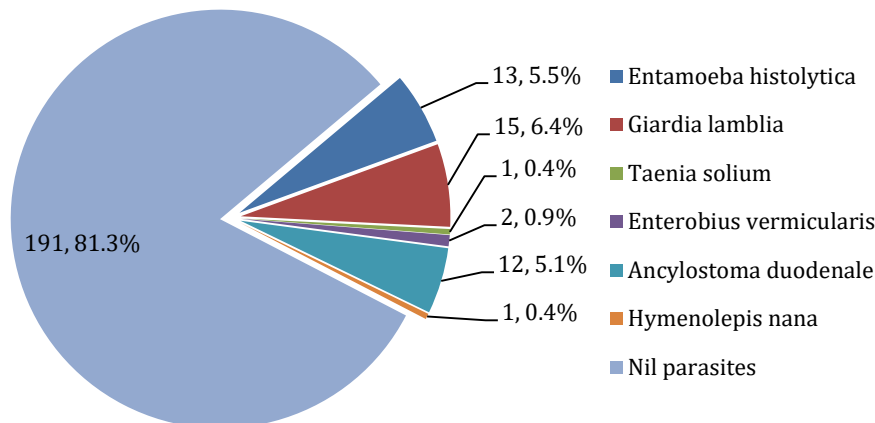
	Yes (%)	No (%)
Acute Morbidities		
Visibly infected skin lesions	25 (10.6)	210 (89.4)
Injuries to the skin and face	137 (58.3)	98 (41.7)
Ear discharge	15 (6.4)	220 (93.6)
Acute respiratory infections	109 (46.4)	126 (53.6)
Acid Peptic disease	114 (48.4)	121 (51.5)
Pharyngitis	24 (10.2)	211 (89.8)
Chronic Morbidities		
Diabetes mellitus	38 (16.2)	197 (83.8)
Hypertension	61 (26)	174 (74)
Bronchial Asthma	52 (22.1)	183 (77.9)
Osteoarthritis	7 (3)	228 (97)

The initial hypothesis proposing no substantial impact of duration of employment on the occupational hazard is contradicted, as the computed F-value (5.173) surpasses the critical table value of F (3.354) with a significant P value of 0.012. Consequently, the rejection of the null hypothesis implies that the duration of employment significantly impacts the occupational hazards faced by the food handlers.

The mean occupational risk score of food handlers was 31.87 (SD=11.3). The highest occupational hazard was found to be physical hazards with a Mean value of 11.67 (SD=5.9) followed by Psychosocial hazards 10 (SD=5.1). [Table 3]

The most commonly reported acute morbidity among food handlers was Acid peptic disease 114 (48.5%), followed by Acute respiratory infection 109 (46.4%) & injuries to skin and face 70(29.8%). The most common chronic morbidity among food handlers was Hypertension 61(26%), Bronchial asthma 52(22.1%) and Diabetes, 38(16.2%) [Table 4].

Out of the 235 subjects, 33 were anaemic (14.04%). The cut-off for 'No Anaemia' for Males was Haemoglobin (Hb) values of 13 and above & for Females, Hb values of 12 and above.¹³ Most of the study subjects 191(81.3%) did not have any intestinal parasitic infestations. 15 (6.4%) had Giardia lamblia, followed by Entamoeba histolytica 13(5.5%). [Figure 1]

**Figure 1: Intestinal parasitic estimates of Food Handlers (N=235)**

DISCUSSION

This cross-sectional study was conducted among food handlers working in the food establishments of a private educational institution in Chengalpattu District, Tamil Nadu. The study included 235 subjects, with 46.4% belonging to the age group of 18 – 33 years. The study population comprised 86% Males and 14% Females.

This study revealed that 46% of food handlers consumed alcohol and 36.6% were smokers. Among dual habits, smoking and alcohol consumption (32.8%) were the most common. This finding is similar to that of a study conducted by Mohan V et al⁶, in which 214 food handlers had common smoking and drinking

habits. Double habituation (both smoking and drinking) accounted for approximately 31.72%. In our study, only 11.9% (28 of 235) of the subjects were dewormed. This is much less than the study conducted in North India, in which 43.1% (78 out of 181) of food handlers received anti-helminthic therapy.¹⁴ This intends the need for periodic de-worming of food handlers to eliminate intestinal parasites.

Regarding vaccination status, 6.8% had received the tetanus vaccine, 12.8% had received Hepatitis A 33.6% had received Hepatitis B, and 11.9% had received the anti-typhoid vaccine in our study. A similar study conducted by Bobhate et al¹⁵ in the teaching hospital of Bareilly in Uttar Pradesh revealed that vaccines against tetanus (53%) and typhoid (48.6%)

were taken by the subjects, the figures of which were higher when compared to 6.8% and 11.9%, respectively, in our study. These vaccination data revealed the need for timely and mass vaccination of all food handlers.

The most common acute morbidity reported in our study was peptic acid disease (48.5%), followed by acute respiratory infection (46.4). The causes of peptic ulcer can be attributed to untimely meal consumption, skipped meals, and long durations between meals, as reported by the participants when inquired further. Injuries to the skin and face were reported by 70 (29.8 %) subjects. A similar study conducted in 2016 in Jalgaon City, Maharashtra by Samiyodhin Ghous et al,¹⁶ revealed that anaemia 54 (25.71%), skin diseases 5(11.90%), ringworm 12(48%), scabies 8(32%) and boils 5(20%) were the most common reported morbidities.

This study also addressed the psychosocial issues of food handlers in their work environment, which is an **under-addressed component** in most workplaces. Work-related stress was reported by 72.8% of the participants. This emphasizes the need for workplace programs to check the mental health of workers. Among physical occupational hazards, prickly heat was the most frequently reported (74.9%), followed by fatigue (52.3), while other reported physical occupational hazards were burns at work, workplace injuries, and heat cramps. In a study conducted by Shirin Hima Bindu⁸ in Telangana, the most commonly reported occupational hazards were burns and scalds, which is similar to our study. The same study explored injuries faced by cooks in three different cooking environments. Our study explored the role of employment duration in various occupational hazards faced by food handlers.

Contact Dermatitis constitutes to about 95% of occupational Dermatoses. Food handlers in restaurants may face skin issues due to factors such as frequent hand washing, contact with diverse foods, and prolonged glove use.¹⁷ On the contrary, the present study reports only 5.5% of contact dermatitis among food handlers. This can be attributed to the fact that the subjects were not aware of their skin condition or did not report it out of fear of losing their jobs or hesitancy to seek treatment for the same. Additionally, the mean duration of employment of the subjects in our study was only 1.39 years and a few chronic skin conditions could take longer to manifest.

The prevalence of anemia in our study was found to be 14.04%, whereas a study conducted in Jalgaon city of Maharashtra revealed anemia to be 25.71%.¹⁴ The present study analyzed the anemic status of the subjects based on the hemoglobin values, but the etiology of anemia needs further exploration and is out of the scope of this study.

Most subjects (81.3%) did not have any intestinal infestations. *Giardia lamblia* constituted the most isolated parasite from stool (6.4%), followed by *Entamoeba histolytica* (5.5%). Other parasites, such as *An-*

cylostoma duodenale and *Enterobius vermicularis*, were also isolated from stool, with a prevalence ranging from 0.5 to 5%. A study conducted in the teaching hospital of Wardha¹⁸ showed cysts of *Entamoeba histolytica* to be 16.7% and *Giardia lamblia* to be 3.6%, which is in contrast to the estimates in our study. A study conducted by Adane et al¹⁹ in Ethiopia estimated 5.5% *Giardia*, which is similar to the present study. These differences can be attributed to socioeconomic differences, sanitary practices, and water sanitation practices across regions. With 88% of subjects reported to have not been de-wormed in the current study, it is surprising that the number of subjects with no intestinal infestations remains high, which calls for further exploration.

A study done by Kumar R et al²⁰ reports that nearly 80% of food handlers underwent medical examinations after being employed, but none of them were recruited by performing a pre-placement examination. The same result was obtained in the current study. The participants reported regular, half-annual medical examinations, but none of them reported pre-placement medical examinations.

In summary, the present study explored various morbidity patterns and occupational hazards of food handlers in teaching hospital settings. The results imply the need for workplace policies that are personalized for every food establishment, regular medical examinations, and ergonomically designed workplaces to preserve the health of the worker.

LIMITATIONS

This study was done in a single institution and hence, the study findings/outcomes may not be generalizable to other external populations. The participants (food handlers) did not reveal the true underlying disease, if any, out of the fear of losing his/her job, which might have altered the result/outcome of the study. These limitations could have affected the validity of the study results to some extent. The assessment of the workplace environment was not done as it was out of the scope of this study.

CONCLUSION

This study explored the various morbidities and occupational hazards faced by food handlers. Nearly half of the subjects reported Acid Peptic Disease & and prickly heat as the commonest morbidity & and occupational hazard respectively. Also, vaccination and de-worming rates were found to be much lower. None of the participants undergo pre-placement medical examinations. The majority of the workers had a moderate occupational risk score which increased with the increasing duration of employment.

RECOMMENDATIONS

The study recommends that all food handlers be regularly de-wormed every 6 months as the propor-

tion of food handlers who received anti-helminthic therapy was much smaller in this study. Also, it recommends that all food handlers mandatorily receive vaccination against enteric groups of organisms & timely administration of booster doses. Food safety courses can enhance knowledge of food safety practices which in turn can help prevent outbreaks. There must be regular, periodic medical examinations and a mandatory half-yearly health check-up to ensure optimum health is required. Considering the high levels of work-related stress, the study recommends conducting 'workplace wellness programmes' in the form of fun activities, interactive game sessions, Yoga and meditation sessions for the food handlers on a regular, rotatory basis. Also, paid holidays and compulsory weekly and monthly off days can improve mental well-being and boost the overall productivity of food handlers.

Based on the conclusions of the present study, here are a few suggestions for further research:

Evaluation of the working environment and assessing if there is need for air conditioning as 'prickly heat' was highly reported by the participants. Assessment of the available ergonomic measures and research for more novel ergonomic measures to combat workplace injuries, shoulder stiffness, falls and varicose veins. Delving deeper into the workplace wellness programmes can provide useful insights for workplace policies in the future.

ACKNOWLEDGEMENT

I am grateful to the management for having permitted me to conduct this study. I am thankful to the canteen and mess managers who coordinated the work and made the data collection process smooth. I also thank the faculties of the Departments of Community Medicine, Microbiology and Pathology for having rendered their valuable insights on this topic. The Lab director and technicians were of immense support during sample collection, processing and early dispatch of reports.

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