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RESEARCH ARTICLE

PRACTICES FOR FOOD SAFETY, SANITARY CONDITIONS AND FOOD HANDLING BY STREET FOOD VENDORS IN THE SUBURBS OF MUMBAI CITY

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ABSTRACT

Objective: To evaluate practices for food safety, sanitary conditions and food handling by street food vendors
Methods: A cross sectional study was conducted in 100 street food vendors in Andheri (East and West) suburb of Mumbai city. A pre-structured questionnaire was used for interview and observation of food vendors to access the food safety and sanitary conditions.
Results: Of the 100 vendors, 2% vendors washed hands before every customer, 12% reported that ready to serve food was kept in closed contained/ protected shelf, 3% reported that place to keep ready to serve food is very clean, 5% stalls had no animals or pets evident around the stall, 5% had proper cleanliness of vending stall, 4% had hand washing facilities available, 63% stalls had clean environment, 4% vendors washed their hands in clean water each time before handing food, 10% vendors used an apron when handling food, 48% vendors clothes were clean, none of the vendor used gloves, 37% vendors had clean short nails, 3% vendors covered hair when handling, preparing and serving food, 48% vendors did not the same utensil to prepare raw and cooked food products and 38% washed cutting board with soap and rinsed in hot water to kill bacteria. Of the 100 vendors, 2% cleaned food preparation surface whenever they washed up, 3% at the end of the day, 1% once a week, 35% when it looked dirty whereas 59% washed it before they prepared food. A significant association was found between frequency of changing oil and age group with higher percentage of vendors above 31 years of age changing oil everyday as compared to those below 30 years of age ($\chi 2=12.133$, $p=0.016$). Significantly higher percentage of vendors aged 31 years and above washed chopping board with soap and rinsed in hot water to kill bacteria as compared to vendors less than 30 years of age ($p=0.002$). There was no significant difference for other food safety and sanitary practices when vendors were classified according to age group ($p>0.05$)
Conclusion: Food safety, sanitary condition and food handling practices are not adequate among street food vendors in Mumbai city. Educational programs need to be developed to educate street food vendors regarding appropriate street food handling practices.

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INTRODUCTION

The street food is prepared on the streets and ready-to-eat, or prepared at home consumed on the streets. Street vended food not only appreciated for their unique flavors, conven ience and the role which they play in the cultural and social heritage of societies, it also become important and essential for maintaining nutritional status of populations (Dardano, 2003). Apart from this, street foods are appreciated for the taste, flavor they offer at low affordable price to the general population (Bhowmick, 2005). Food contamination in devel oping countries is caused by many factors including traditional food processing methods, inappropriate holding temperatures, and poor personal hygiene of food handlers (Feglo 2012).

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Street foods are frequently associated with diarrhoel diseases due to their improper handling and serving practices (Barro *et al*., 2006). Microbial contamination of ready-to-eat foods sold by street vendors and hawkers has become a major health problem.Street food vendors are mostly uninformed of good hygiene practices (GHP) and causes of diarrhoel diseases (Mensah *et al*., 2002), which can increase the risk of street food contamination (Bhaskar *et al*., 2004). In most cases, running water is not available at vending sites; hands and utensils washing are usually done in one or more buckets, and sometimes without soap. Waste waters and garbage's are discarded nearby, proving nutrients for insects and rodents, which may carry food borne pathogens (Tambekar *et al*., 2009). The serving utensils used at the vending site are often contaminated which may have originated from the vendors hands when they touch the food preparation areas, dish cloths and the water during dish washing and hand washing which indicates cross- contamination between dish water, food

preparation surfaces, and the food itself; consequently, perceive a major public health risk (Mensah *et al*., 2002; Cardinal *et al*., 2005; Das *et al*., 2010). Therefore, education and training of street vendors can contribute to a marked improvement of their food handling practices, which may be the most cost effective way to reduce the incidence of food – borne diseases by contaminated street vended foods (INFOSAN, 2010).

MATERIALS AND METHODS

A cross- sectional study was conducted in hundred street food vendors in Andheri (East and West) suburb of Mumbai city. A pre-stuctured questionnaire was used for interview and observation of food vendors to access the food safety and hygiene.

Instruments

1. Interview

The knowledge, attitudes and practices of street food vendors (SFVs) regarding food safety was determined by means of a face to face interview utilizing a pre-structured questionnaire. Two methods of data collection were used:

1. Interviews with street food vendors to collect data on knowledge and attitudes

Hundred vendors were interviewed. A face to face interview was conducted using standardized survey tool containing 62 questions, which included queries on demographic, food safety knowledge, food safety attitudes and practice of street food vendors.

2. Observations to collect data on practices related to food hygiene and safety in the form of checklist

The checklist covers important sections i) information on facilities (source of potable running water; stored water in containers, availability of toilets, adequate washing facilities. ii) Enviroment around the stall (presence of flies, animals and litter). iii) Personal hygiene whether or not head gears and aprons) were worn.

3. Data collection Techniques

Primary source of data was used for the research and information was gathered through the distribution of questionnaires and an observation checklist. The questionnaires were administered personally to the respondents. The method involved to determine vendor locations, making direct observations of vending set ups and conducting brief interviews with vendors to determine where, when and what they sold. An observational checklist study was used in the assessment of food safety practices (food preparation, cooking and serving) by small food vendors during their trade. Some of them were status of nails, handling of food without washing in between were observed.

3.3 Statistical Methods

Analyses were performed using SPSS software for Windows (version 16.0, 2007, SPSS Inc, Chicago, IL). Data are presented as frequency and percentages. Data was classified into 2 groups for analysis purposes age < 30 years and age > 31 years. Cross tabulations of data were made according to age groups and compared using chi-square test to find association in various parameters when classified according to age group. $P<0.05$ were considered to be statistically significant.

RESULTS AND DISCUSSION

Data on practices for food safety, sanitary conditions and food handling by 100 street vendors (94 males, 6 females) is presented in the current study. Of the 100 street vendors, 46% vendors were 30 years of age and below whereas 54% vendors were 31 years and above of age.

Practices towards washing hands

Hand washing practices of the vendors were evaluated. Of the 100 vendors, 2% vendors washed hands before every customer, 99% vendors washed hands before beginning work, 98% vendors washed hands after using toilet, 68% vendors washed hands every time they touched different foods and 11% washed hands sometimes. Table 1 gives percentage of vendors washing hands on different occasions when classified according to age group. As seen in Table 1, there is no significant difference in the percentage of vendors washing hands on different occasions when classified according to age group indicating similar practices of washing hands in both age groups ($p>0.05$)

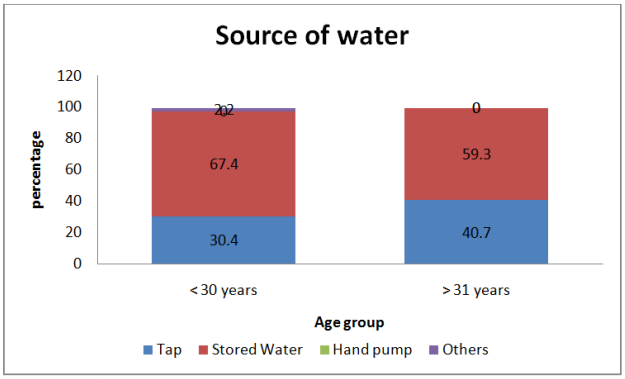
Table 1. Vendors washing hands on different occasions when classified according to age group

Hand washing practice of vendors	< 30 years (n=46)	> 31 years (n=54)	$\chi 2$ (p value)
Before every new customer	1 (2.2)	1 (1.9)	0.013 (0.909)
Before beginning work	45 (97.8)	54 (100)	1.186 (0.276)
After using toilets	44 (95.7)	51 (94.4)	0.076 (0.782)
Every time when touching different food	31 (67.4)	37 (68.5)	0.015 (0.904)
Washes Hands Sometimes	5 (10.9)	6 (11.1)	0.001 (0.969)

Data presented as frequency (percentage)

Source of Water Used

The source of water used for food preparation was inquired. 36% used tap water, 63% used stored water and 1% had other sources of water. Figure 1 presents source of water used by vendors when classified according to age group. As seen in Figure 1, there was no significant association of age group with source of water ($\chi 2=2.168$, p value = 0.338).



Data presented as percentage

Figure 1. Source of water used when classified according to age group

Waste disposal practices

From the 100 street vendors, 98% reported that waste disposal bins were located nearby and 75% reported that waste disposal bins were located within 1 meter of food items. Further, 94% used open lid bins, 1% used closed bin lids and 5% used polythene bags as disposal bins. Seventy one percent had only dry waste bin, 7% had wet disposal bins and 22% had bins for both dry and waste disposal. Table 2 gives waste disposal practices by vendors when classified as per age group. As seen in Table 2, there was no significant association of age group with waste disposal practices indicating that waste disposal practices in both age groups (p>0.05).

Table 2. Waste disposal practices of vendors when classified according to age group

Waste disposal practices	< 30 years (n=46)	> 31 years (n=54)	$\chi 2$ (p value)
Waste disposal bins are located near by			
Yes	44 (95.7)	54 (100)	2.396
No			(0.122)
Waste disposal bins are located within 1 m of food items			
Yes	31 (67.4)	44 (81.5)	2.630
No			(0.150)
Type of disposal bins			
Open lid bins	44 (95.7)	50 (92.6)	0.949
Close lid bins	0 (0)	1 (1.9)	(0.622)
Polythene bags	2 (4.3)	3 (5.6)	
Type of bin for disposal			
Dry Waste	33 (71.7)	38 (70.4)	0.037
Wet Waste	3 (6.5)	4 (7.4)	(0.980)
Both	10 (21.7)	12 (22.2)	

Data presented as frequency (percentage)

Sanitary conditions of food and workstation

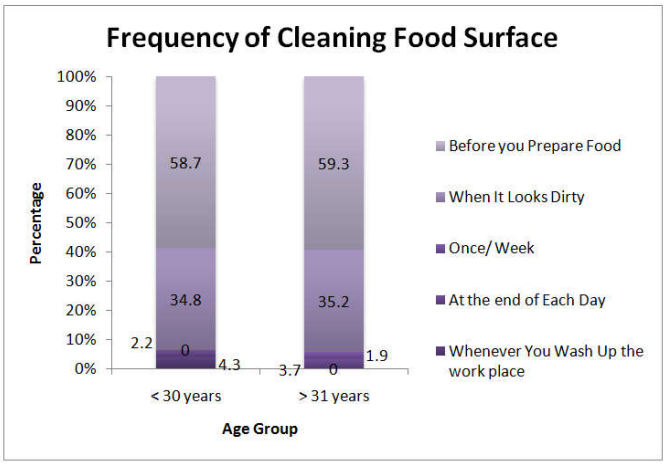
From the 100 vendors, 94% reported that the food they served was very clean, 96% reported that they threw leftover food in dustbin, 12% reported that ready to serve food was kept in closed contained/ protected shelf, 3% reported that place to keep ready to serve food is very clean, 75% reported that there was a separate partition for different food items and 5% reported that overall workstation is very clean. Table 3 presents sanitary condition of food and workstation. As seen in Table 3, there was no significant difference in the sanitary conditions of food and workstation of the 2 age groups indicating similar practices in both groups (p>005).

Table 3. Sanitary conditions of food and workstation when classified according to age group

Sanitary conditions of food and workstation	< 30 years (n=46)	> 31 years (n=54)	$\chi 2$ (p value)
Food items are very clean	3 (6.5)	3 (5.6)	0.041 (0.839)
Leftover food is thrown in dustbin and not reused	46 (100)	50 (92.6)	3.549 (0/170)
Ready to serve food are kept in closed container/ protected shelf	6 (13)	6 (11.1)	0.108 (0.947)
Place where ready to serve food is kept is very clean	2 (4.3)	1 (1.9)	0.532 (0.466)
There is a separate partition for different food items	32 (69.6)	43 (79.6)	1.342 (0.247)
Overall workstation is very clean	2 (4.3)	3 (5.6)	0.076 (0.782)

Data presented as frequency (percentage)

When frequency of cleaning food preparation surface was inquired, it was found that 2% cleaned surface whenever they washed up, 3% washed it at the end of the day, 1% washed it once a week, 35% washed it when it looked dirty whereas 59% washed it before they prepared food. Figure 2 gives frequency of washing food preparation surface when classified according to age group. There was no significant difference in frequency of washing food preparation surface and age group ($\chi 2$=3.396, p>0.05) (Figure 2).



Data presented as percentage

Figure 2. Frequency of washing food preparation surface when classified according to age group

Cleaning practices regarding utensils

Of the 100 vendors, 3% used warm soapy water to clean utensils, 36% used cold soapy water tp clean utensils whereas 61% used clean water to clean utensils. Thirty eight percentage used cleaning water once, 20% used cleaning water twice and 42% used cleaning water many times before replacement. The most common way to clean utensils was by using bucket (74%) followed by putting water on utensils and washing (24%) and lastly by using basket (2%). Table 4 shows utensil cleaning practices of vendors when classified according to age group. As seen in Table 4, there was no significant association of utensil cleaning practices and age group indicating similar practices in both age groups (p>0.05).

Table 4. Utensil cleaning practices of vendors when classified according to age group

Utensil cleaning practices of vendors	< 30 years (n=46)	> 31 years (n=54)	$\chi 2$ (p value)
Utensils are cleaned using			
Warm Soapy Water	1 (2.2)	2 (3.7)	2.135
Cold Soapy Water	20 (43.5)	16 (29.6)	(0.344)
Clean Water	25 (54.3)	36 (66.7)	
Number of times water used for cleaning utensils used before replacement			
Once	16 (34.8)	22 (40.7)	0.405
Twice	10 (21.7)	10 (18.5)	(0.817)
Many times	20 (43.5)	22 (40.7)	
Method used to clean utensils			
Bucket	32 (69.6)	42 (77.8)	3.300
Basket	0 (0)	2 (3.7)	(0.183)
Water put on utensil and washed	14 (30.4)	10 (18.5)	

Data presented as frequency (percentage)

Frequency of changing oil

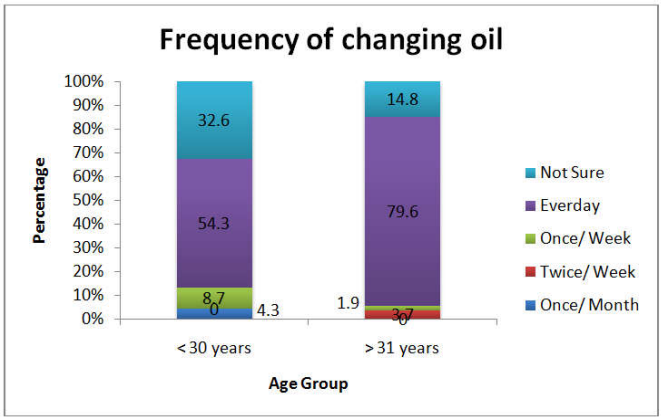
Of the 100 vendors, 2% changed oil once/month, 2% changed oil twice/ week, 5% changed oil once/week, 68% changed oil

everyday whereas 23% were not sure about frequency of change of oil. Figure 3 shows frequency of changing oil when classified according to age group. A significant association was found between frequency of changing oil and age group with higher percentage of vendors above 31 years of age changing oil everyday as compared to those below 30 years of age ($\chi2$=12.133, p=0.016) (Figure 3).

Table 5. Food Safety Observation Of vendors when classified according to age group

Food safety observation of vendors	< 30 years (n=46)	> 31 years (n=54)	$\chi2$ (p value)
Food preparation is done on site	36 (78.3)	47 (87)	1.356 (0.244)
Food vending stall is protected from sun, dust and wind	2 (4.3)	2 (3.7)	0.027 (0.870)
No animals or pets evident around the stall	3 (6.5)	2 (3.7)	0.415 (0/519)
Cleanliness of vending stall is maintained	3 (6.5)	2 (3.7)	0.415 (0.519)
Potable water is accessible at the site/ close to site	32 (69.6)	40 (74.1)	0.250 (0.617)
Adequate hand washing facilities available	1 (2.2)	3 (5.6)	0.740 (0.340)
Adequate waste (water or food) disposal facilities available	41 (89.1)	53 (98.1)	3.582 (0.058)
Environment around the stall clean is far from rubbish, waste water, toilet facilities, open drains and animals	27 (58.7)	36 (66.7)	0.677 (0.411)
Vendor washes his hands in clean water each time before handing, preparation and serving of food	1 (2.2)	3 (5.6)	0.740 (0.390)
Vendor wash their hands each time after visiting the toilet	44 (95.7)	51 (94.4)	0.076 (0.782)
Vendor use an apron when handling, preparation and serving of food	5 (10.9)	5 (9.3)	0.072 (0.789)
Vendor clothes are clean and presentable	20 (43.5)	28 (51.9)	0.698 (0.404)
Vendordoes not handle food with bare hands i.e. uses disposable or reusable gloves	0 (0)	0 (0)	--
Vendor has clean short nails	16 (34.8)	21 (38.9)	0.180 (0.672)
Hair of the vendors covered when handling, preparation and serving of food	3 (6.5)	0 (0)	3.631 (0.057)
Vendor does not blow air into polythene bag before use	31 (67.4)	42 (77.8)	1.360 (0/244)
Vendor does not use the same utensil (knives and boards) to prepare raw and cooked food products or to cut raw vegetables and fresh meat and poultry	19 (41.3)	25 (46.3)	1.530 (0.216)
Vendor does not smoke during the handling/ preparation of food	46 (100)	54 (100)	---
Wash the cutting board with soap and rinse in hot water to kill bacteria	10 (21.7)	28 (51.9)	9.560 (0.002)

Data presented as frequency (percentage)



Data presented as frequency (percentage)

Figure 3. Frequency of changing oil by vendors when classified according to age group

Food safety observation of food vendors

Of the 100 vendors, 84% prepared food on site, 4% vending stalls were protected from sun, dust and wind, 5% stalls had no animals or pets evident around the stall, 5% had proper cleanliness of vending stall maintained, 72% had access to potable water at the site/ close to site, 4% had hand washing facilities available, 94% had adequate waste (water or food) disposal facilities available, 63% stalls had environment around the stall clean, far from rubbish, waste water, toilet facilities, open drains and animals, 4% vendors washed their hands in clean water each time before handing, preparation and serving of food, 95% vendors wash their hands each time after visiting the toilet, 10% vendors used an apron when handling, preparing and serving food, 48% vendors clothes were clean and presentable, none of the vendor used gloves, 37% vendors had clean short nails, 3% vendors covered hair when handling, preparing and serving food, 73% did not blow air into the polythene bag before use, 48% vendors did not the same utensil (knives and boards) to prepare raw and cooked food products or to cut raw vegetables and fresh meat and poultry, 100% vendors did not smoke during handling/ preparation of food and 38% washed cutting board with soap and rinsed in hot water to kill bacteria. Table 5 gives food safety observation percentage of vendors when classified according to gender. As seen in Table 5, significantly higher percentage of vendors aged 31 years and above washed chopping board with soap and rinsed in hot water to kill bacteria as compared to vendors less than 30 years of age ($p<0.05$). There was no significant difference for other food safety practices when vendors were classified according to age group ($p>0.05$) (Table 5)

Conclusion

Food safety, sanitary condition and food handling practices are not adequate among street food vendors in Mumbai city. Educational programs need to be developed to educate street food vendors regarding appropriate street food handling practices.

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