A pilot study on assessing the sustainability of food safety and hygienic practices in street food handling system

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Received: 08-06-2018 Accepted: 01-10-2018 DOI: 10.18805/ajdfr.DR-1381

ABSTRACT
Street food vending units are on a rise in the country as they offer less expensive and a variety of delicacies to the consumer. It also supports the economy of the country as street foods are gathering a lot of attention through food tourism as well. On the other hand, a large number of population is thriving on it as a means of livelihood. However, the safety and hygienic practices followed in these food vending system requires large reforms. In this regard, the present study was undertaken to understand the awareness of street food handlers on food safety and to determine the microbial contamination of the street foods. The current investigation revealed that even though, majority of the food vendors were aware of the safe food handling practices, it was not followed appropriately during food preparation which resulted in higher levels of microbial contamination in their produce. The study also throws light on the methods that could achieve a sustainable food safety in the street food vending systems in the country.

Key words: Food safety, FSSAI, Microbial contamination, Street foods.

INTRODUCTION
Every other day, we witness a street food outlet opening on our lively roads helping us to keep up with the doubling speed of life which is tightly scheduled for work, family, friends, hobbies, travel etc. When we run desperately to become the master of everything, in a little time that we are left with, we opt to eat anywhere and anytime. This resulted in mushrooming of the street food system, which provides an outdoor snacking to around 2.5 billion people globally every day (FAO, 2007a). Street foods are the least expensive and most accessible means of food outside home and also offers diversified delicacies. In India over three million people are directly engaged in street food vending system, thus its contribution to the economy of the country is considerable but immensely underestimated and neglected (FAO, 2011).

Chennai, being the fourth largest urban agglomeration in India, witnesses around twenty to twenty five percent of its population depending entirely on street foods, one of the major reason for this is that the city consists of large floating population of single workers without families who move into the urban centers for work (FAO, 2007b).

In spite of understanding the socio economic importance of street foods and its indispensability among consumers, the major risks factors accompanied by the same is yet to be tackled. Studies have found a positive correlation between consumption of street foods and food poisoning (Ministry of Food and Agriculture and the World Bank 2007).

A panel of microbiologists identified an outbreak of gastroenteritis caused by Salmonella typhimurium with local street foods in Tamil Nadu (Prabhu et al., 2013). A study conducted on the microbial quality of street foods served in Chennai revealed alarming rates of coliforms in foods like Panipuri (7x10^6), Samosa (6x10^4) and Bajji (8x10^7) (Vedesh et al., 2017).

A plethora of similar cases were reported from other parts of India like Mangalore (Bhaskar et al., 2004), Punjab (Kumar et al., 2006), Pune (Chumber et al., 2007) and Orissa (Madhuchhanda et al., 2012). As technology advances reporting the issues on unhygienic handling of foods is at rise, yet how far these issues are sustainably handled?

Seizing of foods that are contaminated or closure of such food stalls can only be considered as ripples in pond until and unless the problem is solved sustainably. And the sustainable solution for this problem actually lies in its cause itself, which is nothing but the knowledge and awareness of the street food vendors. Imparting knowledge about safe and hygienic food handling practices to the street food vendors is equally important as the legal actions taken to monitor food safety. In this regard, the present study was carried out to understand the level of awareness perceived by street food vendors on safe and hygienic food handling practices and also to check how far the methods they adopt deliver safe food to the consumers.

MATERIALS AND METHODS
The current study surveyed fifty randomly selected street food vendors from three clusters of Chennai city using
a structured questionnaire. The questionnaire comprised of demographic details of the respondents, Likert scales for assessing the awareness of the food handlers on food safety and hygiene measures which ought to be followed during food preparation. Further the microbial contamination of selected street foods were also determined.

**Selection of respondents:** For the purpose of the current study a set of inclusion criteria that are in-line with the Food Safety and Standards Authority of India (FSSAI) were considered in identifying the prospective respondents. The yardstick utilized for this research are as follows: a). Petty Food Manufacturer was defined as the one who manufactures or sells any article of food himself or a petty retailer, hawker, itinerant vendor or temporary stall holder’, b). tiny food businesses with an annual turnover not exceeding Rs 12 lakhs and/or whose production capacity of food (other than milk and milk products and meat and meat products) does not exceed 100kg/ltr per day (FSSAI, 2011).

**Location of the study:** Chennai city was the prime location for the study from where, using cluster sampling method three bustling commercial areas namely; T. Nagar, Purasawalkam and Sowcarpet were handpicked and fifty respondents fulfilling the study criteria were randomly selected from these clusters.

**Data collection:** A structured undisguised questionnaire was developed which included close-ended questions on demographic profile and general information (7 questions), awareness on FSSAI and its functions (5 questions) was administered through a face to face in-depth interview. Likert scales were also prepared with ten statements each to assess the respondents’ attitude towards food safety and hygienic measurements that ought to be followed in a food business operation. In addition, the effective implementation of these food safety and hygiene practices in the actual food handling premises by each respondent were recorded using an observation checklist (10 major guidelines).

**Food safety risk analysis:** The most identified risk factors hindering the safe delivery of street foods are microbial contamination, adulteration and unhealthy cooking practices. Therefore, the present study analyzed the microbial contamination of selected street foods viz. panipuri, masala vada, badam milk and sugarcane juice. Apart from this, water from various street food vending systems were also collected and tested for its safety and level of microbial contamination. The microbial contamination study analyzed the aerobic colony count (ACC), yeast and mould, apart from this, the common foodborne pathogens were also quantitatively determined. The food samples were collected in sterilized bags and were transported to the laboratory in aseptic condition for further analysis as described by Bureau of Indian standards (BIS, 1998) under the methods for detection of bacteria responsible for food poisoning [IS 5887 (Part-1): 1976 (Reaff. 2013); IS 5401 (Part-1): 2012; IS 5402:2012; IS 5403:1999 (Reaff. 2013)].

**Data interpretation:** The raw data obtained from the survey was coded and tabulated. Further, the results were interpreted using descriptive statistics of Excel Statistical functions.

**RESULTS AND DISCUSSION**

**Demographic data:** A total of fifty street food vendors participated in the present study from the three major bustling commercial areas of the city viz. T. Nagar (32%), Purasawalkam (32%) and Sowcarpet (36%). The general information of the participants with regards to the demographic data and type of food business are given in Table 1.

Seventy four percentage of the study populace belong to early adulthood while only 26% belong to the late adulthood category. An almost equal proportion of respondents under the study are engaged in semi-mobile and stationery vending stalls like mini-juice stalls, finger snacks stalls etc. while only 6% of hawkers were included in the study because of their higher mobility in nature. Majority of the respondents have a high school level education, while 30% of the respondents have degree level education who are into this business for an extra income.

The gender ratio of the study populace revealed that ninety-six percentage of participants in the study were men when compared to only 4% of women participants. This in spite, of the fact that women street vendors also play very important role in India by generating employment and income opportunities.

**Awareness on FSSAI & its functions:** Twenty eight percent of these street food vending systems are functioning without any license from the government authority. Of the 72% of respondents who claimed to have a corporation license only 11% have the FSSAI license, which highlights the need of

| Characteristics       | n = 50 | Percentage of respondents |
|-----------------------|--------|--------------------------|
| **Age**               |        |                          |
| < 25                  | 22     |                          |
| 26 – 30               | 32     |                          |
| 31 – 40               | 20     |                          |
| > 40                  | 26     |                          |
| **Gender**            |        |                          |
| Male                  | 96     |                          |
| Female                | 4      |                          |
| Illiterate            | 12     |                          |
| **Education**         |        |                          |
| Primary level         | 14     |                          |
| High school           | 44     |                          |
| College level         | 30     |                          |
| Semi-mobile           | 46     |                          |
| **Type of food vending system** | | |
| Stationary            | 48     |                          |
| Hawker                | 6      |                          |
| Sowcarpet             | 36     |                          |
| **Location of the vending unit** | | |
| Purasawalkam          | 32     |                          |
| T Nagar               | 32     |                          |
spreading the knowledge and awareness about the statutory body to ultimate stakeholders. On further interaction with the respondents it could be understood that many feel the corporation license is enough and they were unaware of how an FSSAI license could improve the credibility of their produce among the clients with respect to safety and hygiene. The focused in-depth interviews revealed that only 38% of the respondents had heard about FSSAI either through social interaction or by seeing the logo of FSSAI in the packed raw ingredients they purchase. However, out of this 38% of respondents only six respondents were aware of the functions of FSSAI and only one out of the fifty respondents surveyed underwent the training given by FSSAI for safe food handling.

The above data clearly indicates the level of FSSAI awareness is extremely low among the street food vendors, one reason for this might be the reduced literacy level of the respondents and among a certain set of respondents a false sense of perception exits stating that FSSAI registration is required only for small and large scale industries and not necessary for the street food vending systems. Many are unaware of the fact that street food vending system is also one of the beneficiaries of the Food Safety and Standards Authority act.

**Respondents’ attitude towards food safety and hygiene measurements:** More than half of the respondents agree to the fact that food safety is important and licensing enhances safe food handling and they also accept the need for regular food inspections for a sustainable quality control in the street food handling systems. Majority (68%) of respondents agree that delivering safe food will increase the consumer trust and also gives good profit for the business (Fig. 1).

On analyzing the common cooking practices followed among these food vendors, it came to notice that around 32% of respondents agree with the practice of reusing the oil while cooking, certain respondents revealed that they reuse the oil up to six days. Many respondents associate the quality of reused oil by its physical appearance mainly the change in color (darkening of oil). Other than which they are not aware of the chemical changes that takes place on repeated heating of oils. On the contrary, forty-two percent of the respondents disagree to the extensive use of artificial colors and flavoring substances in foods.

None of the respondents were aware of the temperature danger zone (5°C – 60°C) and majority (58%) believed that microbial contamination will not occur in cooked foods. They were also of view that flies and cockroaches are non-poisonous in nature.

Most of the respondents were informed that they clean their equipment and machinery used for cooking on a daily basis (Fig. 2). They were also agreeing that food workers should use clean aprons, hand gloves and head wears
(40%). Only thirty-eight percent of the respondents disagreed with chewing pan or smoking and spitting near the food stall, others (54%) complained about the lack of space to provide a wash area and reluctance to stop the customers from smoking or chewing pan in nearby premises. While self-hygiene was maintained by majority (70%) of the respondents many (60%) were in suggestion that cleaning of wiping cloths with disinfectants is not required on a daily basis.

Food wastage is a moral issue that arouse serious concern on global scale. The avoidable and unavoidable food waste from food outlets are the additional burden to food loss faced by our country. Hence in the current study, the respondents were enquired about the food wastage management measures they adopted in their respective outlets. Majority (40%) responded that their outlets have zero avoidable waste, while thirty six percent of respondents dispose both food waste into the public dustbins provided.

The safety and hygiene measures implemented by individual street food vending systems were observed with the help of a checklist (Table 2). Majority (55%) of the food vending systems were located in unhygienic locations with open drains and presence of stray animals, many vending units had open dustbins and washing area near to the food preparation/serving unit. Almost all the units had proper cooking utensils however, half of the respondents were using newspapers for packaging foods like masala vada, baji, idli, cookies etc., and such types of foods were served with bare hands. Likewise, the foods displayed on carts were also hardly covered from dust and wind, which gives rise to a serious question of its safety and hygiene as most of these carts are located amidst the city crowd and traffic.

Even though, the respondents are aware of the use of aprons, hand gloves and head gears only 15% of them were found using these in their vending units. Others were of the perception that washing hands before handling the food will overlay the necessity of these kitchen accessories.

WHO (2010) emphasized the necessity for enforcing good hygienic practices like personal hygiene of food handlers which include effective hand washing, use of protective clothing, cleaning procedures for both equipment and food environment, waste management and routine training programmes for food handlers etc.

The Food Standards Agency (2015) stated that a reduction in food hazards benefits in reducing the morbidity, mortality and demands on healthcare services, a reduction in absences from education or loss of productivity at work and increased consumer confidence in food safety.

The observations made under the current study revealed that the microbial quality of the street foods were not maintained properly, which was evident through the presence of pathogenic fecal bacteria like E. Coli in the foods apart from the higher load of other aerobic microorganisms. The microbial contamination in these foods could be primarily related to the unhygienic location of the vending carts, lack of proper covering of foods, cross contamination by keeping raw and cooked foods together in the storage area etc. Similar findings were reported in a study conducted

### Table 2: Checklist concerning food preparation/ personal hygiene of the respondents.

| Statements                                         | Percentage of respondents |
|----------------------------------------------------|--------------------------|
| Appropriate location of vending units              | 45|55 |
| Structure of vending carts (placed at least 60 to 70 cm from above the ground) | 85|15 |
| Presence of proper garbage facility                | 40|60 |
| Presence of potential source of contamination (open drains, stray animals etc.) | 45|55 |
| Proper covering of foods on vending carts          | 50|50 |
| Use of food grade cookware for cooking, storage and serving purposes | 50|50 |
| Proper cleaning of utensils                        | 80|20 |
| Use of aprons, disposable hand gloves and head covers while preparing and serving of foods | 15|85 |
| Hygiene of refrigerator                            | 46|54 |
| Segregation of vegetarian & non-vegetarian foods   | 40|60 |

### Table 3: Microbial load of street foods.

| Sample (n=6)         | Average ACC | Average Yeast & Moulds | Average Coliforms | Average E Coli |
|----------------------|-------------|------------------------|-------------------|----------------|
| Badam Milk (cfu/ml)  | 5400000     | 2200                   | 11000             | 10             |
| Masala Vada (cfu/g)  | 230         | 10                     | 10                | 10             |
| Pani Puri water (cfu/ml) | 22000 | 100000                | 1                 | 1              |
| Sugarcane Juice (cfu/ml) | 4900000 | 300000               | 600000            | 1              |
| Water (cfu/ml)       | 28000       | 1                      | 500 (MPN/100ml)   | 2 (MPN/100ml)  |
on microbial contamination of selected street foods from Hyderabad, where the microbiological analysis revealed a higher risk of E. Coli contamination on peeled and cut fruits when left uncovered compared to the covered ones (Alekhya Sabbithi et al., 2017). The major reason for all the above mentioned practices are the lack of awareness among the vendors with respect to the degree of microbial contamination that can occur in foods.

**CONCLUSION**

The current study revealed that, in-spite of knowing the general hygienic practices majority of the vendors were not following the same in their units. For example, even though 40% of respondents agreed with the use of aprons, hand gloves and head gears only 15% were actually using these in their food preparation units. Thus it revealed the necessity of regular food inspections for imparting a sustainable food safety in the street foods.

Apart from regular food audits, the outcomes from the current study also highlights the importance of imparting knowledge and awareness programs among the street food vendors as many are unaware of the importance of maintaining proper temperature of foods to avoid microbial contamination, they are also unaware of the hazardous effects produced by reheated oils etc.

We are in the era of ‘One Nation One Food Law’ but how far the major reforms in the field of food safety have reached its baseline beneficiaries? The project ‘Clean Street Food’ is a well appreciated initiative started by FSSAI in March 2016, which took its first step by training 20,000 vendors in the capital city out of the 20 lakh vendors in our country with the help of seven training partners at forty training centers. However, the negligible number of vendors those who are aware of FSSAI emphasize that knowledge regarding Food Safety and Standards Authority of India (FSSAI) and its functions should be familiarized to all the street food vendors.

**FUTURE PROSPECTS**

In the light of the current study, it could be observed that a process of collective responsibility can ensure sustainable ‘Clean Street Food’ throughout the cities in India. Hence the current study put forwards an Area Adoption Programme through the student community by which each student can take up an area and help the food vendors through the following approaches:

1. Establishing active networks among the stakeholders to gather information and understand the problems faced by them.
2. Conducting awareness campaigns to educate the vendors on importance of safe food handling and about FSSAI and its functions, also facilitate the vendors with food hygiene kits (apron, a pair of disposable hand gloves, head gear) and safety manuals in local language.
3. Provide training by partnering with food safety trainers so that they can impart their expertise with the food vendors to impart the skill of safe and hygienic food preparation, serving and storage.
4. Support the vendors in getting the FSSAI registration process as many of them were unaware about the process of registration.
5. Giving friendly reminders to the vendors for reassuring safe food handling and also encourage the vendors through awards and best performer titles.

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