



Street Food Consumption and Associated Health Risk

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Abstract: Street foods are ready to eat food or drink /beverages sold on the street, in a market, fair, park or other public place or food available in a public place, such as from a vendor on a street. It is sold by a vendor from a street on a portable food booth, food cart and a portable stall, cart or food truck meant for immediate consumption. Street foods represent a significant part of urban food consumption for millions of low and middle income consumers, in urban areas on a daily basis. Approximately 2.5 billion people around the world consume street food every day. Today researchers, aid organizations and consumer associations are increasingly aware of the socio-economic importance of street foods but also of their associated risks. A lack of knowledge among street food vendors about the causes of food borne disease is a major risk factor. Urbanization and increase in population spreading in many countries in recent years are influential in the development of street food as an illegal sector. Therefore, the objective of this seminar was to review the available information on factors influencing consumption of street foods, the microbial load, sanitary practices, safety of street foods, and associated risk factors on street foods. Finally it is recommended research on street food consumption including local 'Jebena-buna' and its associated risk on health should be implemented in different parts of Ethiopia.

Keywords: Consumer, risk, safety, sanitary practices, street food

1. INTRODUCTION

Street foods are ready to eat food or drink /beverages sold on the street, in a market, fair, park or other public place. It is sold by a vendor from a street on a portable food booth, food cart and a portable stall; cart or food truck meant for immediate consumption and represents a significant part of urban food consumption for millions of low as well as middle income consumers on a daily basis. It may be least expensive and most accessible means of obtaining a nutritionally balanced meal outside the home for many low income people, provided that the consumer is informed and able to choose the proper combination of foods (Kok and Balkaran, 2014). In developing countries, street food preparation and selling provides a regular source of income for millions of men and women with limited education or skills (Ackah *et al.*, 2011). It is highly demanded both by the sellers and consumers because of their tastes, easy availability, low cost, cultural and social heritage connection, and being nutritional (Kok and Balkaran, 2014). People also enjoy street food for a quick, inexpensive bite on the run, to sample flavorful local or exotic food in a social setting, to experience new ethnic cuisines, and to support entrepreneurs, small food businesses and local vendors.

Today, it has become an urban mainstay in large cities and small towns alike, and continues to evolve and tempt the passersby on streets around the world and approximately 2.5 billion people around the world consume street food every day (FAO, 2011). Especially in Far East cuisine culture, production and selling of street food has become a part of social life (Ceyhun and Sanller, 2016). There is increasing recognition that street food vending plays an important socio-economic role in terms of employment potential, providing special income particularly for women and provision of food at affordable costs to mainly the lower income groups in the cities (Chukuezi, 2010). Street food sellers are often with no formal education, untrained in food hygiene, and work under crude and unsanitary conditions and have no or very little knowledge about the cause of food-borne diseases (Barro *et al.*, 2007). In India studies have revealed that as many as 20-30% of foods are consumed as street foods (Sudershan *et al.*, 2009). Food contamination with antibiotic resistant bacteria can also be a major threat to public health, since the antibiotic resistance determinants can be transferred to other

pathogenic bacteria potentially comprising the treatment of severe bacterial infections (Oladipo and Adejumobi, 2010). Traditional processing methods that are used in preparation, inappropriate holding temperature and poor personal hygiene of food handlers are some of the main causes of contamination of street vended foods. Consumers who depend on street foods are more interested in its convenience and usually pay little attention to its safety, quality and hygiene (Nicolas *et al.*, 2007). Controlling, monitoring and surveillance activities of the governing authority are crucial for the effectiveness of food control system.

2. LITERATURE REVIEW

2.1. Factors Influence Street Food Consumption

A cross-sectional survey was conducted through structured interview questionnaires at the participants' homes and 3290 representative sample was drawn from all ethnic groups, and provinces including participants of 16 years and older in South Africa. Table 1 show that frequent street food consumption was highest in Limpopo (20.6%), North West (19.9%), Gauteng (18.9%) and lowest in Northern Cape (1.8%). Adding consumption of both moderate and frequent street food shows that North West Province was the highest consumer (49.3%). Frequent (2 ≥ times/week) street food consumption ranged from 1.8% in Northern Cape to 20.6% in Limpopo; while males and females have a similar moderate intake of street foods, higher percentage males consumed street food (12.1%) and females (10.9).

Table1. Percentage moderate and frequent purchasing of street foods by province, gender and socioeconomic category in South Africa

		Street food Moderate ⁺ use % (CI)	Street food Frequent ⁺⁺ use % (CI)
Provinces	Western Cape (n = 442)	17.5 13.4 - 21.5	8.4 5.0 - 11.8
	Eastern Cape (n = 448)	22.9 18.4 - 27.3	4.9 2.5 - 7.3
	Northern Cape(n = 228)	13.2 8.2 - 18.1	1.8 0.2 - 3.3
	Free State (n = 240)	22.8 15.5 - 30.1	12.0 6.0 - 18.0
	Kwa-Zulu Natal (n = 630)	24.1 19.9 - 28.4	7.8 5.4 - 10.1
	North West (n = 136)	29.4 20.0 - 38.8	19.9 10.8 - 28.9
	Gauteng (n = 613)	20.9 17.0 - 24.8	18.9 15.3 - 22.6
	Mpumalanga (n = 246)	28.0 20.3 - 32.6	10.6 6.9 - 14.3
	Limpopo (n = 307)	26.5 20.9 - 32.0	20.6 14.2 - 27.0
	South Africa (n = 3290)	22.2 20.5 - 23.9	11.3 10.0 - 12.6
Gender	Male (n = 1338)	21.7 19.3 - 24.2	12.1 10.2 - 13.9
	Female (n = 1952)	22.6 20.5 - 24.6	10.9 9.3 - 12.4
LSM	LSM = low (n = 585)	24.1 20.3 - 27.9	9.6 6.9 - 12.2
	LSM = medium (n = 1316)	29.7 26.8 - 32.5	14.7 12.3 - 17.1
	LSM = high (n = 1218)	13.0 11.0 - 15.1	8.3 6.6 - 10.0

⁺Moderate use = 2-3 times a month or about once a week; ⁺⁺Frequent use = 2 or more times a week LSM = Living standards measurement; CI = 95% confidence interval

Source: Steyn *et al.*, 2011

Those in the medium LSM (socio-economic) category were the most frequent buyers of street foods (14.7%) while those in the high LSM category (8.3%) were the less frequent buyers of street foods (Table 1). Street food was hardly used by 90.4% of whites and 84.8% of Indians in contrast to 54.7% of blacks (Table 2); while 5.9% of Blacks used street food every day/nearly every day compared with 3.4% of those of mixed ancestry, 2.1% of Indians and 1.7% of whites. Consumption of street food provides employment for a large sector of the population and there may be ways and means by which this practice can be encouraged if vendors sell healthier food items; such as fresh fruit, dry fruit, nuts, and vegetables such as roasted maize cobs. This is particularly relevant in schools in poorer areas where at times numerous vendors sell their products to children at break periods (Feeley *et al.*, 2009).

Table2. Percentage street food consumption by different ethnic groups in South Africa

	Street food	Black n= 1936 % (CI)	Mixed ancestry n = 604 % (CI)	Indian n = 388 % (CI)	White n = 353 % (CI)
Frequency Of use	Never/Hardly ever	54.7 52.0-57.4	77.6 73.5 - 81.7	84.8 80.5 - 89.0	90.4 87.0 - 93.7
	2-3 times per month	21.9 19.4-23.4	8.8 6.4 - 11.2	8.3 5.0 - 11.5	5.1 3.0 - 7.2
	Once a week	8.9 7.5-10.2	4.5 2.9 - 6.1	2.8 1.1 - 4.6	1.4 0.2 - 2.7
	2-3 times per week	9.1 7.8-10.4	5.8 3.7 - 8.0	2.1 0.5 - 3.6	1.4 0.2 - 2.6
	Nearly every day	3.9 3.0-5.0	1.7 0.7 - 2.6	1.3 0.2 - 2.4	0.6 0.0 - 1.3
	Every day	2.0 1.3-2.8	1.7 0.5 - 2.8	0.8 0.0 - 1.6	1.1 0.0 - 2.5

CI = 95% confidence interval

Source: Steyn *et al.*, 2011

To determine factors that contribute to why people prefer street foods to franchise foods in Vhembe District of Limpopo Province of South Africa revealed that majority of the respondents (80%) chose to eat street foods because of the low cost of the meals compared to the cost of other foods(Mathye and Maliwichi, 2015), while the rest chose to eat from the street food vendors because of various factors such as time, convenience, preference, taste and social factors (Table 3).

Table3. Factors that contributed to the consumption of street foods

Factors consumption of street foods	Percent/ frequency
Socializing	45
Cost	80
Lifestyle/ Convenience/Time	85
Preference/Taste	60
Religion	55

Source: Mathye and Maliwichi, 2015

2.2. Cleanliness and Sanitary Practices of Street Food Vendors

Street foods provide a source of inexpensive, convenient and often nutritious food for urban and rural poor; a major source of income for a vast number of persons, particularly women; and a chance for self-employment and the opportunity to develop business skills with low capital investment (Codex, 1999).To examine general hygiene and sanitary practices of street food vendors in Nigeria study was conducted that 110 random samples of street food vendors were selected to represent 18% of street food vendors in the study area. The study indicated that food vendors lacked basic training on hygiene and only 2.7% had formal training on food preparation, 63.6% acquired skills from parents while 33.7% acquired skills by self-practice (Table 4); 60.0% of the vendors prepared foods in unkempt environment with flies around the foods (Lawal *et al.*, 2014). About 19.1% of vendors said leftover foods are consumed by households and only 4.7% of vendors who stored leftover foods for sale kept them in refrigerators. Majority of the vendors displayed foods in trays without cover (Table 4). Additionally 42.7% of the street food vendors surveyed revealed that they usually have leftovers, while 19.1% of them said the leftover foods are consumed by their households. Majority of the

vendors displayed foods in trays without cover (Table 4). 42.7% of the street food vendors surveyed revealed that they usually have leftovers. 19.1% of them said the leftover foods are consumed by their households. Only 4.7% of vendors who stored left-over foods for sale next day kept them in refrigerator. 18.9% kept them either in a container or cupboard. These poor storage facilities may enhance contamination by pathogenic micro-organisms.

Table4. *The level of personal hygiene, food handling and sanitary practices among street food vendors*

Parameter	Kaduna North n=55 (%)	Kaduna South n=55 (%)	Total N=110 (%)	P-value
Hygiene Practices				
Apron used	10 (18.2)	23 (41.8)	33 (30.0)	
Hair covered	35 (63.6)	16 (29.1)	51 (46.4)	
Neat/clean finger nails	29 (52.7)	35 (63.6)	64 (58.2)	0.867
Chewing/talking while serving	37 (67.3)	42 (76.4)	79 (71.8)	
Presence of undressed skin lesion	6 (10.9)	2 (3.6)	8 (7.3)	
Food exposed to flies	33 (60.0)	24 (43.6)	57 (51.8)	
Food Handling Practices				
Foodstuff washed once before cooking	34 (61.8)	47 (85.5)	18 (73.6)	
Foodstuff washed properly before cooking	17(30.9)	26(47.3)	43 (39.1)	0.054
Food prepared on same point several times	49 (89.1)	44 (80.0)	93 (84.5)	
Oil re-use for frying several times	15 (27.3)	19 (34.5)	34 (30.9)	
Surrounding of vending site				
Not clean	29 (52.7)	37 (67.3)	66 (60.0)	0.412
Clean	11 (20.0)	14 (25.5)	25 (22.7)	
Waste disposal method				
On the street/road	11 (20.0)	15 (27.3)	26 (23.6)	
Drainage/Gutter	16 (29.1)	15 (27.3)	31 (28.2)	0.151
Bush	3 (5.5)	8 (14.5)	11 (10.0)	
Waste bin	17 (30.9)	25 (45.5)	42 (38.2)	

P-value of <0.05 was considered statistically significant

Source: Lawal et al., 2014

The level of personal hygiene, food handling and sanitary practices among the street food vendors in the central state of northern Nigeria indicated 53.6% of the vendors did not cover their hair, 7.3% had undressed wounds, 93.1% of the vendors held money while serving food, 53.6% of the vendors did not cover their hair, 7.3% of them had undressed skin lesion, 51.8% of the vendors exposed foods to flies, 44.5% of vendors used mouth to blow air into polythene bags to open before using it to package foods for customers. Slightly above half (58.2%) of the respondents kept their finger nails clean (Table 5). More than half of the vendors kept their finger nails clean and 60% of the vendors prepared food in an unclean environment with flies all over the place. Some of the vendors’ stalls were located close to their dump site. About 73.6% of vendors did not wash their foods properly before cooking and less than 40% of the vendors used waste bin to keep their waste while the rest dumped wastes on streets, major roads and drainage channels. The vendors that were observed to be serving food with bare hands could promote contamination and introduction of pathogenic microbes on foods if their hands were not properly washed. Vendors that were chewing and talking while serving foods stand the risk of introducing harmful micro-organisms that can trigger food-borne infections especially if the vendor is already a carrier of such organisms like tuberculosis bacteria. Money exchanges a lot of hands and as such may be carriers of harmful organisms. The vendors observed handling money while serving food and this may introduce contaminants through hand contact with the food.

Table5. *Socio-demographic characteristics, food handling practices, care of equipment, vendor type, water supply and skill acquisition of street food vendors*

Parameter	Frequency	Percent
<30	12	10.9

Age (years)	30-39	62	56.4
	40- 49	27	24.5
	≥50	9	8.2
Sex	Male	21	19.1
	Female	89	80.9
Skill acquisition	Formal training	3	2.7
	Self-practice	37	33.7
	Parents	43	39.1
	Other vendor	27	24.5
	Total	110	100
Serving of food	Food served with fork/spoon	35	31.8
	Food served with bare hands	75	68.2
	Total	110	100
Handling of leftovers (n=47)	Consumed	9	19.1
	Stored for use next day	38	80.9
	Total	47	100
Storage of leftovers (n=38)	Cupboard	13	34.2
	Plastic container	23	60.5
	Refrigerator	2	4.7
	Total	38	100

Source: Lawal *et al.*, 2014

2.3. Bacteriological Assessment of Some Street Foods

Street foods are subjected to cross-contamination from various sources such as utensils, knives, raw foodstuffs, flies that sporadically landing on the foods, vendors bare hand serving and occasional food handling by consumers (Tambekar *et al.*, 2009). Consumers who depend on street foods are more interested in its convenience and usually pay little attention to its safety, quality and hygiene (Nicolaset *al.*, 2007). In most cases, tap water is not available for washing hands and utensils at vending sites; hand and utensil washing are usually done in one or more buckets-sometimes without soap. Toilets, waste disposal and refrigeration facilities are rarely available. Wastewater and garbage are therefore discarded nearby, providing nutrients for insects and other household rodents, which may carry food borne pathogens (Tambekar *et al.*, 2009).

A cross sectional study was conducted to investigate the bacteriological quality and associated risk factors of street vended foods on 56 samples of street foods (16 ‘Fuol’, 12 ‘Bonbolino’, 12 ‘Macaroni’ and 16 ‘Sambusa’) were aseptically collected from four locations (Arada, Piazza, Bilko and Azezo) of Gondar Gondar, Ethiopia. Analysis of the food samples revealed that 64.3% of the food samples were contaminated with one or more pathogenic bacteria. Two different bacterial species isolated from the foods sampled were *E. coli* (44.6%), and *S. aureus* (51.8%) (Table 6). The highest incidence of *S. aureus*(66.7%) was seen in ‘Bonbolino’ while the highest incidence of *E. coli* (75%) was observed in ‘Macaroni’. There were statically significant association between contamination of street foods and poor personal hygiene, un-knowledgeable to food borne diseases, storage of foods more than half of a day and illiteracy. The study indicates that the probability of street foods contamination was high in Gondar town (Getu *et al.*, 2013). Poor personal hygiene, improper handling and storage practice of foods and poor knowledge of food vendors towards food borne disease were the associated risk factors to contamination of street vended foods in Gondar (Getu *et al.*, 2013).

Table6. Incidence of isolates from street foods in Gondar town, Ethiopia

Food items	Area	Total examined	Bacteriological result	
			<i>Escherichia coli</i>	<i>Staphylococcus aureus</i>
	Arada	4	1(25)	2(50)
	Piazza	4	0(0)	2(50)
Fuol	Azezo	4	2(50)	0(0)
	Bilko	4	1(25)	2(50)
	Total	16	4(25)	5(31.3)
	Arada	4	2 (50)	3 (75)
	Piazza	4	0 (0)	2 (50)
Sambusa	Azezo	4	3 (75)	2 (50)

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	Bilko	4	1 (25)	2 (50)
	Total	16	6 (37.5)	9 (56.2)
	Arada	3	2 (66.7)	3 (100)
Macaroni	Piazza	3	2 (66.7)	1 (33.3)
	Azezo	3	3 (100)	2 (66.7)
	Bilko	3	2 (66.7)	1 (33.3)
	Total	12	9 (75)	7 (58.3)
	Arada	3	1 (33.3)	3 (100)
Bombolino	Piazza	3	2 (66.7)	2 (66.7)
	Azezo	3	1 (33.3)	3 (100)
	Bilko	3	2 (66.7)	1 (33.3)
	Total	12	6(50)	8(66.7)
	Overall	56	25(44.6)	29(51.8)

Source: Getu *et al.*, 2013

Study was also conducted on street foods in Hawassa City on 72 samples from six food items such as local bread ('ambasha' and 'kita'), raw fish, chilli ('awaze'), avocado and cooked potato were collected. About 31% of the food samples showed total colony counts ranging from 1.7×10^5 to 6.7×10^6 colony forming unit per gram (CFU/g) which is beyond the acceptable limits set for microbiological quality of ready to eat foods. The mean aerobic counts of 'kita' (6.1×10^5 CFU/g), and 'ambasha' (3.0×10^5 CFU/g) (Table 7) were found to be beyond the acceptable level (below 10^5 CFU/g). The coliform counts of all tested food items were beyond the acceptable range. Relatively much higher coliform count was seen in raw fish than in other food types. 'Kita', 'ambasha' and raw fish also showed unacceptable level of Enterobacteriaceae count. Mean Enterobacteriaceae count obtained from 'awaze' (chili), and avocado (Table 7) was within the acceptable range. The mean coliform and Enterobacteriaceae counts in raw fish, 'kita' and 'ambasha' were also higher than the limits. E.coli was the most frequent isolate (29.6%) followed by Salmonella species (12.7% and S.aureus (9.9%). The food samples taken from "Amora Gedel" were more contaminated with bacteria compared to other street food samples sold at other sites (Table 8). Lack of training on the proper handling and processing of food, poor personal hygiene of vendors and unhygienic surroundings could be possible factors for observed problems in the locality (Temesgen *et al.*, 2016).

Table 7. Aerobic bacterial, coliform and Enterobacteriaceae counts of ready to eat street foods against the standard Hawassa, Ethiopia

Food Item	Number	Mean bacterial colony count (CFU/gm)	Coliform count (CFU/gm)	Enterobacteriaceae count (CFU/gm)
Kita	12	6.1×10^5	7.6×10^3	2.3×10^4
Ambasha	12	3.0×10^5	2.6×10^3	1.1×10^4
Raw fish	12	6.7×10^6	5.1×10^4	6.8×10^4
Potato	12	4.0×10^5	6.8×10^3	2.5×10^4
Awaze	12	1.7×10^5	3.9×10^3	8.1×10^3
Avocado	12	2.8×10^5	4.8×10^3	9.4×10^3

Source: Temesgen *et al.*, 2016

Table 8. Aerobic bacterial, coliform and Enterobacteriaceae counts of ready to eat street foods with respect to Vending sites, Hawassa, Ethiopia

Vending Place	Number	Mean bacterial colony count (CFU/gm)		
		Total aerobic count	Coliform count	Enterobacteriaceae count
Bus Station	07	3.8×10^4	1.4×10^3	4.6×10^3
Piazza	11	6.3×10^4	1.4×10^3	3.8×10^3
Gebeya Dar	15	1.7×10^6	1.1×10^5	1.7×10^5
Amora Gedel	28	3.5×10^6	1.5×10^5	4.4×10^5
Kochi	11	8.6×10^4	1.4×10^3	2.8×10^3

Source: Temesgen *et al.*, 2016

2.4. Street Food Consumption in Terms of Food Safety and Health

Millions of people catch diseases originating from food sources and thousands of deaths occur in world (Pilling *et al.*, 2008). Street foods carry diseases originating from food sources in many

countries (Mamun *et al.*, 2013). Street food preparation and sold areas are open to dirt and contamination that threaten health. One of the reasons for spreading of diseases originating from food sources is that street food sellers do not have sufficient information about food safety. Poor hygiene, difficulty in obtaining drinking water, not removing wastes and similar environmental problems and the fact that street food are exempt from legal legislations, all these factors increase risks in ensuring food safety (Kealesitse and Kabama, 2012). Abibo and Lowatt (2015) stated that food processing places, restaurants, food sellers, schools and houses are influential in development of diseases originating from food. Street food safety is influenced starting from the quality of raw materials to food processing and storing and similar steps in the process. Selling points of street food have a limited infrastructure as regards to clean drinking water, toilets, freezing-ice creams, disinfection, hand washing, and removal of wastes. Besides, street food is subject to the contact of insects, rodents, domestic and other animals and unfavorable environmental conditions like air pollution (Lucca and Torres, 2006). Sufficient personnel hygiene of food sellers and appropriate food applications can minimize the transfer of pathogens causing foodborne diseases (Evans *et al.*, 1998; Medeiros *et al.*, 2004). Successful food hygiene education and knowledge about food hygiene practices are important in the prevention of foodborne diseases around the world. Furthermore, regarding street food, detailed food hygiene regulations and food safety system should be in force and should be applied (Ceyhun and Şanller, 2016).

2.5. Risk Factors in Street Food Practices

Quest for profit maximization by the vendors or the need to make street foods affordable for the consumers make some vendors patronize cheap and unsafe ingredients that may be detrimental to the health of consumers. Results of survey conducted by Omemu and Aderoju (2008) showed that vendors of street foods in Nigeria considered the volume (94%) and the price (93%) than the freshness and cleanliness when buying raw foods to be cooked or vended. Studies have shown that home-made cereal flour and condiments used in street foods preparations are contaminated with *Bacillus cereus* (Umoh and Odoba, 1999) which was reported to be responsible for outbreak of food borne illness. Some street food vendors use leftover perishable raw materials for next day preparation without storage facility (Choudhury *et al.*, 2011). The long holding period of more than 6 hrs, sometimes at ambient temperature (Muyanja *et al.*, 2011), were reported to be a common factor contributing to food borne illness through multiplication of microorganisms. Other risk factors identified include the common use of stove charcoal for keeping and warming of food over a long period of time which may not provide adequate temperature enough to prevent proliferation of pathogenic microorganisms (Lues *et al.*, 2006); as reheating of food at temperature below 40 °C could increase salmonella contamination (Cardinale *et al.*, 2005), overheating at higher temperature could lead to loss of essential nutrients and flavors in the food; holding of foods at ground level and incessant uncovering of foods for dispensing exposed street foods to dust contamination and flies which has been linked to food borne diseases such as cholera and diarrheal. The use of same set of cutleries which is not properly cleaned after each use by different consumers led to cross contamination and transmission of infectious diseases among unsuspecting consumers (Mosupye and Holy, 2000). A comparative study on the risks involved in the use of hands and cutleries to serve street foods in Ghana (Mensah *et al.*, 2002) showed that the use of bare hands to serve increased the level of contamination. Environments under which street foods are being prepared, vended and consumed predisposed them to recontamination and cross contamination from environmental pollutants such as airborne chemicals in dusts, exhaust discharges from moving vehicles and industrial engines, burning fumes and offensive smell from accumulated waste and effluent from industrial discharge, insects and rodents (Proietti *et al.*, 2014). About 15 cases of foodborne disease outbreaks monitored in Zhapo, a coastal resort of Guangdong, China, from 2008 to 2011 were traced to the negligence of food vendors (Liu *et al.*, 2015). Studies reported that most vendors knew that they must bath regularly and not attached bath to visible dirt or objectionable odor (Omemu and Aderoju, 2008), washed their hands during food preparation, serving, after using the toilet, sneezing, coughing and handling contaminated materials like exchange of money (Muyanja *et al.*, 2011). Consumers are the major risk bearers of the consequences of street food safety (Alimi and Workneh, 2016). Alimi *et al.* (2016) recommended that safety approach to hazards of street foods should start from good agricultural practices and permeate the whole chain of the business.

2.6. Hazard Analyses of Street Foods

Street food vending has become an important public health issue and a great concern to everybody (Sharmila, 2011). Various studies have identified the sources of food safety issues involved in street foods to be microorganism belonging to the genus *Bacillus*, *Staphylococcus*, *Clostridium*, *Vibrio*, *Campylobacter*, *Listeria*, *Salmonella* (Sharmila, 2011). Street foods are perceived to be a major public health risk due to lack of basic infrastructure and services, difficulty in controlling the large numbers of street food vending operations because of their diversity, mobility and temporary nature (DeSousa, 2008). Lack of factual knowledge about the epidemiological significance of many street vended foods, poor knowledge of street vendors in basic food safety measures and inadequate public awareness of hazards posed by certain foods has severely hampered deployment of a precise scientific approach to this very serious issue of public health and safety. The epidemiological studies to suggest that street foods contribute to a significant number of food poisonings are inadequate, due to paucity of data deficiencies in knowledge about important parameters in the food chain and host pathogen interactions; however, there have been several documented cases of food poisoning outbreaks due to street foods. From the initial contamination of raw foods with pathogenic bacteria to subsequent contamination by vendors during preparation (Tambekar *et al.*, 2008), the factors that should be considered for the analyzing the hazards due to street foods are many (Table 9).

Table9. Source and type of hazard and the microbial risk involved

S.No.	Source	Hazard	Risk involved
1	Vendor location	Improper food handling	Transfer of pathogens like <i>Salmonella</i> and <i>E. coli</i> , <i>S. aureus</i> from human body and environment into foods
2	Raw materials	Improper waste disposal Water Vegetables and spices	Transmission of enteric pathogens like <i>Salmonella</i> , <i>Shigella</i> and <i>E. coli</i> via vectors Passage of pathogens like <i>E. coli</i> , fecal streptococci, <i>Salmonella</i> and <i>Vibrio cholera</i> Introduction sporeformers like <i>Bacilli</i> and <i>Clostridium</i> and pathogens like <i>L. monocytogenes</i> , <i>Shigella</i> , <i>Salmonella</i> , etc.
3	Utensils and equipments	Chemical contaminants Microbial contaminants	Leaching of chemical leading to poisoning Cross contamination of food with <i>Staphylococcus aureus</i> , <i>E. coli</i> and <i>Shigella</i> due to contaminated water, dish cloth, handler
4	Storage and reheating	Improper storage temperature and reheating of food	Likelihood of heat stable toxins produced by pathogens like <i>C. perfringens</i> and <i>B. cereus</i>
5	Personal hygiene of vendors	Biological hazards	Introduction of <i>Staphylococcus</i> , <i>Salmonella</i> and <i>Shigella</i> via carriers

Source: Sharmila, 2011

In Africa 85% of vendors prepared foods like fish, fruit salads, roasted maize and chips in unhygienic conditions, given that garbage and dirty waste were conspicuously close to the stalls (Muinde and Kuria, 2005). In these areas large amounts of garbage accumulates which provide harborage for insects and animal pests that are linked to enteric disease transmission (*Shigella*, *Salmonella* and *E. coli*) (Barro *et al.*, 2007). Contaminated water can create a public health risk when it is used for drinking, washing of foods, incorporated in the food as an ingredient and used in the processing of food or used for washing equipment, utensils and hands. Besides water, other raw materials are also important to the safety of the street vended foods because of the biological, chemical and physical hazards that they might introduce. In order to keep prices down, some vendors purchase cheap or adulterated ingredients containing unpermitted chemical additives from unauthorized suppliers which may further increase the risks associated with the food so prepared. Some food vendors often partially or fully cook some products ahead of time, store them and then reheat them when requested by customers (Omemu and Aderoju, 2008). However, this reheating is often inadequate to destroy bacteria that may be present as this would allow the foodborne pathogens that germinate from spores which survived cooking or that contaminate the food after cooking, to survive and proliferate. Some food handlers may introduce biological hazards by cross contamination after handling raw materials

when they suffer from specific diseases (Ohiokpehai, 2003) and physical hazards by careless food handling practices. Most of the vendors pack the food in polythene bags for their customers and when packing these foods, they blow air into the polythene bags to open them, in this process a number of pathogens can be passed on to the consumer.

3. CONCLUSION

Street foods are foods and beverages that are sold in the street and other open public spaces like schools, bus stations, train terminals and entertainment places that are ready to consume without the need for any processing or preparation. Street food consumption dependent on socio-economic factors and keeps on spreading, sufficient legal regulations and rules regarding safety measures have not been set. Major concern with street food are related to food safety, sanitation problems, traffic congestion in the city also for pedestrians, illegal occupation of public or private space and social problems. The risk of serious food poisoning outbreaks and lack of knowledge among vendors about the causes of food-borne disease linked to street foods remains a threat in many parts of the world. Finally Health Authorities and other concerned body on street food should create awareness in order to improve their hygienic conditions during the preparation, handling, storing and serving of street foods. Authorities must implement policies aimed at assisting, controlling and maintaining street food sector in order to maintain the benefits of street food. It is recommended that research on street food consumption including local 'Jebenabuna'; its associated health risk; social and economic benefits should be implemented in different parts of Ethiopia.

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