



HANDLING PRACTICES & BACTERIOLOGICAL QUALITY OF FRESH VEGATABLE SALADS IN FSEs, MWANZA

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Presentation outline

- Introduction
- Materials and methods
- Results and discussion
- Conclusion

Introduction

- Food safety is critical for promoting public health & economic development
- FSEs offer a range of foods including raw, mild & well-heat treated products
- The consumption of raw/mild-heat treated foods in DC has increased (Mir *et al.*, 2018)
- Veg salads (*Kachumbari*) are highly nutritious, relatively cheap & easy to prepare
- They are rich sources of micronutrients such as vitamins & minerals
- Thus, they are an important component in human diet

Introduction

- However, fresh/raw salads are potentially risky if not well handled
- In Mwanza FSE, people like consuming main meals with *Kachumbari*
- *Kachumbari* has no additional processing (Namukwambi *et al.*, 2022)
- It is also prepared under unhygienic conditions
- Moreover, it is handled by people with limited knowledge
- *Kachumbari* is prepared in advance & stored at ambient conditions

Introduction

- Salads are often contaminated with pathogens like *E. coli* & *Salmonella* spp.
- Consumption of contaminated veg salads may result in FBD outbreaks
- Globally, each year, 10% of people suffer from consuming unsafe foods
- ~ 600m illnesses and 420,000 deaths per annum (WHO, 2015)
- Africa accounts for > 91m illnesses & > 137,000 deaths (WHO, 2015)
- Each year US\$110 billion is spent in medical expenses in DC
- Thus, the public health & economic consequences of FBD in DC are severe



Materials and Methods

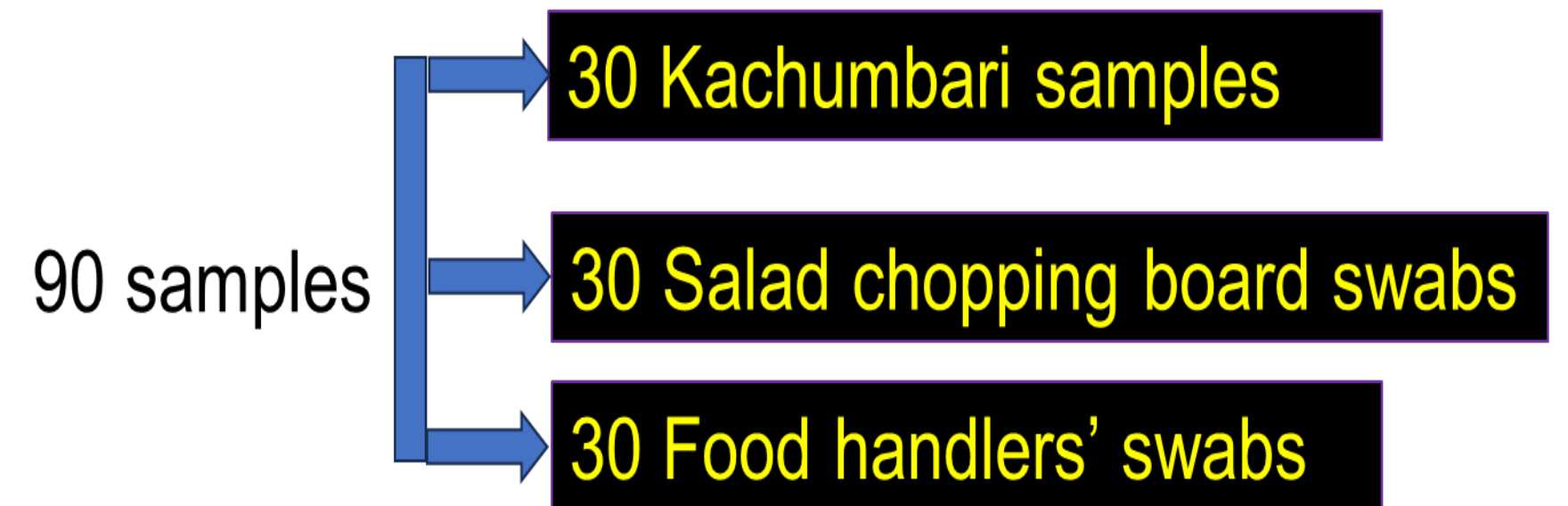
- Study area: Nyamagana & Ilemela, Mwanza city
- Study period: March to April 2024
- Study design: Cross-sectional research
- Sampling procedure: multi-stage sampling technique
- Simple random sampling: 4 wards (2 Nyagana, 2 Ilemela)
- Simple random sampling: 30 FSE (20 SFV & 10 restaurants)

Materials and Methods – Handling practices

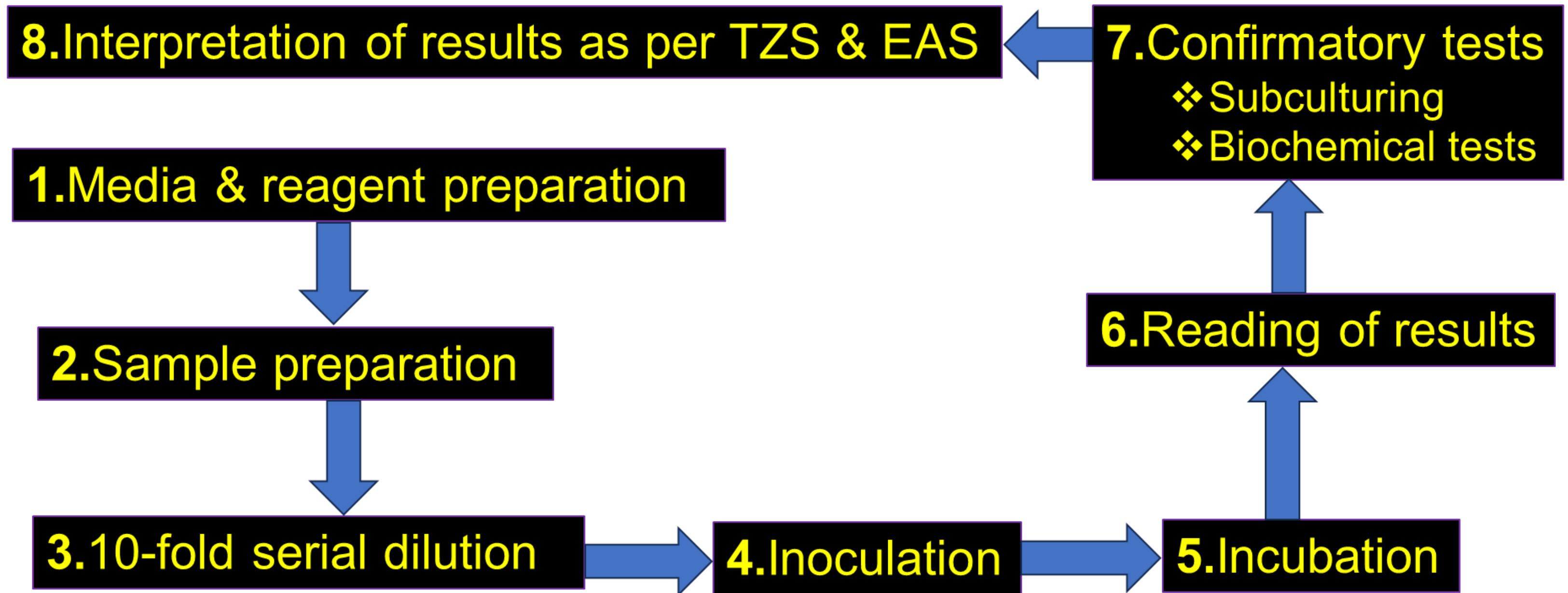
- Face-to-face interviews using a semi-structured questionnaire
 - ✓ Socio-demographic information of handlers
 - ✓ Information on FSK, FSA, FSP

Materials and Methods – Bacteriological quality

- The four bacteriological parameters were selected and analyzed
 - ✓ General process hygiene (TBC)
 - ✓ Personnel hygiene (*S. aureus*)
 - ✓ Indicators of fecal hygiene (*E. coli*)
 - ✓ Food safety (*Salmonella* spp.)



Materials and Method – Bact quality....

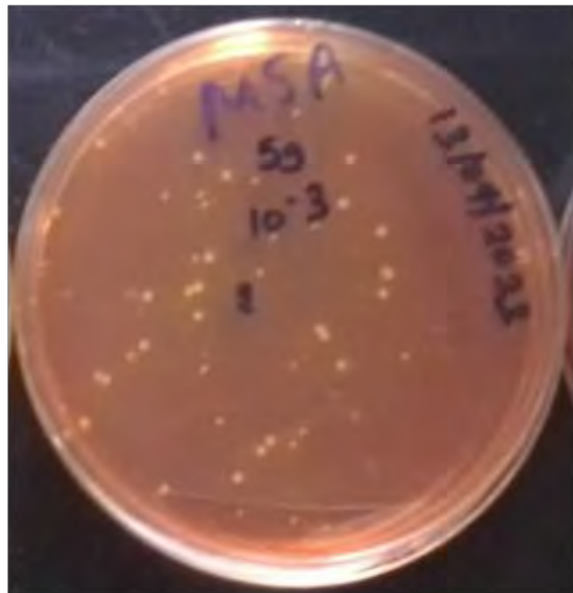


Materials and Methods - culture



S. aureus, shiny black colonies with clear zones around them

BPA (*S. aureus*)
37°C/24Hrs



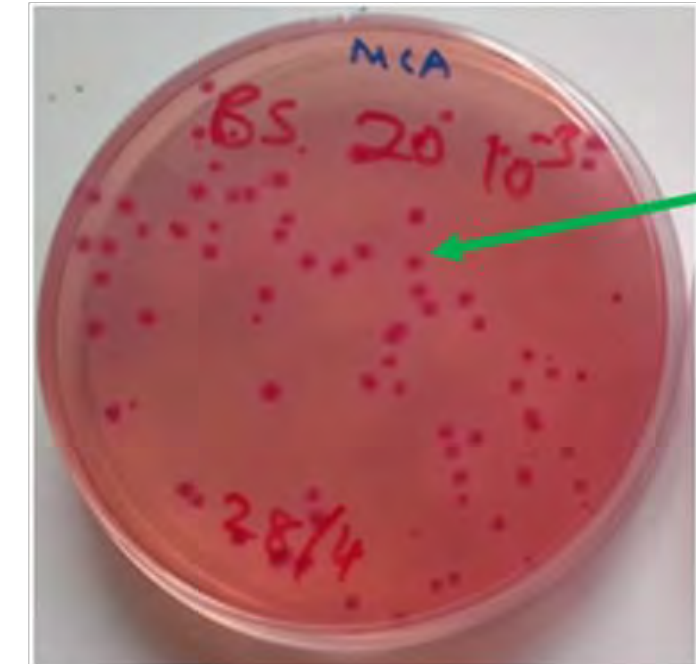
MSA (*S. aureus*)
37°C/Hrs



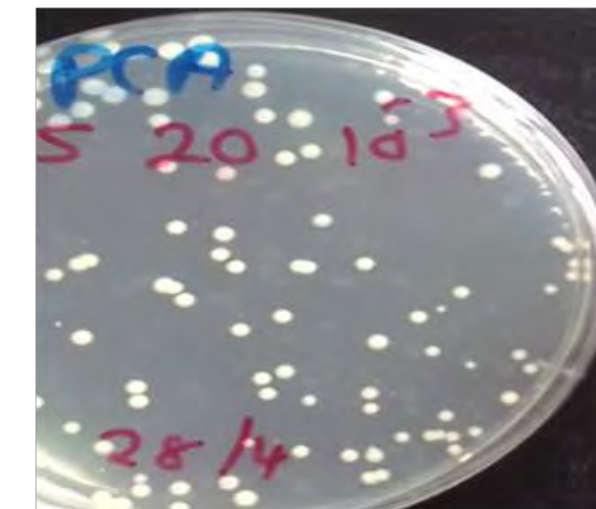
XLD (*Salmonella*)
37°C/24Hrs



SS Agar (*Salmonella*)
37°C/24Hrs

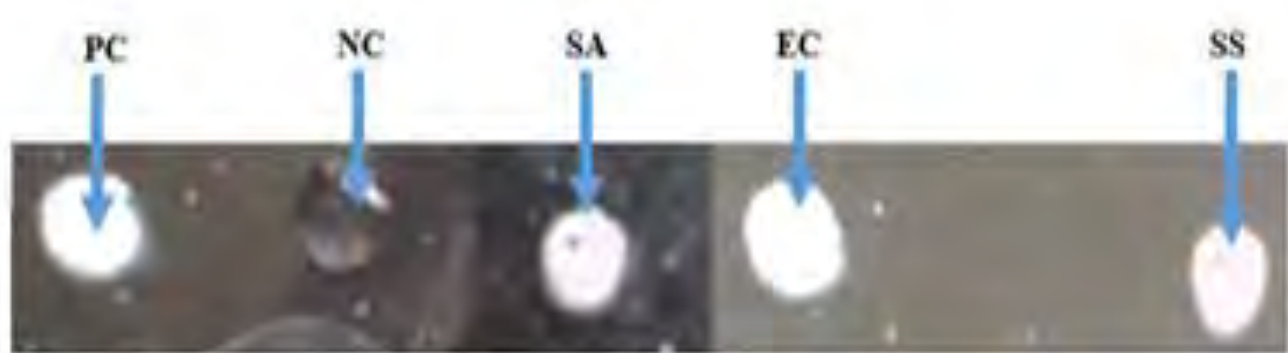


MCA (*E. coli*)
37°C/28Hrs



PCA (TBC)
30°C/24Hrs

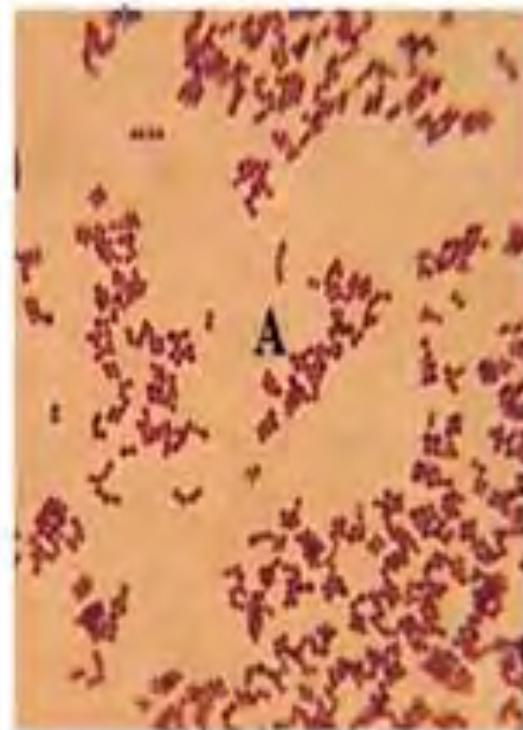
Materials and Methods – Confirmatory tests



Catalase Test



Coagulase test for *S. aureus*



GM+ purple grape like cocci (*S. aureus*)



GM- rod like pink (*E. coli*)



GM- short rods (*Salmonella*)



Oxidase test: -Ve: *E. coli* (EC)

Materials and Methods – Statistical analysis

- **Handling practices**

- ✓ Data were analyzed using IBM SPSS version 25 for Windows
- ✓ AH clustering was used to analyze the handling performance data
- ✓ Mann Whitney test was used to assess diff in handling btn clusters

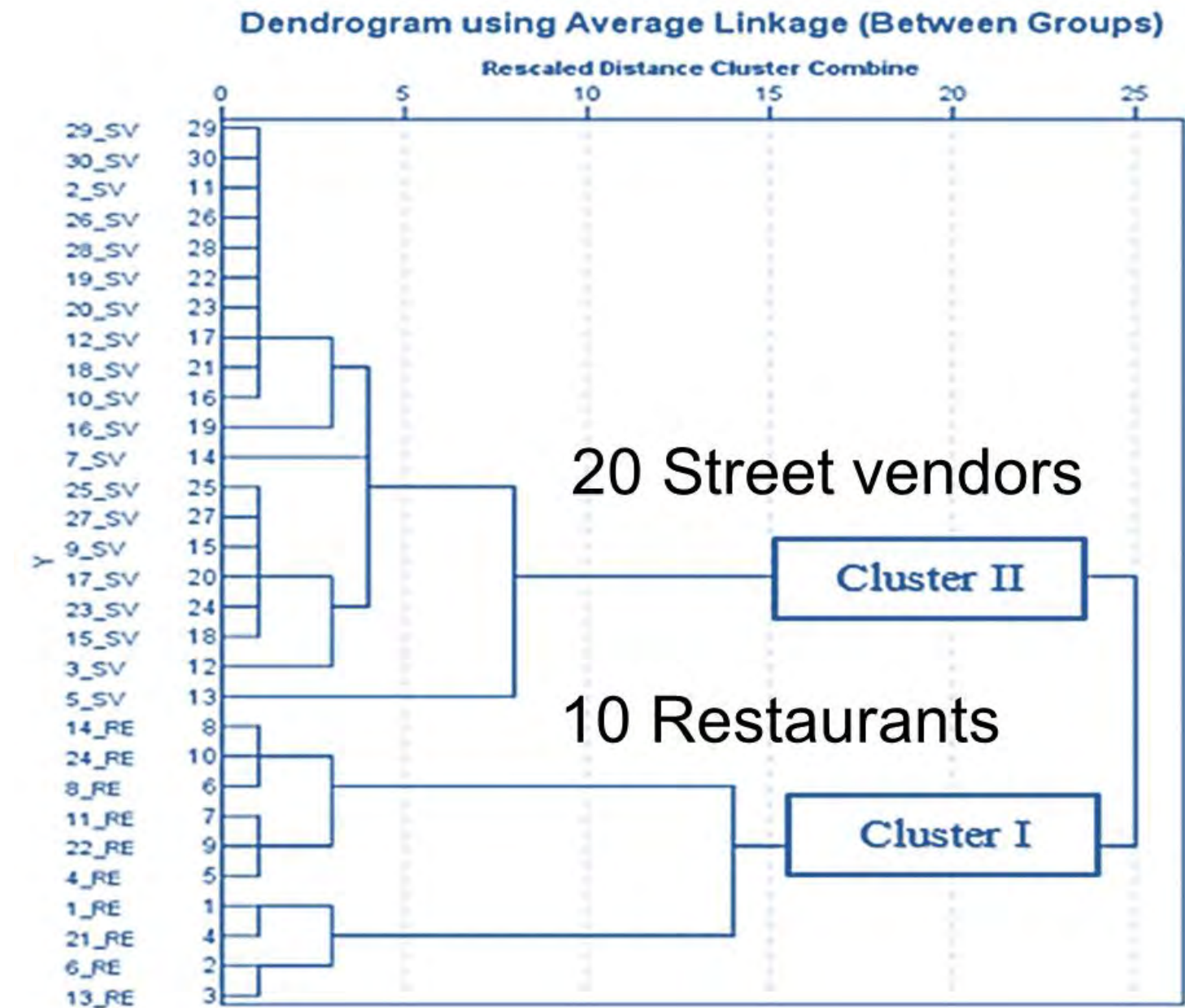
- **Bacteriological quality**

- ✓ One-way ANOVA: diff among mean counts of TBC, SA & EC in *Kachumbari*
- ✓ And means were separated by Duncan Multiple Range
- ✓ A χ^2 : re/ships btn variables (type of FSE and CB) and *Kachumbari* (*E. coli* & *S. aureus*)

Results & Discussion – Handling practices

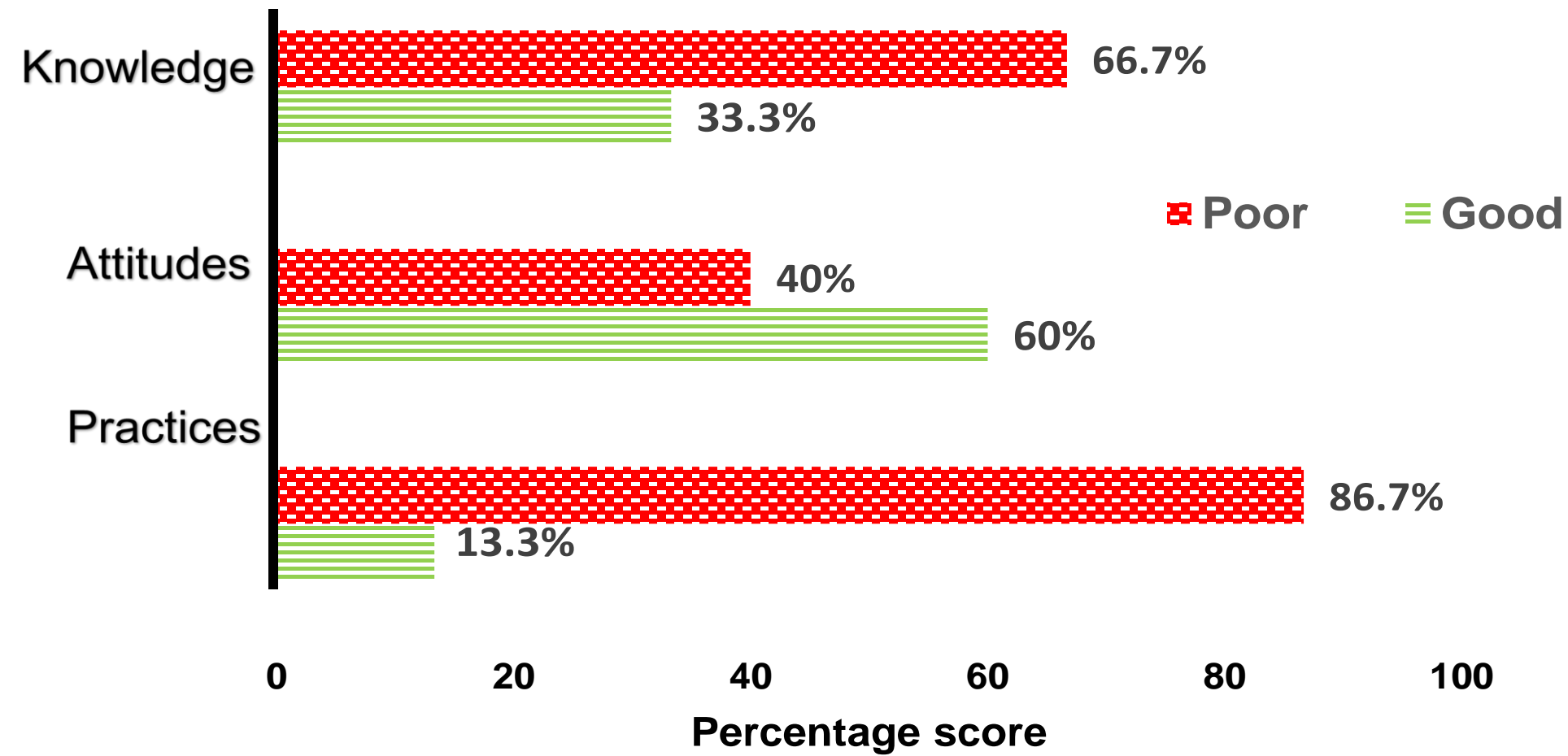
Socio-demographic information

Variable	Category	Frequency (%)		Total (%)
		Cluster I	Cluster II	
Educational level	Informal	0 (0)	0 (0)	0 (0)
	Primary	3 (30.0)	11 (55.0)	14 (46.7)
	Secondary	7 (70.0)	9 (45.0)	16 (53.3)
Food preparation knowledge	Experience	8 (80.0)	20 (75.0)	28 (93.3)
	Training	2 (20.0)	0 (25.0)	2 (6.7)
Experience in RTE food industry (yrs)	<1	0 (0)	4 (20.0)	4 (13.3)
	1 – 2	0 (0)	5 (25.0)	5 (16.7)
	>2	10 (100)	11 (55.0)	21 (70.0)
Business capital (TSh.)	1 00,000 - 500,000	0 (0)	20 (100)	20 (66.7)
	> 500,000	10 (100)	0 (0)	10 (33.3)
Registration by relevant authorities	Yes	10 (100)	0 (0)	10 (33.3)
	No	0 (0)	20 (100)	20 (66.7)

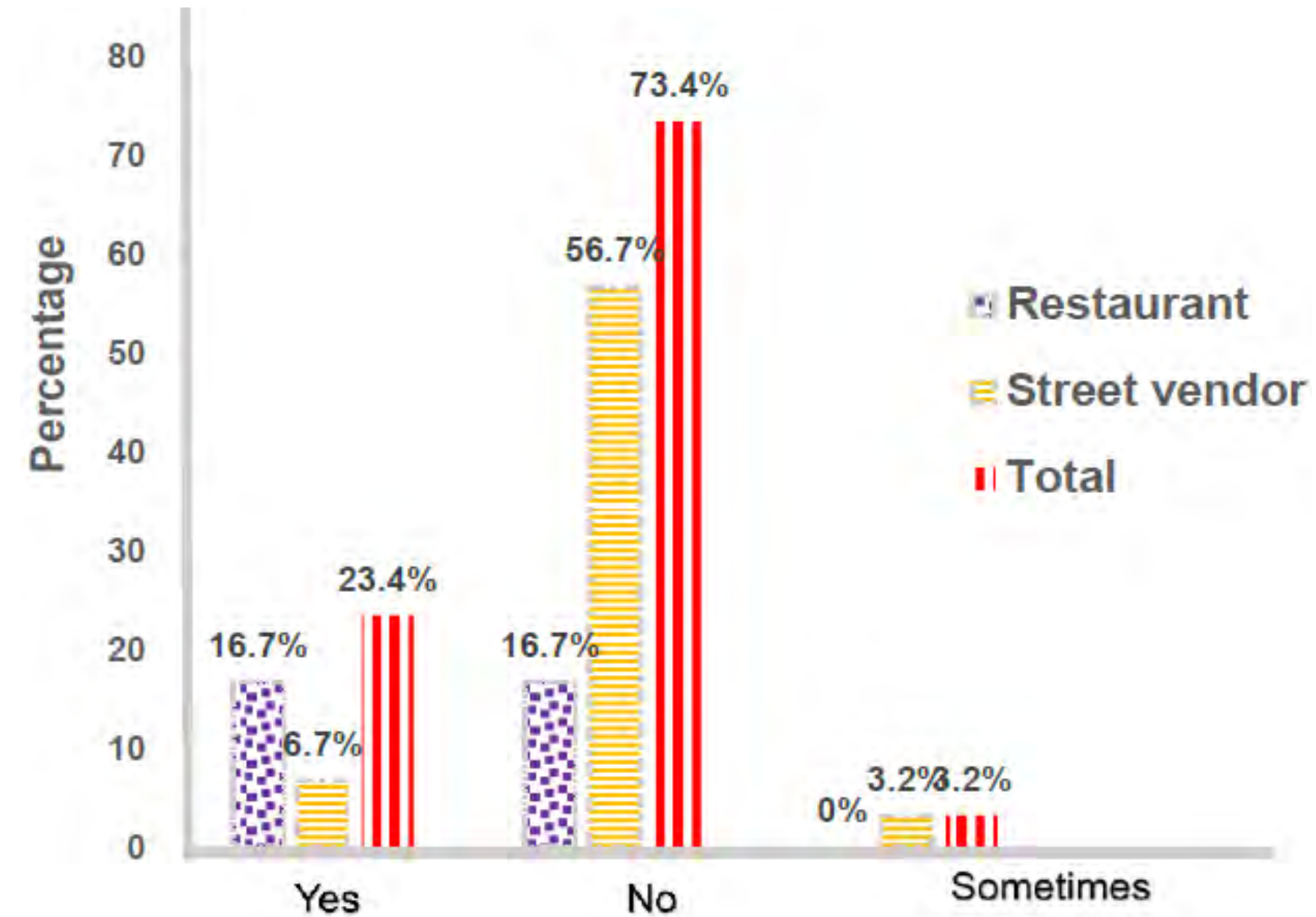


Results & Discussion – Handling practices

Food Safety KAP

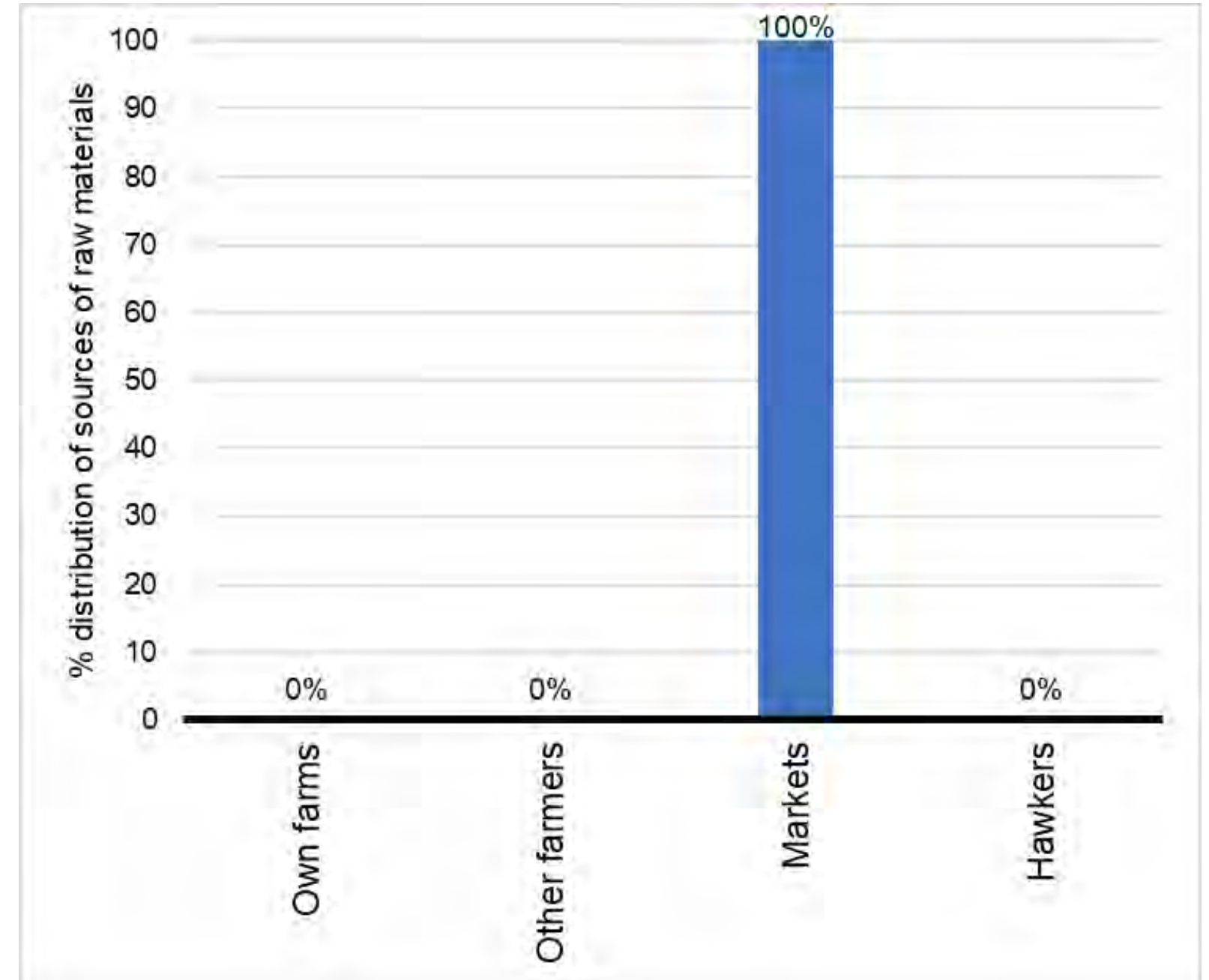
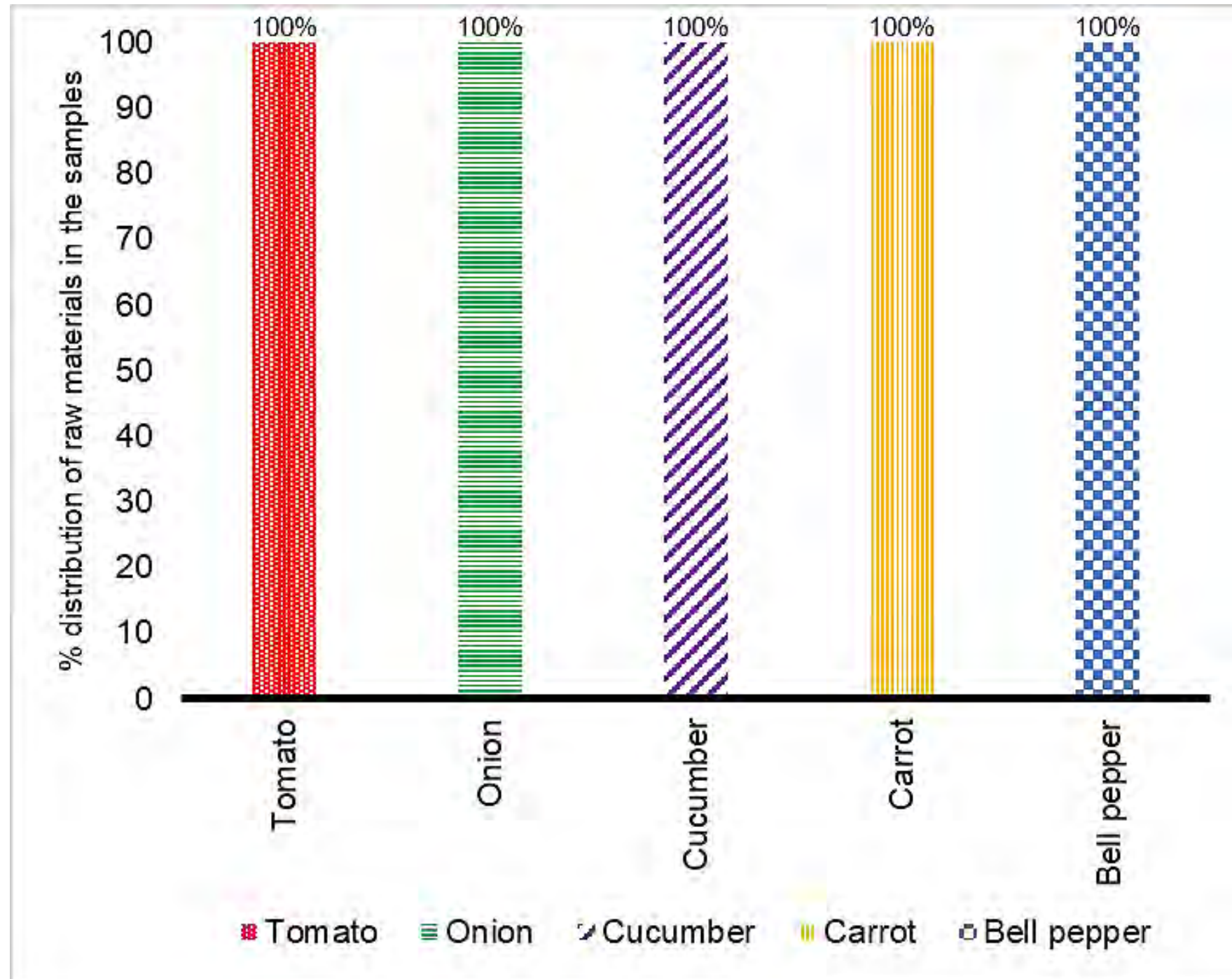


Annual Medical Checkup



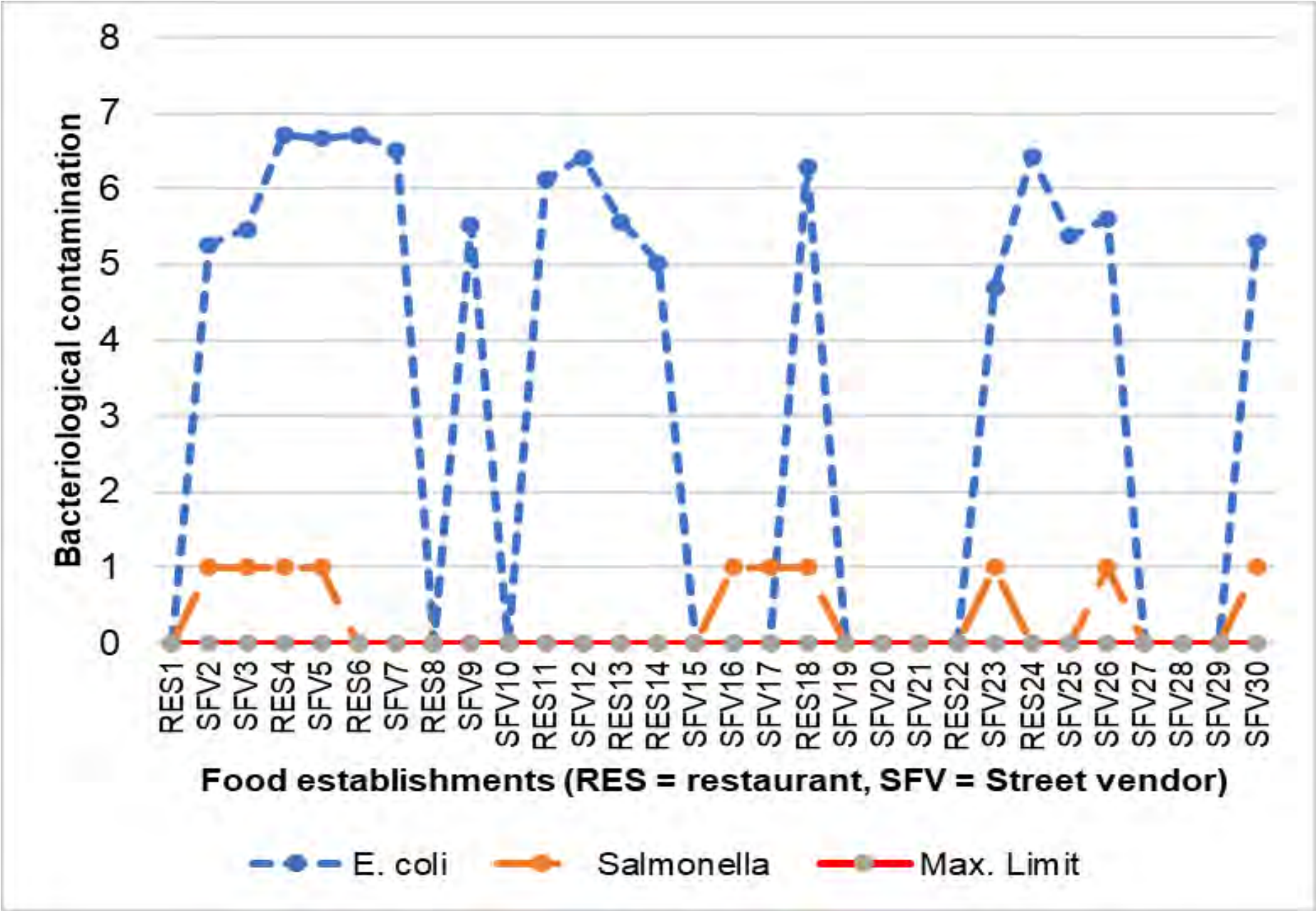
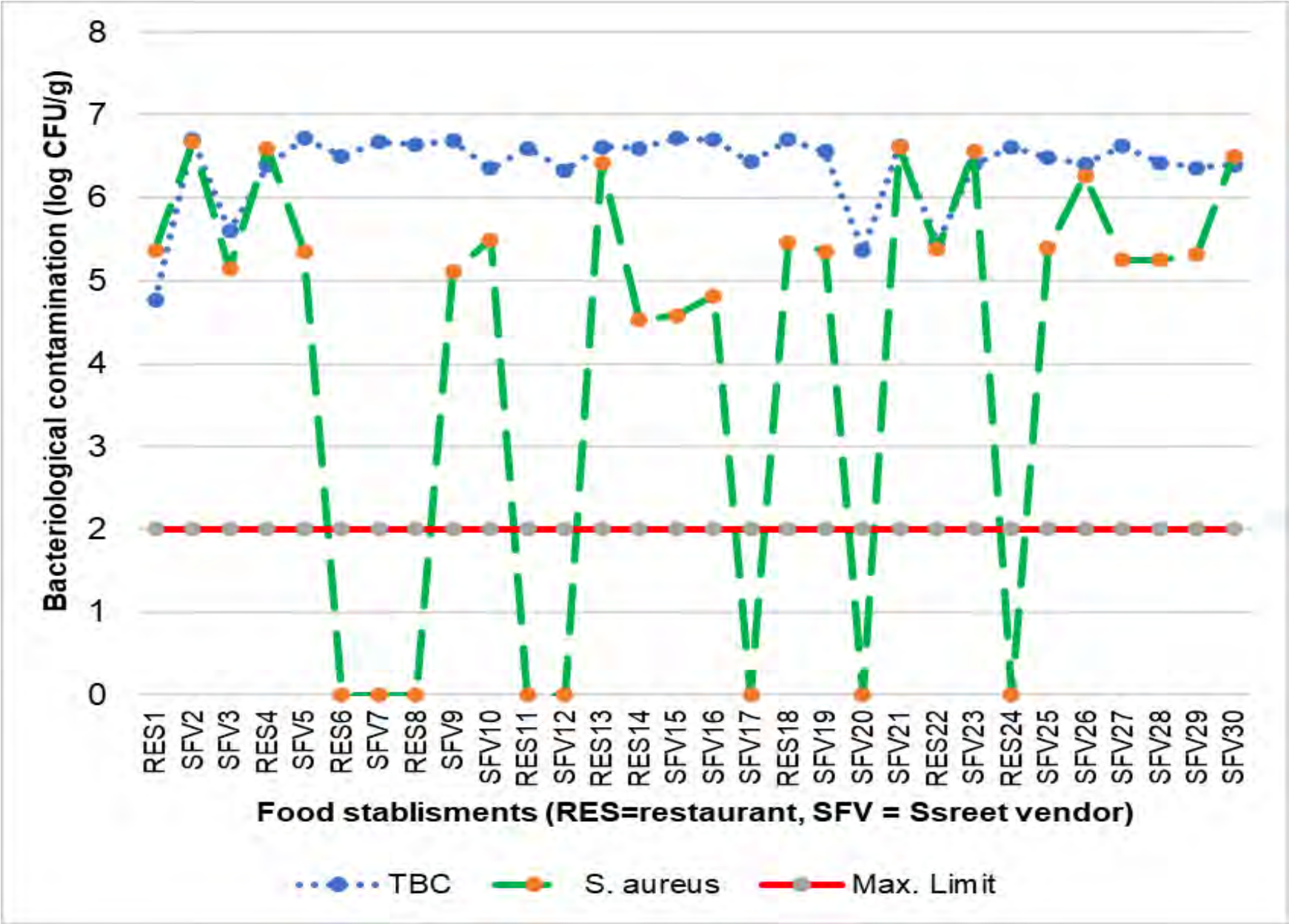
Results and Discussion

- Raw materials used to prepared the salad



Results and Discussion

- Microbiological quality of *Kachumbari*



Organism	SFV	RES	Total (%)
TBC	20	10	30 (100)
<i>S. aureus</i>	16	6	22 (73.3)
<i>E. coli</i>	10	7	17 (56.7)
<i>Salmonella</i> spp.	8	2	10 (33.3)

Results and Discussion

- Microbial counts of *Kachumbari* : RES vs SFV

Microorganisms	Mean \pm SD (log CFU/g)		Range (log CFU/g)
	SFV (N=20)	RES (N=10)	
Total bacterial counts	6.5 \pm 0.3 ^a	5.2 \pm 0.6 ^b	4.8 - 6.7
<i>S. aureus</i>	4.4 \pm 2.4 ^a	3.4 \pm 2.9 ^a	<1 - 6.7
<i>E. coli</i>	2.8 \pm 2.9 ^a	4.3 \pm 2.9 ^a	<1- 6.7

Results and Discussion

- **Microbiological quality of salad chopping boards**
 - ✓ 15 WCB & 15 PCB were used to prepare *Kachumbari* in the study FSE
 - ✓ High counts of TBC: 3.5 to 4.7 (WCB) and 4.1 to 4.7 log CFU.cm⁻² (PCB)
 - ✓ *S. aureus* levels on WCB (<1 to 5.6) and PCB (<1 to 4.8 log CFU.cm⁻²)
 - ✓ 3.4 *S. aureus* on WCB ($p < 0.05$) was higher than on PCB (1.4 log CFU.cm⁻²)

Results and Discussion

- Comparison between chopping board type & *Kachumbari* contamination

Mean values on chopping boards			
	TBC	<i>S. aureus</i>	<i>E. coli</i>
PCB	4.5 ^a	1.4 ^b	0.5 ^a
WCB	4.3 ^a	3.4 ^c	0.5 ^a
Mean values in <i>Kachumbari</i> per chopping board type			
PCB	6.5 ^a	3.4 ^a	4.1 ^a
WCB	6.3 ^a	5.8 ^b	2.9 ^a

Conclusion

- The handling practices in FSE don't guarantee quality of fresh vegetable salads
- The product is most likely contaminated due to lack of trained handlers & facilities
- Salads were contaminated with TBC, *S. aureus*, *E. coli* and *Salmonella* spp
- Thus, the consumption of veg salads has the potential to cause illnesses
- It is likely that the bacterial cont. in the salads came from the hands or CB
- Proper sanitization & hygienic handling should be implemented to minimize the risk of contamination during the preparation, storage & serving of food



Thank You



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