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Article:

Studies on sanitary status of fast-food meals in Sohag city

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Abstract

This study was planned to assess the safety of some fast-food meals prepared in restaurants in Sohag City. One hundred fast food sandwiches including beef shawerma, beef burger, chicken shawerma, and chicken pane were randomly collected from different restaurants in Sohag city (25 of each) for detection of *Escherichia coli* and *Staphylococcus aureus*. The results revealed that the incidence of *E. coli* in beef shawerma, beef burger, chicken shawerma, and chicken pane were 12%,16%,24%, and 8% respectively. While the incidence of *Staph aureus* was 32%, 24%, 40%, and 36%, respectively. The obtained results demonstrate that fast food sandwiches sold in Sohag City constitute a likely potential hazard to human health, and strict hygienic measures are recommended to decrease the contamination level.

Keywords: *E. coli*, *Staphylococcus aureus,* fast food, sandwiches.

Introduction

The Fast food has become a part of our society and our daily life due to some reasons such as changes in our lifestyle, low cost, and the enormous fast-food restaurant advertisements. The phenomenon of fast food has been increasing rapidly in the last years. Although fast-food restaurants are subject to local inspections by public health departments, still a relatively high percentage of restaurants have inadequate food hygiene practices. Moreover, the prevention of foodborne illnesses needs increasing awareness among food handlers and customers on safe food handling practices (Soliman et al., 2021). Most of the developing countries are experiencing increased urbanization resulting in growth of fast-food restaurants. The trend towards consumption of foods has changed with more people moving towards ready-to-eat (RTE) food meals (Talukderet al.,2020). Sandwiches are widely consumed as part of the international food culture; therefore, the investigation of microbiological quality are essential step for risk factor determination of food-borne illnesses (Ajaj et al., 2020). Hygienic food handling is a possible way of protecting people from food borne diseases. Food handlers must use protective equipment like gloves, masks, hair covers, and aprons. The use of food handler certification could improve the food safety outcomes at establishment (Rifat et al., 2022). *E. coli* is a member of the family *Enterobacteriaceae*; it is widely distributed in the environment and contaminated food and water. (Elsayed and Mohamed, 2022). Most of the *E. coli* strains aren't harmful, but some produce a cytotoxin called Shiga toxin, that can inhibit protein synthesis in target intestinal and other organ cells and cause severe diseases in humans, including bloody diarrhea, blood-clotting problems, ,

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kidney failure, and death (Daryaei et al. 2020). Staphylococcus aureus is a common bacterial species found as a commensal in the nose and on the skin of healthy humans and animals. Entero-toxigenic strains of Staphylococcus aureus secretes enterotoxins in food that consequently may cause poisoning when eaten (Al-Humam and Mohamed, 2022). The hygienic conditions of fast food meals must be checked routinely. Exploring novel alternatives to manage foodborne diseases, with a focus on strategies that minimize public health hazards is needed (Tolba and Abdel-Aziz, 2022). This study aimed to detect the incidence of E. coli species and Staph aureus in fast food sandwiches collected from fast food restaurants in Sohag city.

Materials and Methods

One hundred fast food sandwiches such as beef shawerma, beef burger, chicken shawarma, and chicken pane were randomly collected from different restaurants in Sohag city (25 of each). The samples were collected under aseptic conditions, wrapped in sterile plastic bags, sealed, labeled, and kept in ice boxes (APHA, 2001). The collected samples were transferred directly to the laboratory using a cool box (0-4º c) (Varghese and Joy, 2014). Samples were prepared by weighing twenty-five grams of each sandwich under aseptic conditions and then homogenized with 225ml of sterile distilled water by using a homogenizer (DAIHAN Scientific Co., Ltd, Korea). *E. coli* species were identified by morphological examination onto MacConkey agar, biochemical tests and serologically identified according to Sotohy et al. (2019). While *Staphylococcus aureus* was identified by morphological examination onto Baird Parker agar supplemented with egg yolk tellurite emulsion according to Al-Humam and Mohamed (2022) and biochemical tests as catalase test, tube coagulase test, mannitol fermentation test as well as PCR assay were applied for *Staphylococcus aureus* identification according to Yildirim et al. (2019).

Results

From the results illustrated in Table 1 and Figure 1; it's obvious that the incidences of *E. coli* isolated from the examined samples were 12%, 16%, 24%, and 8% for the examined samples of beef shawerma, beef burger, chicken shawerma, and chicken pane sandwiches, respectively. Also data obtained in Table 2 and Figure 2 revealed that the isolated serotypes of pathogenic *E. coli* from the examined samples were *O121:H7 (EPEC)* (6.7%), *O26: H11 (EHEC)* (33.3%), *O128:H2 (ETEC)* (26.7%), *O119:H6 (EPEC)* (13.3%), *O86 (EPEC)* (6.7%), *O44:H16 (EAEC)* (6.7%), and *O111:H4 (EHEC)* (6.7%).The serotypes of pathogenic *E.coli* in beef shawerma were showed in Table 3 and classified as *O26:H11 (EHEC)*, *O111:H4 (EHEC),* and *O128:H2 (ETEC)* (33.3%) for each. *E. coli* serotypes in beef burger were classified as *O121:H7 (EPEC)* (25%), *O26:H11 (EHEC)* (25%), and *O128:H2 (ETEC)* (50%) (Table 4). Table 5 provided that *E. coli* in chicken shawerma were identified as *O26:H11 (EHEC)* (33.3%), *O119:H6 (EPEC)* (33.3%), *O86 (EPEC)* (16.7%) and *O44:H16 (EAEC)* (16.7%). While *E. coli* serotypes in chicken pane were reported in Table 6 as *O26:H11 (EHEC)* and *O128:H2 (ETEC)* (50%) for each. On the other hand, the incidence of *Staph aureus* in the examined samples was recorded in beef shawerma (32 %), followed by beef burger (24 %), chicken shawerma (40%), and chicken pane (36%) (Table 7& Figure 3). Figure 4 showed PCR results for identification of *Staphylococcus aureus* in the examined samples.

Table 1. Incidence of *E. coli* species in examined samples.

Sample	Number of samples	Number of positive	% positive
Beef shawerma	25	3	12 %
Beef Burger	25	4	16 %
Chicken shawerma	25	6	24 %
Chicken Pane	25	2	8 %
Total	100	15	15 %

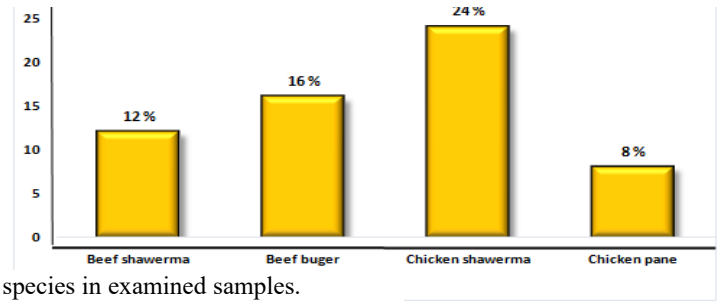


Figure 1. Incidence of *E. coli* species in examined samples.

Table 2. Serological identification of *E. coli* strains in the examined samples.

Identified strains	Number of identified strains	% of identified strain
E. coli O121:H7(EPEC)	1	6.7%
E. coli O26:H11(EHEC)	5	33.3%
E. coli O128:H2(ETEC)	4	26.7%
E. coli O119:H6(EPEC)	2	13.3%
E. coli O 86(EPEC)	1	6.7%
E. coli O44:H16(EAEC)	1	6.7%
E. coli O111:H4(EHEC)	1	6.7%
Total	**15**	

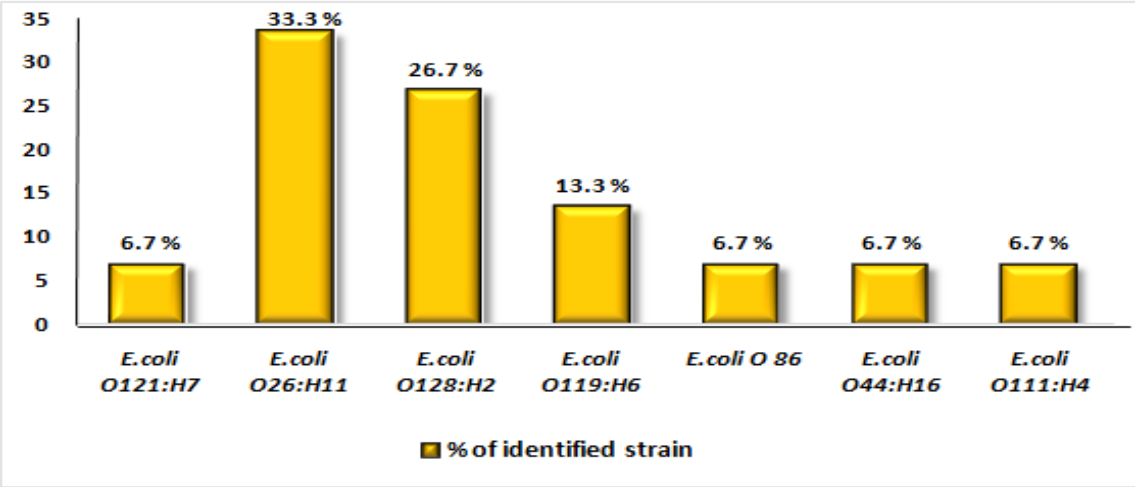


Figure 2. Serological identification of *E. coli* strains in the examined samples

Table 3. Serological identification of *E. coli* strains in beef shawerma

Strains	Number of positive	% positive
E. coli O26:H11 (EHEC)	1	33.3 %
E. coli O111:H4 (EHEC)	1	33.3 %
E. coli O128:H2 (ETEC)	1	33.3 %
Total	3	

Table 4. Serological identification of *E. coli* strains in beef burger

Strains	Number of positive	% positive
E. coli O121:H7 (EPEC)	1	25 %
E. coli O26:H11 (EHEC)	1	25 %
E. coli O128:H2 (ETEC)	2	50 %
Total	4	

Table 5. Serological identification of *E. coli* strains in chicken shawerma

Strains	Number of positive	% positive
E. coli O26:H11 (EHEC)	2	33.3 %
E. coli O119:H6 (EPEC)	2	33.3 %
E. coli O 86 (EPEC)	1	16.7 %
E. coli O44:H16 (EAEC)	1	16.7 %
Total	6	

Table 6. Serological identification of *E. coli* strains in chicken pane

Strains	Number of positive	% positive
E. coli O26:H11 (EHEC)	1	50 %
E. coli O128:H2 (ETEC)	1	50 %
Total	2	

Table 7. Incidence of *Staphylococcus aureus* in examined samples.

Sample	Number of samples	Number of positive	% positive
Beef shawerma	25	8	32 %
Beef Burger	25	6	24 %
Chicken shawerma	25	10	40 %
Chicken Pane	25	9	36 %
Total	100	33	33 %

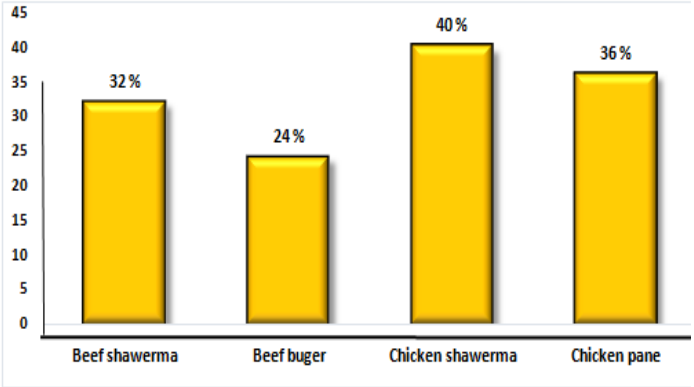
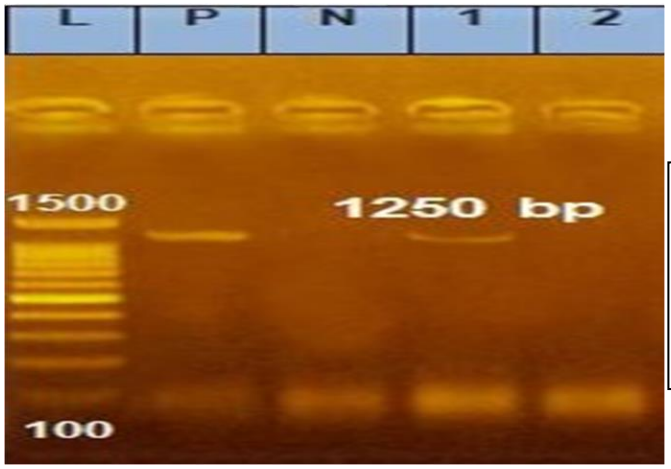


Figure 3. Incidence of *Staphylococcus aureus* in examined samples.



Lane L: ladder marker.
Lane P: positive control for *Staphylococcus aureus.*
Lane N: negative control for *Staphylococcus aureus.*
Lane 1: positive for *Staphylococcus aureus.*
Lane 2: negative for *Staphylococcus aureus.*

Figure 4. PCR results for *Staphylococcus aureus*

Discussion

The incidences of *E. coli* isolated from the examined samples were 15%. Lower incidence of *E. coli O128:H2* (6.6 %) and *E. coli O26:H11* (3.3 %) were reported by Shaltout et al. (2018). While *E.coli* O128:H2, *E.coli* O26: H11 , *E.coli* O121: H7 and *E.coli O44:H18* were identified by Sotohy et al. (2019)(3.3%) for each, and *E.coli* O26: H11 was detected by Younis et al. (2019) with percentage of 20% . Higher incidence of *E. coli O111:H4* with 40% prevalence was reported by Younis et al. (2019). The presence of *E. coli* in RTE foods is undesirable because it indicates that the food has been prepared in unhygienic conditions (Abdalla et al., 2009). The Incident of *Staph. aureus* in the examined samples was recorded in beef shawerma (32 %) followed by beef burger (24 %), chicken shawarma (40%), and chicken pane (36%). Similar results were reported by Shalaby and Zaki (2008) who detect *Staph aureus* in beef shawerma samples with a percentage of 32%. Lower results were reported by Sotohy et al. (2019) who detect *Staph aureus* in beef burger samples with percentage of 16.6%; Ali and Abd-Elaziz (2011) who detect *Staph aureus* in chicken shawerma samples with percentage of (30%), and Eman et al. (2013) who detect *Staph aureus* in chicken pane samples with percentage of 25%. Higher results were reported by Dahiru et al. (2016) with a percentage of 13.9%. The presence of *Staph aureus* is regarded as a good sign of inefficient thermal processing and poor hygienic conditions during food preparation. (Melheiros et al., 2010).

Conclusion

The obtained results demonstrate that fast food sandwiches constitute a likely potential hazard to human health. These types of foods are contaminated due to poor hygiene practices and because of favorable environment for the growth of bacteria. The hygienic manipulation practices are recommended to decrease the contamination level. Obligatory implementation of strict food safety regulations in restaurants is important for providing safe food for consumers.

Authors' contribution

The work was equally distributed between authors. All authors have read and approved the final version of the manuscript.

Conflict of interest:

There is no conflict of interest.

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