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Microbiological Evaluation of Some Fast Food Sandwiches in Fayoum

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SIXTY six random samples of fast food sandwiches, each about 200 g were randomly collected from Fayoum, Egypt. Eleven sandwiches of liver, burger, sausage, chicken shawarma,meat shawarma and chicken crepe were purchased from different shops and markets. The samples were subjected to microbiological examination. The highest mean mesophilic count was $2.36x10^{10}$ CFU/g in chicken shawarma sandwiches samples, while the highest mean count of Entero bacteriaceae count was $4.69x10^{6}$ CFU/g in burger sandwiches samples. *Enterobacter cloacae* is the most isolated Enterobacteriaceae species in sandwiches of burger, meat shawarma, sausage, and liver in a percentage of 69%,44%,42% and 33%, respectively. The percentage of CPS and TN asepositive strains of Staphylococci isolated from examined sandwiches ofliver, burger, sausage, chicken shawarma,meat shawarmaand chicken crepe were 0.53%, 1.61%, 0.53%, 0.53%, 1.07% and 0.53%, respectively. Salmonella and *E.coli* could be detected in liver sandwiches samples only with a percentage of 12% and 4%, respectively.

Keywords: Chicken crepe, Burger, Shawarma, Enterobacteriaceae, Salmonella, *E.coli*.

Introduction

Ready-To-Eat foods (RTE) can be described by terms like ready, convenient, instant and fast foods. Such RTE food includes; burger, shawerma meat pie and sausage rolls, RTE food can be described as the food ready for immediate consumption at the point of scale (Tsang, 2002). The factors that affect microbiological quality of RTE meat food such as shawerma are the following: low quality of raw meat and other ingredients, inefficient cooking, insufficient personal hygene, improper sanitary practices for cooking and processing utensils (Kayaardi et al., 2006).

Contaminated raw food, food handlers, utensils, water, dust & insects are the main sources of pathogenic bacteria in food (Ray, 2005). The microbiological quality of RTE foods must be examined from time to time as it shows its sanitary condition during its production and distribution (Hubbert et al., 1996).

It is known that poultry is a reservoir for a large number of bacteria that may be pathogenic to humans. Typically, these occur at low levels of sanitation and may pose a threat to the consumer if the product is not treated in a safe manner. Therefore, meat products must be produced, transported and sold very carefully and preferably subject to HACCP assessment to prevent any risk exposure (Madden, 1994). *Staphylococcus aureus* is able to produce staphyloxanthin which acts as antioxidant that helps the microbe avoid the reactive oxygen killing that the host's immune system uses (Meng and Doyle, 1998).

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Among foodborne pathogens, Salmonella is the leading cause of deaths from foodborne infections. Humans are infected with salmonella primarily through contamination of food or water products by feces. Another source of human infection, primarily affects farm families, employees and visitors is contact with animals (Mrema et al., 2006).

Owing to continuous demand for fast foods in Egypt and large population consuming different types of fast foods, it is necessary to protect consumers from health risks as well as to ensure the hygienic condition under which they are produced. Therefore, this work has been planned for secure the following topics: Incidence of some foodborne pathogens (*Salmonella* species and *Escherichia coli*), public health importance of the isolated organisms and suggestive control measures for improving the safety and quality of fast foods in Egypt.

Material and Methods

Sixty six random samples of fast food sandwiches, each about 200 g were randomly collected from Fayoum Governorate. Eleven sandwiches of liver, burger, sausage, chicken shawarma, meat shawarma and chicken crepe were purchased from different shops and markets. Collected samples were transferred to the laboratory in an isolated ice box without delay as possible to be checked immediately.

Preparation of fast foods homogenate according to (ISO,2001)

The sample is cutting by sterilized scissor & forceps and mixed thoroughly using sterilized spoon. Aseptically ten ml from the prepared samples to 90 ml of sterile 0.1% peptone water were homogenized by using mechanical shaker (501-11000-00) for one minute. One ml of the previous homogenate was added to 9 ml sterilized diluents for preparation of tenth fold serial dilutions.

1.Total mesophiliccount according to (ISO, 2003a)

Inoculated duple plates of standard plate count agar with the previously prepared decimal dilutions and incubated for 72 hours at 30°C.

2.Enterobacteriaceae count according to (ISO, 2004a)

One ml of each dilution was transferred into each of marked duplicate dishes, then approximately 10 ml of violet red bile glucose medium (Oxoid, 2010) was poured into each dish. The inoculum was mixed carefully with the medium.After complete solidification of the mixture, a covering layer of approximately 15 ml of the violet red bile glucose medium was added and incubated at 37˚C for 24 h ± 2 hr. These colonies were counted CFU/g. Identification of Enterobacteriaceae isolates according to BAM (2001) and Collins et al. (2004).

3. Isolation of Salmonellae according to (ISO, 2002)

Twenty five of the original prepared samples were transferred at aseptic condition to flasks containing 225 ml of sterile buffered peptone water. Inoculated flasks were incubated for 16-20 hr at 37°C. A loopful from each of the previously prepared broth inoculated into a sterile test tube containing 10 ml Rappaport Vassiliadis (RV) broth then incubated for 24 hr at 43°C. A loopful from each RV enriched tube was streaked on the plates surface of Xylose LysinDeoxycholate agar [XLD] and MacConkey agar. Inoculated plates were incubated for 48 hr at 37°C. Suspected colonies were picked up and streaked over slants of nutrient agar which were incubated for 24 hr at 37°C for further identification according to Krieg & Holt (1986).

4.Total Staphylococci count according to (ISO, 2003b)

Duplicate plates of Baird-Parker medium supplemented with egg yolk tellurite were inoculated with 0.1 ml the previously prepared decimal dilutions (Oxoid, 2010) and spreaded. The plates were incubated for 24-48 hr at 37°C. Plates which contain a maximum of 150 typical and/ or atypical colonies were choosen to calculate the Staphylococci count. Identification of the isolated Staphylococci according to BAM (2001).

5. Total molds and yeasts count according to (ISO,2004b)

Inoculated duplicate plates of Yeast – Extract – Dextrose – Chloramphenical Agar with the prepared serial dilutions. The plates were incubated for 3 up to 5 days at 25°C. The total yeasts count and molds count/g was calculated.

Results & Discussion

The impact of microorganisms on human health was also reported. This study was conducted to provide information on the distribution and presence of pathogenic microorganisms in fast food from different restaurants, which are important for humans and to discuss their role in

food poisoning,also caused many human diseases. Studies on the isolation of pathogenic bacteria from fast foods in this study indicated that some gram-negative bacteria and gram-positive bacteria were isolated.

TABLE 1. Total mesophilic count (CFU/g) in the examined fast food samples (N=11).

Sample	Positive samples		Min.	Max.	Mean	± S.E.M.
	No.	%				
Liver sandwiches	11	100.00	10^3	$5.9x10^9$	$7.28x10^8$	$6.51x10^7$
Burger sandwiches	11	100.00	$1.5x10^3$	$2.8x10^9$	$6.45x10^8$	$5.86x10^7$
Sausage sandwiches	11	100.00	$1.9x10^6$	$2.8x10^9$	$7.32x10^8$	$6.65x10^7$
Chicken Shawerma sandwiches	11	100.00	$5.1x10^4$	$2.6x10^{11}$	$2.36x10^{10}$	$2.14x10^9$
Meat Shawerma sandwiches	11	100.00	$9.7x10^4$	$3.5x10^8$	$9.32x10^7$	$8.47x10^6$
Chicken Crepe	11	100.00	$5.1x10^6$	$6.9x10^9$	$1.63x10^9$	$1.48x10^8$

S.E.M. = Standard Error of Mean

The data represented in Table 1 show that the mean value of the total mesophilic count (CFU/g) for the fast food samples were $7.28x10^8 \pm 6.51x10^7$,$6.45x10^8 \pm 5.86x10^7$,$7.32x10^8 \pm 6.65x10^7$, $2.36x10^{10} \pm 2.14x10^9$, $9.32x10^7 \pm 8.47x10^6$ and $1.63x10^9 \pm 1.48x10^8$ in sandwiches of liver, burger, sausage,chicken shawarma, meat shawarma and chicken crepe, respectively.

The results are consistent with those reported by Ismail et al. (2000), Saadia M. Hassanein (2010), Sengupta et al. (2011) and Nehad et al. (2016). Counts of aerobic plate bacteria in chicken and meat shawarma samples were higher than that recorded by Elfaki & Elhakim (2011); Eman & Sherifa (2012); Odu & Akan (2012) and Abdalhamid et al. (2013) with mean values of $5.1x10^4$, $1.2x10^5$, $1.0x10^6$ and $8.4\ x10^5$CFU/g, respectively, while a lower result of aerobic plate bacteria was recorded by Farooq et al. (2013) with mean of $8.1x10^2$CFU/g. Aerobic plate count is tended to indicate the level of microorganisms in products (FDA, 2001). Bacterial count of perishable food is used to evaluate its quality and shelf-life. However, high count may be attributed to unsanitary methods of production or exposure to conditions favoring bacterial proliferation (Bevilacqua et al., 2017)

The most important food bacteria for human pathology is the most common cause of human infection and is widely spread in the environment using fast foods. Our results are consistent with other studies (Kay et al., 1994). Count of total bacteria is considered as an index of sanitary and quality of food (Belland Weaver, 2002). These higher results may by attribute to the processing plants, contamination of products. Heavy bacterial loads enter the treatment processes with the product, and these bacteria can be spread throughout the plant during treatment and thus can produce diseases when these products are not cooked properly and after treatment contamination.

Based on the microbiological guidelines for some ready-to-eat foods (Centre for Food Safety, 2007); microbiological quality of ready-to-eat sandwiches was placed in category III, where the count of aerobic colony at $<10^5$was rated as satisfactory and $10^5$to $<10^6$as acceptable and $\geq 10^6$as unsatisfactory. The mean of APC of all examined fast food samples were unsatisfactory (unacceptable) microbiological quality. This indicated that the rate of contamination by Enterobacteriaceae in all the samples except liver and chicken shawarma is higher than the one stipulated by the current legislation {$\leq 10^4$CFU/g}/ (HPA, 2009)

High bacterial counts in cooked foods indicate that they are contaminated during or after cooking, handling procedures and / or lack of general cleanliness. Other studies have shown that during the preparation of meat and raw vegetables in kitchens, many surfaces can be contaminated, and contaminated microorganisms can survive for long periods of time. In these cases, cross contamination may occur (Gillespie et al., 2000).

TABLE 2.Total Enterobacteriaceae count (CFU/g) in the examined fast food samples (N=11).

Sample	Positive samples		Min.	Max.	Mean	± S.E.M.
	No.	%				
Liver sandwiches	8	72.72	$< 10^2$	$1.6x10^4$	$4.38x10^3$	$3.98x10^2$
Burger sandwiches	9	81.81	$< 10^2$	$3.0x10^7$	$4.69x10^6$	$4.26x10^5$
Sausage sandwiches	10	90.90	$< 10^2$	$2.8x10^6$	$3.56x10^5$	$3.23x10^4$
Chicken Shawerma sandwiches	8	72.72	$< 10^2$	$4.0x10^4$	$7.83x10^3$	$7.11x10^2$
Meat Shawerma sandwiches	5	45.45	$< 10^2$	$2.1x10^6$	$2.53x10^5$	$2.3x10^4$
Chicken Crepe	8	72.72	$< 10^2$	$4.7x10^7$	$4.29x10^6$	$3.9x10^5$

S.E.M. = Standard Error of Mean

From the summarized results given in Table 2, it evident that the mean value of total Enterobacteriaceae count (CFU/g) for the fast food samples were $4.38x10^3 \pm 3.98x10^2$, $4.69 \times 10^6 \pm 4.26x10^5$, $3.56x10^5 \pm 3.23x10^4$, $7.83x10^3 \pm 7.11x10^2$ $2.53x10^5 \pm 2.3x10^4$ and $4.29x10^6 \pm 3.9x10^5$ in sandwiches of liver, burger, sausage, chicken shawarma, meat shawarma and chicken crepe, respectively.

The identified Enterobacteriaceae isolates in all examined fast food samples were recorded as *Escherichia coli*, *Salmonella spp., Enterobacter cloacae*, *Kluyvera spp*., *Enterobactersakazaki*, *Enterobacterpyrinus*, *Edwardsiella spp.*, *Providenciaalcalifaciens*, *Hafniaalvei, Enterobacterasburiae, Providenciarettgeri*, *Citrobacterdiversus*, *Citrobacterrodentinum, Morganellamorganii, Proteus mirabilis* and *Klebsiellaoxytoca* with different percentages (Fig. 1-6). Similar organisms were isolated by Abdalla et al. (2009) and Okonko et al. (2009).

Enterobacter cloacae is the most isolated Enterobacteriaceae species in sandwiches of burger, meat shawarma, sausage and liver in a percentage of 69%, 44%, 42% and 33%, respectively.Salmonella and *E.coli* could be detected in liver sandwiches samples only with a percentage of 12% and 4%, respectively. *Salmonella* spp. *and E.coli* failed to be isolated in all examined sandwiches of burger, sausage,chicken shawarma and meat shawarma and chicken crepe samples (Fig. 1-6).

Recent studies have focused attention on food poisoning diseases due to many pathogenic microorganisms. Many human diseases are associated with fast food pollution. Many workers reported that raw meat and poultry can contain dangerous microorganisms, such as Salmonella and *Escherichia coli*, which can be transferred to other foods during food preparation and storage (Uyttendaele et al., 1999).

Samples showed that pollution may be as a result of poor manufacturing practices used by food vendors. This is a public health concern because these organisms are known as a source of food borne diseases and food poisoning. Good sanitary practices, proper handling, storage and retailing of salads in a clean environment and at a cooling temperature to ensure good quality and safe products (Odu and Akano, 2012).

Detection of any or all members of the family Enterobacteriaceae as indicator of food sanitary quality has received the attention of more food scientists. The occurrence of Enterobacteriaceae indicated microbiological and toxigenic bacteria in meat and lead to public health hazard (Mira, 1989). It turns out that the source of Enterobacteriaceae on meat is associated with the meat handling work surface. Also, the presence of Enterobacteriaceae in minced meat is a sign of direct or indirect intestinal contamination of meat (Erkmen and Bozoglu, 2016). Generally, the Enterobacteriaceae count in all types of street vended meat meals seems to be high and this may be attributed to enteric contamination from different sources during bad handling and marketing.

Enterobacteriaceae may be present in meat products because of the contamination of meat handler's hands and tools and handling surfaces during all stages of processing especially with fecal contamination. Some Enterobacteriaceae

group are pathogenic and may cause dangerous infections and food poisoning to man. In addition, the total Enterobacteriaceae count can be considered as indicative of possible enteric contamination in the absence of coliforms bacteria (Pogorelova et al., 1993).

Bichai et al. (2008) showed that, the presence of *Escherichia coli* can be associated with the use of contaminated irrigation water during growth. Pollution through human handling, use of contaminated containers, or post-harvest washing with polluted water indicates that it can increase the incidence of intestinal pathogens (Angelillo et al., 2000). Feng et al. (2007) suggested that *Escherichia coli* is a part of the natural flora in the colon of humans and other animals, but it can be pathogenic inside and outside the digestive system. Enterotoxigenic *E. coli* (ETEC), this organism is a common cause of "traveler's diarrhea" in developing countries, it affects humans only, with transmission occurs through contaminated food and water with human waste, or by contact between people.

The presence of *E. coli* in RTE foods is undesirable because it indicates that the food has been prepared in poor health conditions. (Abdalla et al., 2009). Coliform is mainly found in water, soil and feces because it is widely distributed in water, soil and plants. (Rompre et al., 2002). They are among the most common bacteria that cause disease. The presence of these organisms in food ready to eat depicts a poor state of poor hygiene and hygiene practices used in the manufacture and packaging of this food product (Jay, 2005).

Most of the coliforms on meat are likely to be caused by animal skin contamination. This contamination can be intestinal origin but may also come from soil and vegetation. To protect against Salmonella infection, it is recommended to heat the food for at least ten minutes at 75 ° C so that the food center reaches this temperature. Salmonella is not destroyed by freezing. It can remain for several weeks in a dry environment and several months in water, often found in contaminated water, contaminated with the feces of special animals. (FDA, 2009).

The data summarized in Table 3 show that the mean value of the total Staphylococci count (CFU/g) for the fast food samples were $9.54x10^6 \pm 8.67x10^5$, $9.42x10^6 \pm 8.56x10^5$, $3.73x10^6 \pm 3.39x10^5$, $1.41x10^7 \pm 1.28x10^6$, $6.38x10^5 \pm 5.8x10^4$ and $11.66x10^7 \pm 1.06x10^7$ in sandwiches of liver, burger, sausage, chicken shawarma, meat shawarma and chicken crepe, respectively. The percentage of CPS and TN asepositive strains of Staphylococci isolated from examined sandwiches of liver, burger, sausage, chicken shawarma, meat shawarma and chicken crepe samples were 0.53%, 1.61%, 0.53%, 0.53% 1.07% and 0.53%, respectively (Table 4).

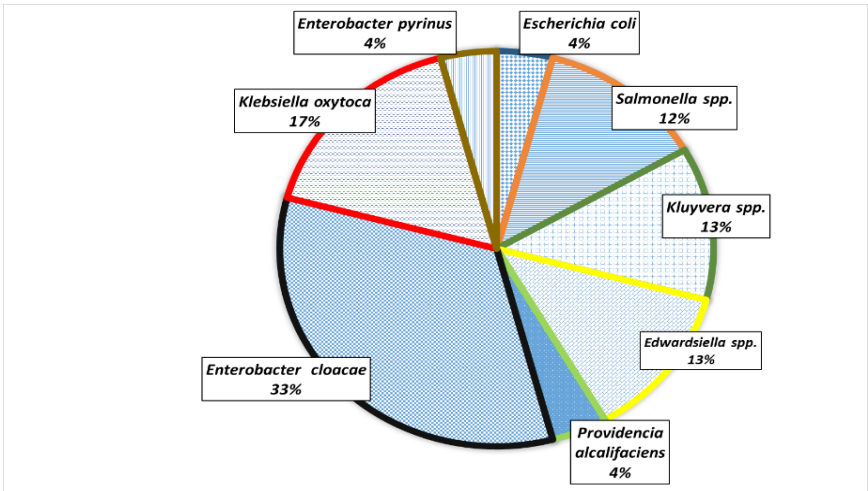

Fig.1. Incidence of Enterobacteriaceae Species Isolated from The Examined Liver Sandwiches.

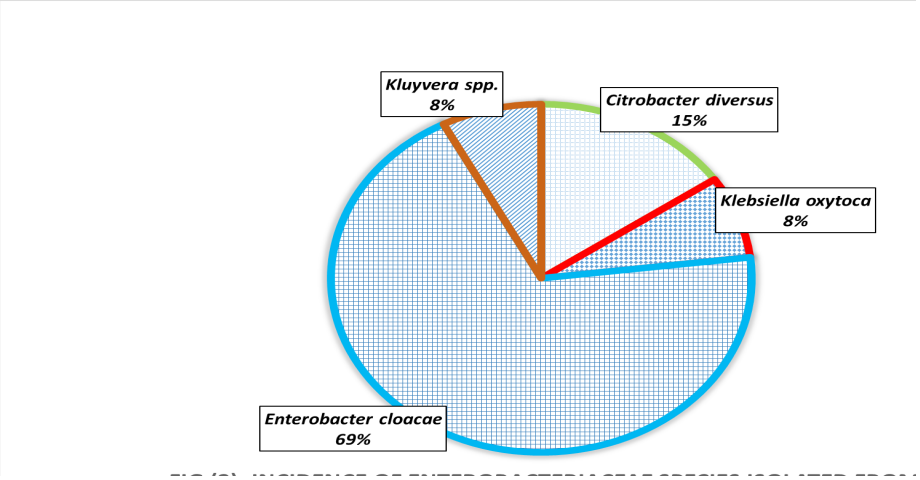

Fig. 2. Incidence of Enterobacteriaceae Species Isolated from The Examined Burger Sandwiches.

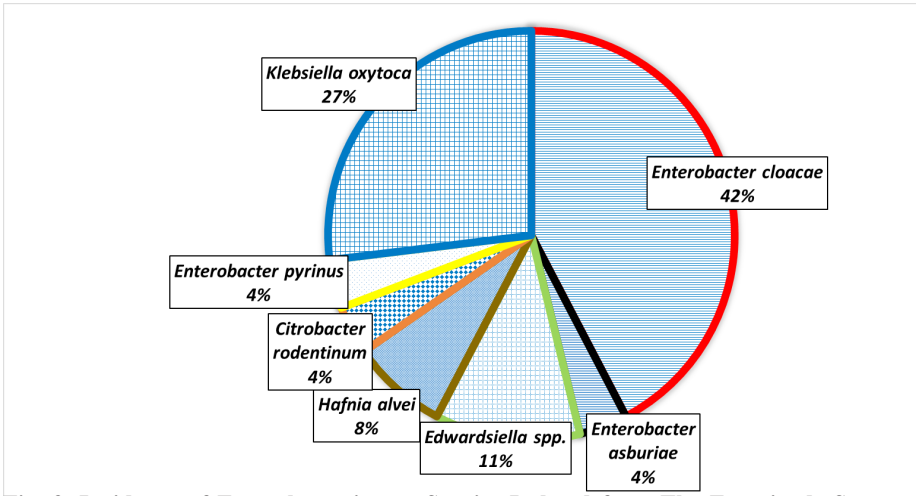

Fig. 3. Incidence of Enterobacteriaceae Species Isolated from The Examined Sausage Sandwiches.

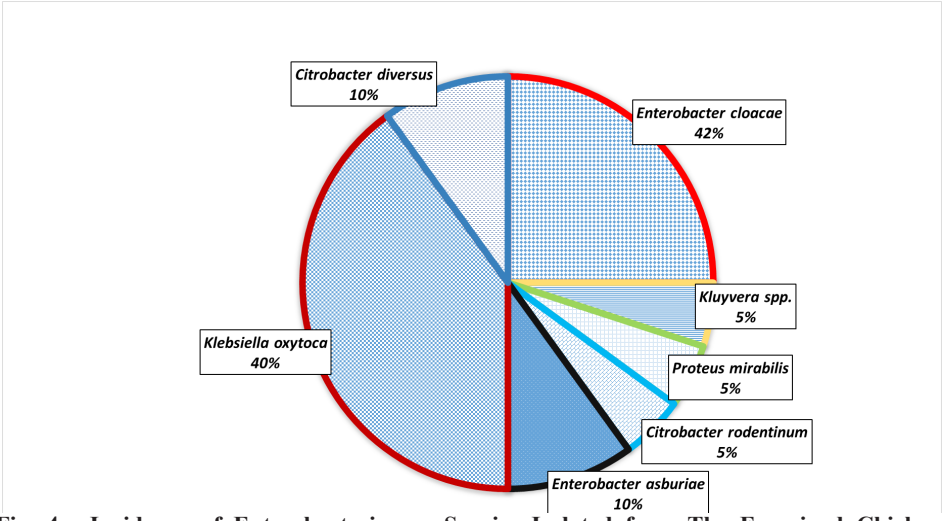

Fig. 4 . Incidence of Enterobacteriaceae Species Isolated from The Examined Chicken Shawarma Sandwiches.

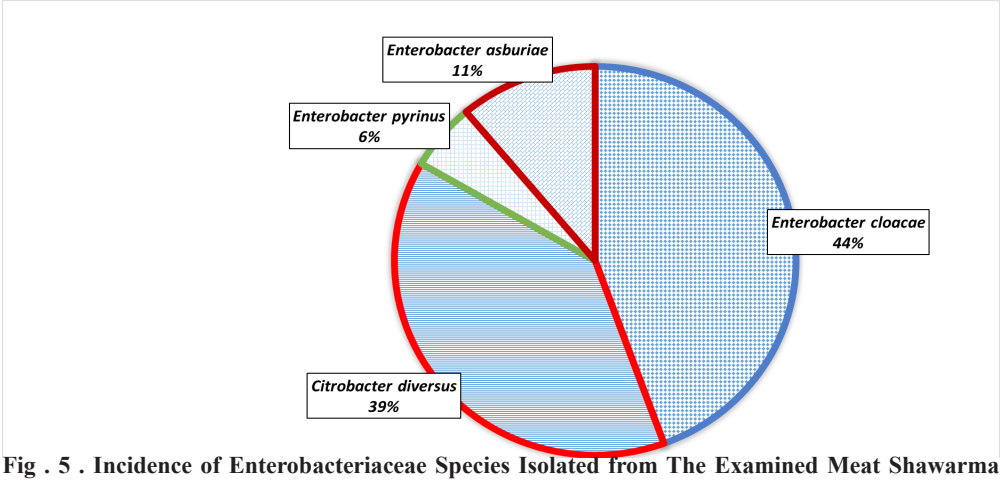

Fig . 5 . Incidence of Enterobacteriaceae Species Isolated from The Examined Meat Shawarma Sandwiches.

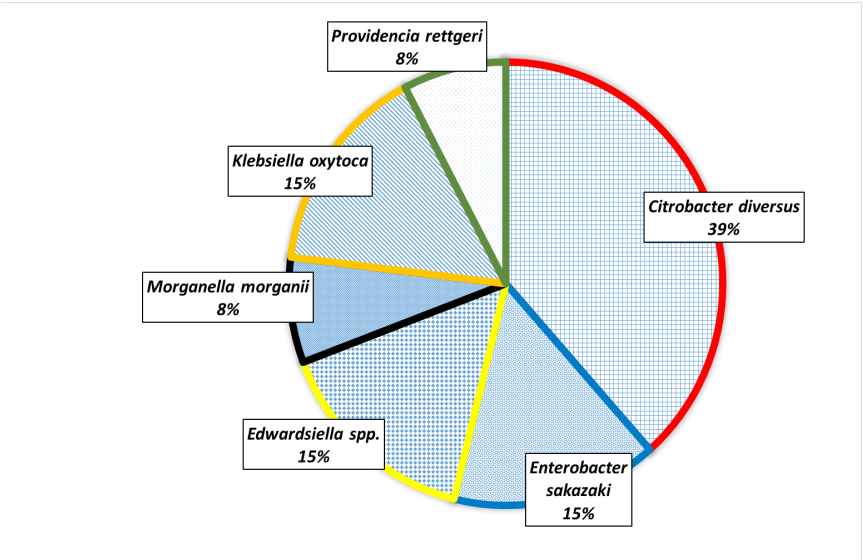

Fig . 6 . Incidence of Enterobacteriaceae Species Isolated from The Examined Chicken Crepe Sandwiches.

TABLE 3. Total Staphylococci count in the examined fast food samples (CFU/g) (N==11).

Sample	Positive samples		Min.	Max.	Mean	± S.E.M.
	No.	%				
Liver sandwiches	9	81.81	$< 10^2$	9.0×10^7	9.54×10^6	8.67×10^5
Burger sandwiches	10	90.90	$< 10^2$	9.8×10^7	9.42×10^6	8.56×10^5
Sausage sandwiches	9	81.81	$< 10^2$	1.9×10^7	3.73×10^6	3.39×10^5
Chicken Shawerma sandwiches	9	81.81	$< 10^2$	1.5×10^8	1.41×10^7	1.28×10^6
Meat Shawerma sandwiches	7	63.63	$< 10^2$	4.7×10^6	6.38×10^5	5.8×10^4
Chicken Crepe	9	81.81	$< 10^2$	7.8×10^7	11.66×10^7	1.06×10^7

S.E.M. = Standard Error of Mean

TABLE 4. Correlation between Coagulase Positive Staphylococci (CPS) and Thermostable Nuclease (TNase) for identification of *S. aureus* and Coagulase Negative Staphylococci (CNS) isolated from the examined fast food samples (No.= 186).

Sample	CPS isolates		CPS&TNase positive isolates		CNS isolates	
	No.	%	No.	%	No.	%
Liver sandwiches	1	0.53	1	0.53	36	19.35
Burger	4	2.15	3	1.61	28	15.05
Sausage sandwiches	2	1.07	1	0.53	32	17.20
Chicken Shawerma sandwiches	3	1.61	1	0.53	28	15.05
Meat Shawerma sandwiches	4	2.15	2	1.07	20	10.75
Chicken Crepe	1	0.53	1	0.53	27	14.51
Total	**15**	**8.06**	**9**	**4.83**	**171**	**91.93**

No. = number of examined isolates.

Recent studies have indicated that *Staphylococcus aureus* and Salmonella are frequent in small numbers on the raw meat surface. These species are most dangerous when grown without competition as in cooked foods. The obtained results are compatible with the previous studies established by Baumgart et al. (2007). The dangerous potential of pre-cooked foods in commercial establishments is high but epidemics are low. The Center for Disease Control reported that more than half of food-borne disease outbreaks can be attributed to meat and poultry products.

Gastroenteritis is produced by eating foods contaminated with toxins produced by *Staphylococcus aureus* superantigen. It has an antioxidant action that helps the microbe avoid the reactive oxygen killing that the host's immune system uses. It is known that staphyloxanthin is responsible for the distinctive golden color (Claudiz et al., 2006).

The focus on essential hand washing techniques has been reported to be effective in preventing the transmission of *S. aureus* bacteria. Use of the amount approved for use and gloves by staff reduces skin contact to the skin, thereby reducing the risk of transmission (Neely and Maley, 2000). Recent reports have shown that many studies have shown that the introduction of *Staphylococcus aureus* into the bloodserum can lead to various complications, including endocarditis and meningitis. (Cosgrove et al., 2009).

In most countries, the most common foodborne disease is *Staphylococcus spp*. Food poisoning and Enterotoxigenic spp were isolated from foods involved in disease. (Doyle and Buchanan, 2013). *Staphylococcus spp* produce disease when the bacteria contaminate food they produce some enzymes which are implicated with Staphylococcus invasiveness and many extracellular substances, some of which are heat stable enterotoxins that renders the food dangerous even though it appears normal (Prescott et al., 2005). Their presence in food indicates poor personal hygiene and poor manufacturing practices of the food vendor. They also can withstand high sodium chloride concentration (Musa and Okande, 2002 &Jawetz et al., 2008).

TABLE 5. Total yeasts and molds count (cells/g) in the examined fast food samples. (N==11).

Sample	Positive samples		Min.	Max.	Mean	± S.E.M.
	No.	%				
Liver sandwiches	7	63.63	$< 10^2$	$2.3x10^8$	$2.34x10^7$	$2.12x10^6$
Burger sandwiches	8	72.72	$< 10^2$	$2.1x10^7$	$2.43x10^6$	$2.20x10^5$
Sausage sandwiches	10	90.90	$< 10^2$	$1.3x10^8$	$1.29x10^7$	$1.17x10^6$
Chicken Shawerma sandwiches	9	81.81	$< 10^2$	$1.1x10^9$	$1.0 x10^8$	$9.09x10^6$
Meat Shawerma sandwiches	9	81.81	$< 10^2$	$1.9x10^5$	$3.47x 10^4$	$3.15x10^3$
Chicken Crepe	8	72.72	$< 10^2$	$5.9x10^7$	$5.57x10^6$	$5.06x10^5$

S.E.M. = Standard Error of Mean

From the summarized results given in Table 5 it evident that the mean value of total yeasts & molds count (CFU/g) for the fast food samples were $2.34x10^7 \pm 2.12x10^6$, $2.43x10^6 \pm 2.20x10^5$, $1.29x10^7 \pm 1.17x10^6$, $1.0 x10^8 \pm 9.09x10^6$, $3.47x10^4 \pm 3.15x10^3$ and $5.57x10^6 \pm 5.06x10^5$in sandwiches of liver, burger, sausage, chicken shawarma, meat shawarma and chicken crepe, respectively.

Results of fungi count were nearly similar to that recorded by Eman and Sherifa(2012) with mean values of $5.2x10^5$ CFU/g and Elfaki and Elhakim (2011). The fungi have been reportedly isolated from ready to- eat-food in other studies by Ayanbimpe et al.(2007) and Oranusi et al., 2013). The presence of fungi in sandwich samples may be due to improper storage causing this foods stuff especially the salad to become humid therefore supporting the growth of these fungi. The vegetables have high water content or water activity this may encourage spoilage if not well preserved. These fungi produce important metabolite called aflatoxin, which has been shown to be highly toxic to man and all domestic and laboratory animals (Aletor, 1990).

Conclusion

Results of the study are a symbolic for contamination, poor and insufficient of hygienic conditions in production and processing of fast food meat products. In order to improve the hygienic quality of these products to safer level for consumption, contamination must be mitigated. This could be ensured by implementing good and satisfactory manufacturing practices. Secondly, proper guidance and trainings for workers about hygiene, safety and quality assurance during handling, and manufacturing of the products are crucial practices to minimalize contamination.A proper heat treatment should be used in the preparation of fast foods and using of high quality raw material.

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التقييم الميكروبيولوجى لبعض ساندوتشات الوجبات السريعة فى الفيوم

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أجريت الدراسة على ست وستين عينـة من ساندوتشات الوجبات السريعة (احدى عشر من كل من الكبدة، كريب دجاج، البرجر، السجق، شاورما دجاج وشاورمة لحم) جمعت عشوائيا من مختلف المحال التجارية بمحافظة الفيوم وذلك لفحصها ميكروبيولوجيا. وكان متوسط أكبر عدد كلى للبكتريا الهوائية هو ٦٣,٢x٠١٠١مستعمرة بكتيرية/ جرام فى عينات الشاورما بينما متوسط أكبر عدد للميكروبات المعوية هو ٩٦,٤x٦٠١ مستعمرة بكتيرية/ جرام فى عينات البرجر وكان ميكروب *Enterobacter cloacae* من أكثر الميكروبات التى تم عزلها من عينات البرجر وشاورما اللحم والسجق والكبدة بنسب٣٣٪, ٢٤٪, ٤٤٪, ٩٦٪ على التوالى. وكانت نسب سلالات المكورات العنقودية (Staphylococci) الموجبة لتلزن البلازما((CPS و الثرمونيوكلايز ((TNase في عينات الكبدة، البرجر، السجق، شاورما الدجاج وشاورما اللحم كريب الدجاج هى ١٦,١٪, ٣٥,٠٪, ٧٠,١٪, ٣٥,٠٪, ٣٥,٠٪, ٣٥,٠٪, على التوالى. وجد ميكروب *Salmonella E.coli* فى عينات الكبدة فقط بنسب ٤٪,٢١٪ على التوالى.