

## الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ (1) خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ (2) اقْرَأْ وَرَبُّكَ الْأَكْرَمُ  
(3) الَّذِي عَلَّمَ بِالْقَلَمِ (4) عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ (5)

سورة العلق: الآيات 1-5

صدق الله العظيم

# DEDICATION

I dedicate this thesis to:

My Kind mother, father

Brothers, sisters, my wife, my son, my  
daughter

Friends, colleagues and teachers

## ACKNOWLEDGMENTS

First of all my thanks and praise to ALMIGHTY ALLAH who blessed me and gave me the health and strength to complete this thesis.

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## Abstract

The purpose of this study was to determine HACCP knowledge, implemented level of food safety system and identify problems and obstacles that hinder the implementation of the HACCP system in food businesses in the Khartoum state. Also the study aimed to detect pathogens bacteria in particular *Salmonella.spp* and determine the microbial contamination of food product, especially Aerobic Plate count and *Escherichia coli*. According to data obtained from this study by survey questionnaire,(42%) of the respondents were found to have low HACCP knowledge, 20% of the respondents had satisfactory high knowledge .The most of the interviewed employees did not implemented food safety practices in food businesses. Twenty-four percent of respondents not recorded end-point temperature of all foods, (20%) did not send food samples or swabs (28%) to the laboratory for testing bacterial contamination. The study indicated difficulties and barriers for the implementing of HACCP and food safety systems, Lack of knowledge on HACCP (82%), lack of cost (72%) lack of time (46%) Also there was no support from authorities (80%). The employees (56%) had volume paperwork, but they were needed simple guidelines (82%). While most of interviewers(92%) locking personnel training were the most common barriers in food businesses were recorded by the employees. a total of 100 samples of meat and meat products were collected from factories and analyzed. Culture and different biochemical and serological tests were used to detect *Salmonella.spp*, *Escherichia coli* and microbial contamination especially Aerobic Plate count. The results showed that 4 (4%) of samples were positive for *Salmonella spp.* and 44 (44%) were positive for the presence of *Escherichia coli*. In addition to (71%) of samples exceed the limit  $10^5$  cfu/g of the Sudanese Standard for Aerobic Plate count test. The study concluded that HACCP and food safety system Knowledge is low in Khartoum state and there is a high microbial contamination on final product. We believe that there is a significant relationship between the knowledge of HACCP and the microbial content of the product. Further investigations are required to confirm these findings.

## الخلاصة

الهدف من هذه الدراسة هو تحديد مدي معرفة العاملين في شركات الأغذية فى ولاية الخرطوم بنظام الهاسب ومستوي تنفيذ برنامج سلامة الأغذية وتحديد المشاكل والعقبات التي تعرقل تنفيذ نظام تحليل المخاطر ونقطة التحكم الحرجة وتهدف أيضا للكشف عن البكتيريا الممرضة وخاصة السالمونيلا وتحديد التلوث الميكروبي للمنتجات الغذائية خاصة العد الكلى للميكروبات الهوائية والإشريشية القولونية.

وفقا للبيانات التي تم الحصول عليها من المستطلعين عن طريق الإستبيان (42%) منهم مستوي معرفتهم للهاسب متدنية و(20%) منهم معرفتهم مرضية وعالية. لم ينفذ معظم الموظفين الذي تمت مقابلتهم اجراءات سلامة الغذاء حيث أن (24%) منهم لم يسجلو درجة حرارة المنتج فى النقطة النهائية و(20%) لم يرسلوا عينات غذائية للمختبر للكشف الميكروبي و(28%) لم يقوموا بمعمل مسحات وإرسالها للمختبر للعرض نفسه .

أشارت الدراسة الى أن الصعوبات والحواجز التي تعيق تطبيق نظام الهاسب ونظم سلامة الغذاء حيث خلصت أن (82%) قلة المعرفة بنظام الهاسب و(72%) التكلفة العالية و(46%) الحاجة للزمن وأيضاً لم يكن هنالك دعماً كافياً من السلطات (80%) وكان حجم الورق لدى الموظفين (56%) ولكن الذين كانوا بحاجة لتوجيهات إرشادية بسيطة (82%) فى حين أن معظم الذين تمت مقابلتهم (92%) يرون قلة تدريب الموظفين. هذه كانت أبرز الحواجز الذي ذكره الموظفين فى شركات الأغذية.

جمعت 100 عينة من اللحوم ومنتجاتها من مصانع اللحوم فى ولاية الخرطوم. تم تجهيز العينات وإجراء التحاليل لعزل الملوثات عن طريق التزريع بالطريقة التقليدية الروتينية فى الأوساط الزراعية للبكتيريا للتعرف على السالمونيلا والإشريشية القولونية والعدد الكلى الميكروبي . تم التعرف على أنواع السالمونيلا بواسطة الشكل الظاهرى للمستعمرات والإختبارات الكيموحيوية والإختبارات المصلية. أظهرت النتائج أن (4%) من العينات ملوثة بالسالمونيلا و(44%) من العينات توجد بها الاشيرشيا القولونية بالاضافة الى أن(71%) من العينات تعدت  $10^5$  للعدد الكلى الميكروبي وهو الحد المسموح به من قبل الهيئة السودانية للمواصفات والمقاييس.

خلصت الدراسة الى أن هنالك تدنى لمعرفة العاملين فى شركات الأغذية لنظام الهاسب وبرنامج سلامة الغذاء وأن هنالك إرتفاع فى تلوث المنتج النهائى بالميكروبات ,عليها نعتقد أن قلت معرفة العاملين فى شركات الأغذية بنظام الهاسب زادت المحتوي الميكروبي للمنتج النهائى. مزيداً من الدراسات مطلوبة على نطاق واسع لتأكيد هذه النتائج.

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## LIST OF ABBREVIATIONS

|           |  |
|-----------|--|
| APC       | Aerobic Pate Count                             |
| BAM       | Bacteriological Analytical Manual              |
| CDC       | Centers for Disease Control and Prevention     |
| FAO       | Food and Agriculture Organization              |
| FDA       | Food and Drug Administration                   |
| HACCP     | Hazard Analysis Critical Control Point         |
| ISO       | International Organization for Standardization |
| RV medium | Rappaport-Vassiliadis medium                   |
| SC broth  | Selenite cystine broth                         |
| SDS       | Sodium dodecyl sulfate                         |
| TSI agar  | Triple sugar iron agar                         |
| USDA's    | United States Department of Agriculture        |
| USFDA     | United States Food and Drug Administration     |
| WHO       | World Health Organization                      |
| XLD agar  | Xylose lysine desoxycholate agar               |
| SPIs      | <i>Salmonella</i> Pathogenicity Islands        |
| MKTTn     | Muller-Kauffmann Tetrathionate-Novobiocin      |
| BS        | Bismuth Sulphite agar,                         |
| VP        | Voges-Proskauer medium                         |
| TSI       | Triple Sugar Iron agar                         |
| BPW       | buffered peptone water                         |
| TT        | Tetra thionate                                 |
| NTS       | non-typhoidal <i>Salmonella</i>                |
| LPS       | lipopolysaccharide.                            |
| FBDs      | food borne diseases                            |
| U.S       | United States                                  |
| DNA       | Deoxyribonucleic acid                          |
| EU        | European Union                                 |
| USFDA     | United States Food and Drug Administration     |

|        |  |
|--------|--|
| MPN    | Most Probable Number   |
| UTI    | urinary tract infections   |
| Codex  | Codex Alimentarius   |
| FSIS   | Food Safety Inspection Service                                       |
| GMP    | Good Manufacturing Practices   |
| NACMCF | National Advisory Committee on Microbiological Criteria<br>for Foods |
| NASA   | National Aeronautics and Space Administration                        |
| NZFSA  | New Zealand Food Safety Authority                                    |
| UK     | United Kingdom   |
| USA    | United States of America   |
| QMS    | Quality Management System  |
| SSOPs  | Sanitation Standard Operating Procedures                             |
| CCPs   | Critical Control Points  |
| CL     | Critical Limits  |
| MC     | Microbiological criteria   |