

Prerequisites as a Deterrent of Adopting Food Safety Management Systems by Public Universities Catering Facilities in the Mount Kenya and Aberdare Regional Bloc

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ABSTRACT

The public needs an assurance that the food they are consuming is safe and free from contaminants which can be achieved by taking adequate food safety measures, especially by adopting of food safety management systems. However, there have been various constraints that have deterred public universities catering facilities from adopting food safety management systems. This cross-sectional survey was carried out to assess the effects of prerequisites on the adoption of food safety management systems by public universities catering facilities in the Mount Kenya and Aberdare regional bloc. The 11 public university catering facilities in the bloc were purposively sampled through which 187 catering staff on permanent and pensionable terms of service were enumerated through the census. A structured questionnaire with a Cronbach's coefficient of 0.79 was administered paving the way for the collection of data which realized a response rate of 80.7%. Descriptive and inferential analysis was executed using the statistical package for social sciences (SPSS) version 26. Findings revealed that there was a moderate positive correlation between prerequisites ($r = 0.475$, $p\text{-value} = 0.000 < 0.05$) and adoption and that 22.6% of the variations in adoption were caused by prerequisites and had a significant effect on adoption of FSMSs ($\beta_1 = 0.582$, $t = 6.590$ and a $p\text{-value} 0.000 \leq 0.05$) by the public universities catering facilities in the Mount Kenya and Aberdare regional bloc. It is recommended that a longitudinal research design be used to conduct research on the adoption of prerequisites to gain further insights into whether the practices are carried out correctly or not.

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1. INTRODUCTION

Catering facilities in public institutions' role in the provision of safe food is great because of the many food handlers in the farm-to-fork food chain who expose it to contaminants [1] and with over 600 million cases of food-borne diseases being reported globally [2], unsafe food threatens human health and economies globally. Universities catering facilities in Kenya have a legal obligation to take adequate measures to ensure food offered for consumption is safe and free from contamination for them to comply with the Public Health Act 2012 of Kenya which prohibits the sale of food without taking adequate measures to safeguard it against infection and contamination. However,

despite food safety occurrences being reported and evidence of noncompliance with food safety measures being observed [3], the Kenya Bureau of Standards certified list of organizations that have been certified in food safety does not have any public university in Kenya which has been certified.

The objective of this research was therefore to assess the effect of prerequisites as deterrents of adopting food safety management systems by public universities catering facilities in the Mount Kenya and Aberdare regional bloc. Importantly, the findings shall benefit the universities management as they will enable them identify challenges,

in existence that affect the adoption of food safety management systems which would therefore make it easy for food safety measures to be followed hence assuring its populace that the food is free from contaminants hence build consumer confidence in the food served within the university catering facilities. The Academia shall also benefit from the findings as they will assist in addressing the knowledge gap and population gap that exist concerning the adoption of food safety management systems in public universities that exists and at the same time enable them to come up with food-safety-specific courses to enrich their curriculum.

Prerequisites are those conditions that an organization must meet before any standard can be implemented and are set depending on the segment of the food chain such as Good Agriculture Practices (GAP), Good Laboratory Practices (GLP), Good Hygiene Practices (GHP), Good Manufacturing Practices (GMP), among others [4]. The basic standards or requirement that should be in place in an organization before any FSMS is installed are the HACCP plan based on the codex Alimentarius principles as discussed by [4] and [5], whereby during the implementation of FSMS, an organization should have a correct examination of the prerequisites, how the GMP and SSOP's have been developed and implemented as well as food handlers training and HACCP plans. Reference [6] were of the view that for an HACCP plan to be developed, GMP and SSOP's should be in place first as they are the building blocks to HACCP plan. This is as a consequence of HACCP plan depending on the hygienic design and maintenance of appliances and facilities, control of procedures, conservation of sanitation, and training all of which require investment so as to ensure safe food.

However [7], gathered that implementation of HACCP plans in restaurants was majorly hindered by a lack of competent managers and inadequate management control which would eventually deter the advancement and successful implementation of a HACCP plan. They also found that in those facilities that had HACCP in place, effective application and maintenance of it was challenging due to barriers such as a lack of detailed food safety materials in place related to HACCP and that those that had specific details concerning HACCP, the staff found it difficult and expensive to comprehend and follow. According to [8] substantiated a positive association between how the staff behaved and how they executed HACCP practices which according to them was a sign that employees needed to acknowledge that the system was easy to use, endeavor to improve their skills on how to use it and thus enable them

to take it as duty to perform HACCP related tasks. Where audits were done on food retailers having certification of HACCP and those having none revealed that neither practiced the HACCP principles correctly yet those that were not certified endeavored harder to ensure that the system functioned and was maintained well [9].

Good manufacturing practices that are founded on excluding undesirable matter, removal of foreign matter, and blocking and destruction of undesirable microorganisms which can negatively impact the provision of safe food are a requirement for implementing FSMSs [4]. These activities take place in a premise in its specific environment; require trained and adequate staffing, are maintained through adequate cleaning and sanitation processes, require enough and clean equipment and utensils as well as proper storage and distribution. Food safety compliance is essential and can be facilitated by implementing and complying with GMPs rules yet non-conformance such as poor sanitation designed facilities, poor individual grooming, lack of documentation, poor programs for cleaning and sanitation maintenance, inadequate operation supervision and missing worker's health control and records exist in food handling facilities [10]. Also, there is a need for written procedures in a premise that should be developed and implemented by the individual facility with a focus on avoiding food contamination and adulteration during food processing through proper hygiene and cleanliness procedures [11]. The procedures explicitly describe specific activities that are required to maintain the hygiene of personnel, utensils and equipment to free them from microorganisms thus preventing the contamination of food through contact, known as standard sanitation operating procedure. These SSOP's are of paramount importance in the overall hygiene and cleanliness of the facility as it prevents cross contamination of food leading to unsafe food and must be followed without failure, and that adequate record keeping is done to prove that the staff followed the facility's SSOP's. Therefore, these PRP's present a ground for the effective application of HACCP before any FSMS can be adopted as they offer a framework in respect of infrastructure and appliances, ingredients and safeguarded handling of food, pest control and cleaning procedures, quality of water, health and personal hygiene as well as training [12]. This study therefore adopted the parameters identified from the reviewed literature thus formed the operational framework as shown in Fig. 1 below.

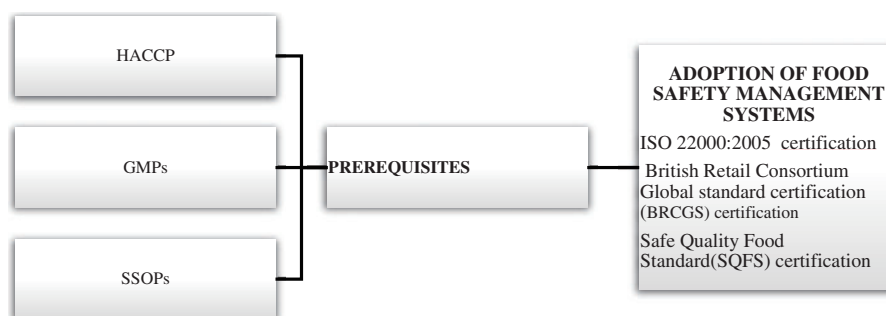


Fig. 1. Operational framework.

2. METHODS

2.1. Research Design

This research used cross sectional survey which enabled the researcher to answer the question of how prerequisites deter adoption of FSMSs in public universities catering facilities. A survey was ideal due to its ability to provide a high representation of respondents, enabling multiple variables to be effectively analyzed thus leading to a high statistical significance of results which could confidently be generalized [13].

2.2. Study Area and Population

The Mount Kenya and Aberdare regional bloc consisting of counties, Nakuru, Laikipia, Nyandarua, Nyeri, Murang'a, Kirinyaga, Embu, Kiambu, Tharaka Nithi and Meru was the area under study. The 11 public universities in the region were targeted accounting for 28.9% of the total universities population in Kenya therefore providing a suitable representation for generalization to be made. They also had a homogeneous characteristic in that they are fully fledged public universities guided by ministry of Education policies and guidelines on the provision of services [14].

2.3. Sampling Technique, Size, and Data Collection Instrument

The regional bloc was purposively sampled to due to high representation of public universities located there; using the census 187 food handlers in the catering facilities on permanent and pensionable terms of service were enumerated to enable data collection. They had been purposively sampled because organizations are not willing to invest in temporal or casual staff due to short time contact the organizations have with these staff and, therefore would focus investments such as training and motivation to permanent staff [15]. The census covered all items in the population leaving no element to chance which led to improved accuracy; Structured questionnaire was preferred as the data collection tool because of its ability to be self-administered, had a minimum bias and gave respondents' adequate time to respond [13].

2.4. Validity and Reliability

To test for reliability as a test for internal consistency which concerns itself with the extent to which a measurement tool measures a phenomenon in a stable manner and produces consistent results over time [16], was done. A pilot test in public institutions of higher learning catering facilities within Nyeri town Sub County was done, and the results tested for internal consistency using Cronbach's coefficient Alpha model with an alpha coefficient of 0.7 being achieved as shown in Table I. A coefficient of anything above 0.7 is efficient and acceptable [13].

TABLE I: RELIABILITY RESULTS

Variable	Cronbach's alpha
Pre-requisites	0.79

2.5. Data Analysis Techniques

After data was collected, editing was done, then coded and eventually entered SPSS version 26 software. It was analyzed through descriptive and inferential statistics to enable description of demographic characteristics of the population, the independent and dependent variables consequently generating the Mean, to measure central tendencies of the data, while standard deviations were utilized to measure dispersions of the data [13].

Inferential analysis carried out on the data included Simple linear regression whereby independent variable (prerequisites) was regressed against dependent variable (adoption of FSMSs) to assess the strength of influence on the independent variable. Product moment correlation analysis was used to determine the correlation coefficients (r) between the variables thus predict if there was any association between the dependent variable and the independent variable. ANOVA statistics which comprised of F-Ratio and the corresponding P-value was generated which was interpreted at the significance of level 0.05, which was advantageous as it assisted in establishing if the regression model was suitable [13].

2.6. Ethical Approvals

Approval to Conduct Research was done by applying for Ethical clearance and approval to conduct research from the Dedan Kimathi University research ethics committee and a license applied for and granted by the National Commission for Science Technology and Innovation.

3. FINDINGS

3.1. Demographic Characteristics

All the 151 respondents who participated in this study were food handlers there were more female workers ($n = 79, 52.32\%$) than male workers ($n = 72, 46.68\%$). When it came to positions in the department, lower-level workers comprising the cooks ($n = 57, 37.7\%$), waiters ($n = 10, 6.6\%$), kitchen assistants, and storekeepers ($n = 14, 9.3\%$) were the majority totaling ($n = 81, 53.6\%$). The majority of the staff were craft certificate holders ($n = 39, 25.8\%$). $n = 42, 27.8\%$ of the staff had work experience ranging between 11–15 years, as illustrated in Table II.

3.2. Adoption of Food Safety Management Systems

The respondents were asked to rate the level of implementation of processes and requirements of adopting the different market based FSMSs on a (scale 5-Fully implemented; 4-Partially Implemented; 3-Not sure of whether it is implemented or not; 2-Inadequately implemented and 1-Not implemented).

The descriptive statistics on adoption of FSMS showed respondents slightly agreeing to requirements for various FSMS being in place notably ISO 22000:2005 (mean 3.63, SD = 1.252), HACCP (mean 3.71 SD = 1.257), GMPs (mean 3.97, SD = 1.035) and SSOPs (mean 3.82, SD = 1.178). Methods of food contamination prevention were implemented (mean 4.18 S.D. = 0.980); and on requirements for BRCGS not being implemented (mean of 2.81, SD = 1.237) as shown in Table III.

TABLE II: DEMOGRAPHIC CHARACTERISTICS

Variable	Parameters	Frequency (N)	Percentage
Gender	Male	72	47.68
	Female	79	52.32
		N = 151	100
Position in department	Catering manager	8	5.3
	Deputy catering manager	4	2.6
	Cateress/caterer	22	14.6
	Assistant cateress/caterer	14	9.3
	Head cook	20	13.2
	Headwaiter	2	1.3
	Cook	57	37.7
	Waiter	10	6.6
	Others (kitchen assistants and storekeepers)	14	9.3
			N = 151
Age	Between 18–25 years.	1	0.7
	Between 26–33	21	13.9
	Between 34–42	64	42.38
	Between 43–50	45	29.8
	Above 50 years	20	13.2
		N = 151	100
Education levels	Primary level education,	2	1.3
	Secondary school education,	24	15.9
	Craft certificate,	39	25.8
	Bachelor degree	24	15.9
	Master's degree	12	7.9
		N = 151	100
Years of experience	1–5 years	18	11.9
	6–10 years	41	27.2
	11–15 years	42	27.8
	16–20 years	30	19.9
	Above 20 years	20	13.2
		N = 151	100

3.3. Descriptive on Prerequisites as a Deterrent of Adopting Food Safety Management Systems

The respondents were asked to rate their level of agreement on food safety practices carried out in their facilities on a (scale 5-Fully implemented; 4-Partially Implemented; 3-Not sure of whether it is implemented or not; 2-Inadequately implemented and 1-Not implemented), and Table IV shows their response.

The descriptive statistics for prerequisites revealed respondents agreeing to follow HACCP activities with notable cases being cold storage of meat (mean 4.36 SD = 0.811), supervision (mean 4.22, SD = 0.986) and identification of dangers to food (mean 4.23 SD = 0.890) hence could allow adoption of FSMSs. However, on separate storage of cooked foods (mean 3.95, SD = 1.002), handling of ready to eat food (mean 3.87, SD = 0.954) and documentation of food safety measures (mean 3.71, SD =

1.175) the respondents showed hints of reservations on their agreement as shown in Table IV.

Additionally, the respondents showed hints of reservations in their agreement towards pest control methods (mean 3.95, SD = 1.076), food material receiving area (mean 3.91, SD = 1.125) which are GMPs required for FSMSs. Not to mention, respondents having reservations in their agreement towards SSOPs practices especially on standard procedures for dealing with injuries and illnesses at workplace (mean 3.38, SD = 1.315), non-smoking policy (mean 3.66, SD = 1.341), personal hygiene guidelines (mean 3.72, SD = 1.228) and hand washing procedures (mean 3.75, SD = 1.250), SSOPs for cleaning kitchen equipment (mean 3.77, SD = 1.223) and SSOP for cleaning restaurant utensils (mean 3.79, SD = 1.168). However, issuance of protective clothing (mean 4.23, SD = 1.067), indicated a duty taken seriously by the universities.

3.4. Inferential Statistics

The study assessed the effects of prerequisites on the adoption of Food safety management systems by public universities catering facilities in the bloc. To achieve this objective simple linear regression was used.

The analysis in Table V established a moderate positive relationship between prerequisites and adoption ($r = 0.475$) whereby 22.6% of the variations in adoption were as a result of prerequisites with a degree of freedom as exhibited by ANOVA $F(1, 149) = 43.429$ and a significance of $p\text{-value} = 0.000 \leq 0.05$ shown in Table VI. This implied that the effect of prerequisite as a deterrent was significant but with a minimal variation and therefore would act as an encourager of adopting FSMSs by the public universities catering facilities.

Prerequisites as deterrents significantly affected adoption by ($\beta_1 = 0.582$, $t = 6.590$ and a $p\text{-value} 0.000 \leq 0.05$), meaning that when all variations are held constant a unit increase in prerequisites will lead to a 0.582 increase in adoption as illustrated in Table VII, hence deriving the model $Y = 1.248 + 0.582 X_2 + \dots$

4. DISCUSSIONS

The descriptive analysis results support [8] regarding how positive staff behavior affects the execution of HACCP practices whereby in this study, staff showed positive behavior towards practicing HACCP practices even if the practices were not well documented, but contradict with [3] whose findings indicated that universities kitchen staff hardly complied with hygiene practices because of lack of internal policies and SSOP's that could guide them to comply with food safety measures. Hygiene practices were being followed albeit with minimal presence of SSOPs which could be as a result of their prior knowledge acquired during college training on food hygiene and sanitation procedures and practices.

From the above results, it is evident that public universities catering staff engage in activities that justify the presence of prerequisites for FSMSs even though the requirements are not well documented and hence may not be verifiable. References [4] and [5] had made justifications that for any FSMS to be adopted and implemented,

TABLE III: DESCRIPTIVE STATISTICS ON ADOPTION FOOD SAFETY MANAGEMENT SYSTEMS

Adoption of requirements	N Valid	Min	Max	Mean	Std. D
AD1 Methods of Preventing food contamination for adoption of FSMSs e.g., sorting cereals, washing vegetables, use of color coded chopping boards, procedures for washing utensils etc.	151	1	5	4.18	0.980
AD2 British retail consortium global standards (BRCGS) requirements for its adoption as a Food Safety Management System (FSMS)	151	1	5	2.81	1.237
AD3 Safe quality standards requirements for its adoption as a Food Safety Management Systems	151	1	5	3.30	1.305
AD4 ISO 22000:2005 food safety management system requirements for its adoption as a Food Safety Management Systems	151	1	5	3.63	1.252
AD5 Food Safety system certification (FSSC 22000) requirements for its adoption as a Food Safety Management Systems	151	1	5	3.15	1.253
AD6 Putting in place Hazard Analysis Critical Control Point (HACCP) as requirement for its adoption as a FSMSs	151	1	5	3.71	1.257
AD7 Use of Good manufacturing practices (GMP) e.g., maintenance of cleanliness, waste management, and pest control methods etc. as a requirement for adoption of FSMSs	151	1	5	3.97	1.035
AD8 Use of Standard sanitation operating procedures (SSOP) e.g., procedures for dealing with injuries, personal hygiene procedures, etc. as a requirements for adoption of FSMSs	151	1	5	3.82	1.178

TABLE IV: DESCRIPTIVES ON PREREQUISITES

HACCP	Action	Valid	Min	Max	Mean	S. D
PRE1	The way we identify dangers to food safety in our facility can facilitate adoption of FSMSs.	151	1	5	4.23	0.890
PRE2	The way we store meats in cold stores/equipment e.g., beef, fish, chicken in our facility can allow adoption of FSMSs	151	1	5	4.36	0.811
PRE3	The way we store cooked foods separate from raw food in our facility can allow adoption of FSMSs	151	1	5	3.95	1.002
PRE4	The way we handle ready to eat foods e.g., salads, smokies in our facility can allow adoption of FSMS	151	1	5	3.87	0.954
PRE5	The way supervision is done towards food safety in our facility can allow adoption of FSMSs	151	1	5	4.22	0.986
PRE6	The way documentation of food safety incidences in our facility is done can allow adoption of FSMSs	151	1	5	3.71	1.175
GMPs (good manufacturing practices)						
PRE7	Our kitchen food preparation areas are easy to clean thus can allow adoption of food safety measures	151	1	5	4.18	0.960
PRE8	The facility has adequate water supply which can allow adoption of food safety measure	151	1	5	4.58	0.752
PRE9	The way we deal with solid kitchen waste such as vegetable peels, food waste in our kitchen can allow adoption of food safety measures	151	1	5	4.25	0.940
PRE10	The drainages in our kitchen can allow adoption of food safety measures	151	1	5	4.25	0.881
PRE11	Our facility Pest control methods can allow adoption of food safety measures	151	1	5	3.95	1.076
PRE12	Our facility food materials receiving area is well organized and can allow adoption of food safety measures	151	1	5	3.91	1.125
PRE13	The way we store cleaning materials can allow adoption of food safety measures	151	1	5	4.02	0.996
SSOPs (standard sanitation operating procedures)						
PRE14	We have hand washing procedures in our kitchen which can allow adoption of food safety measures	151	1	5	3.75	1.250
PRE15	We have Personal hygiene guidelines in our kitchen which can allow adoption of food safety measures	151	1	5	3.72	1.228
PRE16	We are Issued with protective clothing (aprons, hats, gloves, and safety boots) which can allow adoption of food safety measures.	151	1	5	4.23	1.067
PRE17	We have Nonsmoking policy in our kitchen which can allow adoption of food safety measures.	151	1	5	3.66	1.341
PRE18	We have Standard Procedures for Dealing with injuries and illnesses in the facility which can allow adoption of FSMSs	151	1	5	3.38	1.315
PRE19.	We have Standard operating procedures for cleaning kitchen equipment to which can allow adoption of food safety measures	151	1	5	3.77	1.223
PRE20.	We have Standard operating procedures for cleaning restaurant utensils which can allow adoption of food safety measures	151	1	5	3.79	1.168

TABLE V: PREREQUISITES MODEL SUMMARY

Model summary										
Model	R	R square	Adjusted R square	Std. error of the estimate	Change statistics					
					R square change	F change	df1	df2	Sig. F change	
1	0.475 ^a	0.226	0.220	0.73412	0.226	43.429	1	149	0.000	

Note: a. Predictors: (Constant), Prerequisites.

TABLE VI: ANOVA ON PREREQUISITES

ANOVA ^a					
Model	Sum of squares	df	Mean square	F	Sig.
I Regression	23.405	1	23.405	43.429	0.000 ^b
Residual	80.301	149	0.539		
Total	103.706	150			

Notes:

a. Dependent Variable: adoption.

b. Predictors: (Constant), Prerequisites.

TABLE VII: PREREQUISITES COEFFICIENTS

Model	Coefficients			t	Sig.
	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta		
I (Constant)	1.248	0.357		3.490	0.001
Prerequisites	0.582	0.088	0.475	6.590	0.000

Note: a. Dependent Variable: adoption.

HACCP, GMPs, and SSOPs as basic requirements should be in place. Reference [7] on the other hand, had found those facilities that had HACCP installed, its effective application and maintenance were affected by issues pertaining to the lack of detailed food safety materials in place and that in those that had specific details concerning HACCP, the staff found it difficult and expensive to comprehend and follow. The findings of this study, are in contrast to their findings as prerequisites are seen not to affect adoption of FSMs since the catering staff in the public universities catering facilities practice HACCP practices, The GMPs are in place and the SSOPs are also in place albeit inadequately which could be the reason why the variations caused by prerequisites in adoption of FSMs is low.

The universities have a good foundation of building blocks when it comes to FSMs, whereby HACCP plans and GMPs were well practiced even though not well documented, more so many SSOPs practices especially on standard procedures for dealing with injuries and illnesses at the workplace, non-smoking policy SSOP and hand washing procedures), SSOPs for cleaning kitchen equipment and SSOPs for cleaning restaurant utensils were not adequately provided. However, the SSOP on issuance of protective clothing indicated a duty taken seriously by the universities.

5. CONCLUSION

Public universities Catering facilities' standard operating procedures and HACCP plans are in place, although not verifiable, due to a lack of proper documentation and thus not uniformly followed which could eventually deter the adoption of food safety management systems. It is recommended that a longitudinal research design be used to study food safety prerequisites to gain further insights into whether the practices are carried out correctly or not. Also, a legal policy should be enacted to make it mandatory for food handling facilities to have well-documented food safety measures which should be verifiable.

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DECLARATION OF INTEREST

We declare that there is no conflict of interest.

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