

The Effect of Self Learning regarding Food –Borne Diseases on Knowledge and Practices of Primary School Teachers

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Abstract

Background: Foodborne diseases are challenge to global health. These diseases are caused by consuming contaminated food and can range in severity from mild discomfort to life-threatening illness. Therefore, food safety healthy instructions can help in preventing the spread of food borne diseases especially in primary school stage. **Aim:** Evaluate the effect of self-learning regarding food borne diseases on knowledge and practices of primary school teachers. **Subjects and Method: Study design:** a quasi-experimental research design. **Setting:** This study was carried out in ten primary schools which were selected randomly from (forty - seven) schools which are the total number of primary schools at Tanta city. **Subjects:** The total sample was 150 primary school teachers were chosen by systematic random sample technique. **Tools of the study:** Two tools were used to collect the needed data, **Tool I:** A structured questionnaire sheet to assess socio demographic characteristics of the teachers and teachers' knowledge regarding food borne diseases. **Tool II:** Teachers' reported practices regarding prevention of food borne diseases. **Results:** The majority (89.3%) of the studied school teachers had poor knowledge score before self-learning intervention while after self-learning intervention there was an amazing improvement in their knowledge as 99.3% of them had good knowledge score. In addition, the majority (93.3%) of the studied school teachers reported unsatisfactory practices before self-learning, while 88% of them reported satisfactory practices after self-learning intervention. **Conclusion:** Self-learning intervention was effective in improving in teacher's knowledge and practices regarding food borne diseases. **Recommendations:** Encouraging continuous training and self-learning of primary school teachers to enhance their knowledge and practices related to food safety and prevention of food borne diseases.

Keywords: Food borne diseases, Self-learning intervention, Primary school teachers.

Introduction

Food borne diseases are significant health problems and remains one of the growing public health problems in developing and developed countries, causing a rise in social and economic

burden globally (Elbehiry et al., 2023). These diseases can lead to short and long-term health consequences and sometimes can result in death. Children are disproportionately affected by food borne diseases. Approximately half of

the reported food borne diseases occur in children **(Ray et al., 2021)**.

According to the Centers for Disease Control and Prevention (CDC), in 2019, there were an estimated 48 million cases of foodborne illness in the United States, resulting in 128,000 hospitalizations and 3,000 deaths. Also, in 2019, there were 24,484 cases of foodborne illness reported among children in the United States, according to data from the (CDC). This represented approximately 36% of all reported cases of foodborne illness that year. The most commonly reported types of foodborne illness among children were Salmonella, Campylobacter, Escherichia coli (EC), and norovirus. African and South-East Asia regions have the highest burden of food borne diseases **(CDC, 2019)**.

In Egypt, there are no published estimates of economic and public health burdens of infectious diseases, especially food borne diseases, because of the lack of comprehensive surveillance systems. However, a few published studies are available that provide some insight on this issue. The institute for Health Metrics and Evaluation (IHME) of the University of Washington reported that food borne diseases were responsible for (8.21%) of all deaths in Egyptian primary school children from (1990 to 2013). In most recent World Fact Book, the United States Central Intelligence Agency (CIA) classified Egypt as "intermediate" in terms of the degree of risk of major infectious diseases, particularly food borne diseases. Bacterial diarrhea, Hepatitis A Virus, and typhoid fever were reported as the most important food borne diseases **(Aboubakr, 2019)**.

Food borne disease is defined as "a disease caused by agents that enter the body through the

ingestion of contaminated food, these agents may be infectious agents or toxic substances"**(Osaili, 2022)**. Food borne diseases can be classified into two major categories depending on the responsible agent; food-borne infections and food-borne poisonings/intoxications. Food borne infections are diseases whose etiologic agents are viable pathogenic organisms ingested with foods and that can establish infection. More than 250 different food borne hazards have been recognized including infectious bacteria, viruses, parasites and noninfectious chemicals and toxins. The sources of these agents range from being an inherent constituent of the food to intentional addition during food production, processing, or preparation **(De Andrade et al., 2019)**

Food borne diseases can cause short-term symptoms, such as nausea, vomiting, and diarrhea (commonly referred to as food poisoning), but can also cause longer-term illnesses, such as cancer, kidney or liver failure, brain, and neural disorders. These diseases may be more serious in children. Children who survive some of the more serious food borne diseases may suffer from delayed physical and mental development and impacting their quality of life permanently **(Faour-Klingbeil & CD Todd 2020)**.

The Egyptian government has taken several initiatives to address foodborne illnesses in school children. In 2015, the Ministry of Education launched a program called the "Healthy School Canteen Initiative," which aims to improve the nutritional quality and safety of food served in school canteens **(Farahat, 2015)**.

The government has also implemented regulations and standards for food safety,

including the Egyptian Food Safety Law, which was passed in 2017. The law establishes the National Food Safety Authority, which is responsible for setting and enforcing food safety standards and regulations. Despite these initiatives, foodborne illnesses remain a significant issue in Egypt, and there is a need for continued efforts to improve food safety practices and reduce the incidence of foodborne illnesses (**Faour-Klingbeil & CD Todd 2020**).

Self-learning about foodborne diseases is essential for individuals to understand how to prevent and respond to these illnesses, both at the personal and community levels. By taking responsibility for their own learning, individuals can develop a deeper understanding of the causes and effects of foodborne diseases, as well as the strategies and best practices for preventing them (**Loeng, 2020**). Self-learning can also help individuals to stay up-to-date on the latest developments in food safety and foodborne diseases, including emerging threats and new prevention strategies. This is particularly important in a rapidly changing world especially where new pathogens and food safety risks can emerge at any time (**Qi et al., 2019**).

School health nurse plays an important role in keeping students and teachers healthy by implementing educational programs and preventative measures. Such measures as: increasing the awareness about food illnesses and participation in updating health policies, promoting preventive measures such as hand washing, identifying instructions and evaluating students and staff having gastrointestinal signs and symptoms (**Doyle et al., 2018**). As well, documenting findings, identifying potential cases of food illness and follow up students, families, and staff as needed, and providing

clear instructions for food service staff when suspected occurrence of food-borne diseases (**McCabe et al., 2022**).

Significance of the study:

Food borne diseases continues to be a growing problem. Approximately one half of reported food borne illness occurs in children under the age of ten years (**Aboubakr, 2019**). So, teaching about food diseases and food safety in general at the primary school level is crucial, because behavior is more easily influenced at that stage.

Aim of the study

Evaluate the effect of self-learning regarding food borne diseases on knowledge and practices of primary school teachers.

Research hypothesis:

The level of knowledge and practices of primary school teachers regarding food borne diseases will be expected to be improved after applying self-learning.

Subjects and Method

Research design:

A quasi-experimental research design was utilized in this study.

Study setting:

his study was conducted at ten primary schools which was selected randomly by simple random sample technique from (forty - seven) which are the total number of primary schools in Tanta city.

Study subjects:

A total number of 150 primary school teachers were selected from the previous settings. They were chosen by systematic random sample technique. The sample size and power analysis were calculated using Epi-Info 7 software statistical package created by World Health organization and center for Disease Control and Prevention, Atlanta, Georgia, USA version

2011. The criteria used for sample size calculation were as follows: 95% confidence limit, the effect size of the change due to the intervention is 80 % (70%-90%) with a margin of error 10%. The sample size based on the previously mentioned criteria was found at $N > 61$. The sample size was increased to 150 teachers to improve and increase the validity of the collected data.

Study tools:

To achieve the aim of this study, two tools were used in order to obtain the necessary data of this study:

Tool I: A structured questionnaire sheet

This tool was developed by the researcher based on the review of recent and related literatures (Asmahan & Abd El-Razik, 2021), (Allah & Abdelsalam, 2017), to collect the necessary data. This tool included the following two parts:

Part (1): Socio demographic characteristics of the teachers:

This part included basic data such as: age, sex, level of education, marital status, residence, years of experience, history of food poisoning, training courses about food borne diseases and its number, availability of educational material about knowledge and practices of prevention of borne diseases in schools.

Part (2): Teachers' knowledge regarding food borne diseases:

This part was used to assess knowledge of the studied teachers about food borne disease based on the previously related literatures. It included data about: meaning of food borne diseases, risk factors, causes, types of contaminates (biological, chemical, physical), types of diseases transmitted by contaminated food, mode of transmission, clinical features, consequences and preventive measures such as

precautions during purchasing, preparation, storage and serving of food.

Tool II: Teachers' reported practices regarding prevention of food borne diseases:

This tool was developed by the researcher based on the review of recent and related literatures (Asmahan & Abd El-Razik 2021), (Allah & Abdelsalam 2017), to assess the reported preventive practices and measures of the studied teachers concerning food borne diseases. Such measures included: purchasing, preparation, storage and serving measures.

Method

This study was accomplished according to the following steps :

Obtaining approvals:

An official permission to conduct this study was obtained from the Dean of Faculty of Nursing to the responsible authorities (The managers of educational Tanta zones then to the directors of the selected primary schools) in Tanta city after informing them about the purpose of the study.

2. Ethical and legal considerations:

The consent of Faculty's Ethical Committee was obtained to conduct the study. (Code:51-2022)

An informed consent was obtained from the primary school teachers after full explanation about the purpose of the study.

Nature of the study wasn't causing any harm and/or pain for the included teachers.

Privacy of the entire subjects was put into consideration.

Confidentiality was considered regarding the data collected.

The teacher had the right to terminate participation or withdrawal from the study at any time.

Developing the tools:

Tools (I and II) were developed by the researcher based on reviewing the related

literatures and translated into Arabic to suite the language of the included subjects.

Face and content validity were obtained for the study tools (I and II) by distributing it to a jury of five professor's expertise in the field of community health nursing before conducting the study to obtain their opinions. Each of these experts gave an average total percentage of their acceptance for the tool. The recommended modifications were done according to opinions of jury committee. The mean test validity was 91.8%.

Reliability of the tools was tested using cronbach's reliability; Test reliability was (0.918) for tool (I) and (0.921) for tool (II) indicating internal consistency.

Pilot study was carried out on 10% of primary school teachers to test the tools for their clarity, organization, comprehension and to identify obstacles that may be encountered during the data collection. And also, to estimate the time needed to collect the data from each teacher and to detect any ambiguity of the questions. Accordingly, the necessary modifications were done according to the pilot study such as omitting a question and rephrasing some questions. Those teachers were excluded from the entire study sample.

5. The actual study:

The data collection of the present study was done by administered the questionnaire individually to each primary school teacher to assess his knowledge and practices about food borne diseases.

The aim of the study was explained to each teacher.

The researcher met the teachers at school three days per week (Sunday, Monday and Tuesday). The average time spent for collecting data from each teacher was 20-30 minutes.

This study's fieldwork was completed in six months, beginning in early August (2022) and ending in late January (2023).

6. Self-learning was applied through the following phases:

Assessment phase: was applied by using the previously mentioned tools (I& II) through distributing the questionnaire to each teacher to collect base line data as pretest before providing them any information.

Planning phase: A booklet about food borne diseases was constructed based on the recent related literatures (**Elbehiry et al., 2023**), (**Sharif & Nasir, 2018**), and according to teachers' needs that derived from the assessment phase. The general goal of providing the booklet was to improve the knowledge and practices of primary school teachers about food borne diseases.

Implementation phase:

-After pretest, each teacher was provided with a copy of a booklet to use it as a tool of self-learning about food borne disease.

-The researcher emphasized that each teacher should read the booklet guidelines carefully at their convenience and follow its instructions.

-The meetings with the studied teachers were organized to meet them during free classes or during the break.

-The researcher met the teachers individually or in a group according to their availability.

-The meetings were conducted in the teacher's rooms of each school.

-At the start of the meeting, each teacher was informed about the study aim.

-Data for the current study were collected using a structured questionnaire schedule that was provided individually to each teacher.

-The researcher communicated the teachers (face to face or by the telephone) in a definite

time after two weeks to conduct a group discussion about the content of the booklet for any clarifications or misunderstanding.

Evaluation phase: The aim of this phase is to evaluate the effectiveness of self-learning on knowledge and practices of the studied primary school teachers. Evaluation phase was conducted two times:

First time (pre-test): Before implementing the self-learning (providing the booklet) using tool (I and II).

-Second time (post-test): One month after introducing the booklet using tool I (part 2) and tool II.

7-The studied teachers were informed to provide the learned information and preventive practices about food borne diseases to their students.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS version 19 (Statistical Package for Social Studies) created by IBM, Illinois, Chicago, USA. For numerical values the range, mean and standard deviations were calculated. The differences between mean values of total score of knowledge and practices in relation to age and residence were used using student's t test. Differences of mean values before and after interventions were tested by paired t test if data were normally distributed and Wilcoxon signed ranks test if not normally distributed. For categorical variable, the number and percentage were calculated. The correlation between two variables was calculated using Pearson or Spearman's correlation coefficient according to whether the variables were normally distributed or not. The level of significant was adopted at $p < 0.05$.

Results

Table (1): Represents the distribution of the studied school teachers according to their

socio-demographic characteristics. The table shows that, about half (48%) of the studied school teachers were in the age group (40-49) years, followed by 29.3 % of them. Their age ranged from 30-39 years. The age of the studied school teachers ranged between 25-56 years with a mean age of (42.51 ± 7.41) years. Most (70 %) of them were females and less than one third (30%) were males. More than three quadrants (78.1%) of the studied school teachers were married.

Regarding teachers' educational level and residence, the table represents that the majority of the studied school teachers (89.4%) had university level and slightly less than two-thirds (65.3%) of them were from urban areas. Concerning the job experience, the table shows that (41.3%) of studied school teachers had job experience between 10-19 years followed by 36% who had job experience ranged from 20-29 years. The table also shows that their years of experience were ranged from 1-34 years with a mean year 16.22 ± 7.22 .

Table (2): Represents the distribution of the studied teachers according to their previous exposure to food borne diseases, training courses and availability of educational materials at schools. This table shows that only 17.3 % of studied teachers were exposed to food borne diseases and the highest percent of them (42.3%) were exposed three times, followed by 26.9% of them had once exposure to food borne diseases. Regarding the manifestations they had, the table represents that all the entire sample who exposed to food borne diseases had vomiting, diarrhea, fever and loss of appetite and slightly more than three quarters (76.9 %) of them had abdominal pain. Also, more than half of them (57.7%) suffered from shivering.

Regarding the previous training at schools, it was found that more than two thirds (67.4 %) had not previous training concerning food borne diseases, while 32.6 % of them had previous training. The majority (83.7%) of teachers who undergone training courses had it once. As regarding to educational materials, slightly more than three quarters (75.3%) of the studied teachers mentioned that there were educational materials about food borne diseases at their schools. The majority of those who reported the presence of educational materials mentioned posters, brochures and booklets were used as educational materials which represent (83.1%, 48.6% & 24.7%) respectively.

Table (3): Represents comparison of teacher's knowledge before and after self-learning intervention. The table represents that there was a statistically significant improvement in teachers' knowledge before and after self-learning intervention ($p = <0.001$). The majority of the studied school teachers (89.3%) had poor knowledge score before self-learning intervention while after self-learning intervention there was an amazing improvement in their knowledge as (99.3%) of them had good knowledge score.

Table (4): Represents comparison of teacher's reported practices before and after self-learning intervention. It was clear that the majority (93.3%) of studied school teachers reported unsatisfactory practices before self-learning, while majority of them (88%) reported satisfactory practices after self-learning intervention. However, there was significant improvement of the total practices scores of the studied school teachers before and after self-learning intervention, where the mean scores of their total practices increased from (23.99+5.67) before self-learning to (39.85+4.75) after self-

learning intervention. this difference was highly statistically significant ($P <0.001$). The improvement included all practices stages (purchasing, preparation, storage and serving of food).

Table (5): Shows the correlation between teacher's knowledge and practices in relation to their socio-demographic characteristics. This table illustrate there was no significant correlation between Age, educational level and years of job experience of the studied teachers and their knowledge & practices. It also shows there was no a statistically significant between knowledge score and overall practices score

Table (1): Distribution of the studied school teachers according to their personal and socio-demographic characteristics

Variables	Number (n=150)	%
Age (in years):		
20-29	8	5.3
30-39	44	29.3
40-49	72	48.0
50-56	26	17.4
Range	25-56	
Mean±SD	42.51±7.41	
Sex:		
Males	45	30.0
Females	105	70.0
Marital status:		
Single	23	15.3
Married	117	78.1
Divorced	4	2.6
Widow	6	4
Educational level:		
secondary school	8	5.3
University	134	89.4
Post graduate	8	5.3
Residence:		
Rural	52	34.7
Urban	98	65.3
Years of job experience		
<10	28	18.7
10-19	62	41.3
20-29	54	36.0
30-34	6	4.0
Range	1-34	
Mean±SD (median)	16.22±7.22 (16.00)	

Table (2): Distribution of the studied teachers according to their previous exposure to food borne diseases, its manifestations, training courses and availability of educational materials at schools

Variables	Number (n=150)	%
Exposure to food poisoning		
Yes	26	17.3
No	124	82.7
Frequency of exposure: (n=26)		
Once	7	26.9
Twice	4	15.4
Three times	11	42.3
Four times or more	4	15.4
* Manifestations of food poisoning (n=26)		
Vomiting	26	100
Diarrhea	26	100
Fever	26	100
Abdominal pains	20	76.9
Loss of appetite	26	100
Cough and dyspnea	1	3.8
Shivering	15	57.7
Previous training:		
Yes	49	32.6
None	101	67.4
Number of training courses (n=49)		
Once	41	83.7
Twice	6	12.2
Three times	2	4.1
*Availability of educational materials in school:		
Yes	113	75.3
No	37	24.7
*Types of educational materials in school:		
Booklets	28	24.7
Posters	94	83.1
Brochures	55	48.6
Others(skitch)	2	1.7

*More than one answer was allowed

Table (3): Represents comparison of teacher's knowledge before and after self-learning intervention

Knowledge	Before intervention		After intervention	
	No.	%	No.	%
Poor	134	89.3	0	0.0
Fair	16	10.7	1	0.7
Good	0	0.0	149	99.3
Range	10-16		15-24	
Mean±SD	12.97±1.23		22.47±1.36	
T	63.089			
P	<0.001*			

* Significant

Table (4): Represents comparison of teacher's reported practices before and after self-learning intervention

Practices	Before intervention		After intervention	
Food purchase				
Range	3-8		7-8	
Mean±SD	5.17±1.25		7.91±0.28	
t (p)	26.285 (<0.001*)			
Food preparation				
Range	2-15		2-16	
Mean±SD	8.41±3.00		14.68±3.22	
t (p)	17.446 (<0.001*)			
Food storage				
Range	2-15		8-15	
Mean±SD	6.41±4.34		13.25±1.73	
t (p)	17.975 (<0.001*)			
Food service:				
Range	4		4	
Mean±SD	4		4	
Total practice score				
Range	12-40		25-42	
Mean±SD	23.99±5.67		39.85±4.75	
t (p)	25.840 (<0.001*)			
Total practice	No.	%	No.	%
Unsatisfactory	140	93.3	18	12.0
Satisfactory	10	6.7	132	88.0

* Significant

Table (5): Correlation between teacher's knowledge and practices in relation to their socio-demographic characteristics after self-learning intervention

Variables	Knowledge score		Practice score	
	r/rho	P	r/rho	P
Age in years	-0.022	0.791	-0.056	0.496
Educational level	0.118	0.151	0.097	0.238
Years of job experience	-0.054	0.510	-0.021	0.801
Total practice score	-0.025	0.760		

Discussion

Food-borne diseases are a major public health issue faced by communities around the world. The importance of educating individuals about foodborne diseases can empower them to take responsibility for their own health and well-being. This could be applied by adopting safe food handling practices. Schools are the natural settings where the delivery of education takes a primordial prevention of food borne diseases in children. The teachers and school health nurses are the first responsible person for teaching students about disease, hygiene and risk reduction (Elbehiry et al., 2023), (Sharif & Nasir, 2018)

The importance of knowledge in health education must not be ignored, as improvement in knowledge is the first step toward health behavior modification. So, many studies incorporated knowledge in their intervention programs. The present study revealed that there was a significant improvement in teachers' knowledge about food bone diseases. The findings of the current study found that the total knowledge score of the studied school teachers improved significantly throughout the study, as the mean score of their

knowledge increased from (12.97±1.23) pre-self-learning intervention to (22.47±1.36) one month after self-learning intervention. The majority (89.3%) of the studied school teachers had poor knowledge score before self-learning intervention while after self-learning intervention, there was an amazing improvement in their knowledge as 99.3% of them had good knowledge score regarding food borne diseases (Table 3).

From the researcher 's point of view, the knowledge score was low before self-learning intervention may because that more than two thirds of them didn't attend any previous training courses regarding food borne diseases and food safety in addition to lack of information related to food borne diseases content in the school curriculums. This highlights the effectiveness of the self-learning intervention.

These results are nearly in the same line with the findings of Gaber et al., (2019) who assessed the effect of health educational intervention for mothers regarding food safety for their children. Their results showed that the total mean of knowledge before intervention was

5.85±2.78 but it became 12.78±0.86 after intervention. Additionally, this is in agreement with **Awad Allah et al., (2017)** who found that knowledge about safe food handling of their studied sample had highly significant improvement ($p<0.01$) after intervention. Similarly, **Divya et al., (2018)** who done a study to assess the effectiveness of structured teaching programme on knowledge about food hygiene among housewives, concluded that the mean pretest knowledge score was (9.13±2.42) which was less than the posttest knowledge score (13.31±2.02).

As well as the results of the current study are consistent with the findings of **Jessy et al., (2016)** who assessed the knowledge regarding food borne diseases and food safety in Salem, India revealed that the overall pre-test mean score was 12.71 ±8.7 and the post-test mean score increased to 17.68 ±10.39. On the other hand, these findings are contradicted with **Huang et al., (2014)** who studied the effect of food safety education among elementary school students in west China and reported that no significant improvement was found between pre and post intervention regarding students' knowledge.

Food safety practices are essential for preventing foodborne diseases. Lack of following these practices can expose individuals to have serious health consequences. The results of the current study showed that there was highly significant improvement in the total practices score of the studied teachers as the mean total practices' score of them was significantly improved after self-learning intervention. The mean score of their total practices increased from (23.99±5.67) before self-learning to (39.85±4.75) after self-learning intervention (**Table 4**). This

could be attributed to the positive effect of self-learning intervention on improving school teachers' practices regarding preventing of food borne diseases.

From the researcher's point of view, self-learning intervention could provide the teachers with the skills and resources they needed to improve their food safety practices. The self-learning intervention included information about how to properly purchase, prepare, store and serve food safely. In addition to the teachers' motivation and self-efficacy may be improved which helped in implementing those food safety practices. It could help the teachers to understand the importance of food safety and the potential consequences of not following safe food handling practices. This increased understanding may have motivated the teachers to take action to improve their practices.

In accordance with a study conducted in Egypt by **Wahdan et al., (2019)** who studied the effect of an educational program on food safety practices in food preparation and handling procedures and concluded that there were a significant improvement in the mean score of all food hygiene practices of the study participants between pre- and post-intervention scores. As well, **Mohamed et al., (2020)** who conducted a study about the effect of educational program to prevent foodborne diseases, reported improvement in values of the total mean scores relating to the food handlers' over all practices between 91.47 ± 3.45 before the intervention and 101.51 ± 6.85 after the intervention.

Similarly, observations were reported in a study conducted by **Ngivu, (2016)** who studied the impact of food handlers' food safety training in a pediatric hospital

revealed that there was a 35% increase in food safety compliance audit score especially hand hygiene compliance which improved from 50% before the intervention to 100% after the intervention. **Riaz et al., (2016)** also revealed that there was a significant increase in good practice regarding food safety from 30% at baseline to 47% after intervention. Furthermore, these results are in the same line with the study results of **Sinha S et al., (2023)** who concluded that there was an improvement in food safety practices between the pre-test and the post-test with a statistically significant difference ($p < 0.05$).

In contrast with the current study, the study by **Awad Allah et al., (2017)** who conducted a study about knowledge, attitude, and practice of female teachers regarding safe food handling mentioned that no significant change in practices level of their teachers between pre and post intervention. Also, these results were inconsistent with **Elsersy et al., (2018)** who reported that the majority of the studied sample had insufficient practices regarding safety food measures after intervention. Also, these results are contracted with the findings of a study conducted by **Haghi et al., (2019)** in Tehran who revealed that, the majority (94.9%) of their studied sample had insufficient practices regarding safety food measures. As well as these results was in controversy with the study by **Park et al., (2010)** who found that in terms of sample practices and the sanitation performance, there were no significant increases after the training.

The relationship between sociodemographic characteristics and food safety knowledge and practice is complex and multifaceted. Sociodemographic characteristics can influence or not on the

knowledge and practices of individuals regarding food issues. The current study revealed that there was no significant correlation between sociodemographic characteristics of the studied teachers and their knowledge & practices regarding food borne diseases after self-learning (**Table 5**). From the researcher's point of view, it is possible that the demographic characteristics of the studied teachers were not diverse enough to show a significant correlation with their knowledge and practices scores.

These findings with agreement with **Jessy et al., (2016)** that clarified that there was no significant association between the pre-test and post-test level of knowledge and the selected demographic variables both in experimental and control groups. Also, these findings are consistent with **Ncube et al., (2020)** who revealed that no differences were detected in food handler's knowledge regarding food safety measures based on their age and work experience. On the other hand, the present study is also contraindicated with a study done by **Vidhubala, (2019)** who found out the association between post-test knowledge score and the selective demographic variables. The results clarified that the increase in age and education levels showed a positive association with knowledge.

While these findings are in contrast with **Afolaranmi et al., (2015)** who carried out a study entitled "Knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau State, North Central Nigeria" and found that educational level of their participants had positive impact on their practices. Also, **Akabanda et al., (2017)** reported that

educational level had positive effect on their participants knowledge and practices.

Knowledge and practices about foodborne disease are essential for primary school teachers to effectively educate their students about this important topic. The relationship between knowledge and practices about foodborne diseases is complex and multifaceted. The present study clarified that there is no correlation between teachers' knowledge and practices regarding food borne diseases (**Table 5**). From the researcher point of view, this could be attributed to complexity of behavior change as food safety practices are not solely dependent on knowledge. In spite knowledge is considered a necessary component, it may not be sufficient to ensure that individuals consistently engage in safe food handling practices. Practical skills, habits, motivation, and external factors can all play a role in shaping behavior. In some cases, individuals may have adequate knowledge but fail to apply it consistently due to other influencing factors. Secondly, the lack of significant correlation could also be due to the homogeneity of the studied population, as all of them were primary school teachers and had nearly the same characteristics.

These results go in the same line with **Zhou, (2016)** who reported that no statistically significant correlation was found between knowledge and practices regarding safety food. Also, these findings are in the same line with **Mohd Firdaus Siau et al., (2015)** who conduct a study about food court hygiene assessment and food safety knowledge, attitudes, and practices of food handlers in Putrajaya and clarified that there was no significant correlation between stated knowledge and practices about routine protective measures.

Additionally, this go in the same line with the results of **Addo-Tham et al., (2020)** who conducted a study about knowledge on food safety and food-handling practices of street food vendors in Ghana and reported that there was no statically correlation between knowledge and practices. Also, these results are similar with **Abbot et al., (2009)**, and **Mullan et al., (2013)** who reported that there was evidence that knowledge was insignificant predictor of safe food-handling practices. Also, **Zhou, (2016)** who conducted food safety education program among primary school students in China, reported that no statistically significant colleration was found between knowledge and practices regarding safety food.

On the other side, these study results contracted with **Mohamed et al., (2020)** who found a positive correlation between their study participant s' knowledge with their practices. Also, **Cempaka et al., (2019)** study, which was conducted in Indonesia, to assess the level of knowledge, attitudes, and practices of food street handlers at a public elementary school and reported that there was a significantly positive correlation between knowledge and practices of their study participants.

As well as the study by **Zyoud et al., (2019)** who studied knowledge, attitude and practices among parents regarding food poisoning: a cross- sectional study from Palestine reported that there was a positive correlation between their subjects' knowledge and practices. Additionally, a study by **Sani et al., (2014)** who studied knowledge, attitudes and practices of food handlers on food safety in food service operations at the University Kebangsaan Malaysia " and found that, there was a significant positive correlation between

knowledge with practices ($p < 0.05$). Also, a study done by Elsherbiny et al., (2019) found that there were positive correlations between knowledge with practices ($p < 0.05$).

Finally, self-learning was effective way in improving teachers' knowledge and practices regarding foodborne diseases. It can be used to empower the primary school teachers to become messengers for food safety guidelines in their schools and communities. By engaging in self-learning activities, teachers can gain comprehensive knowledge about the sources, prevention, and control of foodborne diseases, as well enabling them to make informed decisions about food purchasing, preparing, storing and serving practices. This knowledge, coupled with the sense of ownership and responsibility fostered by self-learning can motivate teachers to adopt and promote safe food practices in the classroom and beyond. Additionally, self-learning encourages teachers to seek out continuous learning opportunities, ensuring their knowledge remains current and aligned with evolving food safety guidelines. This can significantly reduce the incidence of morbidity and mortality among school age children caused by food borne diseases.

Conclusion:

Based on the findings of the present study, it can be concluded that:

There was a significant improvement in the teacher's knowledge and practices after self-learning intervention. No significant difference was found between teachers' knowledge and their practices in relation to their sociodemographic characteristics.

Recommendations

Based on the results of the present study, the following recommendations were suggested:

Conducting ongoing training for primary school teachers to increase their knowledge and skills regarding food safety to prevent foodborne diseases.

Integrate food related information into the school curriculums to help students to gain good dietary habits and behaviors.

Encourage the availability of an educational material in the schools as brochures, posters and booklets about food borne diseases as well as food hygiene.

Disseminate information to a large sector of community about food borne diseases and food hygiene through mass and social media.

Further research is recommended regarding conducting health educational program for primary school students about food borne diseases and its preventive measures.

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