

ASSESSMENT OF NURSES' PERFORMANCE RELATED TO CONTROL OF SOME PARASITES ACQUIRED FROM FRESH VEGETABLES AS A PATIENT SAFETY MEASURE IN A MILITARY HOSPITAL

By

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Abstract

Foodborne parasitic infection in the hospital constitutes a major health problem particularly for patients who are more vulnerable than healthy subjects to parasitic risks. Parasitic infection represents an area of concern for advanced practice nurse. The work assessed the military nursing staff performance regarding the nosocomial food-borne parasitic infection control. Subjects and Methods: Research design; A descriptive research design was used to identify knowledge, attitudes and practice of nurses related to nosocomial food-borne parasitic infection control measures. Setting: The study was conducted at a general military hospital. Subjects: 50 nurses, the whole available number who covered the inclusion criteria. Data collection tools: It included; (1): Structured interview sheet was constructed after reviewing the relevant literature to elicit information, it included two parts a) subjects' sociodemographic characteristics b) nurses' knowledge regarding nosocomial parasites infections. (2): Rating scale: to assess attitude of nursing staff towards nosocomial parasites infections and its prevention. (3): Observational Checklist: to assess the nurses' practice of self-protection and control of nosocomial parasitic infections control measures. Results: A statistically insignificant difference between knowledge levels about nosocomial parasites infection among military nurses. More than half of participant nurses had positive attitude towards nosocomial parasite infection control and prevention without significant difference between all topics ($P>0.056$). That most participant nurses had unsatisfactory practice to infection control measures with significant lower score for procurement, storage and preparation of raw material followed by personal hygiene ($P<0.05$). Recommendations: Nurses in all roles and settings can demonstrate leadership in infection prevention and control by using their knowledge, skill and judgment to initiate appropriate and immediate infection control procedures.

Key words: Parasites' infection control, Military hospital, Patients safety measure.

Introduction

Nosocomial infection also called "hospital acquired infection" or "the healthcare associated infection" can be defined as an infection acquired in hospital by a patient who was admitted for a reason other than that infection. Nosocomial infections are commonly caused by bacteria. Nosocomial infections can also be caused by viruses, fungi, and parasites (Weinstein, 2004; Kouchak and Askarian, 2012). Most studies of the incidence of nosocomial infections ignore parasitic infections. Based on data from 1,265 intensive care units in 75 countries, it

was found that the proportion of parasites in nosocomial infections was 0.48% overall, and 0.25% in Western Europe (Vincent *et al*, 2009).

Nosocomial infections represent an increasing threat to public health. In most cases, they concern patients with risk factors such as taken radio- and chemotherapy, those whose immune system might be suppressed and those who might be HIV-positive. Intestinal parasites are frequently recorded among patients after chemotherapy, steroid therapy and long-term antibiotic therapy against bacteria, and therefore may

affect the patients in oncological, intensive care, internal medicine, geriatric and pediatric wards (El-Sibaei *et al*, 2006).

An analysis of the available literature also indicates an increase in the number of hospital parasitizes. More travel is taking place to areas endemic for many species of parasites and consequently, symptoms of infection are reported upon returning, sometimes even years later. As these patients are admitted to hospital where in many cases, they can be a source of infection to others, it seems reasonable to extend the list of emergency factors to include parasites such as the *Plasmodium*, *Toxoplasma* and *Trypanosoma*. Also, noteworthy are the mites and insects that can live on the human skin and inhabit the hospital environment. Their activity, and the microorganisms that colonize them, can pose a threat to people weakened or immunosuppressed with chemotherapy or long-term antibiotic therapy (Goralska and Kuratowski, 2013).

The parasitic infections represent an area of concern for advanced practice nurses, particularly those working in rural areas or urban environments populations and those caring for patients with immunodeficiency-related diseases. Zoonotic protozoa increasing in prevalence because of poor sanitation, overcrowding, increased foreign travel, and high-risk sexual behaviors. There is a need for public education to promote awareness and prevention of such infections. This emerging public health problem has been reported sporadically in the medical and prenatal nursing literature (Marecki *et al*, 1997).

The food hygiene in the hospital can acquire peculiar features: indeed, many patients could be more vulnerable than healthy subjects to microbiological and nutritional risks; large numbers of persons can be exposed to infections and possible complications; gastroenteritis can impair digestion and absorption of nutrients and the perception or fear about poor food hygiene practices might result in patients rejecting the meals supplied

by the hospital catering (Buccheri *et al*, 2007). In nosocomial outbreaks of infectious intestinal disease, the mortality risk has been proved to be significantly higher than the community outbreaks and highest for foodborne outbreaks. On the other hand, further peculiar concern arises from the common involvement in the role of food handlers of nurses or domestic staff, who are not specifically trained about food hygiene and (hazard analysis and critical control point) HACCP, but can be engaged in receipt, distribution and serving of ready-made foods and supervision of these services (Lazarević *et al*, 2013).

As a health professional, nurses should have appropriate knowledge about food safety. The importance of safe food for hospitalized patients and the detrimental effect that contaminated food could have on their recovery has been widely emphasized. Food safety in the hospital may have unique features; many patients are more vulnerable than healthy subjects to microbiological and nutritional risk. Larger numbers of patients can be exposed to infection and possible complications. Further concern arises from the common use of nurses as food handlers as they are not specifically trained about food hygiene but can be engaged in the distribution and serving of readymade foods and supervision of these services, so the prevention of foodborne diseases requires all food consumers, especially nurses to be thought about food handling (Sanlier *et al*, 2012).

Many Nosocomial helminthes parasites acquired from not well washed green salad or raw fruits (Minta *et al*, 2007) and protozoa (Vicente *et al*, 2012)

The selected foodborne parasites were 1- Fascioliasis caused by *Fasciola gigantica* or *F. hepatica*, infective is encysted metacercaria (Rashed *et al*, 2010), 2-Ascariasis caused by *Ascaris lumbricoides*, infective stage is mature embryonated egg (El Fakahany *et al*. (2013), 3- Enterobiasis caused by *Enterobius vermicularis*, infective stage is eggs (El Fakahany *et al*. (2013). 4- Hydatidosis

caused by ingestion of eggs dropped from dogs harboring *Echinococcus granulosus* (El Kady *et al*, 2011). The selected protozoa were: 1- Amoebiasis caused by *Entamoeba histolytica*, infective stage is four nucleated cyst (El Shazly *et al*, 2007). 2- Giardiasis caused by *Giardia lamblia*, infective stage is four nucleated cyst (El Shazly *et al*, 2004).

Subjects and Methods

The work aims to assess the military nursing staff performance regarding nosocomial food-borne parasites' infection control, concerning parasites acquired from not well washed green vegetables and suggest recommendations to improve quality of care and patient safety in this regards.

Objectives: 1- To assess the military nursing staff knowledge and attitude as regard parasites' infection control, concerning parasites acquired from not well washed green vegetables and raw fruits. 2- To evaluate the military nursing staff practice regarding parasites' infection control as a patient safety measures. 3- To suggest recommendations for better means of nosocomial food-borne parasitic infection prevention and control measures.

Research design: A descriptive research design was used to identify knowledge, attitudes and practice of nurses related to nosocomial food-borne parasitic infection control measures.

Setting: The study was conducted at a General Military Hospital. All the military nursing staff that accepted to participate in the research and met the inclusion criteria (accepting to participate in the research and has experience more than one year as a nursing staff member) was selected.

Data collection tools: Three tools were constructed after reviewing the relevant literature to illicit information, it included: (Tool 1): Structured interview sheet that concerned with a) subjects' sociodemographic characteristics to gather data related to age, educational level, years of experience, marital status, working departments and their previous training regarding preven-

tion of nosocomial parasites' infections b) to collect data related to nursing staff level of knowledge about nosocomial parasites infections such as epidemiology, causes, population at risk clinical picture, complication, infection control and preventive measure regarding nosocomial parasites' infections. Scoring system for knowledge questions was as follow:

The correct answer took 1 degree. Incorrect answer took 0 (zero) degree.

Then nurses knowledge score percent were classified into knowledge levels as follow: 1- score of < 60% was considered (fail), 2- score of 60- 70 was considered (pass), 3- score of 70- 80 was considered (good), 4- score of 80- 90 was considered (very good) and 5- score of 90 or more was considered (excellent). Tool (2): Rating scale: to assess attitude of nursing staff towards nosocomial parasites' infections control and prevention. Scoring system for attitude statements was 1 degree for agree (positive attitude) and zero for disagree or uncertain (negative attitude). Tool (3): Observational Checklist: It was used to assess the nurses' practice regarding nosocomial parasitic infections control measures. Scoring system for practice items was 1 degree for correctly done and zero for not correctly done or not done.

Validity Test: Developed questionnaires & checklist was submitted to a panel of three experts in the field of nursing education, epidemiology and infection control for content language clarity, relevancy, and readability, ease of understanding, question sequence, and completion time. Questionnaires and checklist were edited after experts' suggestions.

Reliability of the Instruments: For research purpose, reliability test was done on scientific bases.

Data collection procedure: An official permission was obtained from the Director of the Military Hospital, as well as from the nursing director. Informed verbal consents were obtained from each subject before participation in the study. Each nursing staff

was informed about the nature and purpose of the study. Total confidentiality of any obtained information was ensured. Data collection procedure started at the beginning of May 2014 till end of August 2014.

Statistical analysis: Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Data was presented using descriptive statistics in the form of

frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. The qualitative categorical variables were compared using chi-square or Fisher exact test as suitable. Quantitative variables were analyzed using Student t-test. Statistical significance is set at p-value <0.05.

Results

Table I: Nurses' socio-demographic characteristics (N= 50)

Characteristics	No.	%	χ^2 test	P value
Age: <20 years	10	20.0	17.5	0.00015**
20-30 years	28	56.0		
More than 30 years	12	24.0		
Descriptive Statistics	28.23±6.79		Range (19.0 – 44.0)	
Males	15	30.0	16.0	0.000**
Females	35	70.0		
Marital status: Single/divorced	22	44.0	26.2	0.000**
Married	28	56.0		
Education :Bachelor Degree	12	25.0	17.5	0.0001**
Technical Institute of Nursing	10	22.5		
Diploma	28	52.5		
*Attended infection control training course	20	40.0	8.53	0.003**
Not attended	30	60.0		
Years of Experience: <5years	13	26.0	18.1	0.000**
5-10years	28	53.3		
More than 10years	9	18.0		
Descriptive Statistics	9.43±3.87		Range (3.00 – 18.00)	
Department: Medical	21	42.0	3.7	0.16
Surgical	17	34.0		
Emergency/ICU	12	24.0		

Table 2: Knowledge grades of nurses as regard nosocomial parasites (n=50).

Knowledge Grades	No	%	χ^2 test	P value
Fail (<60%)	22	44.0	56	0.000**
Pass (60-70%)	20	40.0		
Good (70-80%)	8	16.0		
Very Good (80-90%)	0	0.0		
Excellent (>90%)	0	0.0		

**Highly statistically significant at p<0.01.

Table 3: Nurses' attitude towards nosocomial parasitic infection (n=50).

Items	+ve attitude		-ve attitude		X ²	p- value
	No.	%	No.	%		
Dealing with suspected cases	19	38.0	31	62.0	10.8	0.215
Measures for defined cases	21	42.0	29	58.0		
Regular investigations for at risk	20	40.0	30	60.0		
Importance of food hygiene	27	54.0	23	46.0		
Precautions for animal raising	25	50.0	25	50.0		
Importance of hand hygiene	28	56.0	22	44.0		
Importance of parasitic infection training programs	18	36.0	32	66.0		
Wearing gloves during patient handling.	24	48.0	26	52.0		
Precautions for eating fresh vegetables	29	58.0	21	42.0		
Importance of infection control measures	23	46.0	27	54.0		
Total	27	54.0	23	46.0		

Table 4: Relationship between total knowledge percent score & nurses' sociodemographic characteristics:

Socio-demographic characteristics			Test	P
Mean ± SD	Mean ± SD	Mean ± SD		
Nurses' Age Groups				
< 20Y (n=10)	20-30Y (n=28)	> 30Y (n=12)	ANOVA	P
52.34±7.55	53.83±6.24	58.65±7.21	0.319	0.728
Male (n=15)		Female (n=35)	t-test	P
52.94 ±6.94		58.32 ±7.92	1.892	0.031*
Nurses' Marital Status				
Single (n=18)	Married (n=28)	Divorced/Widow (n=4)	ANOVA	P
53.56±7.94	58.31±7.24	52.36±8.22	2.144	0.035*
Nurses' Education				
Bachelor Degree (n=12)	Technical Institute (n=10)	School Diploma (n=28)	ANOVA	P
58.82 ±8.19	53.13 ±7.13	52.33 ±7.01	3.173	0.049*
Attending previous courses				
Attended (n=20)	Not attended (n=30)		t-test	P
51.2± 10.05	56.11± 9.23		0.321	0.762*
Nurses' Years of Experience				
< 5Y (n=13)	5-10Y (n=28)	> 10Y (n=9)	ANOVA	P
54.03±11.97	55.95±8.03	58.97±7.14	1.918	0.156
Working Department				
Medical (n=21)	Surgical (n=17)	Emergency/ICU (n=12)	ANOVA	P
55.33±9.55	56.03±8.32	55.87±8.84	1.632	0.237
Total (Mean ± SD)			56.44 ± 9.65	

Table 5: Relationship between nurses' attitudes towards nosocomial parasitic infection & sociodemographic characteristics.

Socio-demographic characteristics			Test	P- value
Mean ± SD	Mean ± SD	Mean ± SD		
Nurses' Age Groups				
< 20Y (n=10)	20-30Y (n=28)	> 30Y (n=12)	ANOVA	P
51.22±9.32	52.43±8.43	55.05±8.43	0.632	0.657
Male (n=15)		Female (n=35)	t-test	P
53.45 ±6.77		56.83 ±7.77	1.875	0.048*
Nurses' Marital Status				
Single(n=18)	Married(n=28)	Divorced/Widow (n=4)	ANOVA	P
52.86±7.01	55.77±7.93	53.21±8.74	2.144	0.042*
Nurses' Education				
Bachelor Degree (n=12)	Technical Institute (n=10)	School Diploma (n=28)	ANOVA	P
55.65 ±8.89	53.54 ±7.76	51.98 ±7.95	1.984	0.037*
Attending previous courses				
Attended (n=20)	Not attended (n=30)		t-test	P
53.45± 10.32	54.54± 9.87		2.403	0.432
Nurses' Years of Experience				
< 5Y (n=13)	5-10Y (n=28)	> 10Y (n=9)	ANOVA	P
52.87±10.43	54.85±9.43	55.07±9.54	0.887	0.213
Work Department				
Medical(n=21)	Surgical (n=17)	Emergency/ICU (n=12)	ANOVA	P
53.84±9.46	55.87±8.21	53.76±8.32	0.945	0.167
Total (Mean ± SD)			(54.94± 8.42)	

Table 6: Nurses' practice related to parasitic infection control measures (N=50)

Items	Appropriate		Inappropriate		X ²	P value
	No.	%	No.	%		
1. Procurement of Raw Material	15	30.0	35	70.0	17.9	0.021*
2. Storage of Raw Materials	17	34.0	33	66.0		
3. Preparation of raw materials	18	36.0	32	64.0		
4. Utensils & Equipments	25	50.0	25	50.0		
5. Cleaning & Hygiene of establishment	26	52.0	24	48.0		
6. Cleaning & Hygiene of surrounding/ environment	31	62.0	19	38.0		
7. Lighting facility	20	40.0	30	60.0		
8. Garbage disposal facility	22	44.0	28	56.0		
9. Pest control	21	42.0	29	58.0		
10. Facilities for Personal Hygiene	23	46.0	27	54.0		
11. Personal Hygiene	17	34.0	33	66.0		
Total	20	40.0	30	60.0		

Table 7: Relationship between total nurses' practices score of infection control measures & sociodemographic characteristics:

Mean ± SD	Mean ± SD	Mean ± SD	Test	P value
Nurses' Age Groups				
< 20Y (n=10)	20-30Y (n=28)	> 30Y (n=12)	ANOVA	P
40.56±9.98	41.56±8.78	41.21±8.65	0.632	0.657
Male (n=15)	Female (n=35)		t-test	P
40.52 ±8.66	41.94 ±8.12		0.983	0.872
Nurses' Marital Status				
Single (n=18)	Married (n=28)	Divorced/Widow (n=4)	ANOVA	P
39.21±8.76	41.83±8.21	40.76±8.99	2.144	0.287
Nurses' Education				
Bachelor Degree (n=12)	Technical Institute (n=10)	School Diploma (n=28)	ANOVA	P
41.21 ±8.22	40.21 ±7.89	41.98 ±7.33	1.984	0.043*
Attending previous courses				
Attended (n=20)	Not attended (n=30)		t-test	P
40.21± 10.77	40.87± 9.43		1.554	0.432
Nurses' Years of Experience				
< 5Y (n=13)	5-10Y (n=28)	> 10Y (n=9)	ANOVA	P
40.07±10.54	41.11±9.65	42.92±9.23	0.887	0.023*
Working Department				
Medical (n=21)	Surgical (n=17)	Emergency/ICU (n=12)	ANOVA	P
39.23±9.12	41.33±7.98	42.08±8.76	0.945	0.167
Total (Mean ± SD)		(40.11± 8.09)		

Discussion

In the present study, >50% of participants were in age category 20-30years, 70.0% of them were females, of which >50% were married, and 52.5% were carried nursing school diploma, 40% attended infection control courses but none of them attended food safety or parasitic infection control training program, 53.3% of them have 5-10 years' working experience, and 42.0% were from medical departments, 34.0% were from surgical departments and 24.0% were from high

pressure areas. Evaluation of the training program on nosocomial food parasites 44.0% failed, 40% passed and 16% got good scores with high significant difference (P<0.01). Nurses in age group >30years got the highest total mean % Knowledge Score. Those carried Bachelor Degree of Nursing got highest total mean % knowledge score. Nurses with working experience more than ten years got highest total mean % knowledge score, with significant difference between total mean knowledge % score ac-

ording to sex, education, previous training courses and marital status ($P < 0.05$). Also, nurses had positive attitude towards nosocomial parasite control and prevention but, without significant difference between all items ($P > 0.05$). Moreover, nurses in the age group > 30 years got highest total mean % attitude score than other age groups and Nurses carried Bachelor Degree of Nursing have got the highest total mean % attitude Score. Also, nurses with work experience > 10 Years got highest total mean % attitude score, with significant difference between total mean attitude % score according to sex, education, and marital status ($P < 0.05$). Besides, most of the participants had inappropriate practice of infection control measures with significant lower score for procurement, storage and preparation of raw material followed by personal hygiene ($p < 0.05$).

Generally speaking, the patient safety is a discipline in the health care sector that applies safety science methods toward the goal of achieving a trustworthy system of health care delivery. Patient safety is also an attribute of health care system; it minimizes the incidence and impact of and maximizes recovery from adverse events, adverse medical events are widespread and include infection (Leach, 2014). All health care professional including nurses are responsible for ensuring patient safety (Ashton, 2014).

On the other hand, Bertran *et al.* (2014) reported that even the trolley food waste generation was a practice embedded within the limitations related to the procedures of meal ordering, which included portion size choices and delivery, communication, tools for menu information, portioning and monitoring of food waste, as well as use of unserved food. They concluded that positive changes to these can be a way forward to develop strategies to reduce trolley food waste at the ward level.

In the present study, regarding the socio-demographic characteristics of nurses, those $> 50\%$ were in the age category 20-30 years, with a high statistically significant differ-

ence between them as regard age categories ($P < 0.001$). Ages ranged from (19-44) and the mean for participants' ages was 28.23 ± 6.79 . A total of 70.0% of them were females; with a highly statistically significant difference as regards sex ($P < 0.01$)... The participants (42.0%) were from medical departments, (34.0%) from surgical departments and (24.0%) were from Emergency & ICU departments; without significant difference between them as regard working department ($P > 0.05$). Moreover, 53.3% of them have 5-10 years' work experience; with statistically significant difference between them as regard work experience ($P < 0.01$). Their working experience ranged from (3.00-18.00 years) with a mean of 9.43 ± 3.87 years. Also, the nurses, 25.0% were University graduated, 22.5% have Technical Institute Nursing Diploma and 52.5% have Nursing School Diploma with a highly significant difference between them as regard education ($P < 0.01$).

Alabaster (2007) reformed nurse education, service modernization and changing roles have modified traditional views of nursing older people but not overturned them. El-Jardali *et al.* (2013) in Lebanon stated that the Lebanese nursing workforce shortages in difficult-to-staff areas have implications not only for quality of care but also for the whole population health outcomes, and that the marriage was positively associated with intent to stay in Lebanon and Jordan whereas years of experience were positively significant for Lebanon and Yemen. Mutale *et al.* (2013) in Zambia accounted men in nursing as equal to 6.6%. Saleh *et al.* (2014) in Egypt dealing with Military nurses showed that half of them were in the age category 20-30 years (50.0%) with statistically significant difference as regard their age categories ($P < 0.05$). Regarding the nursing Staff 75.0% were females; with a highly significant difference ($P < 0.01$), of whom 35% were officers and 65% were sergeants. A total of 25.0% were University graduates, 22.5% carried Technical Institute of Nursing

and 52.5% had Secondary School Nursing Diploma. Their experience years were <5 years (25.0%), 5-<10 years (52.5%) and >10 years (22.5%), in departments of Internal Medicine (40%), Surgery (35%) and Emergency/ ICU (25.0%).

El Bahnasawy *et al.* (2014) in Egypt reported that 24% of the nurses were married, seventy six (76%) single, with mean age of 21.6±5, 90% had diploma in nursing but 10% undergraduate students.

In the present study, 56% of the nurses had satisfactory knowledge level as regard nosocomial parasites, without significant difference

Khudair and Raza (2013) in Qatar found that highly significant relation between nurse's level of knowledge and their age. Baja *et al.* (2014) in Germany found that more the age and experience better the knowledge, and that positive effect of educational degree on the level of knowledge and percent of knowledge improvement after educational session held in studied hospitals.

Abroad many authors worldwide reported nosocomial or hospital acquired parasites. The following were selected representative group. Lettau (1991) in USA stated that both the standard of hygiene and sanitation prevalent in hospitals and the rarity of parasitic diseases compared to viral, bacterial, and fungal infections, reduce the hazard of nosocomial acquisition of parasites to relatively trivial levels, he added that the nosocomial acquisition of parasites might be somewhat underappreciated because the incubation period for clinical illness may be days to weeks and thus a hospital-acquired parasites might not be recognized as such, particularly if the parasite is endemic locally. However, the exact magnitude of the problem in tropical hospitals was also more difficult to determine. Moro *et al.* (2002) in Italy described nosocomial transmission of malaria from patient to patient via blood exposure. Alweis *et al.* (2004) in USA described the transmission of *Plasmodium falciparum* malaria from a patient to a healthcare worker

and then from the healthcare worker to another patient. They concluded that the nurse who had acquired *falciparum* malaria via needle-stick subsequently transmitted malaria to another patient via a break in standard precautions. Sugiyama *et al.* (2006) in Japan examined whether medical staff were infected with *Strongyloides stercoralis* through exposure to the body substances of a patient with disseminated strongyloidiasis, who excreted a large number of *S. stercoralis* in the respiratory secretions and stool-like excretions from a nasogastric tube. They concluded that adherence to the standard precautions is sufficient for preventing the nosocomial transmission of this organism. Vorou *et al.* (2007) in Greece reported that factors facilitating the development of hospital-acquired scabies and nosocomial epidemics were: poor knowledge of scabies epidemiology, unfamiliarity of healthcare workers with atypical presentations, long incubation period, diagnostic delay and incomplete monitoring.

Sanad and Al-Malki (2007) in Saudi Arabia reported that *Cryptosporidium* infection rates of 84% & 74.3% were in patients receiving I.S. drugs for organ transplantation and malignancy respectively. In all patients, the highest infection rate (84%) was among age group 16-40 years while the least (35.3%) was among the infants <2 years (P<0.001). Infections in males (73.9%) was significantly (P < 0.05) higher than females (62.6%). This high prevalence rate revealed the first reported for the cryptosporidiosis among immune-compromised Saudis, indicating the presence of infection source(s) (nosocomial), and thus, transmission in Saudi Arabia.

Bellanger *et al.* (2008) in France described a case of nosocomial infestation with *D. gallinae* from an abandoned pigeon nest suspended on the front wall of the Hôpital Henri Mondor near a window. Khurana *et al.* (2008) in India stated that intestinal infection is still an important public health problem in developing countries like India. Food

handlers might be infected by a wide range of entero-pathogens and *Giardia* was the most common parasite was implicated in transmission of many infections to the public in the community and to patients in hospitals. During the year 2001, they reported an outbreak of ETEC in the neonatal ICU, Advanced Pediatric Centre, and Primer, which was traced back to a food handler involved in the preparation of the milk feed.

Lee *et al.* (2011) in Taiwan reported a case of nasal myiasis caused by *Sarcophaga* spp., noted during hospitalization. The patient underwent coronary arterial bypass surgery and was then mechanically ventilated by means of a nasotracheal tube for the next 8 days.

Góralaska and Kurnatowski (2013) in Europe stated that nosocomial infections represent an increasing threat to public health. They added that most studies of the incidence of nosocomial infections ignore parasitic infections. Based on data from 1,265 intensive care units in 75 countries, it was found that the proportion of parasites in nosocomial infections was 0.48% overall, and 0.25% in Western Europe. An analysis of the available literature indicates an increase in the number of hospital parasitoses.

The current results indicated that, most of the respondents had negative attitudes toward food safety measures, that is may be due to poor awareness of this aspect. This result is similar to the study of Buccheri *et al.* (2007) to evaluate knowledge, attitudes and practice concerning food safety of the nursing staff, the survey revealed that a general positive attitudes toward safe storage practice but respondents fared worse when they were asked about cross contamination, refreezing and handling unwrapped food with cuts or abrasions on hand (Buccheri *et al.*, 2007).

In the present study, most participants had negative compliance scale to infection control measures with significant lower score for the procurement, storage and preparation of raw material followed by personal hygiene ($p < 0.05$). Almanza *et al.* (2007) in

USA determined typical handling practices of home-delivered meals, and provide appropriate handling instructions to reduce the risk of foodborne illness by improving consumer handling of home-delivered meals. They reported advantage of educational program on the improvement of base line knowledge and attitude toward heat exposure health hazard. Gardner (2014) in USA studied the lived experience of nurse educators and the characteristics, traits, practices, and experiences that influenced their development and competence. He declared that the nurse and nurse faculty shortage resulted in a continuous demand for new nurse educators. Chronister (2014) in USA evaluated whether an educational segment monitoring could be improved with focused education. Saleh *et al.* (2014) in Egypt found that 60% of participant nurses have positive compliance scale to infection control measures with significant higher score for precautions for BBPs prevention ($P < 0.05$). El Bahnasawy *et al.* (2014) reported that the implementation of the educational program for Military Nursing Staff on selected infectious disease disasters at Egyptian Eastern Border was effective. They added that the intervention showed statistically significant improvements in nursing staff knowledge, at the immediate post intervention phase, and after three months post-test phase. They concluded the statistically significant strong positive correlations among staff nurse knowledge and scores, multivariate analysis indicated that nursing staff knowledge were positive. El Bahnasawy *et al.* (2014) reported that nurses (96.0%) were willing to attend educational program about health hazard during pilgrim mostly to improve practice (56.0%) and raise awareness (44.0%), with significant improvement regarding adequate knowledge after program implementation. They added that the most needed topics during Hajj were prevention & vaccination (26.0%).

In the present study, nurses in age group > 30years got the highest total mean % com-

pliance score than other age groups. Nurses carrying bachelor degree of nursing got the highest total mean % compliance score; also those with work experience > 10 years have got the highest total mean % attitude score. There was a statistically significant difference between total mean compliance score according to education and years of experience ($P < 0.05$).

In this study, there was a significant relation between nurses' knowledge and their previous training, while there was no significant relation between nurses' previous training and their attitudes and practice. That is may be because only 40 % of the nurses were able to attend infection control educational program and none of them (zero %) could attend courses related to food safety or parasites' infection control. This result is in agreement with a number of studies which have demonstrated a lack of correlation between food hygiene training and improvements in food hygiene behavior (Ansari-Lari *et al*, 2009; Sanlier and Turkmen, 2010).

On the other hand, the epidemiology of (Soil Transmitted Parasites or parasites or in not well washed green salad) STP infections is influenced by several keys determinants, including the environment, population heterogeneity, age, household clustering, genetics and polyparasitism (Hotez *et al*, 2008). Adequate warmth and moisture are key for infection with one or more STH species in Africa in 2005 and considerable geographical variation in the occurrence of STH infections (Broker *et al*, 2009). Several epidemiological studies were done on STPs in Egypt and worldwide, however most of these studies were based on stool examination with no direct estimation of parasitic burden in soil samples

Regarding Egyptian Governorates, several reports detected different STPs with higher prevalence rates (53.4% and 92.5%) in soil samples collected from agricultural villages in Talkha center (Hanafi *et al*, 1987) and in Manoura City of El-Dakahlia Governorate (El-Beshbishi *et al*, 2005).

Kishk and Allam (2000) in Alexandria found prevalence rate of soil contamination with helminthes to be 38.33%. Also, Hussien *et al*. (2010) in Alexandria reported that the soil contamination with different parasites was 31.9% (67 out of 210 soil samples). The soil in the different districts was found to be contaminated with 18 different parasites of medical and veterinary importance that belong to: helminthes (55%), protozoa (34%) and arthropods (4%).

El Zawawy *et al*. (2010) in Egypt investigated the efficacy of sodium dichloroisocyanurate (NaDCC) on the infective stages of common food-borne intestinal protozoa; *E. histolytica*, *G. lamblia*, *Cryptosporidium parvum*, *Cyclospora* and *Microsporidia*; beside its effect on raw green vegetables and fruits. Results revealed significant reductions in viability and infectivity of all examined parasites indicating their susceptibility to the NaDCC. Relative variations in susceptibility were revealed; *E. histolytica* and *G. lamblia* were most susceptible (100% reduction) followed by *Microsporidia* then *C. parvum* and *Cyclospora*. NaDCC did not affect the consistency, color, taste or flavor of raw green vegetables and fruits. The proved efficacy of NaDCC, in cheap and convenient dry tablet form, makes it a promising tool in decontaminating raw vegetables and fruits from food-borne protozoan parasites at household and restaurant levels as well as in catering and fresh produce industry. It is also recommended for disinfection of food preparation surfaces and equipment.

El Fakahany *et al*. (2013) in Qalyoubia Governorate conducted a survey at Benha City (100 soil samples) and Shiblanga village (100 soil samples) representing the urban and rural areas. Geo-parasites were investigated in-doors, around houses, in the fields and the streets from both areas. The results showed that 86/200 soil samples were contaminated with different parasites, the prevalence rate of 43%. Soil samples from Shiblanga village showed higher level of parasitic contamination (56%) and Benha

City showed a lower level of contamination by different parasites (30%). Soil samples obtained from Manshiet El-Nour district, Benha revealed the highest level of parasitic contamination. Parasites were eggs of *H. nana*, *H. diminuta*, *A. lumbricoides*, *Toxocara* spp., *Ancylostoma duodenale* larvae, *E. histolytica* cysts, *Cryptosporidium parvum* oocysts and *T. gondii* oocysts. The parasitic prevalence among Egyptian households stool samples in Qalyobia G. was 30.5%, containing *H. nana* eggs, *A. lumbricoides*, *E. vermicularis* eggs, *A. duodenale*, *E. histolytica* cysts, *C. parvum* oocysts, *B. hominis* cysts and *Isospora belli* oocysts. There was no statistically significant difference in sex regarding infection. School age group was the commonest infected one (59%). Parasites detected were 10/50 houses. *A. duodenale* ova were detected in soil of 4 houses with the same parasite in households' stools, *A. lumbricoides* eggs were detected in four houses with the same parasite in households stools and *E. histolytica* cysts were detected in two houses with the same parasite in households stools.

The WHO (2006) reported that prevention of STP on green vegetable or by well washing of green salad vegetables protect man from many parasitic infections

Abroad, regarding STPs, Ortega *et al.* (1997) in Peru detected oocysts of *C. parvum* and *Cyclospora cayetanensis* from salad vegetables collected in markets of an endemic region. Ulukanligil *et al.* (2001) in Turkey reported the rate of soil contamination with parasites to be 9.4%. Motazedian *et al.* (2006) in Iran reported 84.4%

Gourabathini *et al.* (2008) in Italy reported that the presence of protozoa on leafy vegetables and their sequestration of enteric bacteria in vesicles indicate that they might play an important role in the ecology of human pathogens on produce.

Paul *et al.* (2012) in England stated that Solar ultraviolet (UV)-B radiation (280-315 nm) has a wide range of effects on terrestrial ecosystems, yet the understanding of how

UV-B influences the complex interactions of plants with pest, pathogen and related microorganisms remains limited.

Ranjbar-Bahadori *et al.* (2013) in Tehran reported that the vegetables in the farms were contaminated with *Cryptosporidium* oocysts that infected man on eating underwashed green salad.

Now days, the public health nurse is, assistance to the process of solving one's health, identifying health issues based on a community, using systematic measures which lead to prevention, and aiming at public responsibility. The daily activity of Nurses including Occupational Health Nurses (OHNs) was based on the theory and technology of "empowerment". In promoting the employer-and-employees independent Occupational Safety and Health Activity, the OHN's professional specialty of "empowerment" can play an important role (Ikeda, 2013). Worldwide, many occupational health services are provided by occupational health nurses independently or in collaboration with other disciplines' professionals. The services may be health protection, health promotion, or both, and are designed to reduce health risks, support productivity, improve workers' quality of life, and be cost-effective (Rogers *et al.*, 2014).

On the other hand, nosocomial arthropod-biting sucking as mosquitoes, lice, bugs and ticks (Morsy, 2012) as well as nosocomial myiasis (Morsy, 2014) is another issue of infections' control nurse.

Conclusion

This descriptive study highlighted the importance of raw fruits and vegetables as the potential source for intestinal nosocomial parasites. Fruits and vegetables contamination with the parasites poses health risk to the consumers if consumed without proper cleaning (green salad) and/or cooking.

Nurses (56%) had satisfactory knowledge level (40%) got pass and 16% got good scores) while 44.0% failed with high significant difference ($P < 0.01$). There was a significant difference between total mean know-

ledge % score according to sex, education, previous training courses and marital status ($P < 0.05$). Also, 54% had positive attitude towards nosocomial parasite control and prevention without significant difference between all items ($P > 0.05$), with significant difference between total mean attitude % score according to sex, education and marital status ($P < 0.05$).

Nurses (60%) had inappropriate practice of the infection control measures with significant lower score for the procurement, storage and preparation of raw food materials followed by personal hygiene ($p < 0.05$). There was significant difference between the total mean practice score according to education and years of experience ($P < 0.05$)

Recommendations

Food is at risk in all areas where it is stored, prepared, transported and served. Apart from physician all health care staff are involved in the storage, preparation, transportation and serving of food need training in food hygiene practices to minimize the transmission of gastro-intestinal infections to patients. Perhaps the nosocomial endo-parasites were not dealt with in Egypt.

Nevertheless, the prevention of contamination remains the most effective way of reducing food borne parasitic infection. A comprehensive health education should be given to vendors and farmers of fruits and vegetables and to the general population on the health risks associated with consumption of contaminated raw fruits and/or vegetables. The consumers should always observe the basic principle of food and personal hygiene, that is, thorough washing of the fruits and vegetables before eating and washing hands before meal, especial concern is for health professionals.

Nurses in all roles and settings can demonstrate leadership in infection prevention and control by using their knowledge, skill and judgment to initiate appropriate and immediate infection control procedures. Food handlers are frequently nurses, involved in food operations and supervision functions

without the preliminary and continuous food safety training and education courses that the European and national legislations mandate for professional food handlers. Frequent awareness of foodborne disease hazards and prevention and control measures is a must

Now, is it mandatory to have food safety nurse? Her job description is to ensure:

- 1- Wash patient hands before touching food, and always after using the toilet.
- 2- Cover cuts and sores with waterproof dressings.
- 3- Ensure that the food is palatable and nutritious as well as safe.
- 4- Prohibited smoking, in food-rooms and never cough or sneeze over food.
- 5- Keep kitchen equipment and utensils.
- 6- Keep food clean, covered and either cold or piping or piping hot, separate raw and cooked food.
- 7- Prevent visitors and patients allowed entry into ward kitchens or the use of any facilities.
- 8- Report any symptoms of food ill-health e.g. rashes, diarrhea, vomiting, upper respiratory tract and septic infections to their managers, with details to the occupational health department for guidance ward kitchens to be used by authorized staff.

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