Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1686-1699), Month: May - August 2019, Available at: www.noveltyjournals.com

An Observational Study: Health Care Providers' Knowledge and Its Relationship to Compliance with Standard Infection Control Precautions at Damanhour Fever hospital

Shaimaa Shawky Abdel Wahab[1], Nora Ahmed Bassiouni[2], Yaldez K. Zein Eldin[3]

[1] Teacher of Nursing, School of Nursing, Damanhour Governorate.

[2] Professor of Nursing Administration, Faculty of Nursing, Alexandria University

[3] Assistant Professor of Nursing Administration, Faculty of Nursing, Damanhour University

Abstract: **Health care providers (HCPs) are exposed to blood-borne infections from different pathogens. Standard Precautions (SP) practices are designed to protect healthcare providers (HCPs) and prevent them from spreading infections among patients. Design: descriptive correlational design. Aim: identify the relationship between health care providers' knowledge of and compliance with Standard infection control precautions at Damanhour fever hospital. Setting: Nine inpatient units at Damanhour Fever Hospital. Subjects: 56 nurses, 16 Physicians, 7 Technicians and 5 auxiliary personnel who were available during data collection and agreed to participate in the study. Tools: two tools were developed by the researchers, tool (1): Standard Infection Control Precautions Knowledge Questionnaire to assess Health Care Providers' (HCPs) level of knowledge; tool (2): Standard Infection Control Precautions Observation Checklist developed to observe HCPs compliance with Standard Infection Control Precautions. Results: The study findings were (89.3%) of nurses, (81.3%) of physicians, (85.7%) of technicians, (60.0%) of auxiliaries had high level of knowledge about Standard Precautions (SP) general information. As for overall compliance with SP, 57.1% of nurses, 60% of auxiliaries complied fairly while 87.5% of physicians and 100% of technicians complied poorly to the overall SP. Positive significant correlations were found between overall compliance with standard infection control precautions and nurses, physicians and technicians' level of knowledge where p= 0.046, 0.002 and 0.039 respectively. Recommendations: The findings of the study imply that there is a need for conducting a training program for all HCPs on how to apply and comply with Standard Precautions and to Provide sufficient facilities and equipment required for applying standard infection control precautions. Also, to keep written SP guidelines in the hospital and units policies related to standard infection control precautions accessible to all HCPs all the time.**

Keywords: **Standard precautions, infection control, Hospital acquired infection, Health Care Providers, compliance with Standard precautions.**

1. INTRODUCTION

Health care providers (HCPs) including nursing staff are at risk of occupational hazards because they perform their clinical activities in hospitals. Hospital Acquired Infections (HAIs), pose a serious problem that threatens the health and safety of patients and medical workers worldwide. They acquire infections that arise within the hospital environment. As a result, a negative effect on the quality of health care provided and increase medical care costs (Richmond et al., 2007; Luo et al., 2010).

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1686-1699), Month: May - August 2019, Available at: www.noveltyjournals.com

Rosenthal et al. (2016) defined Hospital Acquired Infection (HAI) as "infection caused by wide variety of common and unusual bacteria, fungi and viruses during the course of medical care". It occurs while patients either receiving care or may be developed after discharge. It also involves occupational infection among staff. HAIs have been increased globally and it is concerned with a significant morbidity and mortality rate (Sayed Ahmed et al., 2008; Craven and Himle, 1992). So, surveillance of HAIs is regarded as an essential part of the infection control program (Castledine and Close, 2007).

Health care providers (HCPs) are exposed to blood-borne infections from pathogens such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) (Richmond et al. 2007; Ghosh, 2013). A report from Egyptian Ministry of Health (2013) indicated that an estimated 600,000 to 800,000 percutaneous injuries occur annually to health care Providers (HCPs). Also, it is estimated by Pruss-Ustun et al., (2005) that two million needle stick injuries incurred each year by Health Care Providers that result in approximately 16000 hepatitis C (HCV) and 66000 hepatitis B virus (HBV) infections. World Health Organization (WHO. 2010) estimates the global burden of disease due to occupational exposure to HBV and HCV infections to be about 40%, and 4.4% of HIV infections among health care providers to be attributable to percutaneous injuries at work.

In 2016, researchers conducted a study about national surveillance of HAIs, they reported 2,688 HAIs in ninety-one Intensive Care Units across 28 hospitals (Talaat et al., 2016). Also, another study done by Talaat et al. (2006) explored evolution of infection control in Egypt: achievements and challenges at 72 hospitals in 13 governorates. The researcher revealed that the mean rate of needle stick injury was 4.9 workers per year. Estimating the burden of disease associated with hospital–acquired infections in Egypt is challenging because of limited surveillance activities and limited microbiology capacities in some public sector facilities. In addition, the complexity of applying the routine system of reporting infection and complexity of case definitions hinders the availability of such data (Talaat et al., 2006).

Compliance with standard infection control precautions can be efficient and effective means to protect HCPs and patients from hospital acquired infections (Siegel et al., 2007). Standard Precautions (SP) are defined as, the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. These practices are designed to protect healthcare providers (HCPs) and prevent them from spreading infections among patients, especially those due to blood-borne pathogens (Egyptian Ministry of Health and Population, 2016).

Standard precautions include the following practices: hand hygiene, use of personal protective equipment such as (gloves, gowns, masks), safe injection practices, decontamination of reusable medical equipment, decontamination of the environment, respiratory hygiene/cough etiquette, management of laundry, management of waste, and management of spillages of blood and body fluids (Labrague, Rosales & Tizon, 2012; Standard Precautions, n.d., 2009).

Furthermore, standard precautions are intended to protect health care providers from percutaneous injuries and prevent transmission of nosocomial infection. As it has to be applied while caring for all patients regardless of the suspected or confirmed presence of an infectious agent (Adly et al., 2014). Health care providers level of adherence to standard precautions may differ from one type of health care provider to another, because they differ in their level of knowledge, previously received training regarding standard precautions (Vaz et al., 2010). Although the high incidence rates of occupational accidents due to exposure to body fluids and sharps (Piai-Morais et al., 2015). Still the compliance with SP is below recommended levels worldwide (Bledsoe et al., 2014; RA & El-Gohary, 2010).

Despite the guidelines of standard precautions developed in several countries, compliance with it is known to be “poor and lacking” (Siegel et al., 2007). Standard precautions in developing low-income countries still not well understood and often practiced partially which result in exposing health care providers to unnecessary risk of infection (RA & El-Gohary, 2010). Understanding reasons for noncompliance will help determine a strategy for improving behavior and programs that target the aspects that were less than satisfactory to improve overall compliance. It is critical to examine factors that influence compliance to encourage those that will lead to total compliance and eliminate those that prevent it (Pyrek, 2018).

There are many factors that affect HCPs non-adherence to standard precautions, some from these factors are related to the working environment such as workplace safety, workload, materials, human resources, the insight that colleagues also failed to follow and management commitment of the institution. Others are individual factors such as knowledge about

the measures of standard precautions and professional, beliefs related to measures of SP and diseases, self-efficacy, forgetfulness, the knowledge on the SP, and the attitudes in function of adherence to SP (Mahat & Eller, 2009; Vaz et al., 2010; Efstathiou et al., 2011; Hessels & Larson, 2016).

Damanhour fever hospital is considered as a high risk workplace for receiving highly and serious contagious diseases such as meningitis, encephalitis, hepatitis A, B, C, swine flu virus H_1N_1 , avian flu virus H_5N_1, AIDS ,and special diseases such as tetanus. Therefore, the present study aims to identify the relationship between health care providers' knowledge of and compliance with Standard infection control precautions at Damanhour fever hospital. Such study can help in identifying the need for training them to increase their knowledge and raise their awareness to SP. Also, findings of this study can spot light on factors that affect their commitment to SP, and provide suggestion for improvement to protect themselves, their patients, and their communities.

2. MATERIALS AND METHOD

MATERIALS

Aim of the study:

To identify the relationship between health care providers' knowledge of and compliance with Standard infection control precautions at Damanhour fever hospital.

Study questions:

1. What is the level of knowledge of HCPs about Standard Infection Control Precautions?

2. What is the level of compliance of HCPs with Standard Infection Control Precautions?

3. What is the the relationship between health care providers' knowledge of and compliance with Standard infection control precautions at Damanhour fever hospital?

Design:

A descriptive correlational research design is used in this study.

Setting:

This study was conducted in all inpatient units at Damanhour Fever Hospital, which is affiliated to Ministry of health and population to provide medical services in the field of fever and infectious diseases to all centers and villages of El Beheira Governorate. The total bed capacity in the hospital is 140. The study was conducted in 9 units namely inpatient units (intensive care unit, critical care unit, hepatic, isolation, dialysis, Male fever unit, Female fever unit, Liver, Pediatric). Also, Diagnostic departments were included (laboratory, radiology), as well as, nutrition department.

Subjects:

The study included four categories of health care providers namely; 56 nurses working in the previously mentioned units, 16 Physicians, 7 Technicians working in laboratory, radiology, and nutrition departments and finally 5 auxiliary personnel who were providing housekeeping services. The study participants shared in the study after their agreement and were present at the time of data collection.

Tools:

Two tools were used in this study.

Tool (1) Standard Infection Control Precautions Knowledge Questionnaire

It was developed by the researchers, after thorough review of related literature to assess HCPs knowledge regarding standard infection control precautions at Damanhour fever hospital (Richmond et al., 2007; Ghosh, 2013; Egyptian Ministry of Health and Population., 2016; Pratheeksha, 2010; Abdel-Salam, 2016; Ismail, 2005). This tool comprises of two parts:

Part one: Health care providers' demographic characteristics such as age, sex, unit, department, educational degree, qualification, years of experience, and attendance of training program regarding standard infection control precautions.

Part two: Questionnaire include 45 multiple choice questions to assess health care providers' knowledge related to blood-borne infection and standard infection control precautions. Respondents were asked to select the correct answer for each question. Correct answer=1 and wrong answer=0. The maximum score is 45 and the minimum is 0. The scoring system for level of knowledge range from 100%-≥80% indicate high level of knowledge, range from <80%-≥60% indicate moderate level of knowledge and range from <60% indicate low level of knowledge.

Tool (2): Standard Infection Control Precautions Observation Checklist

It was developed by the researchers, after an extensive review of literature to observe HCPs compliance with standard precautions in their patient care (Egyptian Ministry of Health and Population., 2016; Rutala & Weber, 2004; Abdel-Salam, 2016; Ismail, 2005; WHO, 2006; Mohamed, 2014; Ahmed, 2004; Abdulmalik, 2004).

This tool consists of two parts:

Part 1: Health care providers demographic data such as age, sex, unit, department, educational degree, qualification, years of experience, and attendance of training program about standard infection control precautions.

Part 2: Observation checklist to assess level of compliance of health care providers with standard infection control precautions in their patient care. The number of items in the observation checklist is different according to the study subject group of the HCPs. The number of items for the nurses is 28 items, for physicians, technicians, and auxiliary personnel are 20 items. Observation rate was on four points scale as following: Done Completely =2, done incompletely =1, Not done=0, and Not applicable without score. The maximum score for nurses is 56, while the maximum score for other health care providers' categories is (80) and the minimum is 0 for all categories. The scoring system for level of compliance range from 100%-≥80 % indicate good level of compliance, range from <80%-≥60% indicate fair level of compliance, and range from <60% indicate poor level of compliance. Variation in the number of items between four groups for HCPs was due to variation in roles they practice.

Method

1. An official permission was obtained from the faculty of nursing and the administrators of the identified hospital for data collection.

2. Tools of the study were tested for content validity and translation by five experts in the field of the study. They were one professor from medical-surgical department and two lecturers from nursing administration department Faculty of Nursing Alexandria University. Also, one professor and one assistant professor from nursing administration department, Faculty of Nursing Damanhour University. Accordingly, necessary modifications were done.

3. **Ethical considerations**: an informed consent from the study subjects was obtained. Confidentiality of the data, privacy, and anonymity of the study subjects were maintained. The subject rights to withdraw from the study were assured.

4. **A pilot study** was carried out on a number equal to 10 % of study subjects rather than study subjects and was not included in the study. Nurses (n=6), physicians (n=2), technicians (n=1), and auxiliary personnel (n=1). The pilot study was carried out in order to check and ensure the clarity of tool, applicability, feasibility, identify obstacles and problems that may be encountered during data collection and the necessary modifications were done.

5. **Reliability:** internal consistency of the study tools were assessed using Cronbach's alpha co-efficient test. Tool I was 0.70. Tool II, part 2 was 0.77.

6. **Data collection** were conducted by the researcher through 3 methods questionnaire, observation, and interview:

a- Questionnaire were hand delivered to physicians, nurses, and technicians who were included in the study subjects. Instructions needed were provided before the distribution of the questionnaire.

b- The questionnaire was completed in the presence of the researcher. To ensure the objectivity of respondents' responses, non-contamination of their opinions, and to check that all items were answered.

c- The interview was only done for auxiliary personnel to assess their knowledge, because more than half of them were able to read and write. It took approximately 20 minutes for every one of them.

d- Regarding observation of study subjects was conducted on each subject included in the study separately for two shifts morning and evening consecutively.

e- The data collection lasted for a period of two months starting from 1st of November to 31st of December 2017.

7. Statistical analysis

- After the data was collected, it was coded and transferred into specially designed formats, to be suitable for computer feeding.

- Verification processes were carried out to avoid any errors during data entry.

- Data was fed to the computer and analyzed using IBM SPSS software package version 20.0**. (**Armonk, NY: IBM Corp**).**

- Quantitative data were described using range (minimum and maximum), mean, and standard deviation.

- Significance of the obtained results was judged at the 5% level.

- **Statistical analysis utilized in this study was as following:**

A: Descriptive analysis

Chi-square test

B: Analytical analysis

1- Fisher's Exact or Monte Carlo correction

2- Pearson coefficient

3. RESULTS

Table (1): Distribution of Health Care Providers at Damanhour Fever Hospital according to their demographic characteristics

Table 1 shows that the majority of nurses (96.4%) were female, and the highest percentage (48.2%) of staff nurses were in the age group ranging from 20-<30 years Concerning their qualification,73.2% of the nurses held secondary technical nursing school diploma and technical nursing institute diploma. Concerning nurses years of experience, the highest percentage (57.1%) of staff nurses had from 1-<10 years of experience, while the lowest percentage (5.4%) was for nurses who had 30 years of experience or more. Also, (85.7%)of the nurses attended a standard infection control precautions training program.

In relation to **physicians**, (81.2%) of them were male. Also, 50.0% of the physicians were in the age group ranging from 20-<30. And three quarters 75.0% of physicians held master degree and diploma degree, while (93.7%) of physicians were working in inpatient care units. Concerning years of experience, the highest percentage (62.5%) of physicians had from 1-<10 years of experience. Also, 50.0% of them attended standard infection control precautions training program.

As regards to **technicians**, (57.1%) of them were male and the same percentage 57.1% were in the age group ranging from 20-<30. In addition, 71.4% of technicians held technical health institute diploma and 71.4% of them were working in diagnostic departments' radiology and laboratory and the rest of them (28.6%) were working in nutrition department. Concerning their years of experience, 57.1% of technicians had from 1-<10 years of experience followed by 28.6% had from 20-<30 years of experience. Moreover, 42.9% of the technicians attended standard infection control precautions training program.

In relation to **auxiliary personnel**, all of them were female and 40.0% of them were in the age group ranging from 20-<30 years old. In addition, 60.0% of auxiliary personnel were able only to read & write and the rest of them (40.0%) had essential education. Moreover, the same table revealed that all (100.0%) of auxiliaries were working in inpatient care units. Regarding their years of experience, the highest percentage of auxiliary personnel (80.0%) had from 1-<10 years of experience, and 80.0% of auxiliary personnel attended standard infection control precautions training program.

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1686-1699), Month: May - August 2019, Available at: www.noveltyjournals.com

Regarding **Health Care Providers (HCPs)**, the same table shows that (77.4%) of them were female. Regarding age group, the highest percentage of HCPs (48.8%) were in the age group from 20-<30. For their qualification (54.8%) of them held secondary technical nursing school diploma and technical health institute diploma. In relation to their work place, majority of them (90.5%) were working at inpatient care units. About their years of experience, the highest percentage (59.5%) of HCPs had from 1-<10 years of experience, while the lowest percentage (7.1%) of HCPs had 30 years of experience or more. Also, three quarters 75.0% of HCPs attended standard infection control precautions training program.

Table (1): Distribution of Health Care Providers at Damanhour Fever Hospital according to their demographic characteristics

Demographic characteristics	Health Care Providers Groups								Total N=84	
	Nurses N=56		Physicians N=16		Technicians N=7		Auxiliaries N=5			
	No.	%	No.	%	No.	%	No.	%	No.	%
Gender										
Male	2	3.6	13	81.2	4	57.1	0	0.0	19	22.6
Female	54	96.4	3	18.8	3	42.9	5	100.0	65	77.4
Age:										
<20	1	1.8	2	12.5	0	0.0	0	0.0	3	3.6
20-	27	48.2	8	50.0	4	57.1	2	40.0	41	48.8
30-	15	26.8	2	12.5	1	14.3	1	20.0	19	22.6
40-	10	17.9	4	25.0	0	0.0	2	40.0	16	19.0
>50	3	5.4	0	0.0	2	28.6	0	0.0	5	6.0
Qualification certificates:										
Read & Write	0	0.0	0	0.0	0	0.0	3	60.0	3	3.6
Primary & Secondary school	0	0.0	0	0.0	2	28.6	2	40.0	4	4.8
Ng School & Technical Institute diploma	41	73.2	0	0.0	5	71.4	0	0.0	46	54.8
B.Sc. Ng & B.Sc. Medicine	14	25.0	2	12.5	0	0.0	0	0.0	16	19.0
Master Ng, Medicine &Diploma	1	1.8	12	75.0	0	0.0	0	0.0	13	15.5
Doctorate Ng & Doctorate Medicine	0	0.0	2	12.5	0	0.0	0	0.0	2	2.4
Workplace										
Inpatient care units	56	100.0	15	93.7	0	0.0	5	100.0	76	90.5
Diagnostic departments	0	0.0	1	6.3	5	71.4	0	0.0	6	7.1
Nutrition debarment	0	0.0	0	0.0	2	28.6	0	0.0	2	2.4
Experience:										
1-	32	57.1	10	62.5	4	57.1	4	80.0	50	59.5
10-	8	14.3	2	12.5	1	14.3	0	0.0	11	13.1
20-	13	23.2	2	12.5	2	28.6	0	0.0	17	20.2
>30	3	5.4	2	12.5	0	0.0	1	20.0	6	7.1
Training/ workshops:										
Yes	48	85.7	8	50.0	3	42.9	4	80.0	63	75.0
No	8	14.3	8	50.0	4	57.1	1	20.0	21	25.0

Ng: Nursing

B.Sc.: Bachelor science

Ng School diploma: Secondary Technical Nursing School Diploma

Technical Institute diploma: Technical Health Institute Diploma

Inpatient care units (Intensive care units, Critical care unit, Dialysis,

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1686-1699), Month: May - August 2019, Available at: www.noveltyjournals.com

Isolation Male, Female, Pediatric and Liver)

Diagnostic (X-ray - Laboratory)

Table 2 shows that nurses, physicians, technicians, and auxiliary had high level of knowledge about Standard Precautions (SP) general information (89.3%), (81.3%), (85.7%), (60.0%), respectively. The same table showed that there were statistical significant differences between knowledge level of HCPs groups and different dimensions of (SP) namely; Personal Protective Equipment (PPE) (p=0.008), medical equipment cleaning (p=0.006), droplet pathogens (p=0.011), waste disposable (p=0.001), safe linen management (p=0.005).

Table (2): Distribution of Health care providers at Damanhour Fever Hospital according to their level of knowledge about standard infection control precautions

Knowledge level about Standard Precautions activities		Health Care Providers Groups								χ^2	MC p
		Nurses N=56		Physicians N=16		Technicians N=7		Auxiliaries N=5			
		No.	%	No.	%	No.	%	No.	%		
Personal Protective Equipment	Low (<60%	15	26.8	2	12.5	5	71.4	0	0.0	12.684	0.008*
	Moderate (60 - <80%)	34	60.7	7	43.8	2	28.6	0	0.0		
	High (≥80% +)	7	12.5	7	43.8	0	0.0	0	0.0		
Medical Equipment Cleaning	Low (<60%	26	46.4	10	62.5	3	42.9	1	20.0	15.328	0.006*
	Moderate (60 - <80%)	24	42.9	6	37.5	4	57.1	0	0.0		
	High (80% +)	6	10.7	0	0.0	0	0.0	4	80.0		
	Moderate (60 - <80%)	35	62.5	6	37.5	4	57.1	0	0.0		
	High (≥80% +)	11	19.6	3	18.8	0	0.0	0	0.0		
Droplet pathogens	Low (<60%	4	7.1	0	0.0	1	14.3	0	0.0	11.621	0.011*
	Moderate (60 - <80%)	15	26.8	11	68.8	4	57.1	0	0.0		
	High (≥80% +)	37	66.1	5	31.3	2	28.6	0	0.0		
Disposable of waste	Low (<60%	19	33.9	10	62.5	3	42.9	0	0.0	35.658	<0.001*
	Moderate (60 - <80%)	30	53.6	0	0.0	0	0.0	0	0.0		
	High (≥80% +)	7	12.5	6	37.5	4	57.1	5	100.0		
Safe management of linen	Low (<60%	53	94.6	0	0.0	0	0.0	2	40.0	11.978	0.005*
	Moderate (60 - <80%)	2	3.6	0	0.0	0	0.0	3	60.0		
	High (≥80% +)	1	1.8	0	0.0	0	0.0	0	0.0		
Overall Knowledge Level	Low (<60%	18	32.1	5	31.3	3	42.9	0	0.0	2.552	0.503
	Moderate (60 - <80%)	38	67.9	11	68.8	4	57.1	5	100.0		
	High (≥80% +)	0	0.0	0	0.0	0	0.0	0	0.0		

χ^2: **Chi square test** MC: **Monte Carlo**

p: p value for comparing between the two groups

*: Statistically significant at $p \leq 0.05$

P:Highly significant at o.oo1

Table 3 shows the distribution of Health Care Providers (HCP) according to their level of compliance with Standard Infection Control precautions activities. Regarding overall hand washing activities, it could be seen that 62% of nurses, 75% of physicians, 57.1% of technicians and 100% of auxiliaries rated poor in their level of compliance. In addition, 91.1% of nurses, 62.5% of physicians, 60% of technicians and 80% of auxiliaries poorly comply to hand disinfection practice. All 100% of physicians, technicians and auxiliaries and 44.6% of nurses poorly complied with wearing proper PPE. As for management of sharps, it could be seen that 62.5% of nurses, 56.5% of physicians, 100% of technicians and 60% of auxiliaries had good level of compliance. Regarding safe handling of contaminated equipment, 35.7 % of nurses had fair compliance, 56.3% of physicians complied poorly, while 57.1% of technicians and 60% of auxiliaries. In relation to respiratory hygiene/ cough etiquette, 50% of nurses, 100% of physicians, 57.7% of technicians and 100% of auxiliaries poorly adhere to it. As for overall compliance with SP, 57.1% of nurses, 60% of auxiliaries complied fairly while 87.5% of physicians and 100% of technicians complied poorly to the overall SP.

Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1686-1699), Month: May - August 2019, Available at: www.noveltyjournals.com

Table (3): Distribution of all Health care providers at Damanhour Fever Hospital according to their level of compliance with standard infection control precautions activities

Level of compliance with SP activities	Nurses		Physicians		Technicians		Auxiliaries	
	No.	%	No.	%	No.	%	No.	%
Overall Hand washing activities								
Good (>80%)	2	3.6	0	0.0	0	0.0	0	0.0
Fair (60%–)	19	33.9	4	25.0	3	42.9	0	0.0
Poor (<60%)	35	62.5	12	75.0	4	57.1	5	100.0
Hand disinfection								
Good (>80%)	5	8.9	6	37.5	2	40.0	1	20.0
Fair (60%–)	0	0.0	0	0.0	0	0.0	0	0.0
Poor (<60%)	51	91.1	10	62.5	3	60.0	4	80.0
Personal Protective Equipment (PPE)								
Good (>80%)	13	23.2	0	0.0	0	0.0	0	0.0
Fair (60%–)	18	32.1	0	0.0	0	0.0	0	0.0
Poor (<60%)	25	44.6	16	100.0	7	100.0	5	100.0
Management of sharps								
Good (>80%)	35	62.5	9	56.3	7	100.0	3	60.0
Fair (60%–)	15	26.8	5	31.3	0	0.0	1	20.0
Poor (<60%)	6	10.7	2	12.5	0	0.0	1	20.0
Safe handling of contaminated equipment								
Good (>80%)	19	33.9	2	12.5	4	57.1	5	100.0
Fair (60%–)	20	35.7	5	31.3	0	0.0	0	0.0
Poor (<60%)	17	30.4	9	56.3	3	42.8	0	0.0
Respiratory hygiene /cough etiquette								
Good (>80%)	18	32.1	0	0.0	3	42.9	0	0.0
Fair (60%–)	10	17.9	0	0.0	0	0.0	0	0.0
Poor (<60%)	28	50.0	16	100.0	4	57.7	5	100.0
Overall Compliance with SP								
Good (>80%)	4	7.1	0	0.0	0	0.0	1	20.0
Fair (60%–)	32	57.1	2	12.5	0	0.0	3	60.0
Poor (<60%)	20	35.7	14	87.5	7	100.0	1	20.0

Table 4 shows that there were **positive significant correlations** found between overall compliance with standard infection control precautions and nurses, physicians and technicians' level of knowledge where p= 0.046, 0.002 and 0.039 respectively.

Table (4): Correlation between Health Care Providers' knowledge of and compliance with standard infection control precautions at Damanhour Fever Hospital for each group.

Compliance with standard infection control precautions		Overall Knowledge about standard infection control precautions			
		Nurse	Physician	Technician	Auxiliary
Overall compliance	R	0.268	0.715	0.778	0.814
	P	0.046*	0.002*	0.039*	0.093

r: Pearson coefficient

*: Statistically significant at $p \leq 0.05$

Level of r : 0.00-0.39: "weak"

0.40-0.59: "moderate"

0.60-1.0: "strong"

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1686-1699), Month: May - August 2019, Available at: www.noveltyjournals.com

4. DISCUSSION

Standard Precautions (SP) are basic level of infection control precautions in the care of all patients meant to reduce the risk of transmission of blood-borne and other pathogens from both recognized and unrecognized sources. Standard Precautions are recommended for the care delivery to all patients, regardless of their presumed infection state. Advent of infection has serious implication on the health care providers' and their patients' health and quality of life. Therefore, standard precautions are important in all health care setting (Adebayo et al., 2015).

The crucial goal for compliance with standard precautions is to protect health care providers' and others from infections. So, compliance and enforcement of SP would lead to reduction of infection in healthcare setting, even when the source of infection is not known (Ismail, 2005; VAz et al., 2010). The knowledge, attitude, and compliance with SP across various setting around the world have various outcome and across the professional groups. Higher proportion is likely to have the knowledge with decreasing number practicing the same (Christiane et al., 2004).

The current study revealed that all HCPs have moderate level of knowledge about SP with no statistical significance difference. Compliance with SP encompass: compliance with hand hygiene, use of personal protective equipment such as (gloves, gowns, masks), safe injection practices, decontamination of reusable medical equipment, decontamination of the environment, respiratory hygiene/cough etiquette, management of laundry, management of waste, and management of spillages of blood and body fluids (Standard Precautions, n.d., 2009; Adly et al., 2014).

Regarding nurses' knowledge about Standard Precautions (SP) almost ranged from moderate and low level of knowledge. They had moderate level of knowledge in relation to personal protective equipment, respiratory hygiene/cough etiquette, blood-borne diseases, contact pathogens, and disposable of waste. While their low level of knowledge was related to hand hygiene, safe injection practices, medical equipment cleaning, respiratory hygiene/cough etiquette, and safe management of linen. In relation to physicians' knowledge of SP majority of them had low level of knowledge related to hand hygiene, safe injection practices, medical equipment cleaning, respiratory hygiene/cough etiquette, contact pathogens, and disposable of waste. For technicians' knowledge of SP majority of them had moderate level of knowledge related to medical equipment cleaning, respiratory hygiene/cough etiquette, blood-borne pathogens, air pathogens, contact pathogens, and droplet pathogens. As well as, majority of auxiliaries had high level of knowledge related to standard precautions general information, medical equipment cleaning, and disposable of waste.

This may be attributed to length of time between educational programs of infection control. These programs include superficial knowledge about Standard Precautions (SP) and lack of interest of HCPs. This is in the same line with Vaz et al., (2010) who concluded that there was adequate knowledge and a fair level of awareness among medical doctors, medical technologists, and nurses towards universal precautions. Ismail (2005) reported that nurses and physicians' knowledge related to blood-borne infections was considered acceptable compared to auxiliary personnel who had less knowledge. The current findings contradicted with those of Atalla (2016) who reported that the majority of nursing students experienced lack of knowledge regarding universal precautions of infection control, Al-Mahdali (2015) reported low level of knowledge of HCW about SP, and Chan et al., (2002) revealed that the nurses' knowledge of universal precautions was inadequate.

Regarding HCPs's compliance with Standards Infection Control precautions as for hand hygiene, Mohamed (2016) emphasized that effective hand hygiene can reduce nosocomial infection by 50%. The present study revealed that the majority of all HCPs did not comply with hand washing before gloving, before direct contact with each patient, and hand disinfection with alcohol. This may be due to lack of supervision and awareness about the importance of proper technique for hand washing. This results in lack of hand washing habits especially before procedures for all HCPs. Load of work due to shortage of nurses and physicians, fear of skin irritation that may result from frequent hand washing and from rubbing hands with alcohol as it causes dryness of skin, water cuts most of the time in the hospital. Lack of availability of hand washing sinks, there is only one sink in each unit for hand washing and it is in the nursing station, which need time to transport to, after each procedure. Hand washing supplies namely: soap, iodine and paper towel. In addition, alcohol and other disinfectants are received on daily basis in the beginning of morning shift. Therefore, most of them used in morning shift and little amounts stay for evening shift. Lack of supervision most of the time especially infection control team makes round only in morning shift, did not make round frequently and lack of policy that determine fixed punishment for non-compliance with fixed procedures by all HCPs.

These findings are in the same line with Gad (2009) who stated that nurses never decontaminate their hands either with antimicrobial soap or an alcohol-based hand disinfect before starting the dialysis. Also, El Shenawi (2002) reported that none of the nurses in hospitals washed their hands at the beginning of the shift, before every procedure even invasive procedure ,and between the different procedures carried out for the same patient or different patients. As well as, Arenas et al. (2005) reported that a low overall adherence of healthcare workers to recommended hand-washing practices.

On the contrary, nurses, physicians, and technicians complied to hand washing after contact with patient, every procedure done for the same patient, and after touching blood, body fluids, secretions or mucous. This was attributed to protect self rather than compliance with hand washing as the hospital received highly contagious diseases. This result is in the same line with Ismail (2007) mentioned that majority of physicians complied with hand washing after patient's contact.

Regarding HCPs' compliance with Standards Infection Control precautions in which personal protective equipment (PPE) is very important for infection control. Beside gloves they include face mask, eye goggles and gown/apron. These protective barriers reduce the risk of Health care providers' exposure to blood and other body fluids. The current study revealed that the majority of HCPs did not comply with PPE. This may be attributed to negligence attitude, lack of supervision of infection control team especially in the evening shift, and unavailability of supplies almost all of the time. This results supported by Mohamed (2014) who mentioned that only one-fifth of study subjects complied with gloving, wearing masks, eye goggles and gowns. Also, Gad (2009) stated that none of the studied nurses wore sterile gown, masks , goggles or face shield. This study results contradicted by Eskander et al., (2013) they revealed that more than half of their study subjects had satisfactory performance towards personal protective equipment. As well as, Mohamed (2016) mentioned that majority of her studied nurses were adequately using protective measures.

In relation to management of sharps, the present study showed that the majority of HCPs complied with it. This may be attributed to availability of puncture resistant containers in the hospital, HCPs awareness of the danger of needle-stick injuries from infection control team as they concern it because of previously injured and infected cases especially between nurses and auxiliaries. This result is supported by Ahmed (2007) who mentioned that nurses disposed sharps and needles in puncture disposal resistant containers and contradicted by Mohamed (2014) cited that the mean percentage of nurses' knowledge about dealing with needles & sharps was poor. Simultaneously, only about one-half of them were completely compliant with sharps management guidelines. These compliant nurses did not recap or bend the used needles. They were also disposing the used needles into sharp box.

Regarding safe handling of contaminated equipment, the current study found that nurses, technicians, and auxiliaries complied with good level. But unfortunately, physicians did not comply with it. As complying include all single use medical equipment is not reused, all reusable medical equipment is cleaned reprocessed appropriately prior to use on another patient, and wear appropriate personal protective equipment when handling and reprocessing contaminated patient equipment. This may be due to limited tasks required from technicians and auxiliaries. Also, close supervision of staff nurses on auxiliaries while dealing with equipment. For nurses, multi-duties required from them keep them from complying properly. Also, single use equipment are not available all the time with needed quantities. But for physicians they do not care about equipment. In this respect, Gad (2009) reported that care of non-disposable equipment was not carried out after hemodialysis procedures.

As regards to compliance with respiratory hygiene/cough etiquette by covering mouth and nose when coughing or sneezing and for nurses added provide surgical masks and non-touch disposal bins for patient's or visitor's use. In the present study, it has been observed that majority of nurses, physicians, and technicians did not comply with it. However, auxiliaries are the only group which complied. This may be due to negligence behavior among the majority of HCPs. Also, HCPs provide patient care most of the time so they are afraid to touch their nose with hands or gloves even though a tissue is found. As well as, for visitors there is not enough masks available to cover relatives and bins not available. In this line, Abdel-Salam (2016) mentioned that nurses' compliance with respiratory hygiene/cough etiquette was unsatisfactory as only one fourth of nurses complied with wearing surgical masks when they were supposed to do, while one fourth of nurses neglected to instruct symptomatic persons to cover mouth/nose when sneezing/coughing.

For overall compliance of all HCPs, nurses and auxiliary personnel had fair compliance with standard infection control precautions. But, physicians and technicians had poor compliance. This may be due to attendance of infection control and quality teams' lectures as their focus group are on nurses and auxiliaries. But, physicians and technicians do not attend

lectures in the studied hospital. In this respect, Mohamed (2016) mentioned that inadequate compliance with universal infection control precautions detected in her study, Ogoina et al., (2015) concluded poor compliance with standard precautions of infection control among HCPs in Nigeria. Also, Al-Mahdali (2015) concluded low rate of compliance of HCPs with SP. In addition to Gad (2009) who revealed that nurses had unsatisfactory performance scores regarding the application of infection control precautions. As well as, Shimokura et al., (2006) reported that nurses' adherence to standard infection control measures was poor. Ismail (2007) mentioned that HCPs compliance with universal infection control precautions was low in general. In contrast, Yanai et al (2006) stated that nearly 90% of hemodialysis nurses reported compliance with each procedure recommended by Center for Disease Control and prevention (CDC) in United States. Also, Labrague et al., (2012) reported that vast majority of students have high compliance with standard precautions.

The present study showed a significant positive correlation between nurses, physicians, and technicians knowledge and compliance with Standard Precautions. This is in the same line with Stein et al., (2003) and Scoular et al., (2000) who found that HCPs compliance with universal precautions is related to their knowledge. Also, the present study showed that there was no significant correlation found between auxiliaries knowledge and compliance with Standard Precautions. This in line with Labrague et al., (2012) who reported that no significant association between knowledge and compliance with standard precautions.

5. CONCLUSION AND RECOMMENDATIONS

The present study concluded that the majority of nurses, physicians, technicians, and auxiliaries have moderate level of knowledge about SP. Also, nurses and auxiliaries have fair overall level of compliance with SP activities. Whereas, physicians and technicians have poor overall level of compliance. There were statistical significant correlations between nurses, physicians, and technicians level of knowledge and their level of compliance with SP. As well as, there was a weak negative statistical significant correlation between nurses' compliance with SP and factors affect their compliance.

Based on the findings of the present study, the following recommendations are suggested.

The findings of the study imply that there is a need for;

Hospital Administration

- Arrange and conduct a training program for all health care providers from infection control committee on how to comply with Standard Precautions to protect themselves and others at Damanhour fever hospital.
- Motivate complying HCPs in different health care units and supporting patient care units such as laboratory, radiation, nutrition and laundry.
- Provide sufficient facilities and equipment required for applying standard infection control precautions in both morning and evening shifts equally.

First line nurse manager

- Keep written guidelines in the hospital and units policies related to standard infection control precautions accessible to all HCPs all the time.
- Utilize illustrated posters to remind HCPs how to comply with SP.

REFERENCES

[1] Abdel-Salam S. (2016). Nurses' compliance with Standard Precautions In Intensive Care Units. Unpublished Master thesis. Faculty of Nursing: Alexandria University.

[2] Abdulmalik S. (2004). Effect of Implementing Standard Guidelines on Prevention of Central Venous Catheter Related Infection among Critically Ill Patients. Unpublished Master thesis. Faculty of nursing: Alexandria University.

[3] Adebayo, O., Labiran, A., & Imarhiagbe, L. (2015). Standard Precautions in clinical practices: A review. *Int. J. Health Sci. Res*, *5*, 521-528.

[4] Adly, R. M., Amin, F. M., & Abd El Aziz, M. A. (2014). Improving nurses' compliance with standard precautions of infection control in pediatric critical care units. *World J Nurs Sci*, *3*, 1-9.

[5] Ahmed A. (2004). Infection Control Measures For Patients Under Going Upper Gastrointestinal Endoscopy. Unpublished Master thesis. Faculty of nursing: Alexandria University.

[6] Ahmed A. (2007). Assessment of nursing care provided for children undergoing Haemodialysis. Unpublished Master Thesis. Faculty of Nursing. Alexandria University.

[7] Al-Mahdali, G. (2015). A Literature Review of HealthCare Workers Compliance to, and Knowledge of Standard/Universal Precautions. MOJ Public Health, 2(5), 1-12.

[8] Arenas, M. D., Sánchez-Payá, J., Barril, G., García-Valdecasas, J., Gorriz, J. L., Soriano, A., ... & Espinosa, M. (2005). A multicentric survey of the practice of hand hygiene in haemodialysis units: factors affecting compliance. *Nephrology Dialysis Transplantation*, *20*(6), 1164-1171.

[9] Askarian M, Yadollahi M, Kuochak F, et al. Precautions for health care workers to avoid hepatitis B and C virus infection. The international journal of occupational and environmental medicine 2011; 2(4):191-8.

[10] Atalla, H. R., Aboalizm, S. E., & Shaban, H. A. (2016). Effect of nursing guidelines compliance to infection control among nursing student. J Nurs Health Sci, 5(1), 23-34.

[11] Bledsoe, B. E., Sweeney, R. J., Berkeley, R. P., Cole, K. T., Forred, W. J., & Johnson, L. D. (2014). EMS provider compliance with infection control recommendations is suboptimal. *Prehospital Emergency Care*, *18*(2), 290-294.

[12] Castledine, G., & Close, A. (Eds.). (2007). *Oxford handbook of general and adult nursing*. Oxford University Press.

[13] Chan, R., Molassiotis, A., Eunice, C., Virene, C., Becky, H., Chit-Ying, L., ... & Ivy, Y. (2002). Nurses' knowledge of and compliance with universal precautions in an acute care hospital. International journal of nursing studies, 39(2), 157-163.

[14] Christian, M. D., Poutanen, S. M., Loutfy, M. R., Muller, M. P., & Low, D. E. (2004). Severe acute respiratory syndrome. *Clinical infectious diseases*, *38*(10), 1420-1427.

[15] Craven, R. F., & Hirnle, C. J. (1992). *Fundamentals of nursing: human health and function*. C. Henshaw (Ed.). Lippincott.

[16] Efstathiou, G., Papastavrou, E., Raftopoulos, V., & Merkouris, A. (2011). Factors influencing nurses' compliance with Standard Precautions in order to avoid occupational exposure to microorganisms: A focus group study. *BMC nursing*, *10*(1), 1.

[17] El Shenawi SH. (2002). Establishing standards for prevention and control of nasocomial infection in ICUs at Alexandria Main University Hospital. Unpublished Master Thesis. Faculty of Nursing. Alexandria University.

[18] Eskander, H. G., Morsy, W. Y., & Elfeky, H. A. (2013). Intensive care nurses knowledge & practices regarding infection control standard precautions at a selected Egyptian Cancer Hospital. prevention, 4(19), 160-174.

[19] Gad G. Nurses' Application of Infection Control Precautions In Hemodialysis Unit at El-Mansoura University Childern's Hospital. Unpublished Master Thesis. Faculty of Nursing: Alexandria University; 2009.

[20] Ghosh, T. (2013). Occupational health and hazards among health care workers. International Journal of Occupational Safety and Health, 3(1), 1-4.

[21] Hessels, A. J., & Larson, E. L. (2016). Relationship between patient safety climate and standard precaution adherence: a systematic review of the literature. Journal of Hospital Infection, 92(4), 349-362.

[22] Ismail A. (2005). Compliance with universal infection control precautions among health care personnel in critical care units. Unpublished Master Thesis. Alexandria University. Faculty of Nursing.

[23] Labrague, L. J., Rosales, R. A., & Tizon, M. M. (2012). Knowledge of and compliance with standard precautions among student nurses. *International journal of advanced nursing studies*, *1*(2), 84-97.

[24] Luo, Y., He, G. P., Zhou, J. W., & Luo, Y. (2010). Factors impacting compliance with standard precautions in nursing, China. *International Journal of Infectious Diseases*, *14*(12), e1106-e1114.

[25] Mahat, G., & Eller, L. S. (2009). HIV/AIDS and universal precautions: knowledge and attitudes of Nepalese nursing students. *Journal of advanced nursing*, *65*(9), 1907-1915.

[26] Ministry of Health. National Infection Control Guidelines. Egypt: Ministry of Health; 2016.14.

[27] Mohamed E. (2014). Nurses' Compliance with Infection Control Guidelines at Governmental Maternity Hospitals In Alexandria. Unpublished Master thesis. Faculty of nursing. Alexandria University.

[28] Mohamed H. (2016). Effect of Applying A Nursing Staff Development Programme On Infection Control Nursing Practices For Patients With Moderate Degree Burn. Unpublished Doctorate Dissertation. Faculty of Nursing. Alexandria University.

[29] Ogoina, D., Pondei, K., Adetunji, B., Chima, G., Isichei, C., & Gidado, S. (2015). Knowledge, attitude and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria. *Journal of infection prevention*, *16*(1), 16-22.

[30] Piai-Morais, T. H., Orlandi, F. D. S., & Figueiredo, R. M. D. (2015). Factors influencing adherence to standard precautions among nursing professionals in psychiatric hospitals. *Revista da Escola de Enfermagem da USP*, *49*(3), 473-480.

[31] Pratheeksha, R. (2010). A study to assess knowledge regarding standard precautions among neuronurses.

[32] Prüss-Üstün, A., Rapiti, E., & Hutin, Y. (2005). Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *American journal of industrial medicine*, *48*(6), 482-490.

[33] Pyrek, K. M. (2018). Product Evaluation and Purchasing Advice for Perioperative Nurses and Infection Preventionists *Education*. Retrieved from: https://www.infectioncontroltoday.com/best-practices-compliance/product-evaluation-and-purchasing-advice-perioperative-nurses-and

[34] RA, A., & El-Gohary, S. S. (2010). Universal Precautions: A Survey of Health Care Providers' Knowledge, Practice and Compliance in A Tertiary Care Hospital in Ismailia City. *Egyptian Journal of Occupational Medicine*, *34*(2), 183-200.

[35] Richmond, J. A., Dunning, T. L., & Desmond, P. V. (2007). Health professionals' attitudes toward caring for people with hepatitis C. *Journal of viral hepatitis*, *14*(9), 624-632.

[36] Rosenthal, V. D., Al-Abdely, H. M., El-Kholy, A. A., AlKhawaja, S. A. A., Leblebicioglu, H., Mehta, Y., ... & Salgado-Yepez, E. (2016). International Nosocomial Infection Control Consortium report, data summary of 50 countries for 2010-2015: Device-associated module. American journal of infection control, 44(12), 1495-1504.

[37] Rutala, W. A., & Weber, D. J. (2004). Disinfection and sterilization in health care facilities: what clinicians need to know. *Clinical infectious diseases*, *39*(5), 702-709.

[38] Sadoh, W. E., Fawole, A. O., Sadoh, A. E., Oladimeji, A. O., & Sotiloye, O. S. (2006). Practice of universal precautions among healthcare workers. Journal of the National *Medical Association*, *98(5)*, 722.

[39] Sayed Ahmed, S. M., Hassan, A., Abbas, S., Allah, A., & Shokry, E. (2008). Compliance with Universal Precautions Among Nurses and Laboratory Technicians in Mansoura International Specialized Hospital. *Egyptian Journal of Hospital Medicine*, *30*.

[40] Scoular, A., Watt, A. D., Watson, M., & Kelly, B. (2000). Knowledge and attitudes of hospital staff to occupational exposure to bloodborne viruses. *Strategies for the management of difficult to treat patients with tuberculosis*, *3*(4).

[41] Shimokura, G., Weber, D. J., Miller, W. C., Wurtzel, H., & Alter, M. J. (2006). Factors associated with personal protection equipment use and hand hygiene among hemodialysis staff. *American journal of infection control*, *34*(3), 100-107.

[42] Siegel, J. D., Rhinehart, E., Jackson, M., & Chiarello, L. (2007). 2007 Guideline for isolation precautions preventing transmission of infectious agents in healthcare settings. Available at https://www.cdc.gov/niosh/docket/archive/pdfs/NIOSH-219/0219-010107-siegel.pdf

[43] Standard Precautions. (n.d.) (2009). retrieved from: https://www.hpsc.ie/az/microbiologyantimicrobialresistance/infectioncontrolandhai/standardprecautions/File,3600,en.pdf. [Accessed in: Dec, 2018]

[44] Stein, A. D., Makarawo, T. P., & Ahmad, M. F. R. (2003). A survey of doctors' and nurses' knowledge, attitudes and compliance with infection control guidelines in Birmingham teaching hospitals. *Journal of hospital infection*, *54*(1), 68-73.

[45] Talaat, M., El-Shokry, M., El-Kholy, J., Ismail, G., Kotb, S., Hafez, S., ... & Lessa, F. C. (2016). National surveillance of health care–associated infections in Egypt: developing a sustainable program in a resource-limited country. *American journal of infection control*, 44(11), 1296-1301.

[46] Talaat, M., Kandeel, A., Rasslan, O., Hajjeh, R., Hallaj, Z., El-Sayed, N., & Mahoney, F. J. (2006). Evolution of infection control in Egypt: achievements and challenges. *American journal of infection control*, *34*(4), 193-200.

[47] Vaz, K., McGrowder, D., Alexander-Lindo, R., Gordon, L., Brown, P., & Irving, R. (2010). Knowledge, awareness and compliance with universal precautions among health care workers at the University Hospital of the West Indies, Jamaica. *Int J Occup Environ Med (The IJOEM)*, *1*(4 October).

[48] Wasiak, J., Cleland, H., Campbell, F., & Spinks, A. (2013). Dressings for superficial and partial thickness burns. *Cochrane Database of Systematic Reviews*, (3).

[49] Wilburn, S. Q., & Eijkemans, G. (2004). Preventing needlestick injuries among healthcare workers: a WHO-ICN collaboration. *International journal of occupational and environmental health*, *10*(4), 451-456.

[50] Wilson, J. (2006). *Infection control in clinical practice*. Elsevier Health Sciences.

[51] World Health Organization (WHO). (2006). Infection control standard precautions in health care. *Health-care facility recommendations for standard precautions. [Internet]. Geneva, Switzerland: World Health Organization*. Available at: https://www.who.int/csr/resources/publications/4EPR_AM2.pdf

[52] World Health Organization (WHO). (2010). *Infection prevention and control in health care: time for collaborative action* (No. EM/RC57/R. 6). Available at http://applications.emro.who.int/docs/EM_RC57_6_en.pdf

[53] Yanai, M., Uehara, Y., & Takahashi, S. (2006). Surveillance of infection control procedures in dialysis units in Japan: a preliminary study. *Therapeutic Apheresis and Dialysis*, *10*(1), 78-86.