

An-Najah National University
Faculty of Graduate Studies

**Knowledge, Attitudes, and Adherence to Methicillin-
Resistant *Staphylococcus aureus* Transmission
Prevention Among Health Care Workers**

By

Lina Odeh Hanna Herimat

Supervisor

Dr. Adham Abu-Taha

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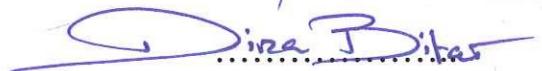
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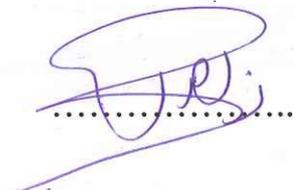
- Dr. Adham Abu-Taha / Supervisor

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- Dr. Dina Bitar / External Examiner

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- Dr. Zaher Nazzal / Internal Examiner

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III

Dedication

To the memory of my father *Odeh Herimat*:

For instilling in me a love of learning.

To my mother *Salwa Handal*:

For her endless love, generosity, and support and for carrying not only her own hardships, but mine as well to pave the way for me to succeed over the years.

To my love *Ayman Saadeh*:

For his unending encouragement and continued support of science.

To my children *Toleen* and *Azmi*:

For their sweet faces and innocent laughter.

To my cousin *Ramzi Handal*:

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To my cousin *Nader Herimat*:

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Many thanks with deep appreciation to you all for brightening my way with your love.

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الإقرار

أنا الموقعة أدناه مقدمة الرسالة التي تحمل العنوان:

Knowledge, Attitudes, and Adherence to Methicillin-Resistant *Staphylococcus aureus* Transmission Prevention Among Health Care Workers

أقر بأن ما اشتملت عليه الرسالة إنما هو نتاج جهد شخصي، باستثناء ما تمت الإشارة إليه أينما ورد، وأن هذه الرسالة ككل أو كجزء منها لم يقدم من قبل لنيل أي درجة أو بحث علمي أو بحثي لدى أية مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's name:

إسم الطالبة: لينا عود حنا مرام

Signature:

التوقيع: Lina

Date:

التاريخ: ٢٠١٦ / ١٢ / ١٨

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List of Abbreviations

Abbreviations	Explanation
AST	Active Surveillance Testing
AMR	Antimicrobial Resistance
CDC	Centers for Disease Control and Prevention
HBM	Health Belief Model
HCWs	Healthcare workers
HH	Hand Hygiene
ICU	Intensive Care Unit
KAP	Knowledge, attitudes and practice
MRSA	Methicillin Resistant <i>Staphylococcus aureus</i>
MOH	Ministry of Health
PCR	Polymorphism Cycle Reaction
SP	Standard Precautions
WHO	World Health Organization
UHWI	University Hospital of the West Indies
UK	United Kingdom
USA	United States of America

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Abstract

Introduction:

Nosocomial Infections are acquired infections in a patient or any healthcare worker after provision of health services for other conditions in a healthcare setting. The Methicillin Resistant *Staphylococcus aureus* (MRSA) infection is a serious nosocomial infection which is preventable. The main objective of the study is to assess knowledge, attitudes and practices of health care workers (HCW's) in West Bank governmental-hospitals toward prevention strategies for MRSA.

Methodology:

A prospective, cross-sectional study was conducted in all thirteen governmental hospitals in the West Bank targeting 331 HCW's randomly selected to fill the self-administrated questionnaires. Data were analyzed by SPSS version 19.

Results:

With a response rate of 94.57%, it is clear that participants have poor knowledge level with regard to MRSA, in general, but have good awareness of MRSA prevention, in particular. With regard to standard

precautions HCWs indicate poor adherence to MRSA infection controls. Differences were identified between HCWs self-reporting and co-worker reporting on standard precautions (gloving: 58.6% vs. 26.1%, gowning: 36% vs. 16.6%, hand hygiene before touching patients: 55.4% vs. 19.4%, hand hygiene after touching patients: 78% vs 29.7%, and overall aspects: 26.1% vs 9.4%). Among 62.8% HCWs surveyed, percentages were low for perceiving MRSA as a global problem, and only 55.2% are aware of the risk of infection in the workplace. Their perceived cues to action were low, where 32.6% of HCWs reported receiving meaningful education about MRSA and approximately 24% of them had personal experience that affected their attitudes towards MRSA.

Conclusion:

There remains a clear need for continuing education programs on nosocomial infections for HCWs across all specialties to promote awareness and encourage adherence towards reducing nosocomial infections in general and MRSA infection in particular.

Chapter One

Introduction

1.1 Background

Infectious Diseases can spread from one person to another through direct or indirect contact ⁽¹⁾. According to WHO and the CDC, despite the achievements in controlling the spread of diseases, there are still estimated millions of new cases of infectious diseases that occur worldwide leading to death ⁽²⁾.

Healthcare settings, despite their role in treating and curing the ill, they might be places for catching and spreading infectious diseases. Nosocomial infections are acquired infections in a patient or any healthcare worker after provision of health services for other conditions in a healthcare setting. Under WHO supervision, a survey conducted showed that the prevalence of nosocomial infections was 8.7% in 4 different regions; Europe, Eastern Mediterranean, South-East Asia and Western Pacific. Annually, these results in a significant burden from life-years lost to hospitalization to productivity losses worldwide. Hospitals have the highest frequencies of nosocomial infections in a healthcare setting, which is shown by the average of 9.6% infection cases in hospitals worldwide ⁽²⁾. Nosocomial infections are defined as those infections that are recorded after 48 hours of hospitalization, upon 3 days after discharge, or within 30 days following an operation ⁽³⁾.

Not only can the setting put a person at risk for transmission of infectious disease, but also a person's behavior in terms of self-treatment of illness can also put them at risk. There are years of scored success in the use of antibiotics in treatment of infectious disease through the prescription of useful antibiotics under truly needed circumstances by physicians. However, patients using non-prescribed drugs, incomplete administration of the full course of prescribed drugs, and sharing prescription antibiotics with others lead to the emergence of Antibiotic-Resistant Infectious Diseases where antibiotics are no longer effective in treating pathogenic microorganisms; this results in Antimicrobial Resistance ⁽⁴⁾. According to a WHO report (2014), antibiotic resistance is a current global problem that puts at risk effective treatment of common infections. The report states that Antimicrobial Resistance (AMR) "results in reduced efficacy of antibacterial, antiparasitic, antiviral and antifungal drugs, making the treatment of patients difficult, costly, or even impossible. The impact on particularly vulnerable patients is most obvious, resulting in prolonged illness and increased mortality ⁽⁵⁾. One of the main reasons for Antibiotic-Resistant is the existence of genetic mutations in bacteria that can form resistance enzymes that render the antibiotics ineffective ⁽⁶⁾.

One of the types of bacteria that have become antibiotic resistant is *S. aureus*. It is gram-positive cocci that create a positive result on coagulase testing. Around one third of the human population are long-term *S. aureus* carriers as a commensal organism that resides on human skin and mucous membranes, while in some it can cause a variety of complicated infectious

diseases ^(7,8). Infected tissue leads to various different types of infections including furuncles and carbuncles, scalded skin syndrome, folliculitis, osteomyelitis, septic arthritis, pneumonia, endocarditis, toxic shock syndrome, thrombophlebitis, and bloodstream infections ⁽⁹⁻¹⁶⁾.

The most significant mode of transmission of *S. aureus* commonly through direct contact (person-to-person), or indirect contact (person-to-contaminated things) according to the CDC ⁽¹⁷⁾. Airborne transmission is controversial, however, according to a study conducted in 1978 reported that in burn wound infections airborne spread usually plays a role ⁽¹⁸⁾.

The first antibiotic that was discovered to resist *S. aureus* was penicillin, followed by Methicillin, both members of a wide-range class of antibiotics consisting of Beta-lactam ring in their molecular structure. However, *S. aureus* quickly developed multi-resistance to these antibiotics, creating a Methicillin-resistant *Staphylococcus aureus* (MRSA) infection ⁽¹⁹⁾.

Generally, two out of every hundred people are carriers of MRSA, according to the CDC ⁽²⁰⁾.

In keeping with WHO report (2014), high frequent MRSA infection reported among Latin America, West African countries, and Europe by range of 44%, 40% and 38%, respectively ⁽²⁾. For those carrying MRSA, some of the first symptoms can be small red swollen bumps that are like pimples, boils or insect bites which are painful and warm to the touch and full of pus that coincide with a fever. The MRSA infection can burrow deep into affected body organs converting into life-threatening infections

such as pneumonia, thrombophlebitis, and bloodstream infections ^(20,21), the last of which accounts for around 50% of the incidence of mortality related to MRSA ⁽²²⁾.

Despite MRSA's severe effects; it is relatively simple to protect people in healthcare settings by adhering to a number of basic Core Prevention Strategies described by the CDC ⁽²³⁾:

- I.* The practice of hand hygiene protocol is an essential cornerstone in prevention of pathogenic microorganisms transmission in health care settings, including the use of either hand washing; "with plain or antimicrobial soap and water" or "alcohol-based hand rubs" an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to inactivate microorganisms and/or temporarily suppress their growth" ⁽²⁴⁾. Where alcohol-based hand rubs proved more effective in killing germs ^(24,25)

According to WHO, every healthcare worker has to implement "The 5 Moments" for hand hygiene to ensure reducing nosocomial infection ⁽²⁶⁾:

- ❖ Before touching a patient.
- ❖ Before clean and aseptic procedures.
- ❖ After contact with body fluids.
- ❖ After touching a patient.
- ❖ After touching patient surroundings.

2. Application Contact Precautions: to care for patients one should use single-use gloves and gown removed and discarded after use. Also, for patient care equipment, sterilization after diagnoses for each patient is a must, whether or not the resident has MRSA infections.

For MRSA colonized patients, a single room should be utilized. The use of masks and eye or face protection is not necessary, despite the existence of controversy about the possibility of airborne MRSA transmission. However, face protection should be used in cases of scatter, splashes or sprays of blood and body fluids and dealing with patients with weak immune system.

3. Determination of previously colonized patients: detecting epidemiologically significant MRSA cases is considered critical criteria in controlling MRSA transmission in a timely fashion.
4. Conducting the MRSA detection test and reporting results quickly: conducting screening of asymptomatic patients and suspected use of oxacillin sensitivity testing will help in rapidly taking preventive decisions.
5. Awareness Raising: it is important to target healthcare workers on a regular basis through MRSA infection prevention education and promotion programs, as well as targeting residents, family and visitors using posters.
6. Implementation of Device and Procedure-Associated Prevention Measures has a major impact were ventilator, central line, and catheter contaminated with MRSA are associated with the

development of various diseases such as pneumonia, bloodstream, and urinary tract infections. In addition, surgical site MRSA infection is common; study done in 2003 points out that MRSA infection is significantly higher in the surgical site than those in outpatients (27).

However, successful mutual strategies for protection from MRSA infection have been used, according to the CDC's Supplemental Prevention Strategies as follows⁽²³⁾:

1. Implementation of Active Surveillance Testing (AST); clinical culture results used, in fact, cost less compared to the PCR technique. However, clinical culture is more time consuming. Overall, screening by a specialist is required, but preferably there would also be regular screenings, especially for those who are in ICU units and patients with weak immune systems.
2. Decolonization treatment for MRSA Carriers: eliminate colonization reducing MRSA infection complications, as well as preventing the spread of infection.
3. Universal utilization of Chlorhexidine Bathing among most vulnerable Patients: to be used specifically in the ICU. Although its impact is not clear on MRSA prevention, it has significantly decreased bloodstream infections.

1.2 Problem statement

Healthcare workers' encounter with patients, expose both to the transmission of infections, increasing MRSA as one of the main hospital-

acquired infections, which makes it an important public health concern ^(28 - 32).

MRSA infection is a preventable disease that presents a global challenge due to its resistance for multi-antibiotics, which makes standard precautions the most vital and effective choice in prevention transmission of MRSA infection in the healthcare setting. In such places, all of the staff, from specialist physicians to sanitation workers have major responsibility in controlling infection. Knowledge is the key of concern, which needs positive attitudes in order to support practice as well as the availability of support in adherence to applicable standard precautions.

However, worldwide, many studies have been conducted to measure MRSA carriage among HCWs p. 5% of HCWs in the US were MRSA carriers ⁽³³⁾. Similar rates were recorded in the European countries such as the UK, Serbia and Portugal ⁽³³⁻³⁵⁾. Higher rates of MRSA carriage were recorded in the developing countries; 27.4% were reported in Africa ⁽³⁶⁻³⁹⁾. On the other hand, variable rates of MRSA carriage among HCWs were reported in the Middle East ranging from 5.3% in Iran to 76% in Saudi Arabia ⁽⁴⁰⁻⁴⁵⁾.

In Palestine 19.4% of HCWs were identified as MRSA carriers ⁽⁴⁶⁾.

And it has been documented that there is little awareness about the knowledge, attitudes and practice regarding MRSA prevention and precautions taken considering it as a serious infectious disease ⁽⁴⁶⁾. This study aimed to get information on HCWs in governmental hospitals based in the West Bank in order to shed light on the reasons causing the gap in

the application of prevention precaution strategies that lead to HCWs carrying MRSA.

1.3 Significance of the study

Methicillin-resistant *Staphylococcus aureus* is a frequently silent disease causing serious infection, and is resistant to various antibiotics, increasing morbidity and mortality in the community in addition to financial burden in health systems. In Palestine, a study conducted in Gaza strip found that the genus *Staphylococcus* was the highest percentage of bacteria isolated in both public and private hospitals (29, 45.3%)⁽⁴⁷⁾. On the other hand, 19.4% of MRSA carriers were identified among healthcare workers⁽⁴⁶⁾.

This study will be conducted to determine HCWs' knowledge, attitudes and adherence to the prevention guidelines in controlling MRSA infections. The results of epidemiological data collected of this study will help in education and promotion programs aimed at reducing MRSA infections in healthcare settings. MRSA is an important infection to control, which will be beneficial to the workers themselves, their patients, and the government by reducing the economic burden.

1.4 Objective

1.4.1 Main Objective

The main objective of the study is to assess knowledge, attitude and practice of HCWs in West Bank governmental- hospitals toward prevention strategies for Methicillin Resistant *Staphylococcus aureus* (MRSA).

1.4.2 Specific Objectives

1. To assess knowledge of HCWs in governmental hospitals in the West Bank regarding the prevention guidelines for Methicillin Resistant *Staphylococcus aureus* (MRSA).
2. To assess attitudes of HCWs in governmental hospitals in the West Bank regarding the prevention guidelines for Methicillin Resistant *Staphylococcus aureus* (MRSA).
3. To assess practice of HCWs in governmental hospitals in the West Bank regarding the prevention guidelines for Methicillin Resistant *Staphylococcus aureus* (MRSA).
4. To review policies and environmental practices of the Palestinian Ministry of Health in decreasing Methicillin Resistant *Staphylococcus aureus* (MRSA) infections in healthcare settings.

Chapter Two

Literature Review

2.1 Knowledge Regarding MRSA Infection

"If you have knowledge, let others light their candles in it"

Margaret Fuller

The first global healthcare-associated infection control campaign was undertaken by WHO in 2005, and was called "Clean Care is Safer Care". It was launched in order to raise health-care workers' and senior managers' awareness regarding preventable nosocomial infection, where hand hygiene plays a critical role in avoidable infection transmission ⁽²⁴⁾.

Several studies have been conducted with respect to awareness of and commitment to standard precautions such as hand hygiene, which is ultimately involved in healthcare-associated infection prevention ⁽²⁴⁾.

An Iranian study in 2005 pointed out that 65.5% of Iranian HCWs were aware of guidelines, and nurses had the highest scores ⁽⁴⁸⁾.

A study was conducted among HCWs in a Nepalese hospital in 2008, showed a good knowledge score and positive attitude towards most aspects of infection control despite the fact that only 50% of HCWs had heard of MRSA⁽⁴⁹⁾.

Generally, in relation to MRSA awareness among Indian physicians at the UHWI was high compared to their poor knowledge regarding multidrug-resistant organisms ⁽⁵⁰⁾.

In Nigeria, only half of the participants among the medical cadre's work of the University of Ilorin Teaching Hospitals were aware of MRSA, which was significantly associated with their age and years of work, where 63.1% reported that their knowledge was gained through hospital rounds. Unfortunately, only 60.6% considered MRSA as a serious disease threat to health ⁽⁵¹⁾.

A Brazilian study found that 43.7% of the nurses admit their lack of knowledge of the evolution of the MRSA infection ⁽⁵²⁾.

In developed countries, knowledge differs between HCWs. In UK, in 2006 a study found that 67% of employees of the UK National Health Service had awareness of 100% regarding MRSA; general media was the most common source of this knowledge ⁽⁵³⁾. However, inadequate awareness and skills regarding MRSA was pointed out in another study ⁽⁵⁴⁾. Two years later, by using a novel questionnaire, a significant difference in the level of knowledge in 293 participants of HCWs regarding awareness about MRSA was reported, where doctors scored the highest scores ⁽⁵⁵⁾.

In the Netherlands, there is a gap between knowledge of and belief toward MRSA protocols and ability of healthcare workers to apply protocol in hospitals ⁽⁵⁶⁾. A similar problem was reported in a study among Portuguese HCWs where a significant gap in awareness appeared among doctors more than nurses ⁽⁵⁷⁾. Another study pointed out the need for ongoing education about MRSA that targets healthcare staff, followed by an evaluation program of the application of practice ability in order to overcome the cognitive deficits which affected adherence to protocols ⁽⁵⁸⁾.

In a mixed-method study, high knowledge regarding MRSA infection was reported among American HCWs in Inova Fair Oaks Hospital (97.8%). Nevertheless, HCWs awareness about the use of alcohol rubs as the most effective in killing germs and MRSA's viability were low; 33.8% and 40.9% respectively ⁽⁵⁹⁾.

Another mix study of qualitative and quantitative methods were used to assess the knowledge and practice related to prevention of MRSA infections among medical staff in Khartoum state hospitals in Sudan.

Very poor responses regarding a full understanding of MRSA was reported, in addition, only 7.3% gave correct answers and 17% were unsure if MRSA was a bacterial or viral infection. Among healthcare workers, nurses reported the lowest awareness about MRSA ⁽⁶⁰⁾.

Based on a cross-sectional study conducted targeting HCWs in Alexandria University hospitals in Egypt, 67.3% of participants had awareness of MRSA control guidelines, where nurses significantly scored the highest by 91.5% ⁽⁶¹⁾.

In a Palestinian study aimed to assess nursing team awareness's of standard precaution, a high score (70%) was reported among 30% of participants ⁽⁶²⁾.

2.2 Attitudes Regarding MRSA Infection

There are few studies that have touched upon the subject of HCWs beliefs among those who had targeted knowledge and practice of standard precautions.

In a Brazil nursing team, 21.7% did not consider MRSA infection to constitute a danger as a nosocomial disease. However, 62.7% of nurses

admitted that MRSA infection causes severe complications, and even mortality cases ⁽⁵²⁾. Unfortunately, 87.9% of Nigerian HCWs believe that there is no way to control MRSA ⁽⁵¹⁾.

In relation to Portuguese HCWs, a study found positive attitudes toward transmission prevention, but this was not translated into practice. According to their beliefs there is a need to reinforce practices to reach global health system goals ⁽⁵⁷⁾.

At French University Hospital, a study was conducted to assess how well hospital staff members perceive MRSA risks, both for themselves and for others. The study concluded that HCWs had a very higher perception of MRSA risks and its effects on themselves in the workplace than its effects on others. This is likely a causative factor for less control over MRSA than staff members. However, the MRSA risk was believed less serious and more manageable than most of the nosocomial infections ⁽⁶³⁾.

2.3 Practice regarding Preventive Precautions

“Standard precautions are the basic level of infection control precautions which are to be used, as a minimum, in the care of all patients.” WHO (2014)

Over the years, the importance of hand hygiene practice has increased worldwide as the major essential, vital, and cost-effective protective method in standard precaution steps to preventing nosocomial infectious diseases ⁽²⁾.

After the launching of the 2005 global patient care campaign, WHO produced a report in 2009 entitled "WHO Guidelines on Hand Hygiene in Health Care", which was a review of observational studies that had been

conducted on the topic of hand hygiene and its relation to prevention of healthcare-associated infection. Although the studies reviewed varied in methods used to measure adherence to hand hygiene among healthcare facilities, and differed in definition of hand hygiene applied strategies, the report concluded that "HCWs cleaned their hands on average from 5 to as many as 42 times per shift" although "the number of opportunities for hand hygiene depends largely on the process of care provided" ⁽²⁴⁾. However, there is still insufficient application observed in many healthcare facilities. Based on WHO guidelines to compliance on hand hygiene, an Australian "hand hygiene (HH) culture-change" program was conducted over two years among HCWs in 521 national hospitals. Results reported a significant rise in rates of adequate hand hygiene from 43.6% at baseline to 67.8%. However, adherence to HH before making contact with the patient was less by 10%-15% from after making contact. The nursing team reported more compliance than other staff. In addition, results reported a decrease in the rate of incidences of MRSA after implementation of the program ⁽⁶⁴⁾.

Several recent international studies were conducted to determine global healthcare workers' adherence to "The 5 Moments Hand Hygiene". The results presented varying proportions of compliance with hygienic hand, some of which was poor.

A Spanish study conducted in 2012 targeted HCWs in eleven primary healthcare centers, and found that only 8.1% of overall HCWs were adhering to hand hygiene as a baseline. However, an interventional

program had a significant effect on raising their commitment to hand hygiene by 21.6% comparable with control participants ⁽⁶⁵⁾.

According to a study that was conducted among Thai HCWs found a gap between direct observation of adherence to all the "5 Moments Hand Hygiene" and HCW self-admitted adherence. 23.2% of HCW participants were found to adhere to adequate hand hygiene practice when observed by an external authority, while 82.4% documented adequate hand hygiene when assessing themselves ⁽⁶⁶⁾.

Another study in which a hand hygiene education program was done, and followed by a UV light assessment of HCWs' hands in Singapore. The study found that nurses had the highest adherence among medical staff, which reported 77% alone. Meanwhile, all health staff recorded an average of 72%. Female staff performed better than male staff. Overall, the study found that the education program was effective ⁽⁶⁷⁾.

A study aimed to measure HCWs' commitment to the hand hygiene implementation advancement in United States of America health care facilities. It was found that there was a variance between advanced and intermediate levels in adherence to the WHO multimodal hand hygiene strategy at 48.9% and 45.0%, respectively. In the meantime, significant association was shown in facilities where infection preventions staff was present ⁽⁶⁸⁾.

A study conducted in 2014 found that there were no more than 7.4 % of participants that carried out all 5 WHO steps of hand washing ⁽⁶⁹⁾.

A study that was done in the northern part of Palestine reported that adherence to hygienic hand wash among a Palestinian nursing team working in northern West Bank hospitals was an average of around 71%. In general, high compliance was reported to standard precaution. This study, in contrast to the proposed study, was limited to practices of nurses in the northern West Bank, whereas the proposed study will target all HCWs in governmental hospitals in the entire West Bank, and will focus on prevention of transmission of MRSA infection specifically ⁽⁶²⁾.

The most recent WHO campaign was implemented in 2014 in Geneva, and called "SAVE LIVES: Clean Your Hands". This global annual campaign continues to emphasize to HCWs the importance of implementing "The 5 Moments" in preventing the outbreak of drug-resistant germ infections ⁽⁷⁰⁾.

"There is clear scientific evidence that good hand hygiene by health workers reduces healthcare-associated infections caused by resistant germs, in particular by MRSA," says Professor Benedetta Allegranzi, technical lead of the WHO "Clean Care is Safer Care" program and of the activities planned for Hand Hygiene Day.

Many studies targeted the application of precaution strategies, in particular for prevention of MRSA infection in healthcare settings, most focus on hand hygiene as a primary precaution. A Brazilian study found that for precaution strategies 81.1% of the nurses recorded used either contact or standard precautions. In general, 90% of HCWs emphasized hygiene hand washing regardless of the patients ⁽⁵²⁾.

A study in 2013 showed differences in the outcome of overall adherence to prevention of MRSA transmission in each different method used, between self-reported and authority-observed, which were 84.4% and 65.4%, respectively. The difference in hand hygiene was the highest by 18.4% in multi-methods for participants ⁽⁵⁹⁾.

In Dutch hospitals, poor infrastructure and conflict prevention weaken the health system and limit its ability to prevent MRSA infection ⁽⁵⁶⁾.

Hand washing as an effective control measure for prevention against MRSA infection is the most followed practice among HCWs in Khartoum, at 41.3% ⁽⁶⁰⁾.

In Israel, a mixed retrospective and prospective study was conducted with the aim of assessing the adherence of HCWs to guidelines for active MRSA surveillance. A poor compliance level was reported. Significant differences were present among hand hygiene and contact precautions, in which nurses performed better than doctors ⁽⁷¹⁾.

2.4 Conceptual Framework

Adherence to standard precautions among HCWs in healthcare settings is law which influenced by many factors in addition to knowledge. The conceptual framework in the present study was derived from Health belief model (HBM) for understanding participants' perceptions in relation to MRSA prevention strategies. In 1950's, psychologists working in the United State Public Health Services presented HBM for the first time to explain why medical screening programs were not fully effective. At first, only four perceptions were developed to explain individual health behavior:

perceived severity; an individual's perception about the seriousness of a disease and its consequence, perceived susceptibility; an individual's perception of probability of disease, perceived benefits; an individual's perception of adopted healthy behavior in decreasing the risk of disease, and perceived barriers; an individual's perception of obstacles in adopted a healthy behavior. Later, two variables were added to the original model: cues to action; the stimulus needed to individuals to change health behavior, and self-efficacy; individual's own ability to achieve something (72-74).

Chapter Three

Methodology

3.1 Study Design and Setting

A prospective, cross-sectional study was conducted in all thirteen governmental hospitals in the West Bank to assess knowledge, attitudes and adherence of HCWs to guidelines aiming at reducing transmission of MRSA infections in these hospitals. Governmental hospitals are considered the main hospitals in Palestine where the majority of inhabitants receive their needed health care.

3.2 Study Population and Sample Size Calculation

Information regarding HCWs working at the governmental hospitals was obtained from the Palestine Ministry of Health based on the last report of 2015. The study population is estimated to be 2824 HCWs from all health-related professions ⁽⁷⁵⁾. A sample size of 339 was calculated using Raosoft sample size calculator with a 5% margin of error, 95% Confidence level, and 50% expected proportion of HCW's lack knowledge, attitudes and compliance related to prevention of MRSA infections ⁽⁷⁶⁾.

Physicians (Specialist and General), Nurses, Midwives, Pharmacists, and Medical Technical Professionals, working at the governmental hospitals were included, Table (1). All other employees of these hospitals who were not directly involved in providing health care to patients were excluded.

Table (2) describes the distribution of HCWs based on the geographical locations. Questionnaires were distributed based on the percentage of

HCWs in each area and divided among professions based on the number, percent of workers in each department and gender, Table (3).

Table (1): Distribution of HCWs based on Specialization

Governorate	Name of The Hospital	Physicians	Nurses	Midwives	Pharmacists	Medical Technical Professionals	Total No.
Jenin	Khalil Suliman	50	174	23	9	44	300
Tulkarm	Thabit Thabit	36	125	15	8	28	212
Nablus	Al Watani	11	85	----	9	19	124
	Rafidia	72	195	29	9	73	378
Qalqilia	Darwish Nazal	32	61	9	4	23	129
Salfit	Yasser Arafat	30	59	12	4	22	127
Tubas	Tubas Turkish Hospital	36	35	8	4	17	100
Total HCWs		267	734	96	47	226	1370
Northern Areas							
Jericho and Jordan valley	Jericho	36	65	10	3	27	141
Ramallah and Al Beira	Palestine Medical Complex	82	278	29	13	72	474
Total HCWs		118	343	39	16	99	615
Middle Areas							
Bethlehem	Al Hussein	60	150	9	9	37	265

(Beit Jala)							
Hebron	Alia	67	218	27	10	62	384
Hebron (Yatta)	Abu Al Hasan Al Kasem	30	49	8	3	17	107
Bethlehem	Psychiatric	7	72	----	1	3	83
Total HCWs		164	489	44	23	119	839
South Areas							
Total by Occupation		549	1566	179	86	444	2824
According to Raosoft sample size Calculator							339

Table (2):Geographical distribution of HCWs

Geographical location	Number of HCWs	Percent	No. of questionnaires
North	1370	48.5	165
Middle	615	21.8	74
South	839	29.7	101
Total	2824	100	340

Table (3): Distribution of questionnaires to HCWs based on Specialization

Governorate	Name of The Hospital	Physicians	Nurses	Midwives	Pharmacists	Medical Technical Professionals	Total No.
Jenin	Khalil Suliman	16.6%	58%	7.6%	3%	14.6%	21.9%
	No. of Questionnaires	6	21	3	1	5	36
Tulkarm	Thabit Thabit	16.9%	58.9%	7%	3.7%	13.2%	15.4%
	No. of Questionnaires	4	15	2	1	3	25
Nablus	Al Watani	8.8%	68.5%	--	7.2%	15.3%	9%
	No. of Questionnaires	1.3	10.2	--	1	2.3	15
	Rafidia	19%	51.6%	7.7%	2.4%	19.3%	27.6%
	No. of Questionnaires	9	24	4	1	9	46
Qalqilia	Darwish Nazal	24.8%	47	7%	3.1%	17.8%	9.4%
	No. of Questionnaires	4	7	1	1	3	16
Salfit	Yasser Arafat	23.6%	46.5%	9.4%	3.1%	17.3%	9.3%
	No. of Questionnaires	4	7	1	1	3	15
Tubas	Tubas Turkish Hospital	36%	35	8%	45	17%	7.3%
	No. of Questionnaires	4	4	1	1	2	12
Northern hospitals							167
Jericho and Jordan valley	Jericho	25.5%	46.1%	7.1%	2.1%	19.1%	22.9%
	No. of Questionnaires	4	8	1	1	3	17
Ramallah and Al Beira	Palestine Medical Complex	17.3%	58.6%	6.1%	2.7%	15.2%	77.1%
	No. of Questionnaires	10	34	4	2	9	57

Middle hospitals							76
Bethlehem (Beit Jala)	Al Hussein	22.6%	56.6%	3.4%	3.4%	14%	31.6%
	No. of Questionnaires	7	18	1	1	5	32
Hebron	Alia	17.4%	56.8%	7%	2.6%	16.1%	45.8%
	No. of Questionnaires	8	26	3	1	8	46
Hebron (Yatta)	Abu Al Hasan Al Kasem	28%	45.8%	7.5%	2.8%	15.9%	12.8%
	No. of Questionnaires	4	6	1	1	2	13
Bethlehem	Psychiatric	8.4%	86.7%	--	1.2%	3.6%	9.9%
	No. of Questionnaires	1	9	--	1	1	10
Southern hospitals							104
Total No. of questionnaires distributed among governmental hospitals							347

NOTE: All the fractions rounded into an integer number where difference appears between the total distributed questionnaires.

3.3 Data Collection Tool

- ✓ Specific objectives 1, 2, and 3 achieved through using an anonymous, self-reported questionnaire developed based on a review of literature which aimed to evaluate Healthcare Workers' knowledge, attitudes and practice to MRSA preventive strategies ^(56,60), **Annex (A)**.

The questionnaire was comprised of four sections:

- ❖ **Section one:** socio-demographic information; age, gender, marital status, place of residence, years of graduation, specialization, location of work place, and years of experience and the part related to their health status.
- ❖ **Section two;** knowledge domain was assessed by using 12 questions including (MRSA: brevity, information sources, mode of transmission, prevention strategies, survival outside the body, infection cases at the workplace, and existence of standard precaution).
- ❖ **Section three;** HCWs' attitudes were measured by 17 questions including beliefs toward the importance of prevention strategies and the development of complications of MRSA infection. According to researchers' results utilizing Health Belief Model used as the most effective in assessing health perceptions ⁽⁷²⁻⁷⁴⁾. Table (4).

Table (4):* Applicable Health belief model questions to measure Healthcare workers' attitudes

Perceptions	Definition	Applicable Questions (17 Qs)
Perceived Susceptibility	HCWs' perception of probability of getting MRSA infection	<ul style="list-style-type: none"> • <i>MRSA is a problem in this hospital.</i>
Perceived Severity	HCWs' perception about the seriousness of MRSA infection and its consequence	<ul style="list-style-type: none"> • <i>MRSA infection is a global health problem.</i> • <i>I am concerned that I will transmit MRSA to my family and/or friends at home.</i> • <i>MRSA infection is a serious disease that could be fatal.</i> • <i>MRSA infection can cause blood infection.</i> • <i>MRSA infection can cause pneumonia in lungs.</i>
Perceived Benefits	HCWs' perception of adopted prevention behavior in decreasing the risk of MRSA infection	<ul style="list-style-type: none"> • <i>If I clean my hands and wear gowns and gloves as recommended, I will decrease my patients' risk of getting MRSA.</i> • <i>If I clean my hands and wear gowns and gloves as recommended, I will decrease my risk of getting MRSA.</i>
Perceived Barriers	HCWs' perception of obstacles in adopted a prevention behavior to decreasing the risk of MRSA infection	<ul style="list-style-type: none"> • <i>Nosocomial Infectious disease is not a problem in this hospital.</i> • <i>As a healthcare worker, I do not have the time to clean my hands or put on gloves and gowns.</i> • <i>Alcohol-rub and/or soap-water based hand hygiene materials are not easily available.</i> • <i>Environmental cleanliness in this hospital and over-crowding of patients make MRSA infection uncontrolled.</i>
		<ul style="list-style-type: none"> • <i>I am comfortable with</i>

Self-Efficacy	HCWs own ability to do something	<p><i>educating patients and their families about MRSA.</i></p> <ul style="list-style-type: none"> • <i>When staff on this unit do not gown and glove before touching a patient with MRSA, I feel comfortable reminding them.</i> • <i>When staff on this unit(s) do not clean their hands, I feel comfortable reminding them.</i>
Cues to Action	The stimulus needed to HCWs to change health behavior	<ul style="list-style-type: none"> • <i>I have received meaningful education regarding MRSA.</i> • <i>Someone I know had MRSA and the experience influenced my attitude towards MRSA.</i>
* Adopted from Seibert D., AMJ Infect control, 2014. ⁽⁵⁹⁾		

❖ **Section four;** HCW's were asked about isolation practices taken by hospitals, in addition to self-reporting and co-workers reported adherence to prevention strategies; wearing gloves, wearing gowns, and hand hygiene before and after dealing with MRSA infected/colonized patients.

✓ Specific objective number 4 achieved by reviewing the infection control policy of the MOH and that of each hospital.

3.4 Development of the Questionnaire

The questionnaire was prepared based on previous literature ^(59,60). The questionnaire was translated from English to Arabic. Two translators whose native language is Arabic and can speak English were asked to translate the English questionnaire into Arabic and review the two copies. This is because the HCWs' language is Arabic.

Subsequently, a pilot - study was conducted using 40 self-reported questionnaires; they were randomly distributed at Rafidya hospital based on HCW's specialization; 28 nurses, 9 physician, 3 midwives, 1 pharmacist, and 7 professional medical technicians, in order to identify problems within realization questions, and test appropriateness of time to fill the questionnaires. After that, certain questions were modified to make them more understandable to serve the objectives of the study where validation of the questionnaire was ensured.

The internal consistency of the questionnaire was tested by measuring the Cronbach's alpha values for the three sets of questions in the questionnaire and gave the following values: 0.71, 0.76, and 0.74 for knowledge, attitudes and practice respectively.

3.5 Study Variables

Independent Variables:

- ❖ *Demographic information:* Age (continuous), gender (nominal; male or female), occupation type (nominal), location of work (nominal), marital status (nominal; married, single, divorced, or widowed), place of residence (nominal; refugee camp, village, or city), graduation years (nominal), and years of experience (nominal).
- ❖ *Medical information:* suffer from chronic health problem and weakened immune system (nominal: yes, no, and don't know), personal experiences with over-the-counter antibiotic consumption (nominal: yes, no, and don't know), and times of over-the-counter

antibiotic consumption (ordinal: once, one to three times, more than three times, and I don't remember).

Dependent Variables:

- ❖ Variables relevant to knowledge, attitudes, and practice of prevention MRSA infection scores (categorical).

3.6 Scoring of Data

Questions used in scoring were chosen based on previous study ⁽⁵⁹⁾.

A. Knowledge section

Twelve questions were used to assess knowledge about MRSA, these were divided into two types of questions; six multiple choice and six likert scale (yes, no and don't know).

Six of these questions ;(questions no.: 3, 4, 5, 6, 7 and 8) were used to develop knowledge scores to determine practical and theoretical understanding of MRSA among HCW's. New variables were created for each question to identify the correct answers from the multiple choices and yes from the likert scale domain got a score of 1 and all other answers scored 0, where overall calculated scores range between (0-6). New variable was created based on the answers; calculated scores, to assessing the level of knowledge of each HCW's as the following definition: People who answered 0-1 out of 6 questions received very poor knowledge score, < 25% of right answers. People who answered 2-3 out of 6 questions received poor knowledge score, 25 – 50 % of right answers. People who answered 4 out of 6 questions received sufficient knowledge score, 50.1-

75% of right answers. People who answered 5-6 out of 6 questions received good knowledge score, >75% of right answers ⁽⁷⁷⁾.

The remaining six questions were summarized into frequencies and percentages.

B. Attitude section

17 likert scale items were classified as strongly agree, agree, don't know, disagree and strongly disagree were scored as 5, 4, 3, 2 and 1, respectively. Where "strongly agree" scored as 5 in 14- items. In questions 10, 11 and 12 "strongly disagree", in which barrier scale items are reverse-scored, scored as the highest. New variables were created for likert scale questions in order to identify belief scores, where calculated scores ranged between (0-13), while questions 1, 3, 4 and 5 were summarized into frequencies and percentages.

C. Adherence section

In determining compliance to MRSA infection prevention 9-items were used to measure adherence to prevention strategies. These questions were composed of 5 likert scale items classified as always, often, sometimes, rarely, and never were scored as 5, 4, 3, 2 and 1, respectively. In the case of practice 3 domains were measured separately; first: HCWs reported on hospital compliance in isolation of MRSA infected patients; (question no.: 1). Second: HCW's self-reported adherence to prevention strategies applied using 4- items; (questions no.: 2, 3, 4 and 5). Third: HCWs reported on compliance of colleagues to MRSA infection standard precautions applied

using 4- items; (questions no.: 6, 7, 8 and 9). New variables were created for 4 likert scale items, in which "always" scored as 1 for self-reported compliance on MRSA prevention, making the range of practice scores between (0-4).

- ✓ The practice of hand hygiene and application of contact precautions are considered as cornerstone procedures. Failure to apply both will be considered non-adherence to the prevention guidelines for reducing Methicillin-Resistant Staphylococcus aureus (MRSA) infections ⁽²³⁾.

3.7 Ethical and administrative Considerations

Permission from the scientific research committee of the Public Health Department and the faculty of graduate studies scientific research board at An-Najah National University as well as the Institutional Review Board followed by Palestinian Ministry of Health were obtained before performing the study.

Verbal consent of participants was obtained at the start of data collection.

3.8 Data Collection

Data was collected from all the thirteen governmental hospitals in the West Bank as shown in Figure (1). At each hospital, the visit began at the administration office followed by meeting with heads of departments where the self-administrated questionnaires were distributed based on the specified number of questionnaires for each hospital, taking into account

HCW's specialization and gender, Table (3). Data were collected during the month of April 2015.

3.9 Data Analysis

Data were entered and analyzed using The Statistical Package of Social Sciences (SPSS) version 19. Frequencies and percentages for each question in the questionnaire were calculated based on specialization.

For each of the three different aspects of questionnaire; knowledge, attitudes, and adherence, new variables separately were created to sum correct scores per participants. Normality of data was tested using Kolmogorov-Smirnov test. Continuous variables were presented as mean \pm standard deviation (SD) or median (Q1- Q3) based on normality of the data. Categorical variables were presented as frequencies and percentages. Group differences on ordinal measure were evaluated using the Mann-Whitney U or Kruskal- Wallis test. Logistic regression and correlation coefficient were used to assess the relationship between socio-demographic characteristic and each of the three aspects, in addition to test the associations between the three aspects with each other.

The significance level was set at $\alpha= 0.05$.

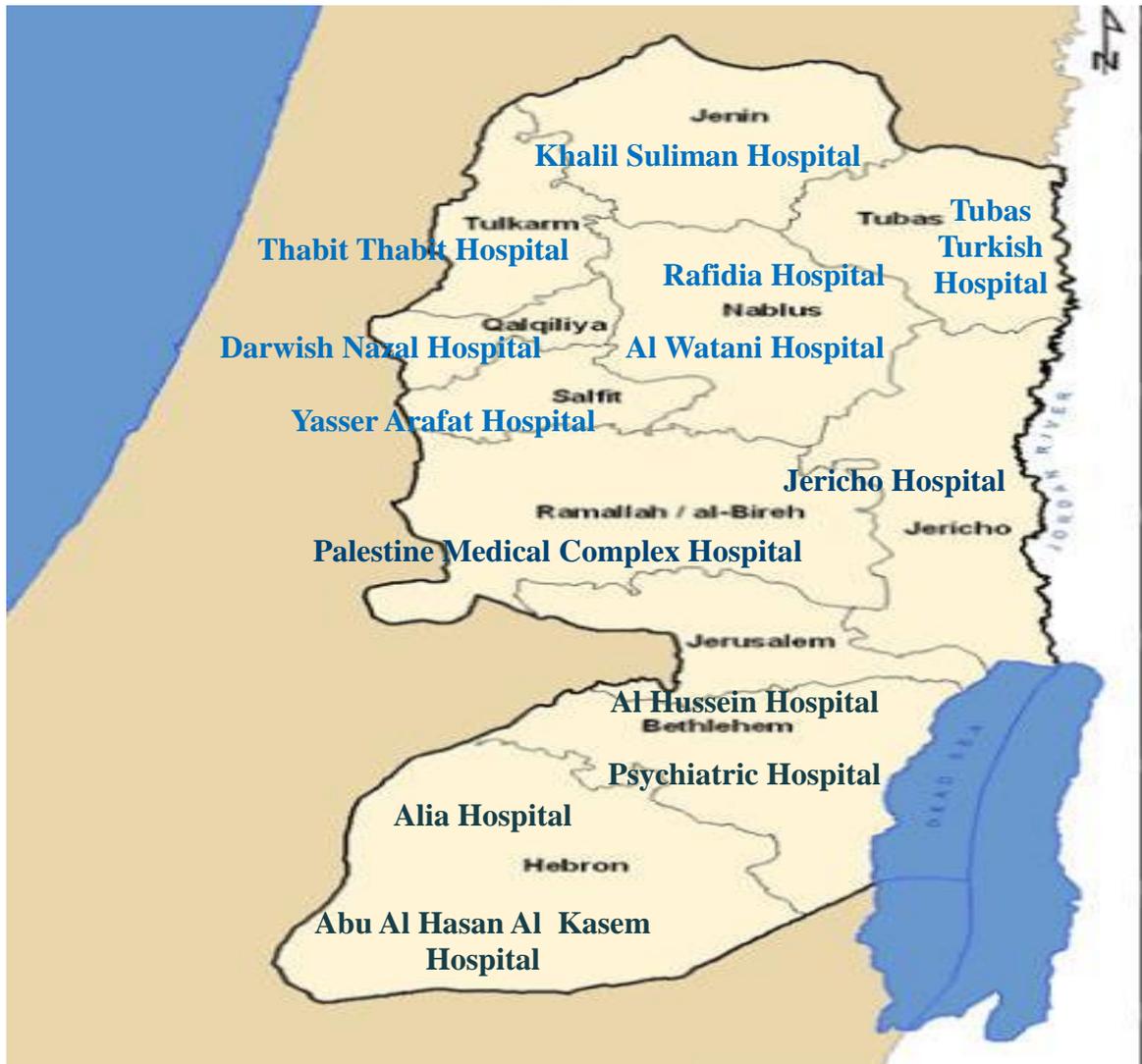


Figure (1): The Distribution of governmental hospitals in the West Bank

Chapter Four

Results

Three hundred fifty questionnaires were distributed to HCWs in all thirteen Palestinian governmental hospitals in the West Bank to assess their knowledge, attitudes and adherence to infection control guidelines to prevent MRSA transmission in their workplace. Three hundred thirty one responses were analyzed out of 342 participants. Eleven questionnaires were cancelled for non-conformity with the conditions (filled at least 3 parts out of four); giving a response rate of 94.57%.

4.1 Socio-demographic Data:

Table (5) describes the distribution of HCW's based on the location of these hospitals. The largest percentage (44.4%) of HCW's was in the north followed by south (32.0%) then the middle (23.6%). About half of the study population was nurses (54.07%), while the other half included the rest of healthcare professions: 19.9% physicians, 15.70% medical technical professionals, 6.04% midwives and 4.22% pharmacists. The highest number of HCWs was in Palestinian Medical Complex hospital (19.03%) and the lowest number of HCWs was in Tubas Turkish hospital (3.02%).

The socio-demographic characteristics of participants are described in Table (6). The age of the majority (49.8%) of HCWs was between (26 -36) years old. Two hundred and ten (63.4%) were males. A total of 236 (71.3%) were married and 136 (41.1%) lived in the city. One hundred and sixty three (49.2%) graduated between the years 2001 and 2010. The

highest percentage of participation was from hospitals of the northern part of the country (44.4%). The majority (40.2%) of the surveyed sample reported that their work experience was five years or less. The number of years of work experience for participants ranged from 0- 35 years (M= 9.38, SD= 7.62).

An overwhelming majority (99.7%) of the study population were healthy. One hundred (30.2%) used over-the-counter antibiotic. Half of them used over-the-counter antibiotic more than three times per year.

Table (5): Distribution of participants based on their specialization

	Geographic Distribution of Hospitals	Hospitals Name	Specialization of the Participants					Total
			physicians	Nurses	Midwives	Pharmacist	Medical Technical Professionals	
Work place of the participants	South	Alia Hospital	10	25	4	1	7	47
		Al Hussein Hospital	8	20	2	1	4	35
		Abu Al Hasan Al Kasem Hospital	4	5	0	2	2	13
		Psychiatric Hospital	1	8	0	1	1	11
	Middle	Palestinian Medical Complex	11	40	3	2	7	63
		Jericho Public Hospital	3	7	1	1	3	15
	North	Khalil Suliman Hospital	7	18	1	0	8	34
		Thabit Thabit Hospital	4	12	1	2	3	22
		Al Watani Hospital	1	7	0	1	3	12
		Rafidia Hospital	9	20	4	1	8	42
		Darwish Nazal Hospital	3	6	1	0	2	12
		Yasser Arafat Hospital	3	7	2	1	2	15
		Tubas Turkish Hospital	2	4	1	1	2	10
		Total	66 (19.93%)	179 (54.07%)	20 (6.04%)	14 (4.22%)	52 (15.70%)	331

Table (6): Socio-demographic Characteristics of the Survey Research Sample

Characteristics		Specializations of Participants					Total
		Physicians	Nurses	Midwives	Pharmacist	Medical Technical Professionals	
Age	18 - 25	4 6.1 %	42 23.5 %	10 50 %	0	5 9.6 %	61 18.4 %
	26 - 35	40 60.6 %	90 50.3 %	8 40 %	11 78.6 %	16 30.8 %	165 49.8 %
	36 - 45	17 25.8 %	35 19.6 %	1 5 %	3 21.4 %	24 46.2 %	80 24.2 %
	≥ 46	5 7.6 %	12 6.7 %	1 5 %	0	7 13.5 %	25 6.9 %
Total		66	179	20	14	52	331
Gender	Female	7 10.6 %	71 39.7 %	20 100 %	9 64.3 %	14 27 %	121 36.6 %
	Male	59 89.4 %	108 60.3 %	0	5 35.7 %	38 73 %	210 63.4 %
Total		66	179	20	14	52	331
Marital status	Single	19 28.8 %	41 22.9 %	3 15 %	2 14.3 %	6 11.5 %	71 21.5 %
	Married	40 60.6 %	126 70.4 %	16 80 %	12 85.7 %	42 80.8 %	236 71.3 %

	Divorced	7 10.6 %	12 6.7 %	1 5 %	0	4 7.7 %	24 7.3 %
Total		66	179	20	14	52	331
Place of Resident	City	35 53 %	66 36.9 %	5 25 %	10 71.4 %	20 38.5 %	136 41.1 %
	Town	17 25.6 %	42 23.5 %	9 45 %	3 21.4 %	11 21.2 %	82 24.8 %
	Village	13 19.7 %	52 29.1 %	6 30 %	1 7.1 %	20 38.5 %	92 27.8 %
	Refugee camp	1 1.5 %	19 10.6 %	0	0	1 1.9 %	21 6.3 %
Total		66	179	20	14	52	331
Graduation Year	≤ 1990	3 4.5 %	14 7.8 %	0	0	5 9.6 %	22 6.6 %
	1991 - 2000	12 18.2 %	31 17.3 %	2 10 %	4 28.6 %	20 38.5 %	69 20.8 %
	2001 - 2010	33 50 %	98 54.7 %	7 35 %	8 57.1 %	17 32.7 %	163 49.2 %
	≥ 2011	18 27.3 %	36 20.1 %	11 55 %	2 14.3 %	10 19.2 %	77 23.3 %
Total		66	179	20	14	52	331

Location of Work place	North	29 43.9 %	74 41.3 %	10 50 %	6 28.6 %	28 53.8 %	147 44.4%
	Middle	14 21.2 %	47 26.3 %	4 20 %	3 57.1 %	10 19.2 %	78 23.6%
	South	23 34.8 %	58 32.4 %	6 30 %	5 14.3 %	14 26.9 %	106 32%
Total		66	179	20	14	52	331
Number of Years of Experience							
Number of Years of Experience	≤ 5	35 53 %	67 37.4 %	13 65 %	4 28.6 %	14 26.9	133 40.2%
	6 - 10	17 25.8 %	49 27.3 %	4 20 %	5 35.7 %	11 21.2 %	86 26%
	11 – 15	9 13.6 %	27 18.1 %	1 5 %	2 14.3 %	9 17.3 %	48 14.5%
	16 – 20	2 3%	16 8.9 %	1 5 %	1 7.1 %	9 17.3 %	29 8.8%
	21 – 25	2 3 %	10 5.6 %	1 5 %	2 14.3 %	7 13.5 %	22 6.6%
	≥ 26	1 1.5 %	10 5.6 %	0	0	2 3.8 %	13 3.9%
Total		66	179	20	14	52	331

4.2 knowledge, attitudes and practice scores of participants according to HCW's specialization

4.2.1 Assessment of Knowledge

Statistical significance was identified among groups of HCWs regarding the knowledge of MRSA abbreviation ($p < 0.001$), as shown in Table (7) where physicians' scored the highest (84.8%).

Table (7): HCWs' knowledge of the MRSA brevity according to specialization

knowledge of HCWs for brevity of MRSA	Correct Response	Specialization of participants					Total	P Value
		physicians	Nurses	Midwives	Pharmacists	Medical Technical Professionals		
	Methicillin - resistant <i>Staphylococcus aureus</i>	56 (84.8%)	97 (54.2%)	5 (25%)	11 (78.6%)	32 (61.5%)	201 (60.7%)	< 0.001
	Total	66	179	20	14	52	331	

Chi square test was used; * P < 0.05, ** P < 0.001.

When participants were asked "How they obtained their information about MRSA", 37% reported scientific reports and posters as their main source of information, followed by mass media (12.7%), and undergraduate studies (11.8%). Only 4.6% reported their source of information as the educational programs offered by the Ministry of Health. In addition, 7.2% HCWs acknowledged having more than one source of the previously reported

sources. On the other hand, 27.5% of the study population never heard of MRSA Figure (2).

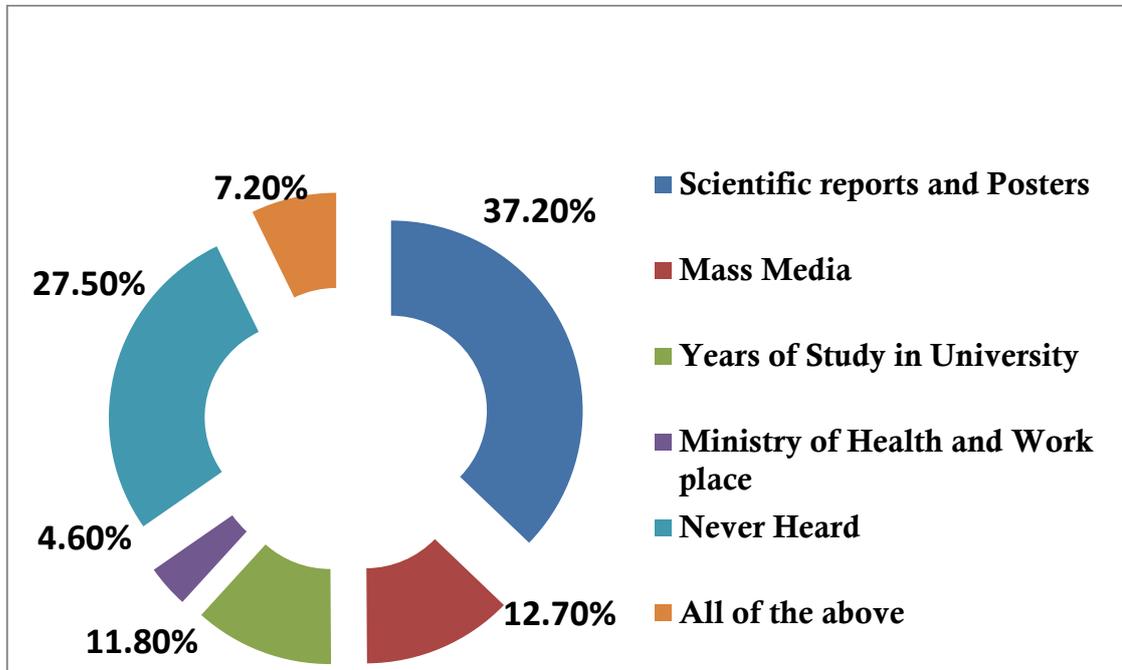


Figure (2): Sources of Information of HCW's about MRSA

Six questions were used to assess knowledge about the prevention measures of MRSA transmission; four multiple choice; (questions no.: 3, 4, 5, and 6) and two true/ false questions; (questions no.: 7 and 8). Each correct answer took a score of 1 otherwise got zero with a total knowledge score of 6 Table (8).

Out of the six knowledge questions, there were three questions that showed statistical significance among HCW's groups, question number 3, 7 and 8.

Question number 3 asked about the mode of transmission of MRSA, (Correct answer is through direct and indirect contact), ($p= 0.040$) .The pharmacists' knowledge score (50%) was higher than the physicians'

(40.9%) and medical technical professionals' (32.7%). The nurses' knowledge score (28.5%) was higher than midwives (10%).

Question number 7 asked whether asymptomatic MRSA carriers can spread infection to others (Correct answer is true), ($p= 0.017$). The pharmacist knowledge score (78.6%) was higher than the physicians' (71.2%). Only seven midwives (35%) answered correctly to get the least knowledge score among HCW's groups.

Question number 8 asked whether MRSA infection became a community-acquired infection (Correct answer is true), ($p= 0.000$). The pharmacists' knowledge score (57.1%) was higher than the physicians' (48.5%), medical technical professionals' (46.2%) and nurses' (25.1%). The knowledge score of midwives (15%) was the lowest.

No statistical significance in knowledge was registered in the remaining knowledge questions.

The question with the highest score was "Prevention of MRSA infection transmission includes which of the below Standard Precautions before contact with MRSA patients/any items in the patients' room" (Correct answer is All of the above; put on gowns, put on gloves and hand hygiene), ($n= 284$, 85.8% correct). Pharmacists were the only group which (100%) answered it correctly.

There was a great ignorance among all the groups regarding "The most effective hand hygiene technique in killing germs is/are" (Correct answer is Hand rub with alcohol), the overall score was 5.7%. Midwives scored for this question 10% while medical technical professionals' score was 2%,

nurses' score was 5%, pharmacists' score was 7% and physicians' score was 9.1%.

The overall scores for the question "How long can MRSA live outside the body on a surface?" (Correct answer is Days) was low, (n=61, 18.4%). The least knowledgeable group in this regard was midwives (5%).

There was a significant difference among HCW's groups regarding knowledge of taking antibiotics would increase the risk of MRSA infection ($p < 0.001$). Pharmacists scored (64.3%) the highest followed by physicians (60.6%), medical technical professionals (42.3%), nurses (30.7%) and midwives (10%).

Table (8): Knowledge of HCW's about the prevention measures of MRSA transmission

Correct Answers of Knowledge Question	physicians N= 66	Nurses N= 179	Midwives N= 20	Pharmacist N= 14	Medical Technical Professionals N= 52	Total N= 331	P- value
*MRSA infection spread: direct and indirect contact	27	51	2	7	17	104	*0.040
	40.9 %	28.5 %	10 %	50 %	32.7 %	31.4 %	
Prevention of MRSA Infection Transmission	55	153	18	14	44	284	0.556
	83.3 %	85.5 %	90 %	100%	84.6 %	85.8 %	
Alcohol Hand Hygiene as most effective prevent MRSA infection transmission	6	9	2	1	1	19	0.454
	9.1 %	5 %	10 %	7 %	2 %	5.7 %	
MRSA live for days on a surface outside the body	14	30	1	5	11	61	0.191
	21.2 %	16.8 %	5 %	35.7 %	21.2 %	18.4 %	
*Asymptomatic MRSA infected people can spread infection to others	47	99	7	11	30	194	*0.017
	71.2 %	55.3 %	35 %	78.6 %	57.7 %	58.6 %	
**MRSA infection becomes a community-acquired infection	32	45	3	8	24	112	**0.000
	48.5 %	25.1 %	15 %	57.1 %	46.2 %	33.8 %	
Note: Chi square test was used; * P < 0.05, ** P< 0.001.							

The percentage of HCW's who knew about cases of MRSA infection among patients and HCW's in their hospitals was low (4.5%) and (1.2%), respectively. No statistical significance was identified among groups.

One hundred and nine (32.9%) HCW's acknowledged the presence of written guidelines for Standard precautions in their workplaces, and 32.9% claimed that they did not have guidelines. While one hundred and thirteen (34.1%) HCW's were not aware of presence or absence of these guidelines.

Only two (0.6%) HCW's of the study sample correctly answered all the six knowledge questions, twelve (3.6%) correctly answered five questions, forty seven (14.2%) correctly answered four questions, ninety (27.2%) correctly answered three questions, seventy six (23%) correctly answered two questions, and ninety two (27.8%) correctly answered one questions. While twelve (3.6%) failed to have any correct answer Table (9).

Table (9): Percentage of HCWs who correctly answered the knowledge questions

Number of knowledge questions	6	5	4	3	2	1	0	Total
Number of HCW's who correctly answered	2 0.6%	12 3.6%	47 14.2%	90 27.2%	76 23%	92 27.8%	12 3.6%	331 100%

The most noticeable results are that One hundred and four (31.4%) had very poor knowledge level, < 25% of right answers. One hundred sixty six participants (50.2%) had poor knowledge level, 25 – 50 % of right answers. While forty seven participants (14.2%) had sufficient knowledge level, 50.1-75% of right answers and only fourteen participants (4.2%) had good knowledge level, >75% of right answers.

4.2.2 Assessment of Attitudes

Thirteen Likert Scale questions were used to assess HCW's attitudes for the prevention of MRSA transmission. Ten positive attitude questions; (questions no.: 2, 6, 7, 8, 9, 13, 14, 15, 16 and 17) and 3 negative attitude questions; (questions no.: 10, 11 and 12).

For the positive attitude questions, each one has a 5-point Likert scale answers (strongly disagree, disagree, uncertain, agree and strongly agree). The answers are scored from 1 (strongly disagree) to 5 (strongly agree). Points of each scale are summed to give a scale score. Higher scores indicate better attitudes in the concepts of the scale.

While for the three negative attitude questions each one has a 5-point Likert scale answers (strongly disagree, disagree, uncertain, agree and strongly agree). The answers are scored from 1 (strongly agree) to 5 (strongly disagree).

The majority HCW's believe that MRSA cause blood infection, pneumonia, and could be a fatal disease (59.8%, 61.0%, and 59.8%, respectively).

Two hundred eighteen participants (65.9%) considered nosocomial infections as a problem in their workplaces. In contrast, more than 20% of HCW's didn't know if nosocomial infections are problematic, 13.9% of participants did not acknowledge the presence of nosocomial infections.

Table (10) shows (agree and strongly agree) answers of the study sample for the ten positive attitude questions. Statistical significance was shown among HCW's group answering two questions; **First:** "MRSA infection is a global health problem" ($p= 0.007$), where 74.2% of physicians believed

that MRSA is a worldwide health problem while only 30% of midwives believed it. **Second:** "Previous experience with MRSA infection influenced my belief towards prevention of MRSA infection"(p= 0.009), All pharmacists (100%) had no experience in this matter.

More than 50% of all HCW's believed that they are at risk of catching MRSA in the hospital. Approximately two third of physicians and more than 50% of nurses, midwives, and medical technical professionals have acknowledged that they may transmit MRSA infection to their families and friends. On the other hand, only 42.9% of pharmacists were aware of the potential to transmit MRSA infections to others.

When asked about adherence to core prevention strategies, the majority of HCW's answered positively.

More than two thirds of HCW's acknowledged that they are responsible for educating patients and their families about the importance of MRSA infection prevention strategies. The majority of HCW's reported that they are responsible for reminding their co-workers to adhere to wearing gowns and gloves and performing hand hygiene.

Generally, Physicians had the highest attitudes score (48.5%) followed by nurses (26.3%), midwives (25%), and medical technical professionals (11.5%).

Table (10): The percentage of Positive Attitudes answers among HCW's of the study sample

Strongly Agree and Agree Answers of Positive Attitudes Question	Physicians N= 66	Nurses N= 179	Midwives N= 20	Pharmacist N= 14	Medical Technical Professionals N= 52	Total N= 331	P- value
MRSA infection is a global health problem	49	113	6	10	30	208	0.007**
	74.2 %	63.1 %	30 %	71.4 %	57.7 %	62.8 %	
As a healthcare worker, I am at high risk of catching MRSA in this hospital	34	100	11	7	30	182	0.955
	51.5 %	55.9 %	55 %	50 %	57.7 %	55.2 %	
As a healthcare worker, I am afraid that I will transmit MRSA infection to my family and my friends	43	107	11	6	30	197	0.604
	65.2%	59.8 %	55 %	42.9 %	57.7 %	32.3 %	
As a healthcare worker, I adhere to Core Prevention Strategies to protect myself	52	145	13	11	43	264	0.525
	78.8 %	81 %	65 %	78.6 %	82.7 %	79.8 %	

Strongly Agree and Agree Answers of Positive Attitudes Question	Physicians N= 66	Nurses N= 179	Midwives N= 20	Pharmacist N=14	Medical Technical Professionals N= 52	Total N=331	P-value
As a healthcare worker, I adhere to Core Prevention Strategies to protect my patients	56	148	15	9	40	268	0.339
	84.8 %	82.7 %	75 %	64.3 %	76.9 %	81 %	
As a healthcare worker, I am responsible for increasing the awareness of patients and their families about the importance of MRSA infection prevention strategies	50	128	13	10	35	236	0.838
	75.8 %	71.5 %	65 %	71.4 %	67.3 %	71.3 %	
As a member of the hospital staff , I am responsible for reminding my co-workers of the importance of adhering to wearing gloves and gowns	55	157	17	14	44	287	0.525
	83.3 %	87.7 %	85 %	100 %	84.6 %	86.7 %	

Strongly Agree and Agree Answers of Positive Attitudes Question	Physicians N= 66	Nurses N= 179	Midwives N= 20	Pharmacist N=14	Medical Technical Professionals N= 52	Total N=331	P-value
As a member of the hospital staff, I am responsible for reminding my co-workers of the importance of performing to hand hygiene	55	158	17	14	44	288	0.483
	83.3 %	88.3 %	85%	100 %	84.6%	87 %	
I have received meaningful education regarding MRSA	25	59	4	4	16	108	0.649
	37.9 %	33 %	20 %	28.6 %	30.8 %	32.6 %	
Previous experience with MRSA infection influenced my belief towards prevention of the infection	23	47	5	0	6	81	0.009*
	48.5%	26.3 %	25 %	0 %	11.5 %	24.5 %	
Note: Chi square test were used; * P < 0.05, **P<0.01.							

The percentage of disagree and strongly disagree answers among HCW's are described in Table (11). No statistical significance was identified regarding answers of negative attitudes questions. The majority (68.6%) of the sample population disagreed that the lack of time and lack of hand hygiene materials have an impact on the spread of MRSA infection. While only seventy three (22.1%) of HCW's disagreed that environmental cleanliness and over-crowdedness of patients in their workplace considered as barriers in MRSA transmission prevention.

Table (11): The percentage of Negative Attitude answers among HCW's of the study sample

Strongly Disagree and Disagree Answers of Negative Attitude Questions	physicians N= 66	Nurses N= 179	Midwives N= 20	Pharmacist N= 14	Medical Technical Professionals N= 52	Total N= 331	P-value
As a healthcare worker, I do not have the time to clean my hands or put on gloves and gowns	44	129	8	9	37	227	0.062
	66.7 %	72.1 %	40 %	64.3 %	71.2 %	68.6 %	
Alcohol-rub and/or soap-water based hand hygiene materials are not easily available	48	125	9	12	33	227	0.079
	72.7 %	69.8 %	45 %	85.7 %	63.5 %	68.6 %	
Environmental cleanliness in this hospital and over-crowding of patients make MRSA infection uncontrolled	16	37	1	5	14	73	0.199
	24.2 %	56.1 %	5 %	35.7 %	26.9 %	22.1 %	

Note: Chi Square test were used; * P < 0.05, **P<0.001

4.2.3 Assessment of Practice

HCW's were asked to fill this section of the questionnaire based on actual dealing with MRSA patients. Thus, participants were divided into two groups; adherent (N=222) and Non-adherent (N= 109) to strategies for prevention.

The statistical analysis of practice included two hundred twenty two (67.1%) HCW's of the participants: (74.2%) physicians, (69.3%) nurses, (45%) midwives, (42.9%) pharmacist and (65.4%) medical technical professionals.

Eight Likert Scale questions used to assess HCW's adherence to MRSA transmission prevention practices; (questions no.: 2, 3, 4, 5, 6, 7, 8 and 9). The answers are scored from 1 (never) to 5 (always). Points of each scale are summed to give a scale score. Higher scores indicate better adherence in the concepts of the scale.

Practice-portion divided into two parts: 1) HCW's self-reported practice strategies and 2) HCW's reported co-workers consistent adherence to the MRSA transmission prevention strategies. Four questions were used in each part.

1) HCW's self-reported adherence to MRSA prevention strategies

HCW's self-reported adherence to MRSA prevention strategies: wearing gloves, gowns, and hand hygiene before and after dealing with MRSA patients, was 36% in comparison to twenty six (11.7%) who said they did not practice these strategies.

No statistical significance reported among HCW's group and self-reporting about adherence to MRSA transmission prevention. HCW's reported higher adherence in performing hand hygiene after touching patients (78 %) than in wearing gloves (58.6 %) and performing hand hygiene before touching patients (55.4 %). The lowest self-reported adherence was consistently put on gowns when dealing with MRSA infected patients; it was (36%). Only 26.1% HCW's reported compliance to all practices, Table (12)

Table (12): HCW's self-reporting adherence to MRSA transmission prevention practices

Answers of Practice Question (Always)	physicians N= 49	Nurses N= 124	Midwives N= 9	Pharmacist N= 6	Medical Technical Professionals N= 34	Total N= 222	P-value
consistently put on gloves when dealing with MRSA infected patients	30	75	4	2	19	130	0.601
	61.2 %	60.5 %	44.4 %	33.3 %	55.9 %	58.6 %	
consistently put on gowns when dealing with MRSA infected patients	20	48	3	2	7	80	0.350
	40.8 %	38.7 %	33.3 %	33.3 %	20.6 %	36 %	
perform Hand Hygiene before touching patients	26	70	6	4	17	123	0.855
	53.1 %	56.5 %	66.7 %	66.7 %	50 %	55.4 %	
perform Hand Hygiene after touching patients	33	103	7	5	25	173	0.233
	67.3 %	83.1 %	77.8 %	83.3 %	73.5 %	78 %	
HCW's adherence to all practices	14	37	1	0	6	58	0.551
	28.5%	29.8%	11.1%	0%	17.6%	26.1%	

Note: Chi Square test were used; * P < 0.05, **P<0.001

2) Co-workers adherence to MRSA prevention strategies

HCW's reported that more than 60% of staff did not adhere to MRSA prevention strategies: wearing gloves, gowns, and hand hygiene before and after dealing with MRSA patients compared to only 9.5% of co-workers who consistently adhered to MRSA transmission prevention practices.

Table (13) describes HCW's groups reporting co-workers' consistent adherence to the MRSA transmission prevention strategies. HCW's reported co-workers practiced highest adherence in performing hand hygiene after touching patients (29.7 %) followed by wearing gloves (22.1 %), performing hand hygiene before touching patients (19.4 %), and wearing gowns (16.6 %). No statistical significance reported between HCWs' reporting co-workers group and consistent adherence to MRSA transmission prevention.

Table (13): Consistent adherence of co-workers to the MRSA transmission prevention strategies

Answers of Practice Question (Always)	physicians N= 49	Nurses N= 124	Midwives N= 9	Pharmacist N= 6	Medical Technical Professionals N= 34	Total N= 222	P-value
consistently put on gloves when dealing with MRSA infected patients	7	33	3	1	5	49	0.282
	14.2 %	26.6 %	33.3 %	16.7 %	14.7 %	22.1 %	
consistently put on gowns when dealing with MRSA infected patients	5	27	2	0	3	37	0.152
	10.2 %	21.8 %	22.2 %	0	8.8 %	16.6 %	
perform Hand Hygiene before touching patients	7	27	3	0	6	43	0.420
	14.3 %	21.8 %	33.3 %	0	17.6 %	19.4 %	
perform Hand Hygiene after touching patients	11	41	4	2	8	66	0.478
	22.4 %	33.1 %	44.4 %	33.3 %	23.5 %	29.7 %	
HCW's adherence to all practices	5	13	1	0	2	21	0.221
	10.2%	10.4%	11.1%	0	5.8%	9.4%	

Note: Chi Square test were used; * P < 0.05, **P<0.001

3) Hospitals' adherence to isolation of MRSA infected patients:

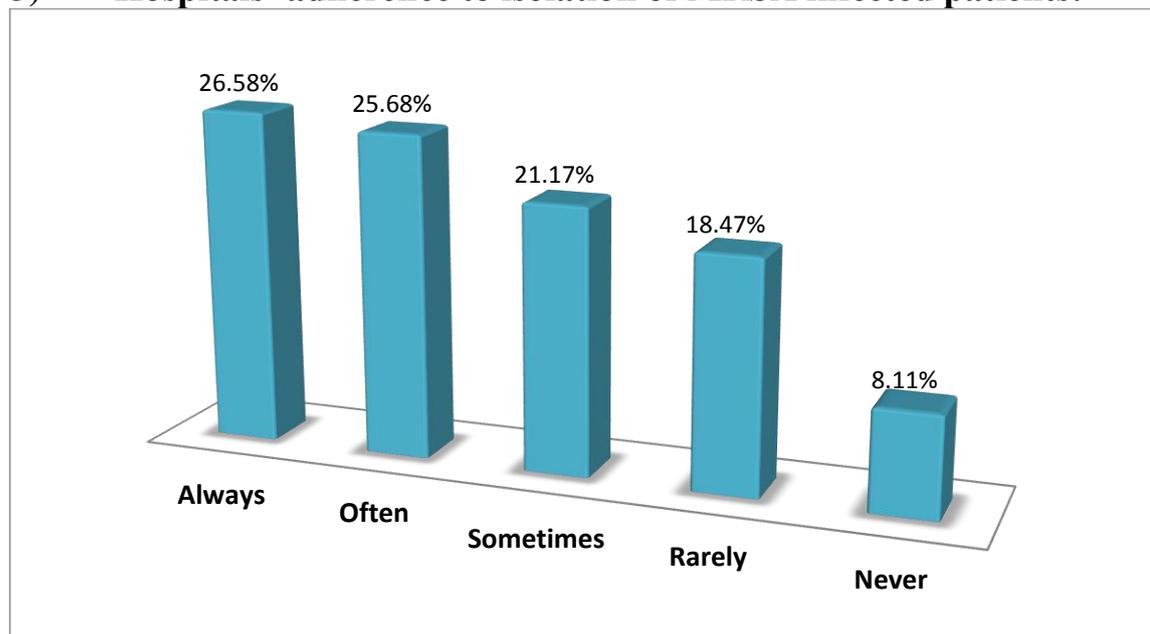


Figure (3): Hospitals' adherence to isolation of MRSA infected patients

Figure (2) shows that HCW's reported that 8.11% of MRSA-infected patients were never isolated during their hospitalization while others reported that 26.58% of hospitals always isolated MRSA-infected patients. On the other hand, the majority (65.32%) of HCW's reported inconsistency in isolating MRSA-infected patients (rarely, sometimes and often; were 18.47%, 21.17%, and 25.68%, respectively).

4.3 Relationship and Correlation between socio-demographic characteristics and knowledge of HCW's

The median of HCW's knowledge score was 2, [interquartile range: 1, 3]. As shown in Table (14), a significant difference in knowledge scores was found between male and female participants (Mann – Whitney test; $p < 0.05$) as well as the specialization, and location of work place of participants (Kruskal- Wallis test, $p < 0.001$).

HCW's whose age is 46 years or older had a moderate median knowledge score while younger HCW's had a lower median knowledge score. Besides, male HCW's had a higher median knowledge score. The study found that pharmacists' median knowledge score was the highest among HCW's groups. Physicians and medical technical professionals had the same median knowledge score of 3, with different interquartile range [2, 4] and [1, 3], respectively. A significantly lower median knowledge score was seen within midwives (1.5). No significance was shown with HCW's median knowledge score and the years of experience.

The logistic regression results showed that the variation in MRSA knowledge score is related to location of workplaces and three of specialties of HCW's. However gender was not a significant predictor for knowledge. Table (15) shows the contribution of each independent variable; gender, HCW's specialization, and the work place, to knowledge score.

Table (14): Socio-demographics of the study sample with differences in knowledge scores

Variable		Frequency (%)	Median [interquartile range]	p- value
Age	18 - 25	61 (18.43)	2 [1, 3]	0.116 ^a
	26 - 35	165 (49.85)	2 [1, 3]	
	36 - 45	80 (24.17)	2 [1, 3]	
	>= 46	25 (7.55)	3 [1, 3.5]	
Gender	Female	121 (36.56)	2 [1, 3]	*0.013 ^b
	Male	210 (63.45)	2.5 [1, 3]	
Marital status	Single	71 (21.45)	2 [2, 3]	0.798 ^a
	Married	236 (71.30)	2 [1, 3]	
	Divorced	24 (7.25)	2.5 [1, 3]	
Place of Residence	City	136 (41.09)	2 [1, 3]	0.354 ^a
	Town	82 (24.77)	2 [1, 3]	
	Village	92 (27.79)	2 [1, 3]	
	Refugee camp	21 (6.34)	2 [1, 3]	
Graduation Years	≤ 1990	22 (6.65)	2.5 [1, 3.25]	0.946 ^a
	1991 - 2000	69 (20.85)	2 [1, 3]	
	2001 - 2010	163 (49.24)	2 [1, 3]	

	≥ 2011	77 (23.26)	2 [1.5, 3]	
Specialization	Physicians	66 (19.93)	3 [2, 4]	**0.000 ^a
	Nurses	179 (54.08)	2 [1, 3]	
	Midwives	20 (6.04)	1.5 [1, 2]	
	Pharmacist	14 (4.23)	3.5 [2.75, 4]	
	Medical Technical	52 (15.71)	3 [1, 3]	
Location of Work place	North	147 (44.41)	2 [1, 3]	*0.007 ^a
	Middle	78 (23.56)	2 [1, 3]	
	South	106 (32.02)	3 [1.75, 4]	
Years of Experience	≤ 5	133 (40.18)	2 [1, 3]	0.788 ^a
	6 - 10	86 (25.98)	2 [1, 3]	
	11 – 15	48 (14.50)	2 [1, 3]	
	16 – 20	29 (8.76)	2 [1, 4]	
	21 – 25	22 (6.65)	2 [1, 3]	
	≥ 26	13 (3.93)	2 [1, 3.5]	
Note: ^a Kruskal_ Wallis test, and ^b Mann-Whietney U test were used; * P < 0.05, **P<0.001				

Table (15): Logistic regression analysis of association between socio-demographic factors and Knowledge

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C. I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Specialization			15.932	4	.003			
	Physicians	-.115-	.385	.089	1	.766	.891	.419	1.897
	Nurses	-.733-	.330	4.935	1	.026	.480	.252	.917
	Midwives	-1.505-	.668	5.079	1	.024	.222	.060	.822
	Pharmacist	1.139	.730	2.439	1	.118	3.125	.748	13.056
	Female	-.296-	.269	1.219	1	.270	.743	.439	1.258
	Workplace			13.937	2	.001			
	North	-.971-	.273	12.651	1	.000	.379	.222	.647
	Middle	-.864-	.316	7.498	1	.006	.421	.227	.782
	Constant	1.017	.353	8.306	1	.004	2.764		

a. Variable(s) entered on step 1: Specialization, Gender, and Workplace.

4.4 Relationship between socio-demographic characteristics and attitudes of HCW's to MRSA prevention transmission

The median of HCW's attitudes score was 9, [interquartile range: 7, 10]. As shown in Table (16), No significant difference in attitudes score was found between participants' socio-demographic characteristics. HCWs of the study population age groups had an equal median attitudes score of 9, with differences in interquartile range: [6, 10], [7, 10], [7.25, 10], and [6, 10], respectively. The study found that pharmacists' median attitudes score was lower than the other HCW's groups. Physicians and nurses had the same median attitudes score of 9, [interquartile range: 7, 10]. In addition, the midwives median attitudes score was higher than the medical technical professionals' median attitudes score, with different interquartile range [2.5, 9], and [7, 10], respectively. No significance was shown with HCW's median attitudes score and the years of experience, as well as number of years since graduation. In addition, refugee camp residency was associated with a higher median knowledge score of 10, [interquartile range: 8, 11]

Table (16): Socio-demographic characteristics of the study sample with differences in attitudes scores

Variable		Frequency (%)	Median [interquartile range]	p- value
Age	18 - 25	61 (18.43)	9 [6, 10]	0.540 ^a
	26 - 35	165 (49.85)	9 [7, 10]	
	36 - 45	80 (24.17)	9 [7.25, 10]	
	>= 46	25 (7.55)	9 [6, 10]	
Gender	Female	121 (36.56)	9 [6.5, 10]	0.632 ^b
	Male	210 (63.45)	9 [7, 10]	
Marital status	Single	71 (21.45)	9 [7, 10]	0.655 ^a
	Married	236 (71.30)	9 [7, 10]	
	Divorced	24 (7.25)	8.5 [6.25, 10]	
Place of Residence	City	136 (41.09)	9 [7, 10]	0.138 ^a
	Town	82 (24.77)	9 [6, 10]	
	Village	92 (27.79)	9 [6, 10]	
	Refugee camp	21 (6.34)	10 [8, 11]	
Graduation Years	≤ 1990	22 (6.65)	9 [6.75, 10.25]	0.641 ^a
	1991 - 2000	69 (20.85)	9 [6, 10]	
	2001 - 2010	163 (49.24)	9 [7, 10]	

	≥ 2011	77 (23.26)	9 [7, 10]	
Specialization	Physicians	66 (19.93)	9 [7, 10]	0.170 ^a
	Nurses	179 (54.08)	9 [7, 10]	
	Midwives	20 (6.04)	8.5 [2.5, 9]	
	Pharmacist	14 (4.23)	7.5 [6, 10.25]	
	Technical Professionals	52 (15.71)	8 [7, 10]	
Location of Work place	North	147 (44.41)	9 [7, 10]	0.582 ^a
	Middle	78 (23.56)	9 [6.75, 10]	
	South	106 (32.02)	9 [7, 10]	
Years of Experience	≤ 5	133 (40.18)	9 [7, 10]	0.768 ^a
	6 - 10	86 (25.98)	9 [7, 10]	
	11 – 15	48 (14.50)	9 [7, 10]	
	16 – 20	29 (8.76)	9 [7.5, 10]	
	21 – 25	22 (6.65)	8 [5, 10]	
	≥ 26	13 (3.93)	9 [6.5, 10]	
Note: ^a Kruskal_ Wallis test, and ^b Mann-Whietney U test were used; * P < 0.05, **P<0.001				

4.5 Relationship between socio-demographic characteristics and practice of HCW's to MRSA prevention transmission

The median of HCW's adherence to practice score was 2, [interquartile range: 1, 4]. One significant difference was found between HCW's self-reported adherence and marital status (Kruskal- Wallis test, $p < 0.001$). Divorced HCW's had the least median practice score was (1), [interquartile range: 0, 3], pharmacists had a higher median adherence score (2.5) than the rest of HCW's group who all reported the same median practice score (2). The Participants' age did not affect their compliance to practice of MRSA prevention transmission strategies where all age groups scored the same median practice was (2). In spite of that, participants who graduated in 2001 and beyond had higher median adherence score than those graduated prior to 2001. Participants who are 26 years experienced or more had the highest median practice score than other HCW's, Table (17). On the other hand, the median of adherence of other staff to practice score was (0), [interquartile range: 0, 2]. As shown in Table (18), no statistical significance in other staff adherence score was found with HCW's socio-demographic characteristics. The study found that the midwives median adherence score was higher than the other HCW's groups.

Table (17): Socio-demographic characteristics of the study sample with differences in adherence to practice scores

Variable		Frequency (%)	Median [interquartile range]	p- value
Age	18 - 25	42 (18.92)	2 [1, 3]	0.750 ^a
	26 - 35	115 (51.80)	2 [1, 4]	
	36 - 45	48 (21.62)	2 [1, 4]	
	≥ 46	17 (7.66)	2 [1, 3.5]	
Gender	Female	73 (32.88)	2 [2, 4]	0.550 ^b
	Male	149 (67.12)	2 [1, 3]	
Marital status	Single	48 (21.62)	3 [2, 4]	*0.038 ^a
	Married	159 (71.62)	2 [1, 4]	
	Divorced	15 (6.76)	1 [0, 3]	
Residence Place	City	91(41)	2 [1, 4]	0.624 ^a
	Town	56 (25.23)	2 [1, 3]	
	Village	57 (25.68)	2 [1.5, 4]	
	Refugee camp	18 (8.12)	2.5 [1, 4]	
Graduation Years	≤ 1990	16 (7.20)	2 [1, 4]	0.340 ^a
	1991 - 2000	39 (17.57)	2 [1, 3]	
	2001 - 2010	111 (50)	2 [1, 4]	

	≥ 2011	56 (25.23)	2 [1, 3.75]	
Specialization	Physicians	49 (22.1)	2 [1, 4]	0.665 ^a
	Nurses	124 (55.86)	2 [1, 4]	
	Midwives	9 (4.05)	2 [1.5, 3]	
	Pharmacist	6 (2.70)	2.5 [1.5, 3]	
	Technical Professionals	34 (15.32)	2 [1, 3]	
Location of Work place	North	74 (33.33)	2 [1, 4]	0.646 ^a
	Middle	63 (28.38)	2 [1, 4]	
	South	85 (38.29)	2 [1, 3]	
Years of Experience	≤ 5	96 (43.24)	2 [1.25, 3]	0.517 ^a
	6 - 10	55 (24.77)	2 [1, 4]	
	11 – 15	32 (14.41)	2 [1, 3.75]	
	16 – 20	18 (8.12)	2 [1, 3.25]	
	21 – 25	12 (5.41)	1.5 [0.25, 2.75]	
	≥ 26	9 (4.05)	4 [1, 4]	
Note: ^a Kruskal-Wallis test, and ^b Mann-Whitney U test were used; * P < 0.05, **P<0.001				

Table (18): Socio-demographic characteristics of the study sample with differences in staff team adherence to practice scores

Variable		Frequency (%)	Median [interquartile range]	p- value
Age	18 - 25	42 (18.92)	0 [0, 2]	0.666 ^a
	26 - 35	115 (51.80)	0[0, 2]	
	36 - 45	48 (21.62)	0 [0, 1]	
	≥ 46	17 (7.66)	0 [0, 1]	
Gender	Female	73 (32.88)	0 [0, 2]	0.198 ^b
	Male	149 (67.12)	0 [0, 1]	
Marital status	Single	48 (21.62)	0 [0, 2]	0.064 ^a
	Married	159 (71.62)	0 [0, 2]	
	Divorced	15 (6.76)	0 [0, 0]	
Residence Place	City	91 (41)	0 [0, 2]	0.137 ^a
	Town	56 (25.23)	0 [0, 1]	
	Village	57 (25.68)	0 [0, 2]	
	Refugee camp	18 (8.12)	1 [0, 2]	
Graduation Years	≤ 1990	16 (7.21)	0 [0, 2.75]	0.288 ^a
	1991 - 2000	39 (17.57)	0 [0, 1]	

	2001 - 2010	111 (20)	0 [0, 2]	
	≥ 2011	56 (25.23)	0 [0, 1]	
Specialization	Physicians	49 (22.1)	0 [0, 1]	0.104 ^a
	Nurses	124 (55.86)	0 [0, 2]	
	Midwives	9 (4.05)	1 [0, 2]	
	Pharmacist	6 (2.70)	0 [0, 1.25]	
	Technical Professionals	34 (15.32)	0 [0, 1]	
Location of Work place	North	74 (33.33)	0 [0, 2]	0.490 ^a
	Middle	63 (28.38)	0 [0, 2]	
	South	85 (38.29)	0 [0, 1]	
Years of Experience	≤ 5	96 (43.24)	0 [0, 2]	0.942 ^a
	6 - 10	55 (24.77)	0 [0, 1]	
	11 – 15	32 (14.41)	0 [0, 2]	
	16 – 20	18 (8.12)	0 [0, 1]	
	21 – 25	12 (5.41)	0 [0, 1]	
	≥ 26	9 (4.05)	0 [0, 3]	
Note: ^a Kruskal_Wallis test, and ^b Mann-Whietney U test were used; * P < 0.05, **P<0.001				

4.6 The relationship between HCWs' knowledge, attitudes and practice to MRSA prevention transmission

The correlation results reported statistical significance between MRSA knowledge score and HCW's attitudes. In which Pearson correlation model results mean that attitudes indicated a significant positive correlation contribution to explaining variations in HCW's knowledge (Correlation $(r) = 0.352$, $p < 0.000$). Also using correlation model identified that HCW's adherence to MRSA prevention was a significantly positive predictor for HCW's knowledge (adherent; $N=222$, Correlation $(r) = 0.110$, $p = 0.044$).

HCW's self-reported adherence to practice was predictor to the study sample attitudes. Pearson correlation model results mean that HCW's adherence to practice indicated a significant positive correlation contribution to explaining variations in HCW's attitudes (Correlation $(r) = 0.228$, $p < 0.000$).

4.7 Policies and practices of Palestinian MOH toward MRSA infection

During the last twenty years, the Palestinian MOH focused on developing and strengthening the health care system in Palestine through improving the performance of the service providers and the quality of the provided health services. To achieve this objective, MOH in cooperation with MARAM managed to prepare and print a manual entitled "Infection prevention and control protocols, 2004" to be adopted in all hospitals.

This manual contained the most effective and important international guidelines and protocols concerning infection prevention.

Several assessments activities including field visits, planning workshops, focus groups were conducted to review the existing national guideline were evaluate the existing protocols and guidelines with main purpose to identify the uncovered infection prevention standard and to diagnose the weak control and linkage between guideline and enhancing better performance of developed strategies, towards keeping MOH adopting the updated international standards in cooperation with MARAM. This approach was achieved by the MOH and MARAM through developing and printing an updated version of the manual "Infection prevention and control training protocols, 2010". This version has highlighted the main elements of essential prevention strategies, which are:

1. Adopting the best hygienic practices of hand washing.
2. Appropriate use of Personal Protocols Equipment (PPE): gloves, masks, goggles, face masks, and gowns.
3. Applying better practices for cleaning, decontamination, disinfection and sterilization.
4. Handling and disposing the medical waste disposal efficiently.

Adhering to the developed hand hygiene and contact precautions have contributed in avoiding the occurrence of MRSA infection as one of the nosocomial infections in general, where there are no specific details on dealing with MRSA ⁽⁷⁸⁾.

Chapter Five

Discussion

The recent study assessed knowledge, attitudes, and practices among HCWs in relation to MRSA transmission prevention. Participants in the KAP study included physicians, nurses, midwives, pharmacists, and medical technical professionals of different age groups and post-graduation experience ranging from 0 to 35 years. In total, 331 participants representing varied professions currently practicing in all 13 governmental hospitals in the West Bank participated in this survey.

When it came to data analysis, there was a dilemma to include the 27.5% of participants who never heard of MRSA or not. The fact that 27.5% of participants never heard of MRSA is by itself a result and should be included, presented and analyzed. This group of participants was included in the final analysis because they filled out the questionnaire and gave positive responses in other aspects of the study. Excluding such a group would suggest a bias in the results and is considered a mis-interpretation of the actual situation regarding infection control. The idea of presenting this piece of result is that hospital workers are expected to be aware of infection prevention protocols and universal precautions. The fact that these people did not hear about MRSA indicates a serious problem in the function of infection control committees in these hospitals.

5.1 Section I: Knowledge

The study showed half of all participants presenting poor knowledge levels concerning MRSA transmission prevention. In questions relating to implementation guidelines for isolation of MRSA patients 39.6% of HCWs indicated they follow proper guidelines sometimes or rarely, while 8.1% indicate that these procedures are never followed. In addition, the survey team observed several instances in which patients diagnosed with MRSA infection were being treated and held in common areas with other patients. This is likely due to low rates of knowledge on MRSA treatment among physicians and nurses despite their frequent contact with patients. Similar studies carried out presented divergent HCWs knowledge results. Levels of MRSA knowledge reported in the present study are not different than similar studies conducted. In Nigeria and Egypt, low knowledge scores of 52% ⁽⁵¹⁾ and 67.3% ⁽⁶¹⁾, respectively, were reported among HCWs. In another study conducted in Sudan, knowledge levels showed gaps in the ability of Sudanese HCWs to correctly answer questions related to the epidemiology of MRSA ⁽⁶⁰⁾. In a study conducted among Brazilian nurses, 56.8% of participants have acknowledged relating to the reasons *Staph aureus* bacteria develop resistance to antimicrobials medicines ⁽⁵²⁾. These results are in contrast to a UK study in which 100% of participants were highly knowledgeable about MRSA ⁽⁵³⁾. In another study conducted in the UK in 2009, researchers assessed the knowledge levels with MRSA practice guidelines and found a correlation between levels of knowledge in regard to MRSA precautions and the specialty of

the HCWs ⁽⁵⁵⁾. These findings were supported by another study conducted in two hospitals in Tayside, Scotland where variation in correct answers to management and etiology of MRSA were directly related to the specialties of participants ⁽⁵⁴⁾.

The current study presented remarkable variability in practical and theoretical understanding of MRSA prevention strategies among HCWs where an 85.8% majority indicated good knowledge of practical MRSA transmissions prevention. In contrast only 5.7% of HCWs indicated knowledge about the effectiveness of using alcohol hand rubs and 18.4% were aware of the ability of MRSA to live outside the body for days. In the USA, a study indicated similar variances in results, although overall percentages were higher than the present study where 98.1% of HCWs reported knowledge related to MRSA control, 40.9% of HCWs were aware of the ability of MRSA to live outside the body for days, and 34.6% of HCWs indicated knowledge about the effectiveness of using alcohol hand rubs ⁽⁵⁹⁾.

HCWs around the globe utilize various information resources on MRSA. In Egypt, 23.8% of HCWs indicate their main source of MRSA information was obtained through the internet ⁽⁶¹⁾ whereas Nigerian and Sudanese HCWs; 78.6% and 58.7%, respectively, indicated textbooks as main source of information ^(51,60). In the current study, 37% of participants indicated they use scientific reports and posters as a main source of information. Interestingly, results for more developed countries are not

impressive. 24% British HCWs reported mass media as the core source of information on MRSA transmission prevention ⁽⁵³⁾.

The majority of HCW's knew nothing about cases of MRSA infection neither among patients nor among HCW's in their hospitals and this shows a major failure of the infection control team at these hospitals.

Even though, one third of participants acknowledged the presence of infection prevention guidelines, this was not reflected on the workers knowledge.

5.2 Section II: Attitudes

It is well-documented that people's beliefs and risk perceptions towards threat and self-protection directly affects an individual's behavior ^(79,80).

The *Handbook of Health Behavior Research* defines health behavior as "behavior patterns, actions and habits that relate to health maintenance, to health restoration and to health improvement". In relation to assessing health behaviors, a meta-analysis study conducted in 1992 indicated that the HBM variables are significant in analysis of health behavior of individuals ⁽⁸¹⁾. Therefore, attitudes in the current study were detected using Health Belief Models in several domains: Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, Cues to Action, and Self-Efficacy.

A study conducted at French University Hospital found that HCWs had very high perception of MRSA risks and potential serious effects on themselves in the workplace ⁽⁶³⁾. In another study, American research has

reported gaps between HCWs agreements with MRSA as a national problem and as a problem in their workplace, 90.9% and 47.8%, respectively, considering MRSA as a national problem but not at their workplaces ⁽⁵⁹⁾. Compared to our findings, which indicated lower percentages, 62.8% of HCWs perceived MRSA as a global problem and 55.2% of HCWs are aware of infection risks in the workplace. The American study highlighted the relationship between HCWs motivation to maintain compliance with MRSA control practices and the ability to overcome barriers and perceive MRSA as a problem in the workplace ⁽⁵⁹⁾. On the other hand, a negative correlation was indicated between perceived personal risk and perceived personal control among French HCWs ⁽⁶³⁾.

The current study, perceived cues to action indicated a need for meaningful education about MRSA among HCWs, whose positive responses were as low as 32.6%, in comparison with 72.9% of American HCWs. Research made visible the relationship between attitudes perceiving MRSA as a risk factor as a first step in motivating HCWs to adhere to compliance and control practices ⁽⁵⁹⁾. The low rate of compliance among HCWs in the current study is explained by their attitudes toward MRSA precautions.

5.3 Section III: Practice

Increased adherence to standard precautions - hand hygiene and contact precautions - are broadly recognized to be the most important factors in decreasing the spread of nosocomial infections in health care facilities

according to the CDC. Multiple studies placing HCWs as the core target group in their research prove that the level of commitment of HCWs is the main reason for success in reducing MRSA infection ^(82,83). In other studies, positive financial effects were observed with successful MRSA infection control ^(84,85). Yet, the present study indicated poor adherence regarding performance in all aspects of MRSA infection control precautions among HCWs, 26.1% compared to an American study, which indicates that 85.4% of HCWs adhere to all aspects of infection control. However, the current finding is consistent with that of an Israeli study, which indicated poor performance in implementing infection control precautions as well ⁽⁷¹⁾.

The WHO campaign to reduce drug-resistant infections, entitled "SAVE LIVES: Clean Your Hands," highlighted the importance of hand hygiene ⁽⁷⁰⁾. In relation many interventions and studies were designed to focus on hand hygiene as a cornerstone in prevention strategies in MRSA prevention. This helped underline the correlation between compliance to hand hygiene and reducing the spread of MRSA infection ^(71,82,83). The participants in the current study demonstrated a considerably higher performance to hand hygiene after touching patients than other aspects of MRSA control, with 78% of HCWs following hand hygiene procedures after touching patients. On the other hand, rates of performance of hand hygiene before touching patients were lower than those for after touching patients, with 55.4% and 78%, respectively. This is a failure in understanding the idea behind hand hygiene. It is the single most

important means of preventing the spread of infections and its objective is protecting self and other patients from contacting infectious agents. Regarding HCWs' observations of co-workers' compliance to standard precautions, gaps were present when compared to HCWs' self-reporting. Where performing hand hygiene after touching patients was much lower than self-reported, 29.7% and 78%, respectively. As well as for hand hygiene before touching patients was lower than self-reported, 19.4% and 55.4%, respectively. In a similar American study these differences were reported, but results were much higher than in the current study where intended behavior of hand hygiene and observed hand hygiene among American HCWs reached 95.1% and 84.6%, respectively ⁽⁵⁹⁾. Another dramatic gap was found in the current study between self-reporting and observation of co-workers' intended to comply with contact precautions.

Chapter Six

Limitations, Conclusion, and Recommendations

6.1 Limitations of the study

A number of limitations faced the present study summarized as follows:

1. Bias associated with self-administered questionnaires make it difficult to confirm the credibility of self-reporting with the actual compliance when dealing with MRSA infected patients.
2. HCWs working in government hospitals had high workloads and were unable to participate in the current study, despite several attempts. This resulted in unequal distribution of questionnaires by hospitals, where workers in less loaded hospitals have higher numbers of representation and completed questionnaires. Target numbers by area of specialty were not affected.
3. The current political situation put financial constraints on government hospitals, making supplies necessary for compliance scarce at times.

6.2 Conclusion

In conclusion the current study showed that knowledge related to the epidemiology of MRSA was poor between HCWs. However, HCWs had a very good level of knowledge about strategies to prevent MRSA infection. This is especially important for implementation practices where understanding how to control MRSA infection is vital for overall performance and implementation by HCWs. Unfortunately, HCWs

demonstrate non-compliant performance in regard to these precautions, which also indicates poor adherence to infection controls. In addition, slightly more than half of HCWs considered MRSA infection as problem. The majority of participants do not worry from spread of infections to their families and friends, which was identified by self-reporting due to lack of educational programs.

There remains a clear need for continuous regular lectures and health education on nosocomial infections for HCWs across all specialties. In addition to further observational studies to assess HCWs compliance to MRSA control practices to further uncover causes of noncompliance.

6.3 Recommendations

1. Implementation of continuous evaluation projects targeting HCWs across all specialties through a variety of activities aimed to assess their knowledge towards nosocomial infections, in general, and MRSA in particular. These evaluations would be directly followed by educational programs as needed.
2. Needs for further studies to identify the reasons behind the significant correlation between socio-demographic factors; gender and location of work place, and the level of HCWs knowledge.
3. Change beliefs among HCWs about the importance of prevention compliance and highlight the many options available to increase performance of prevention strategies of infection through the use of the Health Belief Model in educational programs.

4. Assess practice of MRSA control precautions and reasons behind lack of commitment through observational studies to facilitate more accuracy in findings as compared to using questionnaires.
5. Conduct in depth studies to identify specific causes and solutions for compliance, and use the data to secure funding (likely through grants) to address financial deficits and increase compliance, for example the establishment of isolation rooms meeting international standards to increase the application precautions among workers.
6. Conducting "Hand hygiene" campaigns all across the governmental hospitals to promote awareness of nosocomial infections and encourage adherence to standard precautions.

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Appendices

Annex I: KAP Questionnaire in Arabic



جامعة النجاح الوطنية

كلية الدراسات العليا

برنامج ماجستير الصحة العامة

الأعضاء العاملين في الرعاية الصحية

تهدف هذه الدراسة إلى قياس مستوى المعرفة والمواقف والممارسات فيما يتعلق بالوقاية من المكورة العنقودية البرتقالية المقاومة للمثيسيلين (MRSA) للعاملين في الرعاية الصحية ضمن المستشفيات الحكومية في الضفة الغربية. النتائج لن تستخدم إلا في مناقشة البحوث العلمية من أجل التركيز على توفير بيئة صحية سليمة خلال تقديم الخدمات الصحية من أجل مكافحة العدوى والوبائيات المرتبطة بالمستشفيات. يرجى الإجابة على الأسئلة بمصادقية وموضوعية لمن يرغب بالمشاركة.

يسمح لأي من المشاركين بالانسحاب في أي وقت دون أي مبرر، ولأولئك الذين يرغبون في الحصول على النتائج النهائية للدراسة يمكنكم تزويدنا بالبريد الإلكتروني الخاص ليتم إرسال نسخة عن نتائج الدراسة

شكراً لتعاونكم

القسم الأول: المعلومات الشخصية والوضع الصحي

العمر:	<input type="checkbox"/> 25-18	<input type="checkbox"/> 35-26	<input type="checkbox"/> 45-36	<input type="checkbox"/> 55-46	<input type="checkbox"/> 56 و اكبر
الجنس:	<input type="checkbox"/> أنثى	<input type="checkbox"/> ذكر			
الوضع الاجتماعي:	<input type="checkbox"/> أعزب/ أعزباء	<input type="checkbox"/> متزوج/ة	<input type="checkbox"/> مطلق/ة	<input type="checkbox"/> أرمل/ة	
مكان الإقامة:	<input type="checkbox"/> مدينة	<input type="checkbox"/> بلدة	<input type="checkbox"/> قرية	<input type="checkbox"/> مخيم	
سنة التخرج:	-----				
التخصص:	-----				
مكان العمل:	-----				
سنوات العمل:	-----				

هل تعاني من أمراض مزمنة مثل أمراض القلب، الرئة، الكلى، الكبد، مرض السكري، الربو، أنيميا فقر الدم أو أي مشاكل أخرى في الدم؟

نعم لا لا اعلم

هل تعاني من ضعف في جهاز المناعة نتيجة الإصابة بأمراض مثل السرطان، لوكيميا (سرطان الدم) أو /و الايدز؟

نعم لا لا اعلم

هل أنت من اللذين يستخدمون الأدوية بدون وصفة طبية؟

نعم لا لا اعلم

إذا كانت إجابتك نعم، كم مرة سنوياً قد تلجأ لهذا التصرف؟

مرة واحدة من مرة- ثلاث مرات أكثر من ثلاث مرات لا اذكر

القسم الثاني: المعرفة : الجزء الأول

1. "MRSA" هي اختصار يدل على

- Maraviroc-resistant Sparrowpox avipoxvirus
- Methicillin -resistant Staphylococcus aureus
- Maxipime-resistant Salmonella arizonae
- Don't Know

2. من أين حصلت على معلوماتك المتعلقة بال " MRSA " ؟

من خلال البرامج التعليمية من قبل وزارة الصحة أو/و المستشفى التي تعمل بها من الإعلام

من المقالات و التقارير العلمية من خلال الدراسة في الجامعة لم اسمع بها أبداً

3. عدوى "MRSA" تعتبر من الأمراض التي تنتشر من خلال :

النقل جوا الحمل بالنواقل النقل بالدم النقل عن طريق الغذاء و الماء

النقل عن طريق الاتصال المباشر و غير المباشر الإفرازات التنفسية لا اعلم

4. الوقاية من انتقال عدوى ال MRSA يتضمن إتباع أيا من الاحتياطات المعيارية التالية قبل التعامل مع المريض الحامل ل MRSA أو/و أيا من الأدوات الموجودة في غرفة المريض

ارتداء المعطف وضع القفازات غسل الأيدي كل ما ذكر أعلاه لا شيء مما ذكر

5. تقنية غسل اليدين الأكثر فعالية في قتل الجراثيم

غسل اليدين بالماء والصابون فرك اليدين بالكحول كل ما ذكر أعلاه

6. إلى متى يمكن لل MRSA العيش خارج الجسم على السطح؟

ثواني دقائق ساعات أيام لا اعلم

القسم الثاني: المعرفة : الجزء الثاني

رقم السؤال	الأسئلة	لا	نعم	لا اعلم
7	مرضى ال MRSA الذين لا يعانون من أعراض يمكنهم أن ينشروا العدوى للآخرين			
8	عدوى ال MRSA أصبحت عدوى المكتسبة من المجتمع			
9	تناول المضادات الحيوية يزيد من خطر عدوى ال MRSA			
10	هل تعرف عدد حالات الإصابة بعدوى ال MRSA بين عمال الرعاية الصحية في هذا المستشفى؟			
11	هل تعرف عدد حالات الإصابة بعدوى ال MRSA بين المرضى في هذا المستشفى؟			
12	هل يوجد في المستشفى مبادئ توجيهية مكتوبة للاحتياطات المعيارية؟			

رقم السؤال	الأسئلة	أوافق بشدة	أوافق	لا اعلم	لا أوافق	لا أوافق بشدة
1	الأمراض الناتجة عن جرثومة الـ MRSA مرض خطير يمكن أن يكون قاتل					
2	الأمراض الناتجة عن جرثومة الـ MRSA تشكل مشكلة صحية عالمية					
3	جرثومة الـ MRSA يمكن أن تسبب عدوى مجرى الدم					
4	جرثومة الـ MRSA يمكن أن تسبب الالتهاب الرئوي					
5	الأمراض المعدية المكتسبة في منشآت الرعاية الصحية ليست مشكلة في هذا المستشفى					
6	كعامل في مجال الرعاية الصحية ، أنا في خطر كبير من الإصابة بـ عدوى الـ MRSA في هذا المستشفى					
7	كعامل في مجال الرعاية الصحية ، أنا أخشى من أنني سوف أنقل جرثومة الـ MRSA لعائلتي وأصدقائي					
8	كعامل في مجال الرعاية الصحية ، أنا ملتزم باستراتيجيات الوقاية الأساسية لحماية نفسي					
9	كعامل في مجال الرعاية الصحية ، أنا ملتزم باستراتيجيات الوقاية الأساسية لحماية مرضاي					
10	كعامل في مجال الرعاية الصحية ، ليس لدي الوقت لغسل يدي ، ارتداء المعطف و لبس القفازات					
11	أن الكحول و الماء والصابون كأساسيات لغسل الأيدي ليست متاحة بسهولة					
12	البيئية غير النظيفة في هذا المستشفى واكتظاظ المرضى تجعل من غير الممكن السيطرة على جرثومة الـ MRSA					
13	كعامل في مجال الرعاية الصحية ، أنا مسؤول عن زيادة وعي المرضى وأسرهم حول أهمية استراتيجيات الوقاية من جرثومة الـ MRSA					
14	كعضو من طاقم المستشفى، أنا مسؤول عن تذكير زملائي في العمل من أهمية الالتزام ارتداء القفازات و المعطف					
15	كعضو من طاقم المستشفى، أنا مسؤول عن تذكير زملائي في العمل من أهمية الالتزام بغسل الأيدي					
16	لقد حصلت على تثقيف ذو مغزى بشأن جرثومة الـ MRSA					
17	تجربة سابقة مع عدوى MRSA أثرت على اعتقادي نحو الوقاية من العدوى					

القسم الرابع: الالتزام باستراتيجيات الوقاية

1. هل يتم عزل المرضى المصابين بجرثومة الـ MRSA في هذا المستشفى؟
 دائما غالبا احيانا نادرا ابدا
2. هل تضع باستمرار قفازات عند التعامل مع المرضى المصابين بجرثومة الـ MRSA؟
 دائما غالبا احيانا نادرا ابدا
3. هل تضع معطف أحادي الاستعمال عند التعامل مع المرضى المصابين بجرثومة الـ MRSA؟
 دائما غالبا احيانا نادرا ابدا
4. هل تقوم بغسل يديك قبل لمس المرضى؟
 دائما غالبا احيانا نادرا ابدا
5. هل تقوم بغسل يديك بعد لمس المرضى؟
 دائما غالبا احيانا نادرا ابدا
6. هل يضع الموظفون الآخرون باستمرار قفازات عند التعامل مع المرضى المصابين بجرثومة الـ MRSA؟
 دائما غالبا احيانا نادرا ابدا
7. هل يضع الموظفون الآخرون باستمرار معطف أحادي الاستعمال عند التعامل مع المرضى المصابين بجرثومة الـ MRSA؟
 دائما غالبا احيانا نادرا ابدا
8. هل يلتزم الموظفون الآخرون بغسل أيديهم قبل لمس المرضى؟
 دائما غالبا احيانا نادرا ابدا
9. هل يلتزم الموظفون الآخرون بغسل أيديهم بعد لمس المرضى؟
 دائما غالبا احيانا نادرا ابدا

شكرا لتعاونكم

Annex II: KAP Questionnaire in English

An-Najah National University

Faculty of Graduate Study

Public Health Master

This study aims to measure the level of healthcare workers' knowledge, attitudes and practices regarding MRSA infection prevention among governmental hospitals in the West Bank. Results will only be used for scientific research discussion in order to focus on the gap faced in providing a healthy environment during the delivery of health services avoiding nosocomial infectious disease cases. Please answer the question with credibility and objectivity.

Any participants will be allowed to withdraw at any time without any justification, and those who wish to get the final results of the study can provide us with a valid email address

Thank you for your cooperation

First Part: Demographic Characteristics and Health Status

Age:	<input type="checkbox"/> 18-25	<input type="checkbox"/> 26-35	<input type="checkbox"/> 36-4	<input type="checkbox"/> 46-55	<input type="checkbox"/> or older
Gender:	<input type="checkbox"/> Male	<input type="checkbox"/> Female			
Material Status:	<input type="checkbox"/> Single	<input type="checkbox"/> Married	<input type="checkbox"/> Divorced	<input type="checkbox"/> Widowed	
Residence Place:	<input type="checkbox"/> City	<input type="checkbox"/> Town	<input type="checkbox"/> Village	<input type="checkbox"/> Refugee Camp	
Year of Graduation:	_____		Specialty:	_____	
Workplace:	_____		Years of work:	_____	

- ✚ **Do you have a chronic health problem such as (heart disease, lung disease, kidney disease, liver disease, asthma, diabetes, anemia or other blood disorders)?**
 Yes No Don't Know
- ✚ **Do you have a weakened immune system such as (cancer, leukemia or HIV/AIDS)?**
 Yes No Don't Know
- ✚ **Do you have personal experiences of over-the-counter antibiotic consumption?**
 Yes No Don't Know
- ✚ **If yes, how many times in the year?**
 Once One to three times
 More than three times I don't remember

Second Part: Knowledge, 1st section

1. MRSA, one of the Nosocomial Infectious Diseases, is brevity of

- Maraviroc-resistant Sparrowpox avipoxvirus
- Methicillin -resistant Staphylococcus aureus
- Maxipime-resistant Salmonella arizonae
- Don't know

2. Where did you obtain your main information about MRSA?

- Years of study at University Education Programs of the Ministry of Health or in this Hospital

Mass Media Scientific reports, Posters Never heard

3. MRSA infection is most often transmitted by:

Airborne Vector-borne Blood-borne Droplet Spread

Food and Water borne Direct and indirect Contact Don't know

4. Prevention of MRSA infection transmission includes following which of the below Standard Precautions BEFORE contact with MRSA patients/any items in the patients' room:

Put on gowns Put on gloves Hand hygiene All of above None of above

5. The most effective hand hygiene technique in killing germs is/are

Hand wash with water and soap Hand rub with alcohol All of the above

6. How long can MRSA live outside the body on a surface?

Seconds Minutes Hours Days Don't Know

Second Part: Knowledge, 2nd section

NO.	Knowledge Questions	Yes	No	Don't Know
7	Asymptomatic MRSA infected people can spread infection to others.			
8	MRSA infection becomes a community-acquired MRSA infection.			
9	Taking antibiotics increases your risk of MRSA infection.			
10	Do you know how many MRSA infection cases among Healthcare Workers in this hospital?			
11	Do you know how many MRSA infection cases among patients in this hospital?			
12	Dose the hospital have written guidelines for Standard precautions?			

Third Part: Attitudes questions

No	Perception Questions	Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree
1	MRSA infection is a serious disease that could be fatal					
2	MRSA infection is a global health problem					
3	MRSA infection can cause blood infection					
4	MRSA infection can cause pneumonia in lungs					
5	Nosocomial Infectious disease is not a problem in this hospital					
6	As a healthcare worker, I am at high risk of catching MRSA in this hospital					
7	As a healthcare worker, I am afraid that I will transmit MRSA infection to my family and my friends					
8	As a healthcare worker, I adhere to Core Prevention Strategies to protect myself					
9	As a healthcare worker, I adhere to Core Prevention Strategies to protect my patients					
10	As a healthcare worker, I lack time required to clean my hands or put on gloves and gowns					
11	Alcohol-rub and/or soap-water based hand hygiene materials are not easily available					
12	Environmental cleanliness in this hospital and over-crowding of patients make MRSA infection uncontrolled					
13	As a healthcare worker, I am responsible for increasing the awareness of patients and their families about the importance of MRSA infection prevention strategies					
14	As a member of the hospital staff , I am responsible for reminding my co-workers of the importance of adhering to wearing gloves and gowns					
15	As a member of the hospital staff, I am responsible for reminding my co-workers of the importance of performing to hand hygiene					
16	I have received meaningful education regarding MRSA					
17	Previous experience with MRSA infection influenced my belief towards prevention of the infection					

Fourth Part: Compliance with MRSA prevention strategies

1. **Does this hospital isolate MRSA infected patients?**
 Always Often Sometime Rarely Never
2. **Do you consistently put on gloves when dealing with MRSA infected patients?**
 Always Often Sometime Rarely Never
3. **Do you consistently put on gowns when dealing with MRSA infected patients?**
 Always Often Sometime Rarely Never
4. **Do you perform Hand Hygiene before touching patients?**
 Always Often Sometime Rarely Never
5. **Do you perform Hand Hygiene after touching patients?**
 Always Often Sometime Rarely Never
6. **Do other staff members consistently put on gloves when dealing with MRSA infected patients?**
 Always Often Sometime Rarely Never
7. **Do other staff members consistently put on gowns when dealing with MRSA infected patients?**
 Always Often Sometime Rarely Never
8. **Do other staff members perform Hand Hygiene before touching patients?**
 Always Often Sometime Rarely Never
9. **Do other staff members perform Hand Hygiene after touching patients?**
 Always Often Sometime Rarely Never

THANK YOU FOR YOUR PARTICPATION

Annex III: IRB form

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

**An - Najah
National University**

Faculty of Medicine & Health Sciences
Department of Graduate Studies



**جامعة النجاح
الوطنية**

كلية الطب وعلوم الصحة
دائرة الدراسات العليا

IRB Approval letter

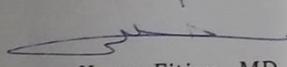
Study title:
Knowledge, Attitudes and Adherence of Healthcare workers to the Prevention guidelines for reducing Methicillin-Resistant *Staphylococcus aureus* (MRSA) infections in the West Bank Governmental Hospitals.

Submitted by:
Lina Herimat

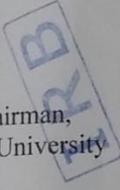
Date Reviewed:
Feb 8, 2015

Date approved:
Feb 25, 2015

Your study titled: “**Knowledge, Attitudes and Adherence of Healthcare workers to the Prevention guidelines for reducing Methicillin-Resistant *Staphylococcus aureus* (MRSA) infections in the West Bank Governmental Hospitals**” with archived number 9/Feb/2015 , Was reviewed by An-Najah National University IRB committee & approved on Feb 25, 2015 .


 Hasan Fitian , MD

IRB Committee Chairman,
 An-Najah National University



نابلس - ص.ب 7 او 707 هاتف 707 707/8/14 (970)(09)2342902/4/7/8/14 ، فاكسميل (970)(09) 2342910
 Nablus - P.O.Box: 7 or 707 - Tel (970) (09) 2342902/4/7/8/14 - Faximile (970)(09)2342910
 Email: hgs@najah.edu Web Site: www.najah.edu

جامعة النجاح الوطنية
كلية الدراسات العليا

تقييم المعرفة والسلوكيات والالتزام فيما يتعلق بالوقاية
من المكورة العنقودية البرتقالية المقاومة للمثبيلين
بين العاملين في مجال الرعاية الصحية

إعداد

لينا هريمات

إشراف

د. ادهم ابو طه

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في الصحة العامة
بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.

2016

ب

تقييم المعرفة والسلوكيات والالتزام فيما يتعلق بالوقاية من المكورة العنقودية البرتقالية
المقاومة للمثيسيلين بين العاملين في مجال الرعاية الصحية

اعداد

لينا هريمات

اشراف

د. ادهم ابو طه

الملخص

مقدمة: عدوى المستشفيات هي عدوى تصيب المرضى أو/و العاملين في مجال الرعاية الصحية اثناء عملية تقديم العلاج بالمستشفيات بهدف معالجة مشكلة صحية مختلفة. عدوى المكورة العنقودية البرتقالية المقاومة للمثيسيلين هي احدى اهم عدوات المستشفيات المكتسبة و هو مرض يمكن الوقاية منه.

الهدف من الدراسة : قياس مستوى المعرفة والمواقف والممارسات فيما يتعلق بالوقاية من المكورة العنقودية البرتقالية المقاومة للمثيسيلين (MRSA) للعاملين في الرعاية الصحية في المستشفيات الحكومية في الضفة الغربية.

الطريقة: أجريت دراسة مقطعية في جميع المستشفيات الحكومية في الضفة الغربية حيث تم استخدام الاستبيانات وشملت الدراسة 331 عامل في مجال الرعاية الصحية. تم جمع البيانات و تحليلها عن طريق استخدام الرزم الاحصائية للعلوم الاجتماعية SPSS اصدار رقم 19.

النتائج: بمعدل استجابة 94.37 % اظهرت الدراسة أن المشاركين كانوا على مستوى ضعيف من المعرفة بما يتعلق بالمكورة العنقودية البرتقالية المقاومة للمثيسيلين (MRSA) بشكل عام، بينما كانوا على مستوى عالي من المعرفة بالاحتياطات المعيارية المتعلقة بالوقاية من عدوى المكورة العنقودية البرتقالية المقاومة للمثيسيلين (MRSA) بشكل خاص.

ظهر ضعف بمدى التزام العاملين في مجال الرعاية الصحية بالاحتياطات القياسية لضبط عدوى MRSA . كذلك اظهر العاملين في مجال الرعاية الصحية اختلافات ما بين التبليغ الذاتي و التبليغ عن زملائهم من حيث الالتزام بالاحتياطات القياسية (لبس القفاز: 58.6% مقابل 26.1%،

ج

لبس المعطف: 37% مقابل 16.6%، نظافة اليدين قبل لمس المرضى: 55.4% مقابل 19.4%، نظافة اليدين بعد المرضى لمس: 78% مقابل 29.7%، التزام الكامل بكل ما سبق: 26.1% مقابل 9.4%).

سجلت نسب منخفضة بين العاملين من حيث الادراك بأن عدوى MRSA اصبحت مشكلة صحية عامة بالإضافة لاعتقادهم بخطر الإصابة بالعدوى في أماكن العمل, حيث كانت النسب 62.8% و 55.2%، على التوالي. واطهرت الدراسة أيضاً حاجة للتعليم الهادف بخصوص MRSA بين العاملين لدعم العظة للعمل التي كانت ضعيفة بين العاملين بنسبة هي 32.6%. الاستنتاجات: لا تزال هناك حاجة واضحة للمحاضرات المنتظمة ضمن برنامج التعليم المستمر في مجال التنقيف الصحي حول عدوى المستشفيات لدى العاملين في مجال الرعاية الصحية من جميع التخصصات. بالإضافة إلى الحاجة لإجراء المزيد من الدراسات الرصدية لتقييم مدى التزام العاملين لممارسات مكافحة عدوى MRSA لمواصلة الكشف عن أسباب عدم الامتثال من اجل العمل على معالجتها.