An-Najah National University
Faculty of Graduate Studies

Prevalence of Methicillin – resistant *Staphylococcus aureus* nasal carriage among patients and healthcare workers in Hemodialysis centers in North West Bank- Palestine

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This thesis was defended successfully on 16/December /2010 and approved by:

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2. Dr. Hassan Hijaz / External Examiner	.....
3. Dr. Ayman Hussein / Internal Examiner	.....

Dedication

To

My lovely family (my parents, my brothers Eng.Mahmood and Eng.Ibrahim and my sisters Mai and Dr.Karam and her husband Dr. Nedal Salhab)

To my new life, my husband Eng.Amer Kamal.

To Anas and Ruba Salhab .

Acknowledgement

I would like to express my sincere gratitude to my Supervisor Dr. Adham Abu Taha for his supervision, encouragement, guidance and help throughout this work.

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I also like to thank my lovely family (my parants,my brothers Mahmood and Ibraheem and my sisters Karam and Mai)for love ,encouragement and endless support.

Finally special thanks are due to An-Najah National University.

الإقرار

أنا الموقعة أدناه، مقدمة الرسالة التي تحمل العنوان:

Prevalence of Methicillin – resistant *Staphylococcus aureus* nasal carriage among patients and healthcare workers in Hemodialysis centers in North West Bank- Palestine

معدل انتشار البكتيريا العنقودية المذهبة المقاومة للمثسلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية

اقر بأن ما اشتملت عليه هذه الرسالة إنما هو نتاج جهدي الخاص، باستثناء مـــا تمـــت الإشارة إليه حيثما ورد، وان هذه الرسالة ككل، أو أي جزء منها لم يقدم من قبل لنيل أية درجة علمية 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: **اسم الطالبة:**

Signature: **التوقيع:**

Date: **التاريخ:**

List of Acronyms

Abbreviation	Explanation
S. aureus	*Staphylococcus aureus*
MRSA	Methecillin - resistant *Staphylococcus aureus*
MSSA	Methecillin – susceptible *Staphylococcus aureus*
CA-MRSA	Community associated Methecillin- resistant *Staphylococcus aureus*
HCWs	Healthcare workers
ICU	Intensive care unit
CHD	Chronic hemodialysis
DM	Diabetes Mellitus
SD	Standard Deviation

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Prevalence of Methicillin –resistant *Staphylococcus aureus* nasal carriage among patients and healthcare workers in Hemodialysis centers in North West Bank- Palestine.

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Abstract

Staphylococcus aureus has long been recognized as important pathogen in hospitalized patients and has severe consequences, despite antibiotic therapy. Hemodialysis patients are immunosuppressed, and this increases their susceptibility to infection. The nasal carriage of MRSA among dialysis patients is significant not only in terms of predisposing to subsequent infections, but also in playing an important role in transmission among dialysis unit staff and their family members.

This study aimed to explore the prevalence of Methicillin – resistant *S. aureus* nasal carriage among patients and healthcare workers in hemodialysis center in Northern West Bank-Palestine, to identify the risk factors associated with MRSA colonization in both patients and HCWs, and to assess the association between lab coat contaminations with *S. aureus* nasal colonization in healthcare workers. The cross sectional study was conducted in the period between October 2009 and January 2010 on 356 patients and 48 healthcare workers from the five hemodialysis units in governmental hospitals in Northern West Bank, Palestine. This study utilized two main instruments, questionnaire and nasal and HCWs lab coat swabs. The response rates of this study was 82.3% of patients and 75 % of

HCWs. Data were analyzed using the Statistical Package for Social Sciences SPSS software (version 17). Evaluations were carried out at 95% confidence level and $P < 0.05$ was considered statistically significant.

The prevalence of *S. aureus* nasal carriage is 17.9% (17.7% of patients and 19.4% of HCWs) and the prevalence of MRSA nasal carriage is 3.9% (3.75% of patients and 2.6% of HCWs). The percentage of white lab coat contamination with *S. aureus* was 8.3%, including 5.6% MRSA.

S. aureus nasal carriage among patients was statistically associated with previous chronic disease (p=0.004), DM (p=0.020) and previous skin lesion around intravascular device. *S.aureus* nasal carriage among HCWs was statistically associated with wearing gloves at the working time (p= 0.039) and changing gloves when caring for more than one patient (p=0.005). There was no association between *S. aureus* lab coat contamination with *S. aureus* nasal colonization in healthcare workers. Our data suggest that HD patients have lower rates of *S. aureus* nasal carriage compared with other countries. Monitoring and eradication of MRSA from patients, healthcare workers and their family members should be considered to prevent continuous spread between healthcare facilities and the community.

Chapter One

Introduction and Literature Review

Chapter One
Introduction and Literature Review

1. Introduction and literature review

1.1 Background

Staphylococcus aureus is one of the most important pathogens worldwide and has emerged as a prominent organism infecting critically ill persons; the impact of *S. aureus* infection on human health has dramatically increased as a result of its remarkable ability to become resistant to antimicrobials [1]. Because of its primary habitat is moist squamous epithelium of the anterior nares, most invasive *S. aureus* infections are assumed to arise from nasal carriage [2], the difference between methicillin-resistant *Staphelococcus aureus* (MRSA) and methicillin-susceptible *Staphylococcus aureus* is resistance to ß-lactam antibiotics; this is often associated with resistance to multiple other antibiotics, which limits the therapeutic options [3].

National estimates in the United States 2000-2002 suggested that the prevalence of *S. aureus* and methicilin resistant *S. aureus* (MRSA) colonization ratios were 31.6% and 0.84% respectively, and about 7% or more of patients admitted to the hospital are colonized with MRSA [4]. Although asymptomatic nasal colonization with *S. aureus* is common, it appears to be an important factor in the development of most infections due to this organism [5].

Hemodialysis is a primary method of treatment for long–term measure until renal transplantation or peritoneal dialysis can be performed. It continues to be an important option for individuals with the end stage renal disease [5]. The dialysis unit and its population provide an ideal setting for cross-transmission of pathogens, because regular hemodialysis is required 3 times per week for 3-4 hour shifts in a closed setting and because healthcare workers provide concurrent care to multiple patients [6].

The treatment cost is too high for patients with bacteremia in hemodialysis units. In a study conducted at Duke University in the United States, regarding the cost for patients with *S.aureus* bacteremia caused by MRSA and MSSA, the results showed that after the initial hospitalization, 14.8 % of patients with MRSA and 12.4% of patients with MSSA were re-hospitalized within 12 weeks for reasons related to bacteremia with average costs $ 32.655 for MRSA bacteremia and $ 18.803 for MSSA bacteremia[7].

1.2. *Staphylococcus aureus*

S. aureus is the most clinically significant species of staphylococci; *S. aureus* characteristics gave the reason for their pathogenicity; which takes many forms. They grow comparatively well under conditions of high osmotic pressure and low moisture, which partially explains why they can grow and survive in nasal secretions and on the skin [8]. *S. aureus* has been recognized as an important cause of disease around the world and it has

become a major pathogen associated with both hospital and community – acquired infections [13] .

1.2.1 Pathogenesis of *S. aureus* infections

S. aureus causes a variety of suppurative infections and toxinoses in humans. It causes superficial skin lesions such as boils, styes and furuncules; more serious infections such as pneumonia, mastitis, phlebitis, meningitis, and urinary tract infections; and deep-seated infections, such as osteomyelitis and endocarditis. *S. aureus* is a major cause of hospital acquired (nosocomial) infection of surgical wounds and infections associated with indwelling medical devices. *S. aureus* causes food poisoning by releasing enterotoxins into food, and toxic shock syndrome by release of super-antigens into the blood stream [9].

Although methicillin-resistant *S. aureus* (MRSA) has been entrenched in hospital settings for several decades, MRSA strains have recently emerged outside the hospital becoming known as community associated- MRSA((CA-MRSA) or superbug strains of the organism, which now account for the majority of staphylococcal infections seen in the clinic [9].

1.2.2 Virulence factors of *S.aureus*

S. aureus expresses many potential virulence factors: 1- surface proteins that promote colonization of host tissues; 2- invasins that promote bacterial spread in tissues (leukocidin, kinases, hyaluronidase); 3- surface

factors that inhibit phagocytic engulfment (capsule, Protein A); 4- biochemical properties that enhance their survival in phagocytes (carotenoids, catalase production); 5- immunological disguises (Protein A, coagulase, clotting factor); 6- membrane-damaging toxins that lyse eukaryotic cell membranes (hemolysins, leukotoxin, leukocidin); 7- exotoxins that damage host tissues or otherwise provoke symptoms of disease, and 8- inherent and acquired resistance to antimicrobial agents[9] .

1.2.3. Epidemiology

The primary reservoir of staphylococci is the nares, with colonization also occurring in the axillae, vagina, pharynx, and other skin surfaces. Nasal carriage in patient admitted to the hospital is common because close contact among patients and hospital personnel is not unusual; transfer of organisms often takes place. Increased colonization in patients and hospital workers frequently occurs in hospitals. Both hospital and community-acquired infections caused by drug resistant *S. aureus* has increased in the past 20 years [10].

1.2.4. Methicillin - resistant *Staphylococcus aureus* (MRSA)

Antibiotic resistant bacteria are an increasing problem in the world among infected patients; antibiotic resistance is associated with increases in length of hospital stay, healthcare costs, and patient morbidity and mortality [11]. Strain of *S.aureus* that is resistant to methicillin, oxacillin, nafcillin, cephalosporins, imipenem, and other beta lactam antibiotics [12].

Recent data from the Centers for Disease Control and Prevention showed that 59.5% of all healthcare–associated *S. aureus* infections in the United States are caused by MRSA [13]. Also, the proportion of MRSA has rapidly increased from below 5% in the early 1980s to 29% in 1991[3]. In New York City, MRSA accounts for ~30% of nosocomial infection and 50% of associated deaths [14]. Furthermore, the incidence of MRSA has increased in healthcare facilities in the United States since the mid-1970s [12], the proportion of *S. aureus* isolates resistant to methicillin in participating hospital increased from approximately 29%, in the early 1990's to 47% in 1998. In addition, mortality among patients with MRSA infections is significantly higher than mortality among patients with susceptible form of the same bacteria [11].

1.2.4.1. Reservoir

The anterior nares are a common colonization site. Colonized healthcare workers may also serve as a reservoir [15]. Colonization strains may serve as endogenous reservoirs for overt clinical infection or may spread to other patients [16].

While 25% to 30% of population colonized with *S. aureus*, approximately 1% is colonized with MRSA, so healthcare workers (including physicians, nurses, and paramedical) who carry MRSA colonized in their nostrils and skin are responsible for increased risk of getting infections to patients when they deal with them [17] . In a study done in the emergency department in 5 urban teaching hospitals in Pittsburgh,

United States, the prevalence of *S. aureus* nasal colonization among healthcare workers were 31.8%, and about 13.6% of them were colonized with MRSA. An overall prevalence of MRSA in that population was 4.3%[4].

1.2.4.2. Modes of Transmission

There are many ways associated with the MRSA transmission; some of these are associated with surrounding persons and others with the surrounding environment. Some modes of transmission are:

- Person-to-person contact, for example, via transiently colonized hands of staff.

- Fomites such as bed linens or environmental surfaces are not thought to play a major role in transmission except in special populations, such as patients in burn units or intensive care units [15].

Contamination of healthcare workers clothing including white coats, may be a vector for MRSA transmission. A study done on healthcare workers found that about 23% of healthcare workers white coats were contaminated with *S. aureus* of which 18% of them were MRSA [11] .In a study carried out at university collage hospital medical school in London, all medical students coats were bacteriological contaminated, the most organisms were *Staphylococcus.sp* including *S. aureus* [18] ·Another study showed that the cuffs and pockets of the coats were the most highly contaminated areas. This study was conducted in the East Birmingham

Hospital in the UK to determine the level and type of microbial contamination present on the white coats of doctors; it showed that about 25% of the white coats screened were contaminated with *S. aureus*, Also, in this study the nose swabs were taken from the same individuals where there coats were contaminated with *S. aureus*; it found that 48% of those individuals have *S. aureus* isolated from their nose [19].

- Hands of staff appear to be the most likely mode of transmission of MRSA from patient to patient.

- Droplet-borne transmission is less common, but may be important in patients with tracheotomies who are not able to control their secretions [15].

1.2.4.3 MRSA colonization

Colonization is the presence, growth and multiplication of the organism in one or more body sites without observable clinical symptoms or immune reaction [12]; colonized patients were considered as a chief source of *S. aureus* in hospital; approximately 10% to 40% of people on admission have nasal carriage of *S. aureus* [16].

A "carrier" refers to an individual who is colonized with MRSA [12]. There are three patterns of carriage.

1- Persistent carriers: individuals always carry one type of strains, and those formed about 20% of the carriers and were more common in children than adults.

2- Intermittent carriers: this pattern confirms a large proportion of the population (60%) and the strains change with varying frequency.

3- Non carriers: people who almost never carry *S. aureus* and those are minorities of people (20%) [3].

1.2.4.4. MRSA infection

Invasion and multiplication of MRSA in a body site are accompanied by clinical signs and symptoms of infection (e.g., fever, lesions, wound drainage) or increased white blood cell count [15]. Infections caused by MSSA and MRSA are growing concern, particularly among patients in intensive care and surgical units, immunocompromised patients, and elderly patients in hospitals and nursing homes [20].

S. aureus infection is a major cause of skin, soft tissue, respiratory, bone, joint, and endovascular disorders. The majority of these infections occur in persons with multiple risk factors for infection. The major diseases by *S. aureus* are:

- Bacteremia: The overall rate of mortality from staphylococcal bacteremia, ranges from 11 to 43%, Factors associated with increased mortality include an age of more than 50 years, non-removable foci of infection, and serious underlying cardiac, neurologic, or respiratory disease. The frequency of complications from staphylococcal bacteremia is high, ranging from 11 to 53%. As many as 31% of patients with bacteremia, who do not have evidence of endocarditis, do have evidence of metastatic

infection. An increasing percentage of bacteremic infections are related to catheterization

- Endocarditis: The incidence of *S. aureus* endocarditis has increased and accounts for 25 to 35% of cases, it occurs in intravenous drug users, elderly patients, patients with prosthetic valves, and hospitalized patients. *S. aureus* endocarditis is characterized by a rapid onset, high fever, frequent involvement of normal cardiac valves, and the absence of physical stigmata of the disease on initial presentation.

- Metastatic Infections: *S. aureus* has a tendency to spread to particular sites, including the bones, joints, kidneys, and lungs. Suppurative collections at these sites serve as potential foci for recurrent infections. Patients with persistent fever despite appropriate therapy should be examined for the presence of suppurative collections

- Sepsis: A minority of bacteremia or local infections progress to sepsis. Risk factors for sepsis include advanced age, immunosuppression, chemotherapy, and invasive procedures. *S. aureus* is one of the most common gram-positive pathogens in cases of sepsis.

- Toxic Shock Syndrome: The disease is characterized by a fulminant onset, often in previously healthy persons. The diagnosis is based on clinical findings that include high fever, erythematous rash with subsequent desquamation, hypotension, and multiorgan damage [21].

1.2.4.5. Common risk factors for acquiring MRSA

• Hospitalization or confinement in a setting where MRSA is endemic

• Prolonged hospital stay

• Multiple hospitalizations

• Age over 65 years

• Invasive devices (e.g., catheters, gastric/endotracheal tubes, surgical drains, sumps). MRSA is a leading pathogen in catheter related blood stream infections, because this device quickly becomes coated with biofilm, MRSA itself contributes and promotes the formation of biofilm, which facilitates the transfer of genetic material conferring resistance between species [22] .The use of temporary or semi-permanent hemodialysis catheters for hemodialysis remains an essential component of dialysis practices; the use of these catheters is often complicated by infectious complications such as catheter-related bacteremia, which is the most significant infectious complication of hemodialysis catheters; when MRSA often colonizes the anterior nares and disseminates to infect other parts of the body ,among end-stage renal disease patients undergoing long-term dialysis, these site include vascular access sites [23]. In a prospective study conducted on hemodialysis catheters found that about 8% of hemodialysis catheters were removed because of exit-site infection; and about 41% were removed because of fever and clinical suspicion of catheter related sepsis where the most isolated organisms were MSSA and MRSA [24]. Another

study done between 1995 and 1997 shows that *S. aureus* including MRSA is the most common organisms identified and contributed to 29% of blood stream infections related to vascular access [25].

• Open wound

• Severe underlying illness

• Treatment with multiple broad-spectrum antibiotics [15]. The use of antibiotic correlates with risk for MRSA colonization and infection, in multiple studies, the results show the hospitalized patient's prior antibiotics exposure (of almost any kind) is strongly linked to subsequent infections with MRSA [11].

• Close proximity to patients colonized or infected with MRSA

• Inpatient in a neonatal or surgical ICU

• Inpatient in a burn unit.

• Certain patient populations, such as hemodialysis patients, intravenous drug users, those with dermatological diseases such as eczema, and patients with insulin-dependent diabetes mellitus, have increased rates of staphylococcal carriage [15].

1.2.4.6. Diagnosis of MRSA infection:

MRSA infection can be diagnosed by positive culture together with signs/symptoms of infection. In this case, MRSA is usually cultured from

blood, wounds, respiratory secretions, urine, or surgical specimens. Common sites of infection (and colonization) include wounds, tracheostomy sites, respiratory tract of intubated patients, and IV catheter sites [15].

Colonization can be detected by culture of the organism from an asymptomatic patient. In this case, MRSA is usually cultured from the skin, nares, or rectum. After *S. aureus* is identified, antibiotic susceptibility testing should be performed [15].

1.2.4.7. Treatment of MRSA infection:

The antibiotic of choice for MRSA infections is vancomycin given intravenously. Many minor MRSA infections can be successfully treated with trimethoprim-sulfamethoxazole, if susceptibility is established by testing. Unnecessary use of antibiotics should be avoided with all patients; this reduces the survival advantage of MRSA and other resistant bacteria.

The effectiveness of decolonization (i.e., treating colonized patients to eradicate their MRSA) is questionable. Uses of topical agents such as mupirocin, and antibacterial soaps have had some efficacy in the absence of foci of active infection. The decision to attempt decolonization must be made by the patient's physician and should be evaluated on an individual basis [15]. The application of mupirocin has been recommended for the preoperative eradication *S. aureus* from patients under going cardiac surgery, patients with human immunodeficiency virus, and patients undergoing hemodialysis and continuous ambulatory peritoneal dialysis [20].

1.3 The prevalence of *S. aureus* nasal carriage

The anterior nares are the main reservoir for *S. aureus*. According to several studies which have examined community nasal carriage of *S. aureus* the proportion ranges from 20%-45% in diverse subpopulations, such as adults patients, healthcare workers (HCWs), college students and injection drug users with estimated methicillin –resistance *S. aureus* (MRSA) colonization 1.3% [20]. Many studies worldwide showed that average carriage rates screened in HCWs were 4.6% of MRSA and 23.7% of MSSA while 5.1% had clinical infections with MRSA [2, 26].

Nasal carriage is a significant contributor to the epidemiology and pathogenesis of these health care- associated infections; the epidemiologic pathways include patient to patient spread and frequently patient to HCW to patients. The MRSA colonization also can be found in many sites in HCWs, the carriage rates were 6.4% for hands, 1.6% for perineum, and 0.3% for pharynx whereas the mean nasal MRSA carriage in HCWs was 4.1 % [26].

Many studies were conducted to assess the nasal carriage of MRSA among healthcare workers, the prevalence of *S. aureus* in Kasturba medical collage medical students, Mangalore, India, was 100% and 75% of both postgraduates and undergraduates respectively, and postgraduates with MRSA higher than that of undergraduates, 42.3% and 4.16% respectively [27]. In United State, in Sedgwick county Emergency Medical Service in Wichita, Kansas, the rate was 54.1% among paramedics and

about 10.2% of these were MRSA and were 49.0% for methicillin susceptible *S. aureus* (MSSA) [20], in Singapore General Hospital 20.2% of HCWs were found to be colonized with MRSA , 11.2 % of them were nasal carriage only and about 6.7% had concurrent nasal carriage and throat carriage [23], in Portugal it was 4.8%, the nurses and nurse aids were the HCWs categories with the highest risk of becoming colonized with MRSA [28], and in the largest hospital in Iran (Milad Hospital) 31.1% of HCWs were nasal carriers of *S. aureus* [29]. In other study were conducted in north Jordan the prevalence of *S. aureus* nasal carriage were 19.8%,only 5.8% were found to be carrier with MRSA[38].

The population of patients who undergo chronic hemodialysis (CHD) has contributed substantially to the emergence and dissemination of antimicrobial-resistant pathogens [6]. In addition to that, the dialysis patients are well recognized as having high rates of invasive infection due to MRSA; the overall incidence of invasive MRSA infections among dialysis patients was higher than that among the general population [20]. Many studies conducted in several countries among hemodialysis MRSA nasal carriage. In a study done in Denmark dialysis centers about 59.5% of hemodialysis patients carried *S. aureus*, primarily in the nose (44%) [31]. Whereas in Saudi Arabia hemodialysis center was 38% (58.7% among 75-84 year's age group and 50% in 65-74 year's age group) [32], and also in Portugal hospitals the study done to detect the prevalence of MRSA nasal carriage among patient and HCWs, found that the prevalence of MRSA nasal carriage among patients screened was 4.8% and in HCWs was 5.1%

[28] . In an other prospective study, conducted in King Fahd Hospital and tertiary care center in the Eastern Province of Saudi Arabia, involving 205 end stage renal disease patients, the results of the study have showed that about 38.05% for *S. aureus* nasal carriage was observed including 27.3% for MSSA and 10.7% for MRSA, the highest prevalence of nasal carriage group were those patients aged 75–84 years (84.6% MRSA and 46.2%MSSA) [33]; the colonized patients were older and more likely to be diabetic and with a higher proportion of women than men[29].

2. Significance of the study

Hemodialysis patients are at high risk of infection, because hemodialysis requires vascular access for prolonged periods. In hemodialysis units, several patients receive dialysis concurrently; this would increase the risk of transmitting MRSA person-to-person infections directly or indirectly via contaminated devices, equipment and supplies, environmental surfaces, or hands of personnel. Furthermore, hemodialysis patients are immunosuppressed, which increases their susceptibility to infection, and they require frequent hospitalizations and surgery, which increases their opportunities for exposure to nosocomial infections. Bacterial infections, especially those involving vascular access, are the most frequent infectious complications of hemodialysis and a major cause of morbidity and mortality among hemodialysis patients. Patients with MRSA bacteremia face a higher mortality risk, longer hospital stays, and higher inpatient costs than do patients with MSSA bacteremia

Transmission of MRSA from the dialysis centers through family members of patients and healthcare workers and into the community has been documented in several studies [23, 24, 25, 26, 32, 36, and 37].

The nasal carriage of MRSA among dialysis patients is significant not only in terms of predisposing to subsequent infections, but also in playing an important role in transmission among dialysis unit staff and their family members. Monitoring and eradication of MRSA from patients, healthcare workers and their family members should be considered to prevent continuous spread between healthcare facilities and the community.

3. Objectives of the study

3.1 Main objective

This research will determine the Prevalence of Methicillin – resistant *S. aureus* nasal carriage among patients and healthcare workers in hemodialysis center in Northern West Bank-Palestine.

3.2 Secondary objectives

1- Identify the risk factors associated with MRSA colonization in both patients and HCWs.

2- Assess the association between lab coat contaminations with *S. aureus* nasal colonization in healthcare workers.

Chapter Two

Methodology

Chapter Two
Methodology

This chapter describes the type of study, identification of population, setting, ethical considerations, instruments, data collection, and experimental work.

2.1 Study design

This cross- sectional study was designed to measure the prevalence of Methicillin – resistant *Staphylococcus aureus* nasal carriage among patients and healthcare workers in Hemodialysis centers in North West Bank- Palestine.

2.2 Target population

According to the statistics of Ministry of Health of Palestinian authority for the year 2009 the total population of our study in hemodialysis centers in governmental hospitals is 404 (356 hemodialysis patients and 48 HCWs). Our study involved five hemodialysis units distributed on five Governmental hospitals in Northern West Bank, Palestine; the distribution of our population according to the Hospital is as follows in table 2.1:

Table (2.1): Distribution of the study population:

Hospitals	No. of total Patients	No. of total HCWs
Nablus	130	14
Ramallah	80	10
Jenin	70	9
Tulkarm	45	9
Qalqiliya	31	6
Total	356	48

- **Inclusion criteria:**

- Hemodialysis patients in Northern West Bank, Palestine.

- HCWs working in hemodialysis units in Northern West Bank, Palestine.

- **Exclusion criteria:**

- HCWs working in other departments of the hospital other than hemodialysis units.

2.3 Setting

The five hemodialysis units in Northern West Bank governmental hospitals, Al-Watani Hospital in Nablus, Dr.Thabit Thabit Governmental Hospital in Tulkarm, Khalil Suliman Governmental Hospital in Jenin, Qalqilia Governmental Hospital in Qalqilia and Ramallah Governmental Hospital in Ramallah) were involved in this study

2.4 Data collection

Data was collected over a period of four months between October 2009 and January 2010. The research had permission from the Ministry of health before starting the collection of data.

Anterior nares swab were taken from the hemodialysis healthcare worker's as well as the hemodialysis patients, also Swabs from the white coat of HCWs. At the same time they were interviewed using a structured questionnaire after their consent to take part in this study.

2.4.1 Instrument of data collection

The study utilized two main instruments:

2.4.1.1 Questionnaire

A specially designed two questionnaires were prepared for this purpose.

The HD patients Questionnaire including: Demographic variables (Age, gender and Duration on HD (year), Medical history variables (previous use of antibiotic in the last 6 months, previous skin lesion around intravascular device before changing it, previous chronic disease diagnosis, Diabetes mellitus, Types of DM), and Exposure to health care variables (patient address, previous admission in the hospital, previous admission for surgical operation).The questionnaire was validated by distributing it to 10 patients

The HD healthcare workers Questionnaire includes : Demographic variables (gender, age and type of HCWs), And medical history variables (previous use of antibiotic in the last 6 months, previous chronic disease, previous infection with *S. aureus*, previous admission in the hospital, previous admission for surgical operation) and it was validated by

distributing it to10 HCWs. Questionnaires were filled by the researcher through using Arabic, and then the data were entered to the questionnaire using English language.

2.4.1.2 Nasal swabs and HCWs lab coat swabs:

Anterior nares swab were taken from the hemodialysis healthcare worker's as well as from the hemodialysis patients. Also swabs from the white coat of HCWs were taken.

2.5 Experimental work

2.5.1 Materials used in swab culture

1. Sterile swabs with transport media (EUROTUBO®)
2. Sterile Normal saline
3. Manitol salt agar Media
4. Muller-Hinton Media (Oxoid®)
5. Oxacillin powder
6. Catalase 3%
7. EDTA plasma
8. Gram stain
9. Microscope (Olumpus)

10. Sterile calibrated loops 10(ml)

11. Incubator (thermostar J –Dahan technologies)

12. Autoclave (tuttanuer Autoclave – Steam Sterilizer model 1730 MKEC)

2.5.2 Collecting swabs

2.5.2.1. Nasal swab

Sterile swab was moistened with sterile normal saline and was rotated at least 5 times in one nares, then was placed in the transport media

2.5.2.2. White coat swab

The label, hip pockets and outer surface of the cuffs were swabbed with sterile swab moistened with normal saline and was placed in the transport media.

All collected swabs were transferred to the university labs by bacterial transport media within 12 hours.

2.5.3 Culture and confirming the result

1. The swabs then were cultured by platting them onto two mannitol salt agar plates, one of which was supplemented with oxacillin (4µg/ml). These inoculated plates were incubated at 35ºC for 48 hr.

2. Colonies suspected to be *S. aureus* were confirmed by: Gram stain, catalase test and coagulase test.

3. Colonies suspected to be MRSA were inoculated on to Muller – Hinton agar containing (6µg/ml) oxacillin and 4% NaCl to confirm the methicillin resistance.

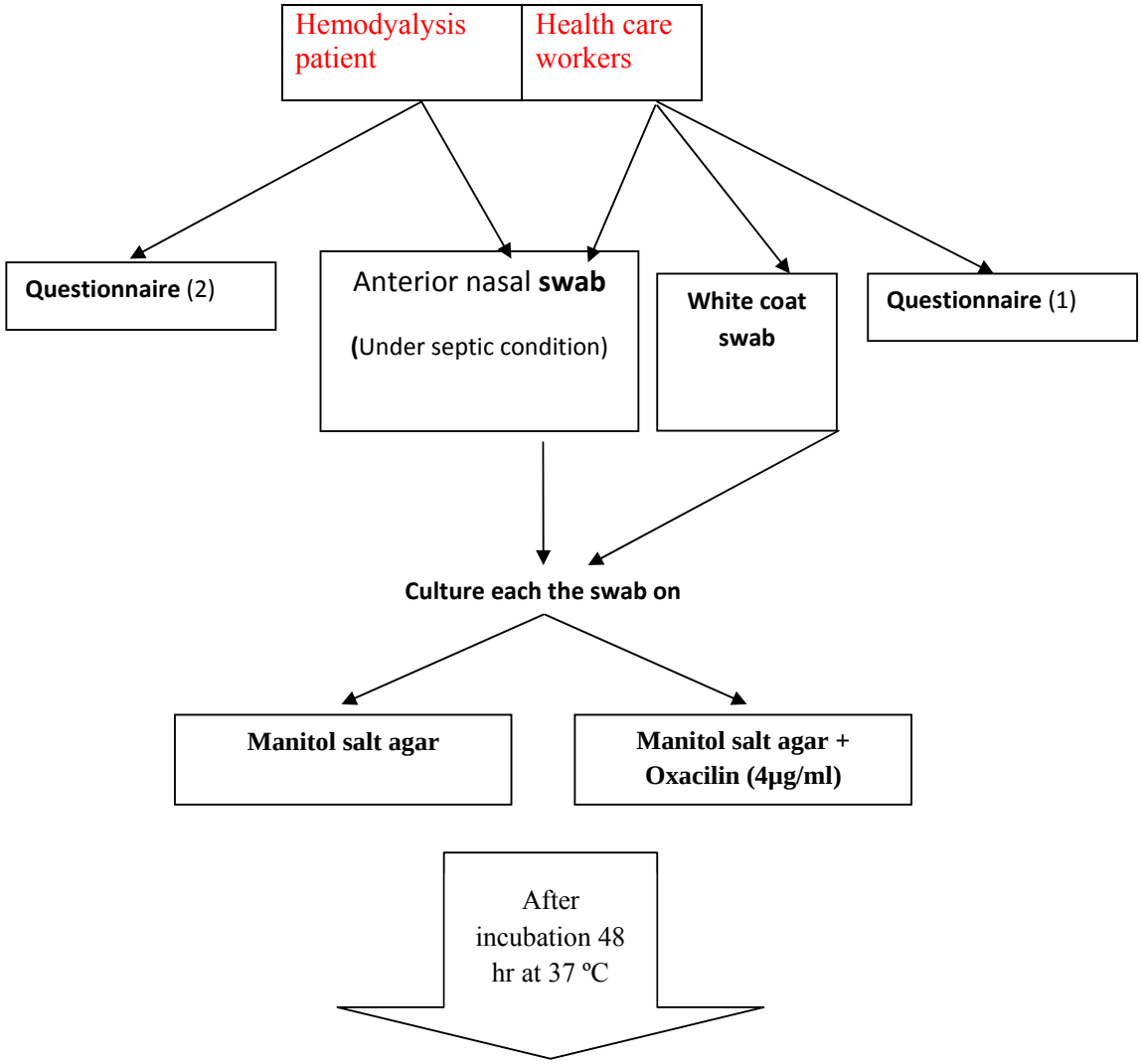
2.6 Statistical analysis

Data was tabulated and analyzed using the Statistical Package for Social Sciences (SPSS) software, version 17. Data were presented as frequencies. Chi-square analysis ($\chi 2$) was used in findings on comparison of positively *S. aureus* nasal carriage cases according to individual characteristics. Evaluations were carried out at 95% confidence level and $P < 0.05$ was considered statistically significant.

2.7 Ethical issues

Permission obtained from the Palestinian Ministry of Health to conduct this study in the governmental hospitals in Northern West Bank. No participant in this research was included unless were received inform consent from the participant to take part in this research.

2.8 Flow chart explaining the experimental work

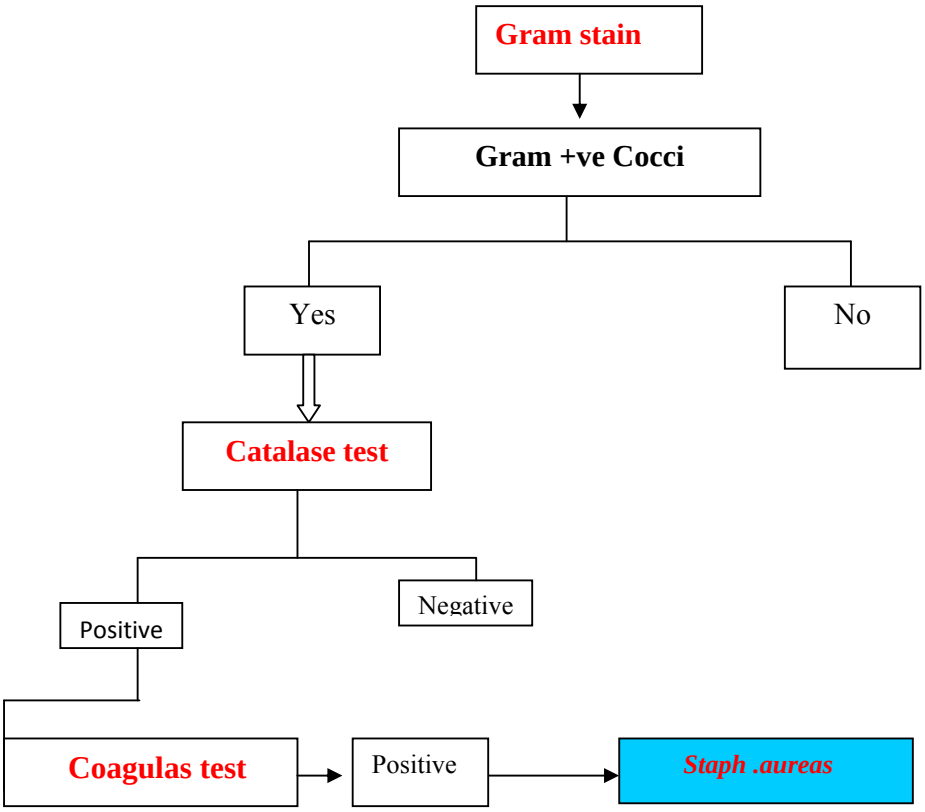


Plates / Color of the growing colonies	Manitol salt agar	Manitol salt agar + Oxacilin (4µg/ml)	
Yellow colonies	+ ve	+ ve	MRSA
Yellow colonies	+ ve	- ve	MSSA

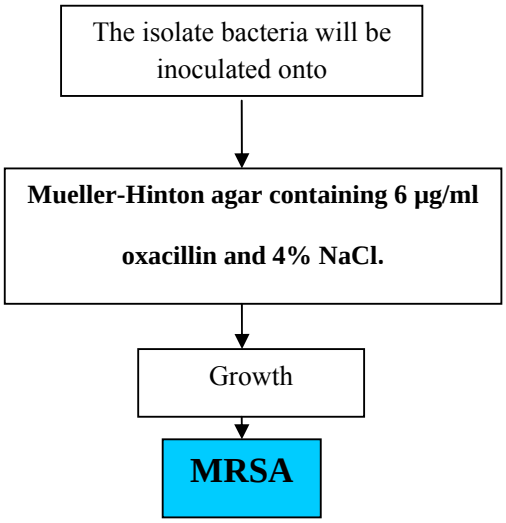
+ve= growth of yellow colonies ,-ve =no growth of yellow colonies

TO CONFIRM THE RESULT

To confirm the bacteria is *S. aureus:*



To confirm the bacteria is MRSA:



Chapter Three

The Result

Chapter Three
Results

This cross-sectional study was conducted in the period between October 2009 and January 2010 on 356 patients and 48 healthcare workers from the five hemodialysis unit in governmental hospitals in northern West Bank, Palestine. Figure 3.1 shows the areas of research at the map of West Bank, Palestine.

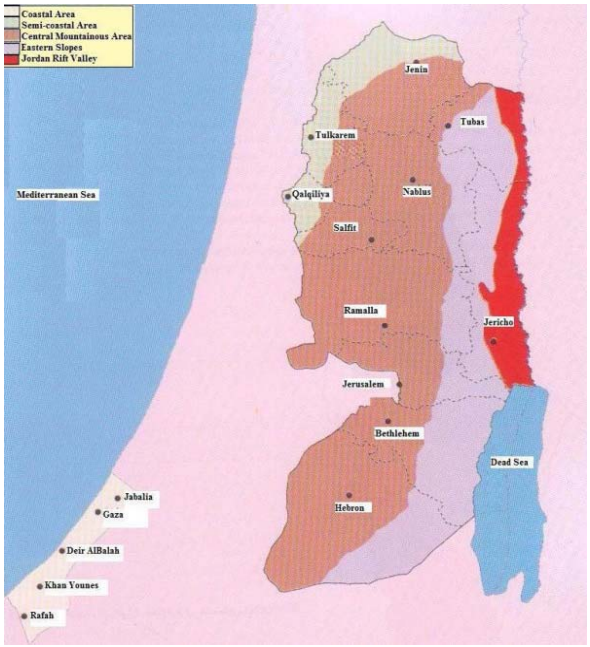


Figure (3.1): Map of West Bank showing the areas of research.

Table (3.1): Distribution of participants in the study:

City / Subjects	Nablus No. (%)	Ramallah No. (%)	Jenin No. (%)	Tulkarm No. (%)	Qalqilia No. (%)	Total No. (%)
Patients	98/130 75.5%	66/80 82.5%	64/70 91.4%	39/45 86.6%	26/31 83.8%	293/356 82.3%
HCWs	10/14 71.4%	6/10 60%	7/9 77.7%	9/9 100%	4/9 66.6%	36/48 75%

Table 3.1 shows the distribution of participants in the study in all hospitals. The total response rates of patients are 82% and the total response rate in HCWs is 75%. 98 patients and 10 HCWs from Nablus hospital, 66 patients and 6 HCWs from Ramallah hospital ,64 patients and 7 HCWs from Jenin hospital, 39 patients and 9 HCWs from Tulkarm hospital and 26 patients and 4 HCWs from Qalqiliya hospital .

Table (3.2): Distribution of participant patients' gender in the study:

Population		Patients	HCWs	Total
		No. (%)	No. (%)	No. (%)
Gender	Male	164(56%)	12(33.3%)	176(53.5%)
	Female	129(44%)	24(66.7)	153(46.5%)
Total		293	36	329

56% of participating patients were male and 44% were female ,and 33.3 of participating HCWs were male and 66.7% were female .the mean ages of participants were 53.5±16.9 years old of patients and 33 ± 6.8 years old of HCWs. The mean period on hemodialysis was calculated as 36.3 ± 37.5 months (range 0.5-204 months) for 293 patients on HD.

3.1 Prevalence of *S. aureus* (MSSA and MRSA) in HD units

The overall prevalence of *S. aureus* nasal carriage is 17.9% (17.7% of patients and 19.4% of HCWs). 13.9% is MSSA nasal carriage (14% patients and 13.9% HCWs), whereas the prevalence of MRSA nasal carriage is 3.9%, (3.75% of patients and 2.6% of HCWs). And the percentage of white lab coat were contaminated with *S. aureus* is 3/36

(8.3%). Including 1/36 (2.8%) contaminated with MSSA and is 2/36 (5.6 %) with MRSA as shown in Table 3.3.

Table (3.3): Prevalence of *S. aureus* (MSSA and MRSA) in HD units:

	S. aureus		**MSSA**		**MRSA**	
	No. (%)	**Total**	**No. (%)**	**Total**	**No. (%)**	**Total**
Nasal carriage among hemodialysis patients	52/293 (17.7%)	59/329 (17.9%)	41/293 (14%)	46/329 (13.9%)	11/293 (3.75%)	13/329 (3.9%)
Nasal carriage among HCWs	7/36 (19.4%)		5/36 (13.9%)		2/36 (2.6%)	
White lab coat contamination	3/36 (8.3%)		1/36 (2.8%)		2/36 (5.6%)	

3.2 Distribution of *S. aureus* (MRSA and MSSA) nasal carriage among patients in HD units in northern West Bank.

Table 3.5 summarizes the distribution of *S. aureus* nasal carriage among patients in five hemodialysis units distributed in Northern West Bank (Nablus ,Ramallah, Jenin ,Tulkarm and Qalqiliya) the prevalence of *S.aureus* nasal carriage was found to be 34.8%(24.2% MSSA,10.6% MRSA) in Ramalla Governmental Hospital, 32% (26.6 %MSSA, 6.3%MRSA) in Khalil Suliman Governmental Hospital in Jenin, 20. 5%(all of them MSSA) in Dr. Thabet-Thabet Hospital in Tulkarm ,and no nasal carriage of *S. aureus* in both Al-Watani Hospital in Nablus and Qalqiliya Governmental Hospital; and there is significant difference in nasal carriage among patients in these different centers with *p* value (0.000).as shown in Table 3.4.

Table (3.4): Distribution of *S. aureus* (MRSA and MSSA) nasal carriage among patients in northern West Bank HD units

HD unit (No. of patients)	*S. aureus* nasal carriage in patients		MSSA nasal carriage in patients		MRSA nasal carriage in patients	
	No. (%)	*P* value	No. (%)	*P* value	No. (%)	*P* value
Ramallah (66)	23(34.8%)	0.000	16(24.2%)	0.000	1(10.6%)	0.003
Jenin (64)	21 (32%)		17(26.6%)		4 (6.3%)	
Nablus (98)	0 (0%)		0%		0%	
Tulkarm (39)	8 (20.5%)		8 (20.5%)		0%	
Qalqiliya (26)	0 (0%)		0%		0%	

3.3 *S. aureus* nasal carriage and demographic variables among HD patients

Gender and age were not statistically significant with *S. aureus* nasal carriage with *p* values (p=0.339), (p=0.775) and with MRSA nasal carriage with (p=0.923) and (p= 0.533) respectively as shown in Table 3.5

Table (3.5)*: S. aureus* nasal carriage and demographic variables among hemodialysis patients:

Variables	*S. aureus* nasal carriage among patients		MRSA nasal carriage among patients	
	No. (%)	*p* value	No. (%)	*p* value
Gender				
Male	26(15.9%)	0.339	6(3.7%)	0.923
Female	26(20.2%)		5(3.9%)	
Age				
5-14	1 (50%)	0.775	0%	0.533
15-24	4(20%)		1(5%)	
25-34	1(5.6%)		0%	
35-44	10(21.3%)		0%	
45-54	10(20.5%)		4(8.5%)	
55-64	13(16.5%)		4(5.1%)	
65-74	8(14.8%)		2(3.7%)	
75-84	4(19%)		0%	
>85	1(14.3%)		0%	

Figure 2.3 shows that the mean duration on HD of *S. aueus* nasal carrier patients (38.8±36.4 months) and for MRSA nasal carrier patients

(62.8±51 months) are not statistically significant with *p* values (*p*=0.271) and (*p*=0.111) respectively.

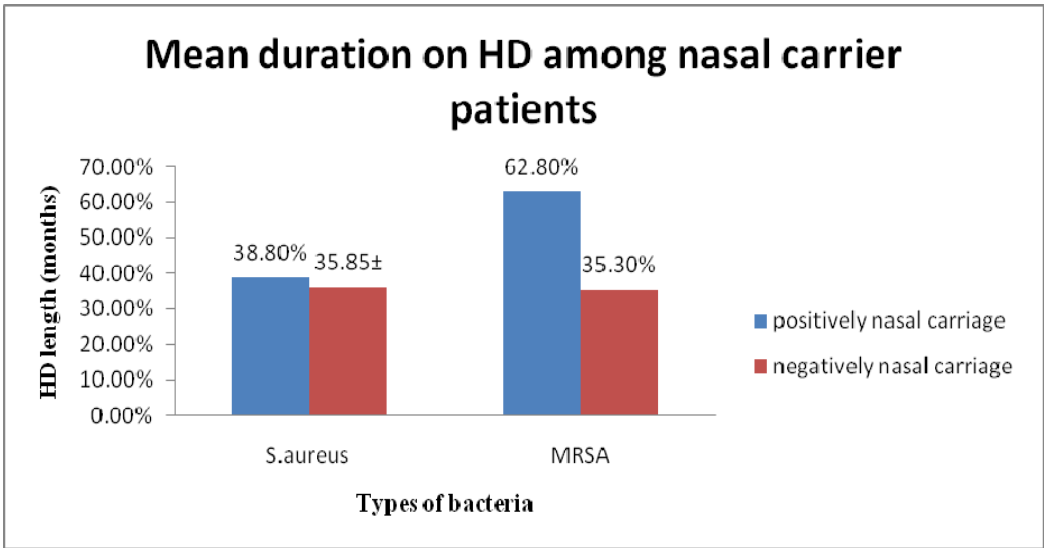


Figure (2.3): Mean duration on HD

3.4 *S. aureus* nasal carriage and medical history variables among HD patients

Most hemodialysis patients take different antibiotics for different reasons, there is no significant association between previous use of antibiotics in the last 6 months and *S. aureus* nasal carriage (*p*=0.686), or with MRSA nasal carriage (*p*= 0.074).

This study showed that there is significant relationship between *S. aureus* and MRSA nasal carriage and previously chronic diseases with *p* values (*p*= 0.031) and (*p*= 0.028) respectively, also there is significant association between the diabetic patients and *S. aureus* nasal carriage (*p*= 0.020) and MRSA (*p*= 0.060).and the previous skin lesion around intravascular device before change it had a significant association with *S.*

aureus (*p*=0.008) and MRSA nasal carriage (*p*=0.049) as shown in table 3.6.

Table (3.6): *S. aureus* nasal carriage and medical history variables among hemodialysis patients

Variables	***S.aureus* nasal carriage among hemodialysis patients**		**MRSA nasal carriage among hemodialysis patients**	
	No. (%)	***p* value**	**No. (%)**	***p* value**
Previous use of antibiotic **yes** **no**	33 (17.1%) 19 (19%)	0.686	10 (5.2%) 1(1%)	0.074
Previous skin lesion around intravascular device **yes** **no**	41(22.3%) 10.1(11%)	0.008	10(5.4%) 1(0.9%)	0.049
Previous chronic disease diagnosis **yes** **no**	43(20.9%) 9(10.3%)	0.031	11(5.3%) 0%	0.028
Diabetes mellitus: **Diabetic** **Non diabetic**	31(23.5%) 21(13%)	0.020	8(6.1%) 3(1.9%)	0.060

3.5 *S. aureus* nasal carriage and exposure to health care facilities variables among HD patients

The hospital has been always considered as a source of nosocomial infection, Table 3.7 represent that in this study there is no association between *S. aureus* or MRSA nasal carriage among HD patients and previous admission in the hospital , previously admission for surgical operation or their address whether they were described inpatients or outpatients with *p* values >0.05

Table (3.7): *S. aureus* nasal carriage and exposure to health care facilities variables among HD patients:

Variables	***S. aureus* nasal carriage among hemodialysis patients**		**MRSA nasal carriage among hemodialysis patients**	
	No. (%)	***p* value**	No. (%)	***p* value**
Patients address inpatient outpatient	0% 52(17.8%)	0.642	0% 11(3.8%)	0.843
Previous admission in the hospital yes no	47 (16.9%) 5 (33.3%)	0.105	11(4%) 0	0.432
Previous admission for surgical operation yes no	35(17.8%) 17(17.7%)	0.990	8(4.1%) 3(3.1%)	0.692

3.6 Distribution of *S.aureus* (MRSA and MSSA) nasal carriage among HCWs in HD unit in northern West Bank

Table 3.8 shows clearly the prevalence of *S.aureus* nasal carriage among HCWs was found to be 42.9% (28.6%MSSA, 14.3%MRSA) in Khalil Suliman Governmental Hospital in Jenin, 11.1%(all of them MSSA) in Dr. Thabet-Thabet Hospital in Tulkarm, 50%(33.3% MSSA and 16.7%MRSA) in Ramallah Governmental Hospital in Ramallah and no nasal carriage of *S. aureus* in both Al-Watani Hospital in Nablus and Qalqiliya Governmental Hospital in Qalqiliya and there were statistically significant differences, with *p* value (0.044).

Table (3.8): Distribution of *S. aureus* (MRSA and MSSA) nasal carriage among HCWs by northern West Bank HD units:

HD unit (No. of HCWs)	*S. aureus* nasal carriage in HCWs		MSSA nasal carriage in HCWs		MRSA nasal carriage in HCWs	
	No. (%)	*P* value	No. (%)	*P* value	No. (%)	*P* value
Jenin (7)	3 (42.9%)		2(28.6%)		1 (14.3%)	
Nablus (10)	0 (0%)		0%	0.242	0%	
Tulkarm (9)	1 (11.1%)	0.044	1 (11.1%)		0%	0.436
Qalqiliya (4)	0(0%)		0(0%)		0%	
Ramallah(6)	3(50%)		2(33.3%)		1(16.7%)	

3.7 *S.aureus* nasal carriage and demographic variables among HD HCWs

In table 3.9 the gender, age and type of HCWs showed not statistically significant with *p* values (*p*=0.766), (*p*=0.963) and (*p*= 0.618) respectively. This was shown in table 3.9:

Table (3.9): *S. aureus nasal* carriage and demographic variables among hemodialysis HCWs

Variables	*S. aureus* nasal carriage among HCWs	
	No. (%)	*p* value
Gender		
Male	2 (16.7%)	0.766
Female	5(20.8)	
Age		
20-29	3(21.4%)	0.963
30-39	3(18.8%)	
40-49	1(20%)	
50-59	0%	
Type of HCWs		
physician	0%	0.618
nurse	7(19.4%)	

3.8 *S. aureus* nasal carriage and medical history variables among HD HCWs

The study showed there is no significant association between *S. aureus* nasal carriage and medical history of HCW such as shown in our

study about previously chronic disease (*p*= 0.618), previous use of antibiotics in the last 6 months (*p*=0.434), previous infections with *S. aureus* (*p*=0.374), previous admission in the hospital (*p*= 0.558) or previous admission for surgical operation (*p*=0.434).as present in table 3.10.

Table (3.10): *S. aureus nasal* carriage and medical history variables among hemodialysis HCWs:

Variables	***S. aureus* nasal carriage among hemodialysis patients**	
	No. (%)	***p* value**
Previous use of antibiotic yes no	 2 (13.3%) 5 (23.8%)	 0.434
Previous chronic disease diagnosis yes no	 0% 7 (20%)	 0.618
Previous infection with *S. aureus* yes no	 0% 7 (21.2%)	 0.374
Previous admission to the hospital yes no	 3 (15.8%) 4 (23.5%)	 0.558
Previous admission for surgical operation yes no	 2 (13.3%) 5 (23.8%)	 0.434

3.9 *S.aureus* nasal carriage and job related activities variables among HD HCWs

Table 3.11 represents the previous area of HCWs service such as operating room, ICU units, or other departments in the hospital and if they work in other departments when they were in hemodialysis unit were not statistically significant with *S. aureus* nasal carriage (*p*=0.207) or (*p*=0.137) respectively.

whereas wearing gloves at the working time and changing gloves when caring for more than one patient were statistically significant with *S. aureus* nasal carriage with(*p*= 0.039)and (*p*=0.005) respectively .

Table (3.11):*S. aureus* nasal carriage and job related activities variables among HD HCWs

Variables	*S. aureus* nasal carriage among hemodialysis patients	
	No. (%)	*P* value
Wearing gloves		
yes	6 (17.1%)	0.039
no	1 (100%)	
Changing gloves between patients		
yes		0.005
no	3 (10.3%)	
	4 (57.1%)	
Previous department		
operating room	4(36.4%)	0.207
ICU unit	1 (20%)	
other department	2 (10%)	
Working in other departments while working in hemodialysis unit		
yes	1 (7.1%)	0.137
no	6 (27.3%)	

3.10 White lab coats contamination with *S. aureus*

Table 3.12 represents the time, the place where lab coats laundering, sharing lab coats with other colleagues and the reason for wearing lab coats were variables with no statistically significant differences with lab coat contamination with *S. aureus* or MRSA.

Table (3.12): White lab coats contaminated with *S. aureus*:

	white lab coat contaminated with *S. aureus*		white lab coat contaminated with MSSA		white lab coat contaminated with MRSA	
	No. (%)	***p* value**	**No. (%)**	***p* value**	**No. (%)**	***p* value**
How often do you get your coat washed?						
<3 days(27)	2(7.4%)		0%		2(7.4%)	
< 7 days(9)	1(11.1%)	0.728	1(11.1%)	0.079	0%	0.401
Location of laundery						
home (31)	3(9.7%)		1(3.2%)	0.684	2(6.5%)	0.559
hospital(5)	0%	0.468	0%		0%	
sharing lab coats with other colleagues						
not at all (24)	2(8.3%)	0.100	0%	0.151	2(8.3%)	0.303
some times (12)	1(8.3%)		1(8.3%)		0%	
all the time (0)	0%		0%		0%	

3.11 Association between lab coat contamination and *S. aureus* nasal colonization in healthcare workers

Table 3.13 showed there is no association between *S. aureus* lab coat contaminations and *S. aureus* nasal colonization in healthcare workers

Table (3.13): The association between *S. aureus* lab coat contamination with *S. aureus* nasal colonization in healthcare workers:

		***S. aureus* nasal carriage**		**Total**	***P* value**
		Yes	**No**		
Lab coat contaminated with *S. aureus*	**Yes**	0	3	3	0.374
	No	7	26	23	
Total		7	29	36	

Chapter Four

Discussion and Recommendations

Chapter Four
Discussion and Recommendations

Understanding and evaluating the sources of bacterial infection, risk factors associated with it and mode of bacterial transmission, help in putting the effective plan for preventing and control of the infections.

Because methicillin-resistant *Staphylococcu aureus* is one of the most important causes of nosocomial infections worldwide and usually acquired via spreading; one of the most effective methods for preventing the spread of MRSA, requires detection of colonized patients and healthcare workers and assessing the associated risk factors of colonization.

The main objective of our study is to determine the prevalence of MRSA nasal carriage among patients and HCWs in HD centers in Northern West Bank, Palestine.

The current study explores the prevalence of *S. aureus* nasal carriage in five hospitals of Northern West Bank –Palestine (Nablus, Ramallah, Jenin, Tulkarm and Qalqilia). Our results demonstrated clearly a low prevalence rate of *S. aureus* nasal carriage 17.9%(17.7% among patients and 19.4% among HCWs) also low prevalence of MRSA nasal carriage 3.9% (3.75% among patients and 2.6% among HCWs) .These rates are lower than those reported in other areas of the world.

In Denmark, a study was undertaken in four dialysis centers to establish the prevalence of *S. aureus* carriage in a Danish population of patients on HD show that the *S. aureus* strains isolated from nasal swabs

were 59.5% [31].Whereas in Germany, a study conducted to determine the prevalence of nasal carriage of *S. aureus* and it was 53% (41% MSSA, 12% MRSA) [40].

In 2006, a study was conducted in St. John Hospital and medical center in USA , the colonized patients undergoing dialysis with *S. aureus* were 33%(65% MRSA,35% MSSA) [30] .

In Saudi Arabia , a study was conducted in king Fahd Hospital and tertiary care center, involving end stage renal disease patients that showed about 38.05% *S. aureus* nasal carriage was observed including (10.7% MRSA and 27.3%MSSA)[33].

In Turkey a study was conducted in Ankara University Hospital to determine the rate of nasal MRSA carriage among staff, showed that the prevalence of MRSA nasal carriage in HD staff was 1/11 (9.1%) [36].

Our data suggest that HD patients have lower rates of *S. aureus* nasal carriage compared to other countries, and that is because the prevalence of *S. aureus* nasal carriage among Nablus and Qalqilia patients was zero percent, and these units forming the largest percentages in our populations (45.2 % from the total population), the zero percent in Nablus may be due to the fact that all the patients were receiving a prophylactic doses of vancomycin ahead of each session of dialysis. It is true that this practice was good in preventing MRSA colonization but it increases the risk for the emergence of vancomycin-resistant strains . The zero percent

in Qalqilia may be due to the fact that the unit is a newly established one and was operative in march 2009. Another reason could be due to that most of these patients had dialysis in Nablus to the early time under the same conditions of Nablus HD patients. Moreover, the high prevalence of *S. aureus* nasal carriage among Jenin HD patients than Tulkarm HD patients may be due to the fact that patients were more overcrowded in the Jenin HD unit than in the Tulkarm HD unit.

Among health care workers the prevalence of *S. aureus* nasal carriage was 19.4% and only 2.6% were MRSA and 13.9% were MSSA.

The differences observed in prevalence among countries may be due to differences in the prescribing practices of antibiotics, sample size and culturing method.

It is worth noting that in our study the HCWs carriage of *S. aureus* was studied at the same unit that had patients' carriage and gives the explanation that patients are playing the role of reservoir and the *S. aureus* may be community acquired *S. aureus* (CA -*S. aureus*).

Our data suggest that there is a significant association between *S. aureus* nasal carriage and having a chronic diseases including DM with *P* values (p=0.004) and (p= 0.020) respectively. Rates of *S. aureus* nasal carriage among diabetic patients was higher than that in non diabetics (23.5% and 13% respectively). This is in agreement with other published reports in the US [30] and Denmark[31].

There was significant association between previous skin lesion around the primary vascular device and *S. aureus* nasal carriage (p=0.008).

Wearing gloves at the working hours and changing them between patients, were the only variables associated with *S. aureus* nasal carriage with (p= 0.039) and (p=.005)respectively. It is imperative to wear gloves while taking care of patients and it is very important to wash hands and wear new gloves each time.

In a study conducted at the University of Maryland Medical Center, to determine if gloves and gowns were frequently contaminated with MRSA and Vancomycin –Rsistant Enterococci during patients' care, it was shown that a significant number of HCWs acquired MRSA on their hands after removal of their gowns and gloves [44].

4.1 Study Limitation

Because of limited medical information in patients' files, especially about previous infections, laboratory test results and medications, the data collected, depended on patients' memory or that of their family members. Also some patients didn't respond to the questionnaire and rejected to participate in the study. Another major limitation was the timing of the study, it was performed concurrently with outbreak of **H1N1** in Palestine.

4.2 Recommendations

1. It is important to eradicate MRSA colonization in both patients and HCWs to prevent its spread to the community.

2. Use of personal protective equipment specially masks by all HCWs when they are in direct contact with patients.

3. There is a need for a widespread screening program for MRSA nasal carriage among HCWs in all hospitals to know the exact prevalence of HCWs nasal carriage in Palestine, and also developing a program for determining and treating MRSA colonization for all HCWs.

4. There is a need for a screening program for vancomycin-resistant microorganisms in our hospitals specially at locations where vancomycin is being heavily used.

5. Rational antibiotic prescribing based on local guidelines to prevent the development of bacterial resistance.

6. Lab coats should be washed at the premises and should not be taken to employees' houses.

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Appendix

Hemodialysis patient's questionnaire:

بسم الله الرحمن الرحيم

جامعه النجاح الوطنية

كليه الدراسات العليا

برنامج الصحة العامة

هذه الدراسة معده لنيل درجه الماجستير في الصحة العامة ,تقوم بها الطالبة معالي"محمد سعدي" أبو ربيع من كليه الدراسات العليا /جامعه النجاح الوطنيه وهي بعنوان :

معدل انتشار البكتيريا العنقودية المذهبة المقاومة للمثسلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية.

Prevalence of Methicillin – resistant *Staphylococcus aureus* nasal carriage among patients and Healthcare Workers in Hemodialysis Centers in North West Bank Palestine.

وتهدف هذه الدراسه الى قياس مدى انتشار البكتيريا العنقودية المذهبة المقاومة للمثسلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية،نرجو من حضرتكم التعاون معنا في اخذ عينه(مسحه انفيه) بالاضافه الى تعبئه الاستبيان ،مع العلم ان هذه المعلومات ستستخدم لأغراض البحث العلمي فقط وستعامل بالسرية التامة،مع جزيل الشكر لكم:

الطالبه

معالي ابوربيع

[1] Sex:
Male □ female □
[2] Age:
( )
[3] Address of patient:
□ Inpatients □ out patients
[4] Previous use of antibiotic in the last 6 months:
□ yes □ no
[5] Previous admission in the hospital:
□ yes □ no
[6]. previous admission for surgical operation:
□ yes □ no
[7]. long term of hemodialysis:

[8] Previous chronic disease diagnosis:

[9] Diabetes mellitus
□ Insulin dependent DM □ Non insulin dependent DM □ Non diabetic
[10] Previous skin lesion around intravascular device before change it
□ yes □ no

Patient name and signature:
Date:

Hemodialysis healthcare workers questionnaire :

بسم الله الرحمن الرحيم

جامعه النجاح الوطنيه

كليه الدراسات العليا

برنامج الصحه العامه

هذه الدراسه معده لنيل درجه الماجستير في الصحه العامه ,تقوم بها الطالبه معالي"محمد سعدي" ابوربيع من كليه الدراسات العليا /جامعه النجاح الوطنيه وهي بعنوان :

معدل انتشار البكتيريا العنقودية المذهبة المقاومة للمثسلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية.

Prevalence of Methicillin – resistant *Staphylococcus aureus* nasal carriage among patients and Healthcare Workers in Hemodialysis Centers in North West Bank Palestine.

وتهدف هذه الدراسه الى قياس مدى انتشار معدل انتشار البكتيريا العنقودية المذهبة المقاومة للمثسلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية،نرجو من حضرتكم التعاون معنا في اخذ عينتين (مسحه انفيه، ومسحه من معطف العمل) بالاضافه الى تعبئه الاستبيان ،مع العلم ان هذه المعلومات ستستخدم لأغراض البحث العلمي فقط وستعامل بالسرية التامة،مع جزيل الشكر لكم :

الطالبه

معالي ابوربيع

[1] Sex:

□Male □ female

[2] Age:

( )

[3] Type of health care workers:

□ Physician

□ Nurse

□ Nursing assistance

□ Technicians.

[4] Previous use of anti biotic in the last 6 months:

□ yes □ no

[5] Previous admission in the hospital:

□ yes □ no

[6] Previous admission for surgical operation:

□ yes □ no

[7] Previous chronic disease diagnosis:

[8] Previous infected with *staph aureus*

□ yes □ no

[9] Wear gloves at the working site

□ yes □ no

[10] Do you change gloves when caring for more than one patient?

□ yes □ no

[11] Previous area of service:

□ Operating room

□ ICU unit

□ Other department ----------

[12] Do you work in other departments when you are in hemodiaysis unit?

□ yes □ no

White coat associated questions:

[13] How often do you get your coat washed?

□ <3 days

□< 7 days

□<2 weeks

□<4 weeks

□>4 weeks

[14] Location of the laundering

□Home

□Hospital

□other ……where?

[15] The reasons for wearing the white coat
□to cover clothes (protection method)
□to keep warm
□to look like a healthcare worker

[16] Do you share the lab coats with your colleagues in some times?
□ Not at all □ some times □ all the time

Healthcare worker name and signature:
Date:

جامعة النجاح الوطنية
كلية الدراسات العليا

معدل انتشار البكتيريا العنقودية المذهبة المقاومة للمشلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية

إعداد
معالي "محمد سعدي" أبو ربيع

إشراف
د.ادهم أبو طه

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في الصـــحة العامـــة بكلية الدراسات العليا في جامعة النجاح الوطنية بنابلس، فلسطين.

2010م

معدل انتشار البكتيريا العنقودية المذهبة المقاومة للمشلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية

إعداد

معالي "محمد سعدي" أبو ربيع

إشراف

د.ادهم أبو طه

الملخص

تعتبر المكورات العنقوديه المذهبه ممرضا هاما بين مرضى المستشفيات ولها عواقبها على الرغم من العلاج بالمضاضات الحيويه, وبما ان مرضى غسيل الكلى يعانون من كبت المناعه وحاجتهم الى دخول المستشفى والجراحه بشكل متكرروفان هذا يزيد من قابليتهم للاصابه بهذه البكتيريا.

هدفت الدراسه الي قياس مدى انتشار البكتيريا العنقودية المذهبة المقاومة للمشلين في أنوف المرضى والطاقم الطبي في وحدات غسيل الكلى في شمال الضفة الغربية.وتحديد عوامل الخطر المرتبطه باستعمار هذه الجرثومه بين المرضى والعاملين في مجال الرعايه الصحيه .بالاضافه الى تقييم العلاقه بين حمل هذه الجرثومه في انوف العاملين في مجال الرعايه الصحيه وتلوث المعاطف بنفس نوع الجرثومه.

أجريت هذه الدراسة المقطعية في الفترة ما بين تشرين أول 2009 وكانون ثاني 2010.وقد شملت الدراسة 356مريض و 48عامل في مجال الرعاية الصحية داخل وحدات غسيل الكلى الخمسه في المستشفيات الحكومية في شمال الضفة الغربية في فلسطين.تم استخدام وسيلتين رئيسيتين: الاستبيان ومسحات للزراعة (مسحه انفيه ومسحه من معطف العاملين في مجال الرعاية الصحية)

كان معدل الاستجابة لهذه الدراسه 82.3% بين المرضى ,و75% بين العاملين في مجال الرعاية الصحية. تم تحليل لاستبيانات باستخدام حزمه البرامج الاحصائيه للعلوم

الاجتماعيـــة, وجـــرت التقييمـــات علـــى مســـتوى ثقـــه 95% واعتبـــرت القيمـــة p value (اصغرمن0.05) ذات دلاله احصائيه.

كشفت الدراسة أن انتشار البكتيريا المحمولة في الأنوف كانت 17.9%(17.7% بـــين المرضى 19.4 بين العاملين في مجال الرعايه الصحيه). و كان معدل انتشار البكتيريا المقاومه للمثســـلين 3.9%(3.75%بـــين المرضـــى و 2.6 % بـــين العـــاملين فـــي مجـــال الرعايـــه الصحيه).وكانت نسبه المعطف التي يرتديها العاملين في مجـــال الرعايـــه الصـــحيه وملوثـــه بالبكتيريا العنقوديه المذهبه 8.3% و6.7% مقاومه للمثسلين.

تبين من خلال الدراسه ان مرضى غسل الكلى في فلسطين لديهم انخفاض فـــي معـــدل انتشار البكتيريا العنقوديه المذهبه المحموله في انوفهم بالمقارنه مع البلدان الاخرى.ومن الجدير بالذكر ان العاملين في مجال الرعايه الصحيه الحاملين لهذه البكتيريا موجودين بـــنفس وحـــدات غسيل الكلى التي تشمل المرضى الحاملين لهذه البكتيريا في انوفهم ايضا.