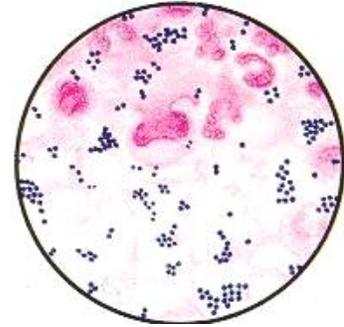


Methicillin Resistant Staphylococcus Aureus (MRSA)

Achievement in Al-Mafraq Hospital - Abu Dhabi, UAE



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INTRODUCTION:

WHAT IS STAPHYLOCOCCUS AUREUS?

Staphylococcus Aureus often referred to simply as "Staph". It is a gram positive bacterium, which can be found throughout the nature and they thrive in moist, warm places and very often lives harmlessly on the skin and mucous membranes, especially in the nose, hair, axilla, and perineum and on the hands. Simple colonization with Staphylococcus Aureus, including Methicillin Resistant Staphylococcus Aureus (MRSA) has no impact on a healthy individual, but these bacteria may be transferred to other people including patients and to the environment around the patient.

These organisms are responsible for most of the skin infection such as: skin abscess, or post-operative wound infection. However, if the bacteria manage to invade the blood stream, then they may cause sepsis, endocarditis, pneumonia, enteritis, hepatic abscess, osteomyelitis...etc. Meanwhile, the toxic-producing Staphylococcus Aureus cause the systemic reaction known as Toxic Shock Syndrome (TSS), and scalded skin syndrome.

- Staphylococcus aureus is well known for its role in hospital acquired infection.

- 25% of the individuals are permanent carrier of Staphylococcus Aureus for unknown reasons.
- Health Care Workers (HCW) have a higher Staphylococcus Aureus nasal carriage rate (50% to 90%) than the general population.

What is MRSA?

MRSA is an abbreviation to **Methicillin Resistant Staphylococcus Aureus**, which means that the Staphylococcus Aureus is resistant to all *B-Lactams* antibiotics, which include the followings:

1. Penicillins:

- Aqueous Penicillin G*, Procaine Penicillin G, Penicillin V (oral) and Benzathine Penicillin G (long acting).
- Penicillinase Resistant Penicillins*: Oxacillin, Nafcillin, Methicillin, Cloxacillin and Dicloxacillin.
- Broad Spectrum or Second Generation Penicillins*: Ampicillin and Amoxicillin.
- Third Generation Penicillins*: *Carbenicillin and Ticarcillin*.
- Fourth Generation Penicillins*: Piperacillin and Azlocillin.
- Combined Penicillin and Anti B-lactam Agent*: Augmentin and Tazocin.

2. Cephalosporins:

- First Generation Cephalosporin*: Cephalothin (keflin), Cefazolin (kefzol), Cephadrine (Velosef), Cephapirin (Cefadyl) and Cephalexin (keflex).
- Second Generation Cephalosporin*: Cefaclor (Ceclor), Cefoxitin [a Cephamycin similar to Cephalosporin (Mefoxin)] and Cefuroxime (Zinacef or Zinat).

C. Third Generation Cephalosporin: Cefotaxime (Claforan), Ceftriaxone (Rocephin), Ceftazidime (Fortum) and Cefixime (Suprax).

D. Fourth Generation Cephalosporin: Cefipime (Maxipime).

3. Carbapenems:

This is a broad-spectrum agent. Such as: Imipenem/Cilastatin (Teinam) and Meropenem (Meronem).

4. Other Antimicrobial Groups:

This includes the followings:

A. Aminoglycosides: Such as, (Amikin, Gentamicin).

B. Quinolones: Such as, (Ciprobay).

C. Macrolides: Such as, (Erythromycin).

D. Clindamicin.

The mechanism of resistance in these strains is the production of a penicillin-binding protein, which has a low affinity for *B*-lactam antibiotics.

HOW IS STAPHYLOCOCCUS AUREUS SPREAD?

Staphylococcus Aureus can spread among people having closed contact with infected people. Also through indirect contact by touching objects (i.e., towels, sheets, wound dressings, clothes, and equipment) contaminated by the infected skin of a person with MRSA or Staphylococcus Aureus.

DEFINITIONS:

Nosocomial MRSA: Patients who is not known to be MRSA on admission and his/her MRSA discovered first three days after admission.

Community MRSA: Patients who has been discovered to have MRSA within the three days of admission.

Colonized MRSA: Patients who is a carrier of staph bacteria, but without causing illness.

MRSA Outbreak: Defined as three or more nosocomial cases of MRSA with the same strain within 30 days or less cared for in one unit.

HISTORY OF STAPHYLOCOCCUS AUREUS TREATMENT:

- In 1940's, Penicillin was introduced for the treatment of Staphylococcus Aureus.
- By 1950's, Multi strain of Staphylococcus Aureus had developed resistant to Penicillin. This resistance was caused by an enzyme called *B. Lactamase* (Penicillinase).

- In 1959, the first revolution treatment for Penicillin Resistant Staphylococcus Aureus was introduced into clinical practice by using Methicillin (a penicillinase stable agent).
- By 1961, the first isolate of MRSA was reported in UK, France, and Denmark. Since then, outbreak of MRSA has been reported from all over the world and reported to be a major cause of nosocomial infection.

FIRST OUTBREAK OF MRSA IN AL-MAFRAQ HOSPITAL

Al-Mafraq Hospital of Abu Dhabi is one of the biggest hospitals in the UAE, its maximum capacity is almost 550 beds and has most of the specialized units such as CICU, ICU, CCU, NICU, Burns Unit, Kidney transplant, as well as Medical, Surgical, Neuro-surgical, ENT, Eye, Orthopaedic, Paediatric, Urology, Oncology, Gynaecology and labour departments.

The history of MRSA within Al-Mafraq Hospital started by the end of 1994, when reported the first isolate of MRSA case in the Burns Unit (B/U) among the Yemeni civil war injuries, whom admitted with a history of extensive deep burns. Later on, an extreme outbreak of MRSA occurred in the hospital, especially in the burns unit, resulting 163 cases (which is equivalent to 1%) out of the 1995 total

BU	MISC	ICU	FSW	MSA	NICU	OTHERS	TOTAL
92	34	19	33	15	3	49	163=1%

Table - 1 (1995 MRSA)

hospital admissions, which counted as 16,100 patients. See Table No. 1.

Most of the detected cases of MRSA were located in the Burns Unit, since 24% of the total MRSA cases were reported from their, which is counted as 39 cases (41.4%) out of the Burns unit total admissions, which counted as 94 patients.

The real reasons behind of this increase in the number of MRSA cases could be contributed to the following factors:

1. Lack of knowledge and information about MRSA and its control and prevention.
2. Unavailability of related policy and procedure.

Soon after the detection of the first few cases of MRSA, the hospital infection control multidisciplinary committee responded immediately with this new event, by developing a very specific policy and procedures for MRSA in accordance with the instructions and guidelines of the MRSA advisory group in the Ministry Of Health (MOH), which includes a screening guidelines and treatment protocol.

THE AIM OF DEVELOPING MRSA POLICY AND PROCEDURE:

1. To detect, isolate and control the spread of MRSA outbreak, and to provide a framework for early intervention and management.
2. To provide basic data for future medical and nursing intervention.

PREVENTION MEASURES:

Soon after the detection of the MRSA outbreak, several measures were taken to prevent and control the spread of the multi-resistant strain, by implementing the newly instituted policy and procedures, which include the following course of action:

1. Explaining the situation of MRSA to all health care workers (medical and non-medical staff) through out unit meeting.
2. Identifying and isolating the source of infection. This was carried out by taking nasal and wound swabs from all admissions including the transfer in cases as well as, from the nasal and hands of all those who are in contact with positive MRSA patients, by using Pepton water moist-ended swabs, followed by isolating all carriers in a single room. Contact precautions are to be adhered to in addition to routine use of standard precautions.
3. Minimize all health care workers (HCW) movement to other wards/units (by not pulling out for help any of the HCW involved in the care of known MRSA case to any other unit).
4. Hand washing is very essential and important before and after each procedure as well as after the removal of gloves. Followed by taking random microbiological sampling swabs to check the effectiveness of hand washing as well as to isolate the source of infection carriers.
5. The use of personnel protective equipments (PPE) whenever it is indicated.
6. Treatment Protocol, which is consist of the following:
 1. Daily body bath with 4% chlorhexidine gloconate. But, not for Burn patients and neonates.
 2. Daily wound dressing (to be carried last). Keeping in mind not to leave the wound exposed for long time in order to avoid any cross infection.
3. Prescribing an appropriate antibiotic, which is based on the culture and sensitivity.

A. *Topically* such as: Fucidine and Bactroban. This will be used if the patient is reported to be a carrier of MRSA without signs and symptoms of infection.

B. *Systemically* such as: Vancomycin or Teichoplanin or Zyvox. This will be used if the patient is reported to be MRSA with signs and symptoms of infection.

7. Dedicated medical equipment in the patient's room to avoid any cross infection.
8. Good disinfection of used instrument.
9. Linen (treated as infected materials) to prevent the spread of infection. Used linen should be collected in the room in appropriate hot soluble laundry bag and then removed from the room to a clean bag or container for transport to laundry. A double bag method is acceptable, but not necessary.
10. Clinical waste is discarded in a yellow clinical waste bag.
11. Educating patient and his relatives about all the procedures, which will be taken in order to prevent and control the spread of MRSA.
12. Visitors were restricted to avoid any cross infection.
13. Notifying other side before transferring of patients. This matter was brought to the attention of hospital monthly sisters meeting and to all professional infection control groups in the UAE in order to co-operate in this matter
14. Good Terminal Disinfection (T.D.), which was carried out with an approved disinfectant solution. Followed by checking of the room for removal of all dust and dirt visibly and bacteriologically to check the effectiveness of the TD.

RESULTS:

- A total of 163 cases (including 10 of HCW) were reported during 1995 as a carrier of MRSA, which isolated from the anterior nares and hands.
- Twenty-three cases were admitted or transferred in already with an infection of MRSA, either from the wound or nose.
- All of them were isolated in single rooms and treated by antibiotics, as well as with daily bath and dressing of the wounds.
- Eleven patients out of the 163 cases died with different diseases, but MRSA strains were not incriminated as a direct cause of death.
- By the end of 1997, the MRSA outbreak came to the end leaving a few sporadic cases in some units counted as 37 cases out of the total hospital admissions (17,527 patients)

SECOND OUTBREAK OF MRSA:

But this situation did not last for long, since the few sporadic cases which has been left in some of the units by the end of 1997, as well as the continuous of transferring in patients from other hospitals carrying already MRSA before coming in to Mafrag Hospital. This situation caused another outbreak in 1999, resulting 40 cases, which is equivalent to 0.17% out of the total hospital admissions, which counted as 22,312 patients.

Once again, most of the reported cases of MRSA were detected from the Burns Unit, which reported 23 cases (57.5%) out of the total MRSA cases. See Table No. 2.

YEAR	BU	MSC	ICU	F&W	MBA	MMD	IVS	SCBU	FWW	CCU	ORTHO	VIP	C.ICU	PKC	MENT	P.I.W	P.A.	MMB	FENT	A.N.W	Q.VV	TOTAL	
1996	39	34	19	13	16	7	5	3	7	4	5	3	2	1	2	2	1	0	1	0	0	0	163
1997	15	12	8	7	5	4	1	0	1	1	2	1	0	1	0	0	0	1	0	0	0	0	64
1998	3	6	5	2	1	8	4	7	1	2	0	0	0	0	0	0	0	0	0	0	0	0	37
1999	9	3	0	1	2	5	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	23
2000	23	6	0	2	2	1	1	1	1	1	2	0	0	0	0	0	0	0	0	1	0	0	40
2001	7	5	0	1	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	17
2002	9	1	0	2	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	16
2003	13	9	2	3	1	3	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	34
2003	9	2	2	1	0	2	0	0	2	1	1	0	0	1	0	0	0	0	1	0	0	0	29
TOTAL	131	77	36	32	31	28	12	13	14	9	12	5	2	4	2	2	2	2	1	1	0	0	422

Three years statistic study of MRSA (1995-2003)

Table - 2

FACTS AND FINDINGS:

The real reasons behind the second outbreak of MRSA in the Burns Unit, were related to many factors, which affected negatively in the control and prevention of infection, such as:

- The sporadic cases which has been left in by the year of 1997.
- The continuous of transferring in patients from other hospital carrying MRSA before coming in to Mafrag Hospital and mainly to the Burns Unit, since the B/U is considered to be a unique unit for the management of Burns in the UAE.
- The frequent use of antibiotics.
- Shortage of staff.
- The wound it self,
 1. Which consider being a very good media for the growth of many microorganisms.
 2. The long hospitalizations of burns patients, since the more you stay in hospital the more you are prone to get infection.
- Poor hand washing, which has been approved microbiologically.
- The common use of bathtub and toilets.
- Bad cleaning process, which has been approved microbiologically.

- Usage of unapproved disinfectant solution in the process of environmental terminal disinfection.
- The air-conditioning (A/C) ducts, which never ever cleaned since the Burns Unit build up.

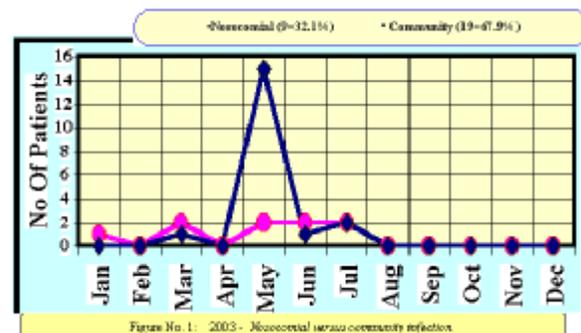
RECOMMENDATIONS:

Based on the above-mentioned facts and findings, the hospital multidisciplinary for infection control, recommended the following course of action:

1. To restrict the admissions of MRSA carriers from other hospitals.
2. To restrict the use of antibiotics.
3. To use approve disinfectant solution in the process of cleaning and disinfection.
4. To have an effective educational program regarding the importance of implementing infection control policies and procedures.
5. To have random culture screening of the staff and the environment, in order to isolate the source of infection.
6. To discharge those patients whom their general condition permit.
7. To close burns unit temporarily for maintenance purpose.

RESULTS:

Few months after the implementation of hospital infection control multidisciplinary recommendations, there was a dramatic improvement in the number of MRSA cases, which dropped to 17 cases (0.06%)



out of the total hospital admissions during the year of 2000, which counted to be 26,830 patients. For more details, refer to the attached table No 2, which illustrate very clearly the dropping number of MRSA cases. Once again, seven cases (41%) out of 17 were reported from the Burns Unit to be the highest among other units.

LESSON LEARNT:

Very good experience lesson has been learnt from the first outbreak of MRSA, which happened by the end of 1994. This reflect positively in gaining good experience in managing the situation of the year, 2003 which serve as an evidence to the lesson learnt, since 28 cases (0.11%) were reported as MRSA out of the hospital total admissions, which counted to be 25,443 patients. Nineteen out of the 28 cases were reported as community infection versus to only nine cases as nosocomially infected (see Figure 1). Meanwhile, 14 cases out of the community cases were among the Iraqi war injuries that admitted by the month of May 2003 to the Q. Ward and to the B/U carrying already MRSA in their noses and wounds. For more details, refer to the attached table No. 3.

Keeping in mind that the hospital total admissions is continuously increasing and the number of MRSA is decreasing compared with the year of 1995, which reported 163 cases of MRSA out of 16,100 patients admitted in the same year. Meanwhile, 28 cases of MRSA were reported out of 25,443 patients admitted during the year of 2003. Moreover, this situation was the same in the B/U for more details refer to figure No. 2

2003 MRSA CASES

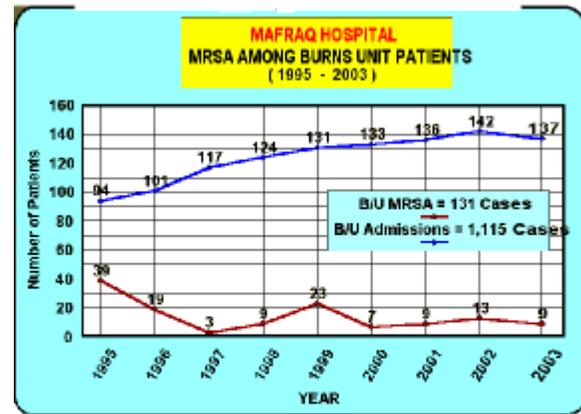
2003	B/U	MSC	MND	MVE	FSW	ICU	CCU	ORT H	FMW	Q/W	TOTAL
JAN.									1		1
FEB											0
MAR			1	1					1		3
APR											0
MAY	7	1	1					1	7		17
JUN	1					2					3
JUL	1	1			1		1				4
AUG											0
SEP											0
OCT											0
NOV											0
DEC											0
TOTAL	9	2	2	1	1	2	1	1	2	7	28

* Date: 08/10/03 Table - 2 Page: 18

On the other hand, the last nine years statistic study of MRSA (1995-2003) illustrate very clearly that there is a very dramatic improvement in detecting and controlling the situation of MRSA cases in Mafraq hospital, which reported 422 MRSA cases, which is equal to 0.21% out of 200,023 patients admitted to all Mafraq hospital wards and units. For more details refer to Table No. 2

This dramatic improvement in controlling and preventing the spread of MRSA could be attributed:

1. To the early intervention and management (nursing and medical).
2. To the understanding and implementation of MRSA policy and other policies relevant to prevention and control of infection by the nursing staff and all levels of other health care workers.
3. To the maximum co-operation and continued support amongst staff.



CONCLUSION:

MRSA infection is serious and should not be ignored. Therefore, the policy model of MRSA and its detection and management could easily be implemented in any of the MOH hospitals. Keeping in mind the importance of the educational program to all levels of health care workers as well as to the patient him self and his relatives.

Last and not least, I hope that this statistic report, short it may be, gives you a birds-eye view about how the MRSA took place in our hospital as well as how to avoid and control the spread of any possible infection.