


Antimicrobial Drug Consumption in Emergency Services at North West (Tabuk) Region Hospitals, Saudi Arabia

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Received: 15-12-2018;

Accepted: 13-02-2019

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www.ptbreports.org

DOI:
10.5530/PTB.2019.5.20

ABSTRACT

Objectives: This article describes antimicrobial medication use among different age groups and the cost associated with it in emergency department at Northern West (Tabuk) hospitals, Saudi Arabia. The aim of this study to declare the antimicrobial medication use in emergency Units at North West Region Hospitals, Ministry of Health, Saudi Arabia. **Methods:** It is a 12-month antimicrobial drug consumption by emergency services at North West region hospitals. It included all adults, pediatrics and neonatal population. The medications were selected by Central Antibiotics committee at MOH as part of the National Antimicrobial Stewardship program. The consumption is driven from pharmacy database and calculated based on off stranded unit of antimicrobial per hospital. The cost of antibiotics consumption was calculated by using Ministry of Health National Cost database. All cost used was as US currency. **Results:** The total number of Antimicrobial standard units at Emergency departments were (8,805.00) with average (1,761.00) per hospital. The highest general drug consumption was Azithromycin PO 200 mg/15 ml (4253) and Ceftriaxone IV 1 g (805) and Gentamicin IV 80 mg (401) at Emergency departments. The total cost of antimicrobial consumption was (24,822.60 USD) and (4,964.52 USD) per hospital. The highest cost medication consumption from Adults Emergency departments was 59.85% (24,822.60 USD) followed by pediatrics Emergency departments 28.99% (7,197.03 USD) and Neonates Emergency departments of 11.16% (2,769.98 USD). The highest medication cost was for very broad-spectrum antibiotics like Meropenem IV, Azithromycin PO and Moxifloxacin IV. It consumed more than 60 % of the cost burden. **Conclusion:** The Emergency department had a high consumption of antimicrobial drugs with burden cost. Antimicrobial stewardship program at Emergency services are necessary to prevent bugs related resistance, improve patient outcome and avoid necessary additional economic burden on healthcare system in the Kingdom of Saudi Arabia.

Keywords: Antimicrobial, Consumption, Emergency, Services, North West (Tabuk), Hospitals, Saudi Arabia.

INTRODUCTION

Over the past few years, several microbes have become resistant to antibiotics marketed in the Kingdom of Saudi Arabia.¹⁻³ The resistance has resulted due to misuse of antibiotics and missed doses of antibiotics as per prescribing guidelines.⁴⁻⁶ The patient came to the hospital and visited the emergency unit, then the ambulatory care clinic or hospital admission to the regular wards or critical care units. Each hospital provided specialized services to the patients and the patients received the appropriate antibiotics for disease management. The first department visited by the patient was the emergency section. The ER is responsible for treating the acute care of disease with the appropriate medication including antibiotics. The antibiotics utilization or consumption differed from one hospital to another. The general administration of pharmaceutical care at the Ministry of Health established antibiotics stewardship program in 2014.⁷ The program has a strategic plan over five years with several accomplishments and projects including imperial therapy of antibiotics for disease management. Also, a part of the stewardship program was the antibiotics consumption and use at the Ministry of Health hospitals. The analysis of antibiotics consumption before starting the program is necessary to measure the clinical and economic impact of the program.^{8,9} Several investigations

showed difference in consumption and utilization of antibiotics from one country to another with an emphasis on emergency services.^{10,11} It is based on antibiotics prescribing regulations and infectious diseases treatment guidelines. To the best of our knowledge there is no investigation in the KSA or Gulf and Middle East countries about antibiotics consumption at ER services.

The goal of the study is to explore the antibiotics consumption at ER in the Northern region (Tabuk) hospitals in the Kingdom of Saudi Arabia.

METHODS

This study shows a 9-month antimicrobial drug consumption by Emergency department at North West region hospitals which includes all adults, pediatrics and neonatal population. Five hospitals were included included of which hospital 1 has been established in 1980 to serve 100 beds and its, serves the maternities and pediatrics. Hospital 2 was hospital established in 1990, with the pharmacy care having many departments including, which they are inpatient, outpatient, narcotics, drug information center, clinics and emergency and serve 100 beds, also has most specialties (pediatrics, OR, ICU, ER, nursery, AKU, and SW). Hospital 3 build was built up in 1983, which is containing 100 beds, all also all specialties are available except chemotherapeutic department.

The pharmacy have several departments, which they are inpatient, outpatient, narcotics and emergency pharmacy. Hospital 4 was started in 1991, the capacity of the hospital is 200 bed, which is the largest in the region and also it does contain verities of specialized and served 7 departments. The pharmacy care units containing five departments which are inpatient, outpatient, narcotics, information center, emergency and clinics department. Hospital 5 hospital was established in 2005, which is the newest although the pharmacy serves 100 beds with different departments they are including inpatient inpatient, outpatient, information centers, narcotics, emergency and clinics, also cover 9 types of wards as the most hospitals in the region. Antibiotics committees were formulated at the above mentioned hospitals through a letter of recommendation which was sent by the General Administration of Pharmaceutical Care at the Ministry of Health for Tabuk Region on October 2013, which stipulates the importance of forming a specialized committee on antibiotics under the supervision and follow up of the department of pharmacy care in the region. Letters of formation of the Antibiotics Committee were sent to all hospitals in Tabuk region in January 2014. In March 2014, this committee was approved by the Director General of Health Affairs in Tabuk Region and guidance to start the application of antibiotics in all hospitals in the region. The actual implementation of the program began in January 2015. The objective of the antibiotic committees was to improve antimicrobial use for hospitalized adults and minimize the emergence and spread of antimicrobial resistance. The objective of the antibiotic committees was to improve antimicrobial use for hospitalized adult and minimizing the emergence and spread of antimicrobial resistance. While the functions of each committees were Supervising the assessment and application of antibiotic strategies in hospitals which are designed by the Antibiotics Committee of the Ministry. Preparation of quarterly reports on the implementation of strategies for the use of antibiotics in hospitals and discussed with the Committee of Pharmacy and therapeutics in the regions. Preparation of bacterial resistance statistics for antibiotics in the area and follow-up and updating. Supervising the training of medical staff (doctors, pharmacists, nurses, specialists, technicians) on the optimal use of antibiotics. Visits to hospitals to ensure the accuracy and validity of the implementation of strategies. Review and analyze indicators of the application of strategies for the use of antibiotics and consider their development in the region of Tabuk. And writing the annual report on the performance, productivity and impact of the program in the region of Tabuk. The antibiotics medications were selected by Central Antibiotics committee at MOH as part of the National Antimicrobial stewardship program. The consumption is driven from pharmacy database and calculated based on off stranded unit of antimicrobial per hospital. The antimicrobials consisted of antibacterial drugs, antifungal and antiviral medications. The cost of antimicrobial consumption was calculated by using Ministry of Health National Cost database. All cost used was as US currency.

RESULTS

There were a total of 5 hospitals of which hospitals with 100-300 beds represented 80% while those with (50-99 beds) were 20%. All hospital (100%) were accredited by Saudi Board of Hospital Accreditation (CBAHI) while none (0%) were accredited by International Joint Commissions. The total months response rate for Emergency departments was 49 (36.29%) that included adults response rate of 18 (40%), pediatrics response rate 22 (48.88%) and neonates response rate 9 (20%) with an average 49 (36.29%) (Table 1). The total number of Antimicrobial standard units at Emergency departments were (8,805.00) with average (1,761.00) per hospital. The highest consumption from pediatrics was 57.19% (5,036.00) followed by adult's patient 35.72% (3,145.00) and neonates 7.09% (624.00) at Emergency departments. The highest general drug consumption was Azithromycin PO 200 mg/15 ml (4253) and

Ceftriaxone IV 1g (805) and Gentamicin IV 80 mg (401) at Emergency departments. The highest drug consumption was Azithromycin PO 200 mg/15 ml (4253) and Ceftriaxone IV 1g (134) at pediatrics Emergency departments. The highest drug consumption was Ceftriaxone IV 1g (598) followed by Gentamicin IV 80 mg (291) and Azithromycin PO 250 mg (262) at adults' Emergency departments. The highest drug consumption was Azithromycin PO 200 mg/15 ml (83) and Ceftriaxone IV 1g (73) at neonates' Emergency departments. The total cost of Antimicrobial consumption was (24,822.60 USD) and (4,964.52 USD) per each hospital. The highest cost medication consumption from Adults Emergency departments 59.85% (24,822.60 USD) followed by pediatrics Emergency departments 28.99% (7,197.03 USD) and Neonates Emergency departments 11.16% (2,769.98 USD). The highest drug cost consumption was Meropenem IV 1g (4,039.92 USD) followed by Moxifloxacin IV 400 mg (3,953.00 USD) and Meropenem IV 500 mg (2,516.00 USD) at adult's Emergency departments. The highest drug cost consumption was Azithromycin PO 200 mg/15 ml (4039.92 USD) followed by Meropenem IV 1g (1,066.8 USD) and Meropenem IV 500 mg (748 USD) at pediatrics' Emergency departments. The highest drug cost consumption was Meropenem IV 1g (1,066.8 USD) followed by Imipenem + Cilastatin IV 500 mg (550.00 USD) and Meropenem IV 500 mg (544 USD) at neonates' Emergency departments. The highest medication cost was very broad-spectrum antibiotics like Meropenem IV, Azithromycin PO and Moxifloxacin IV. It consumed more than 60% of the cost burden (Table 2).

DISCUSSION

In the Northern region, hospitals had emergency services. The emergency services included the medical emergency, surgical, pediatrics, Obstetrics and Gynecology. The study showed huge antibiotic consumption at emergency services. The most antibiotics were consumed by pediatrics followed by adults and neonates. That is related to the number of pediatric cases need for antibiotics; it was more than adults and neonates. In pediatric cases, the drug most consumed was Azithromycin oral and few cases received Ceftriaxone. That is as the cases of common cold or chest infection demand for antibiotics. The parenteral Ceftriaxone prescribed for many central nervous system infections. In neonates, the same antibiotics consumption pattern was observed as in pediatrics. In adults, the drug most consumed was parenteral Ceftriaxone or intravenous Gentamicin or Azithromycin orally, that's similar to the previous study with ceftriaxone prescribing at emergency units only¹¹ and similar study with Azithromycin usage a study.¹⁰ That may be related to general respiratory disorders or others. The most antibiotics cost consumption was from adults' cases while less cost of pediatrics and neonates. That may be as parenteral Ceftriaxone is more expensive when received by adults than Azithromycin orally received by pediatrics and neonates. Besides; the adults consumed other expensive medications including intravenous Meropenem and Imipenem. Almost three medications consumed sixty percent of the budget which had been used by adult's patient. The emergency hospital services at the northern region at Kingdom of Saudi Arabia is demanding to antibiotics stewardship and prescribing guidelines for adults, pediatrics and neonatal cases.¹²⁻¹⁴ inappropriate antibiotic use is a major constituent of unreasonable drug recommending in children. Our studies recommend that instruction about the lucid use of antibiotics is required for health professionals within the pediatric emergency department setting.

CONCLUSION

The antibiotic consumption at Emergency services is high. Targeting of antibiotic stewardship program is necessary at North West region hospitals in the Kingdom of Saudi Arabia. Further studies about annual an-

Table 1: Hospitals demographic data.

	Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5	Total
No of Beds						
<50						
50-99				YES		1 (20%)
100-300	YES	YES	YES		YES	4 (80%)
301-400						
401-500						
CIBAHI	Yes	Yes	Yes	Yes	Yes	5 (100%)
JCI	No	No	No	No	No	0 (0%)
Repose Rate						
ICU units						
Adults	9	9	4	0	9	31 (68.88 %)
Pediatrics	0	6	4	0	8	18 (40 %)
Neonates	2	4	4	0	9	19 (42.22 %)
Total	11	19	12	0	26	68 (50.37 %)
Inpatient wards						
Adults	9	9	4	9	9	40 (88.88 %)
Pediatrics	7	9	4	9	9	38 (84.44 %)
Neonates	3	9	4	9	7	32 (71.11 %)
Total	19	27	12	27	25	110 (81.48 %)
OPD clinics						
Adults	9	9	4	0	8	30 (66.66 %)
Pediatrics	6	8	4	1	7	26 (57.77 %)
Neonates	0	8	4	0	0	12 (26.66 %)
Total	15	25	12	1	15	68 (50.37 %)
ER units						
Adults	9	5	4	0	0	18 (40 %)
Pediatrics	0	9	4	9	0	22 (48.88 %)
Neonates	0	5	4	0	0	9 (20 %)
Total	9	19	12	9	0	49 (36.29 %)

Table 2: Anti-infectious drugs consumption at Emergency departments.

Quantity consumption Anti-infectious drugs	Dosage Forms	Neonates	cost (USD)	Pediatrics	cost (USD)	Adults	cost (USD)	Total Quantities	Total cost (USD)
Cloxacillin sodium IV 250mg	Vial or amp.	0	0	0	0	0	0	0	0
Flucloxacillin sodium IV 250mg	Vial or amp.	0	0	0	0	0	0	0	0
Piperacillin + Tazobactam IV 2.25 g	Vial	20	27.2	30	40.8	100	136	150	204
Piperacillin + Tazobactam IV 4.5 g	Vial	10	21.87	10	21.87	110	240.54	130	284.27
Ceftazidime IV 1g	Vial	31	23.15	40	29.87	110	82.14	181	135.15
Ceftriaxone IV 1g	Vial	73	54.02	134	99.16	598	442.52	805	595.7
Cefepime IV 1g	Vial	20	37.52	20	37.52	40	75.04	80	150.08
Cefepime IV 2g	Vial	46	159.47	55	190.67	154	533.87	255	884.01
Imipenem + Cilastatin IV 500mg+500mg	Vial	50	550	55	605	165	1,815.00	270	2,970.00
Meropenem IV 500mg	Vial	40	544	55	748	185	2,516.00	280	3,808.00
Meropenem IV 1g	Vial	40	1066.8	40	1066.8	150	4,000.50	230	6,134.10
Tigecycline IV 50mg	Vial	0	0	0	0	0	0	0	0

Table 2: Con'

Amikacin IV 100mg	Vial or amp.	0	0	10	3.24	20	6.48	30	9.72
Amikacin IV 500mg	Vial or amp.	20	9	60	27	100	45	180	81
Gentamicin IV 20mg	Vial or amp.	30	18	60	36	160	96	250	150
Gentamicin IV 80mg	Vial or amp.	50	30	60	36	291	174.6	401	240.6
Azithromycin PO 250mg	Tablet	0	0	0	0	262	18.86	262	18.86
Azithromycin PO 200mg/15ml	Suspension	84	79.79	4253	4039.92	20	19	4357	4,138.71
Clindamycin IV 300mg	Ampoule	30	51.99	31	53.72	130	225.29	191	331
Vancomycin IV 500mg	Vial	20	27	32	43.2	90	121.5	142	191.7
Linezolid PO 600mg	Tablet	0	0	0	0		0	0	0
Linezolid IV 600mg	Premixed bag	0	0	0	0	0	0	0	0
Linezolid PO 100mg	Suspension	0	0	0	0		0	0	0
Rifabutine PO 150mg	Tablet	0	0	1	0.09	52	4.58	53	4.66
Ciprofloxacin IV 200mg	Bottle	30	22.17	30	22.17	100	73.9	160	118.24
Moxifloxacin IV 400mg	Vial	0	0	0	0	118	3,953.00	118	3,953.00
Moxifloxacin PO 400mg	Tablet	0	0	0	0	60	67.8	60	67.8
Levofloxacin IV 500mg	Premixed bag	0	0	0	0	0	0	0	0
Amphotericin B liposomal 50mg	Vial	0	0	0	0	0	0	0	0
Amphotericin B 50mg	Vial	0	0	0	0	0	0	0	0
Voriconazole IV 200mg	Vial	0	0	0	0	0	0	0	0
Voriconazole PO 200mg	Tablet	0	0	0	0	0	0	0	0
Casopfungin IV 50mg	Vial	0	0	0	0	0	0	0	0
Micafungin IV 50 mg	Vial	0	0	0	0	0	0	0	0
Acyclovir IV 250mg	Vial	30	48	60	96	130	208	220	352
Valaciclovir PO 500mg	Tablet	0	0	0	0	0	0	0	0
Artemisinin PO 250mg	Capsule	0	0	0	0	0	0	0	0
Artesunate PO 50mg	Tablet	0	0	0	0	0	0	0	0
Artesunate IV 60mg	Ampoule	0	0	0	0	0	0	0	0
Proguanil PO 100mg	Tablet	0	0	0	0	0	0	0	0
Artemether +Lumefantrine PO 20/120mg	Tablet	0	0	0	0	0	0	0	0
Artemether IV 20mg	Ampoule	0	0	0	0	0	0	0	0

tibiotic consumption and utilization are highly recommended in Saudi Arabia.

ACKNOWLEDGEMENT

Non.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

ER: Emergency; **KSA:** Kingdom of Saudi Arabia; **MOH:** Ministry of Health; **OR:** Operation; **ICU:** Intensive Care Unit; **AKU:** Artificial Kidney Unit; **SW:** Surgical Wards; **UDS:** United State Dollars.

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