



Research Article

ISSN : 2277-3657  
CODEN(USA) : IJPRPM

## ***Factors Affecting Physicians' Choice of Antibiotics for Treatment of Community Acquired Urinary Tract Infections and Their Correlation with Antimicrobial Susceptibility Test Results in King Khalid University Hospital during 2013-2014***

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### **ABSTRACT**

*Objectives: The study is aimed at determining the factors that affect physicians' choices for empiric treatment of community acquired urinary tract infections and assessing the antimicrobial resistance in KKHU during 2013-2014, then correlating physicians' choices with lab susceptibility results. Methods: A cross sectional questionnaire was used and retrospective study of lab results of antimicrobial susceptibility test concerning urinary tract infection was carried out. The targeted population was the physicians who were responsible for diagnosing and treating patients with UTIs. Self-administered questionnaire was given to each participant. The first section was designed to investigate factors influencing the physicians' choice of antibiotics; second section of the questionnaire presented two medical cases of UTIs. This was followed by comparing physicians' answers with lab susceptibility results. Sample size was 112 physicians, and 2935 retrospective antimicrobial susceptibility reports. Results: The most important factors taken into consideration are drug contraindication (like pregnancy), mechanism of action, co-exist disease (like renal failure), drug-drug interaction, side effects of antibiotics and patient history of medications, and the least important ones are gender, high, weight, race, socio-economic state and residency. For two clinical cases, results showed that more than 60% of physicians prescribed penicillin or nitrofurantoin as empiric treatment. Conclusion: The results have shown that the most important factors were contraindication uses, spectrum (wide or narrow) and side effects of antibiotic. And less important were demographic data such as, high, weight, and gender. Unlike our results, the race factor was important factor on choice of antibiotics considering the studies of other countries. Physicians' choice agreed to some extent with antimicrobial susceptibility test results.*

**Keywords:** *Urinary tract infection, Factor, Antibiotic, Resistance, Lab susceptibility results, Guidelines*

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### **INTRODUCTION**

Urinary tract infections (UTI), is one of the most common problems spread among humans and a more common problem in primary care [1–3]. The patients who visited primary care and emergency department of King Khalid University hospital comprised the population of the study. According to 1997 national medical care survey and national hospital ambulatory medical care survey, urinary tract infections accounted for 7 million office visits and 1 million emergency department visits, resulting in 100,000 hospitalizations [4]. UTI affect women more than men and as many as 60% of all women report having had a UTI at least once in their lifetime [4, 5]. Therefore, females

need always clean genital areas to prevent or decrease chances of infections. There are risk factors that increase chances to develop infections in immunocompromised persons such as diabetics, AIDS, pregnant women, infant and elderly, which can happen through some actions (catheter) or transmit through environment swimming pool. DM has been identified as an independent risk factor for UTIs in women, which found to lead impaired local host defense mechanisms which are thought to be the underlying cause [6]. UTIs are more prone to be with DM patients in addition to that they will have more worse complication [6,7].

However, the treatment choices for urinary tract infections mostly regards antibiotics, which are prescribed in first line of hospitals i.e. primary care clinic and emergency department. Our study will discuss the factors affecting empirical choice of antibiotics for treatment of community acquired urinary tract infections. It will describe effectiveness of antibiotics against organisms and the factors that let physicians to choose specific antibiotics among the others to treat urinary tract infection (UTI). There are many antibiotics which are used for UTI treatment.

According to WHO, "patients with infections caused by drug resistance bacteria are at higher risk for death than patients without bacterial resistance. So, resistance is defined as the resistance of microorganism to an antimicrobial drug that was originally effective for treatment of infections caused by it [8].

## **METHOD**

This research aims to investigate the factors that affect physicians' choices of antibiotics for treatment of community acquired Urinary Tract Infections (UTIs) using a cross sectional analysis methodology. Physicians who are responsible for diagnosing patients with UTIs are considered in this study as the target population. This population is limited to physicians and internship students working in primary care and emergency departments at King Khalid University Hospital (KKUH). KKUH physicians are selected as the target population for two reasons. We include all those physicians in our study, as the total number of them is 246. Given this limited number, we have not performed sampling. KKUH is one of the major hospitals in Saudi Arabia and understanding the factors that affect physicians working in such an institution should provide a background study to be compared and contrasted with results from similar studies conducted at other hospitals. The second reason is the limited time and budget, since coverage of other hospitals is infeasible. The infeasibility is not only related to the number of physicians whose data is going to be collected, but due to the possibility of managerial procedures that may differ from one hospital to another in terms of prescribing antibiotics, conducting laboratory tests or admission of new patients.

The physicians' contact information has been collected from the relevant departments. A self-administrated questionnaire is designed to be the primary data collection method. The questionnaire design process involved a focus group discussion and reviews of related studies<sup>1</sup>. The data collection process was conducted from 15 November 2014 to 15 December 2014.

The questionnaire contains two sections. The first section is designed to investigate whether a list of selected factors plays a role in influencing the physicians' choice of antibiotics prescribed to UTIs patients. These factors include demographical attributes such as age, gender, race, socio-economic status and residence. In addition, the questionnaire considers patient medical history related factors as well as drug specific factors.

The second part of the questionnaire presents two medical cases, which are designed to be atypical in order to induce uncertainty about the cases. These cases are followed by four open-ended questions. These questions are left open-ended in order to assess the variance between different physicians with respect to their choices of antibiotics for each medical case as well as their reference guideline if any. This research will also include a 3000 Antimicrobial Susceptibility reports as a secondary data source. These reports have been collected from the laboratory for the period spanning from August 2013 until February 2014. It is planned to use this data to correlate it with the questionnaire finding. Testing of the sample size, sample technique and data collection methods for accuracy, logistics, suitability, clarity and timing of the data collection is going to be performed through a pilot study.

In this study, we will use Microsoft Excel as the analytical software providing its capability in organizing, formatting, analyzing and calculating the data entered in addition to its advance techniques in sorting, manipulating

and statistically analyzing the data. The participants will receive a consent form containing all the information they need about the study. The consent form will contain the purpose of the study, risk, benefits and confidentiality of his/her collected data. After the participants' approval, they will have a copy of his/her consent form to assure their rights. The data collected from the questionnaire will be used in a confidential manner.

## RESULTS

Our study was collected as two parts, the first part was aimed to get the most important factors that influence choosing antibiotics among physicians and assessing the adherence of physicians to guidelines. Considering the age variable, 67 physicians out of the research sample are at the age range of (25 to less than 35 years old), equal to (59.8 %), whereas 20 physicians did not specify their ages including (17.9 %), and it was found that the ages of 19 physicians is at the range of (35 to less than 50 years old) equal to (17 %). Also, it was found that the ages of 5 physicians out of the research sample are at the range of (From 50 to less than 65 years old); finally, we found that, (0.9 %) out of the research sample are (65 years old and more).

The distribution of research sample according to the gender variable is as follows: (70) of research sample are (males) with percentage of (62.5 %), whereas it was found that [42] out of research sample are (females) and their percentage is (37.5 %).

Considering the distribution of research sample according to the professional level variable, we found that the professional level of (44.6 %) out of the research sample is Resident, whereas it was found that the professional level of (37.5 %) out of the research sample is registrar; finally, we found that the professional level of (17.9 %) out of the research sample is Consultant.

We found that most important three factors affecting doctors' choice of antibiotics to treat urinary tract infections are drug contraindication, mechanism of antibiotic and coexist Disease respectively, and least three factors are race, height and residence as shown in Table (1).

**Table No. 1.**

Sr.	Order	Factors	Response			
			High	Moderate	Low	No Influence
1	9	Age	59 (52.7)	43 (38.4)	8 (7.1)	2 (1.8)
2	12	Gender	18 (16.1)	45 (40.2)	28 (25)	21 (18.8)
3	15	Height	6 (5.4)	26 (23.2)	36 (32.1)	43 (38.4)
4	13	Weight	26 (23.2)	26 (23.2)	35 (31.3)	25 (22.3)
5	16	Race	6 (5.4)	24 (21.4)	35 (32.1)	45 (40.2)
6	14	Residence	10 (8.9)	47 (42)	33 (29.5)	22 (19.6)
7	11	Socio-Economic status	16 (14.3)	48 (42.9)	29 (25.9)	18 (16.1)
8	10	Parental opinions (for children)	24 (21.4)	40 (35.7)	29 (25.9)	18 (16.1)
9	7	Patient stage of disease (e.g. acute, chronic... etc)	70 (62.5)	35 (31.3)	4 (3.6)	2 (1.8)
10	8	Chronic illness (e.g. HTN,DM..etc)	74 (66.1)	27 (24.1)	9 (8)	2 (1.8)
11	3	Coexist Disease	78 (69.6)	27 (24.1)	4 (3.6)	1 (0.9)
12	6	Patient history of antibiotics	79 (70.5)	25 (22.3)	5 (4.5)	3 (2.7)
13	2	Mechanism of antibiotic (e.g. broad spectrum, narrow ... etc)	81 (72.3)	25 (22.3)	5 (4.5)	1 (0.9)
14	4	Drug-Drug interaction	79 (70.5)	25 (22.3)	8 (7.1)	-
15	5	Side effect of antibiotic	80 (71.4)	20 (17.9)	12 (10.7)	-
16	1	Drug contraindication (e.g. pregnancy)	99 (88.4)	11 (9.8)	2 (1.8)	-

Regarding following guideline among physicians, we found that the number of doctors who follow guidelines are 55 out of 112 who participate in the study which represents 49.1%.

The most frequent guideline which was chosen by doctors is NICE guideline and it represents 22.3% of doctors who chose guideline as shown in Table (2).

**Table No. 2.**

Doctors' followed guidelines	Frequencies	Percentage	Doctors' followed guidelines	Frequencies	Percentage
American Academy of Pediatrics	7	6.3	ksu	1	0.9
American urology	2	1.8	Ministry of health guidelines	1	0.9
BNF	1	0.9	nice	30	22.3
Infectious Diseases Society of America (IDSA)	1	0.9	bmj	2	1.8
infection guidelines	1	0.9	World health organization	2	1.8
Internet	7	6.3			

The second part of the study aimed to assess physicians' choices of antibiotics and correlate it with recent lab susceptibility results by presenting to medical cases of UTIs. The first case was about young female with cystitis and the second case about elderly man with pyelonephritis, and the results shown in Table (3).

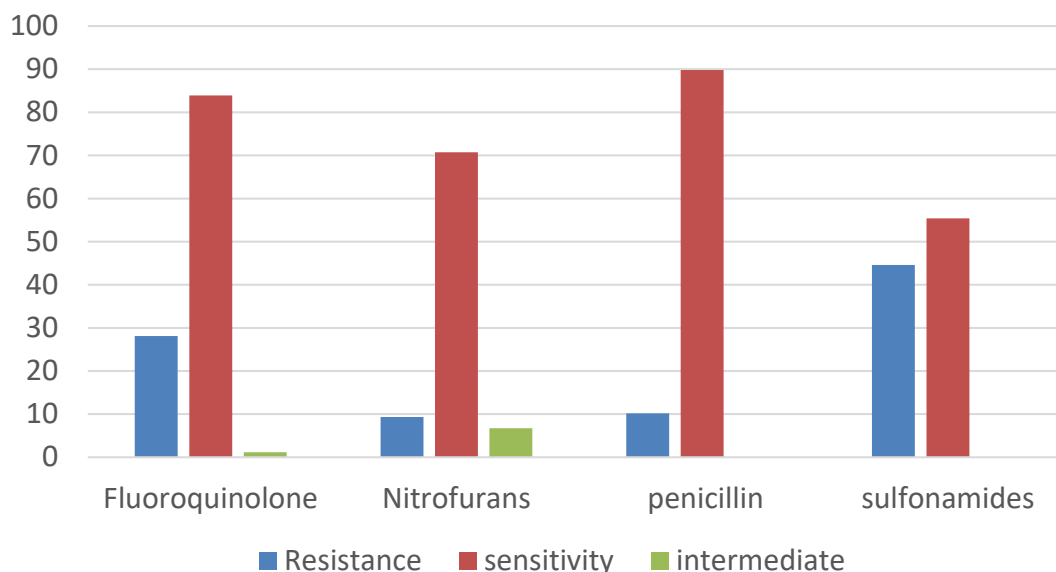
**Table No. 3.**

The antibiotics in the first case	First case	Second case
Nitrofurans	34 (30.4%)	16 (14.3%)
Sulfonamides	10 (8.9%)	24 (21.4%)
Fosfomycin.	6 (5.4%)	4 (3.6%)
ampicillin	37 (33%)	20 (17.9%)
Fluoroquinolones	8 (7.1%)	30 (26.8%)
Others	17 (%15.2)	18 (%16.1)
Total	112 (%100)	112 (%100)

By looking at the Table (3) related to antibiotics in the first case, it is declared that (penicillin) came in the first position with percentage of (33%), and (Nitrofurans) came in the second position with percentage of (30.4%), followed by (Sulfonamides) with percentage of (8.9%), then (Fluoroquinolones) with percentage of (7.1%); finally, (Fosfomycin) came with percentage of (5.4%). The most antibiotics were prescribed in second case are Fluoroquinolones (26.8%) and Sulfonamides (21.1%) respectively.

Regarding Lab susceptibility results, the most sensitive antibiotic found is penicillin by percentage of (90%) and the most resistant one is sulfonamide by percentage of (45%) as shown in diagram No. 1.

**Diagram No. 1.**



## DISCUSSION

This study is designed to determine the most important factors affecting physician decision prescribing empirical antibiotics choice for treating patient with urinary tract infections (UTIs), and also to assess the knowledge about antibiotics in correlation with lab susceptibility results. This is done among primary care and emergency physicians in King Khalid University Hospital from August 2013 until February 2014.

The results in Table (1) showed that the most important factors considered during prescription of antibiotics are: drug contraindication, mechanism and side effects of antibiotics, drug-drug interactions, patient history of using antibiotics and chronic illnesses, actually there is no available enough previous similar studies regarding these factors, but our results showed the highest impact on our physicians' opinion, many conditions like pregnancy and renal failure have contraindication to some antibiotics; also some drugs when combined with other drugs will give side effects. History of using antibiotic appears to have high impact because when a patient uses specific antibiotic for a long time, he may develop resistance to that antibiotics, so it gives clue to the physician for avoiding that antibiotic. On other hand, by looking back again to Table (1), our results also showed the least important factors with less impact and low influence such as gender, race, residence, socioeconomic state, weight and high of the patient. Same previous studies proved that physicians may prescribe cheap medication to the patient with low socioeconomic state which may lead to improper treatment and increased bacterial resistance, in opposite to our results which found that socioeconomic state is not taken into consideration; the explanation is that because our study was restricted to one of the biggest governmental hospitals which usually provides free treatment and availability of medications. Other previous studies conducted in California and Boston showed gender, race and inappropriate prescription of antibiotics to have significant association, and these findings are not consistent with our results, the reason behind it is multiple different cultures and wide variations of ethnicity in that area compared with our area. A study also showed that parental pressure considered as a major factor influences physicians prescribing behavior, but our results showed a low influence of this factor (21%) [9–11].

Regarding assessing the adherence of physicians to the guidelines by looking to Table (2), it is shown that our physicians were adherent to the guidelines by 49%, compared with identical study applied in France by local health organization to evaluate guidelines that followed by physician which showed that 80% of them prescribed antimicrobial agents empirically by their own decision without following guidelines [12,13].

Second part of the study was about presenting two medical cases of urinary tract infections, which were designed to be two different cases then correlating physicians' choices with lab susceptibility results. The results showed that the most sensitive antibiotic were penicillin followed by fluoroquinolones. Similar study was done in southeast Nigeria, the results were all negative gram stain having had high resistance to penicillin which is different from our results, because of this variation in the sensitivity from one area to another, we evaluated the adherence to the recent lab susceptibility results [14].

First case was about women with cystitis, with regard to the Table (3), 33% of physicians chose penicillin as empiric treatment and 31% of them chose nitrofurans, and with regard to lab susceptibility results Diagram (1), we found that both of these two antibiotics have high sensitivity as approximately 90% and 71% respectively, which mean prescribing of antibiotics in this case is compatible with the lab results. The second case was about elderly man with pyelonephritis, with regard to Table (3) and Diagram (1) 26.8% of physicians prescribed fluoroquinolones which is highly sensitive within a percentage of 83% followed by 21.4% of physicians who prescribed sulfonamide which is the most resistance one by a percentage of 45%. The rest of physicians prescribed antibiotics which are more sensitive, by these results we can conclude that physicians' choice agreed to some extent with antimicrobial susceptibility lab test results.

## CONCLUSION

The most important factors were drug contraindication, mechanism and side effect of antibiotic and coexist of the disease respectively and the least important factors were demographic factors of the patient such as, gender, high and Wight. Unlike our results, the race factor was important factor on choice of antibiotic from studies of other countries. Physicians' choice agreed to some extent with antimicrobial susceptibility lab test results. We recommend performing a general study including large number of hospitals, also we recommend having a guideline for treatment of community acquired urinary tract infection according to recent laboratory susceptibility test results.

## ACKNOWLEDGMENT

The authors extend their appreciation to the Deanship of Scientific Research at King Saud University for funding this work through the Undergraduate Research Support Program. Also we would like to thank microbiology information technology, primary care, and emergency and urology departments at king Khalid University Hospital.

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