

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Prevalence of Urinary Tract Infection and Associated Microorganisms in Iran; A meta- Analysis Study

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### ABSTRACT

This study aims to evaluate the prevalence of UTI and determine the most prevalent microorganisms in Iran by using meta- analysis. By use searching the keywords in information Databases such as SID, Magiran, Iranmedex, Science direct, PubMed and Google Scholar, a total number of 40 papers were selected between 1996-2011 years, based on inclusion criteria in this study. All papers were enrolled to Meta analysis after qualitative control by using random effect model. Heterogeneity between studies was assessed by I-Square index, and then data was analyzed by using R-software (Version 2.11.1) and STATA software (version 10). Eleven papers were recognized eligible to be enrolled Meta analysis from 40 selected papers. Totally, 66448 individual was studied. The prevalence rate of UTI in Iran was 13.3% (CI95%; 7.8-17.8). E.Coli with prevalence of 62.1% (CI95%; 55.4-68.9) was the most prevalent microorganism and Enterobacter with prevalence of 2.8% (CI95%; 1.8-3.8) were the lowest isolated microorganisms. Health education, prescription of the best antibiotics based on urine culture, and avoidance from overdose of antibiotics and self medication are recommended In order to reduce the prevalence of UTI.

**Keywords:** UTI, Microorganisms, Meta-analysis, Iran.

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## INTRODUCTION

The Urinary Tract Infection (UTI) is the most prevalent disease in urogenital system so that approximately 10% of people suffer from it at least once during their lifetime [1, 2]. UTI may lead to involvement of urinary bladder, one or both kidneys, uterus and urinary tract. As usual, cystitis is not assumed as a serious bacterial infection except with kidney involvement (Pyelonephritis), the acute and chronic syndromes may be seen in kidney so that eventually it may be followed by blood pressure (hypertension), preeclampsia, and kidney chronic failure as well [3].

Urinary tract infection is the second most prevalent infection among children [4]. The prevalence rate of infection depends on age and gender [5-7] so that 3-5% of girls and 1% of boys suffer from UTI at childhood (5, 6, 8). During first year after birth, this syndrome is more prevalent in boys than girls and afterwards the girls suffer from this infection further than boys at childhood [7]. UTI is more prevalent in boys, who were not circumcised than the boys who were so [5, 9-12].

In US, UTI causes more than 7 million cases of annual visits and prescriptions by physicians [13, 14]. About 100'000 cases of hospitalization take place due to UTI during a year, most of them are hospitalized. This number of hospitalizations comprises of 40% of hospital- driven infections (13, 14), which most of them are related to catheter in urinary tracts [15-17].

Regarding rate of prevalence, non-specific symptoms, and long-term complications in UTI that may impose a lot of medical costs to healthcare-medical system in the country, it is vitally important to propose an overall estimation from rate of prevalence of the infection and its major creative microorganisms for healthcare and medical interventions and approximation of its economic burden.

In recent years antibiotic sensitivity of bacteria to drugs commonly used to treat urinary tract infections continues to change, So that Resistance E.Coli to amoxicillin and ampicillin 20-30% of cases, and resistance to cotrimoxazole more than 20% are estimated [18]. Failure to correctly diagnose the cause of infection and Self-treatment of people can be causes of treatment failure [19]. So for mentioned reason and Importance of UTI, the aim of this study is estimate the prevalence rate of UTI and its major creative microorganisms in Iran by using meta-analysis method.

## MATERIALS AND METHODS

In the meta-analysis study, the prevalence of UTI and its major creative microorganisms in Iran are determined. This study has been carried out by technique of review of documentations and conducting meta-analysis on the existing sources. In order to access to the associated researches, the needed searches were done without any time limit by means of Persian and English keywords (with their possible combinations) including '*microorganism, urinary infection, prevalence, frequency, and Iran*' in SID, Google Scholar, Magiran, Iranmedex, Sciencedirect, and Pubmed.

### **The criteria for selection and evaluation of quality in essays:**

Initially, a list of titles and abstracts from all existing essays the mentioned databases was prepared by the researcher(s) and it was independently studied. Then, the relevant essays entered into process of survey. The inclusion criterion in various essays was to referring to estimation of prevalence of UTI.

### **Data extraction:**

In the present study, 40 essays were evaluated that were carried out within time period (1996-2011) with reference to rate of prevalence of microorganisms, which produce UTI. Then the needed information in each essay was collected to analyze, it including the related data to subject, title, name of journal, and author (bibliographic data), and methodological information consists of method of study and type of plan and general data in every study, including sample size, prevalence rate, location of conducting study, time, and other needed information was employed as aggregate data.

**Statistical analysis:**

The variance of each study was calculated with respect to binominal distribution. The studies were combined together according to number of samples and variance. Given the existing heterogeneity in studies, the random model for composition of studies was utilized. I-Square ( $I^2$ ) test was used for evaluation of heterogeneity and the given data were analyzed by using R-software (ver. 2.11.1) and STATA (ver. 10).

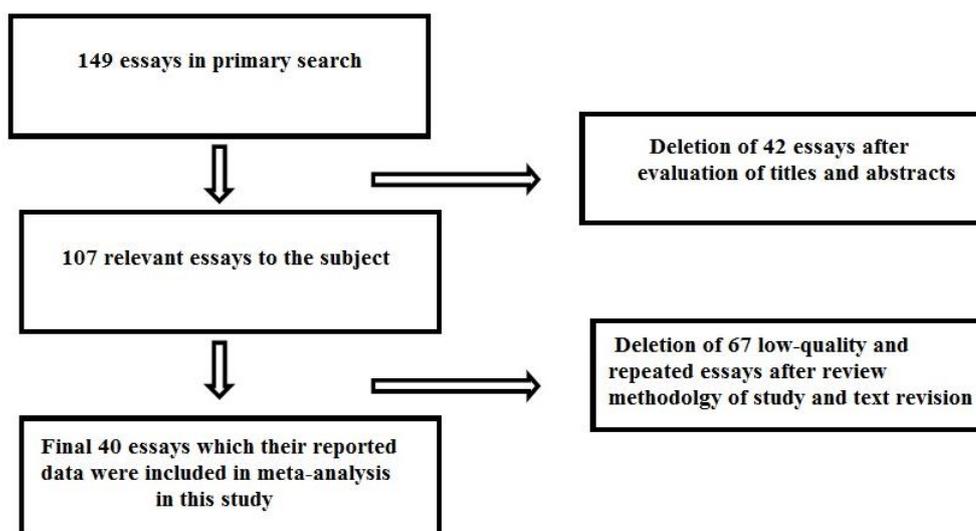
**RESULTS**

Totally, 149 Papers were found and studied at first step. 107 essays were selected after reviewing the titles. At the stage of qualitative evaluation of abstract, those essays that did not really represent the main population in terms of sample size and random model method was not employed to determine the samples and also the essays with some methodological defects and lack of the suitable quality, were excluded from the process of the study. Finally, 40 essays were selected to be included in meta-analysis step.

From 149 essays collected in the mentioned databases during primary search, 40 qualified essays were selected with 66448 participants, after implementing inclusion criteria to enter analysis process. Out of 40 studied essays, prevalence of UTI was generally reported in 11 essays and in other essays the prevalence of disease was determined according to gender, age groups, and other demographic variables so that eventually the final analysis was done based on 11 essays [20-29]. At last, according to 11 essays, 5557 cases of UTI were examined. Characteristic of papers studied was showed in table 1.

**Table 1: Characteristics of papers studies were enrolled in Meta-analysis**

Place of study	Year of study	Sample size	Prevalence of UTI
Tehran	2006	1216	1.15%
Hamedan	2006	377	10.1%
Ardabil	2005	454	4.1%
Tehran	2007	214	44.9%
Birgand	2006	278	1.1%
Mashhad	2005	166	2.85%
Tehran	2001	164	33.5%
Tehran	2003	400	1.8%
Isfahan	2008	315	15.9%
Ghaem-Shahr	2008-2009	1061	6.97%
Hamedan	2009	912	34%



**Figure 1: Flowchart of study and inclusion in studies with systematic review and meta-analysis**

Based on data analysis, prevalence rate of UTI was estimated 13.3% (CI95% 8.8-17.8). The prevalence rate of UTI was estimated 3.1% and 15.5% in males (CI95% 0.0-6.4) and females (CI95% 8.7-22.4), respectively. The lowest prevalence rate (1.1%) was related to the study that was done by Fesharakinia et al (2006) in Birjand city on 278 students of primary school while the highest prevalence rate (44.9%) was in the investigation of Ghanei et al (1995-2005) on 214 patients, who received implanted kidney in the Tehran city. Among 11 studies in which prevalence rate of UTI was reported, 1 study (9.09%) was done in north of Iran, 5 studies (45.45%) were conducted at center of Iran, 3 studies (27.27%) at western regions of the country, and 2 studies (18.18%) were carried out at eastern parts of Iran. Details of UTI prevalence rate are mentioned separately for various regions in figure 2. The relation among UTI prevalence rate with year of conducting study by means of meta-regression is given in figure 3.

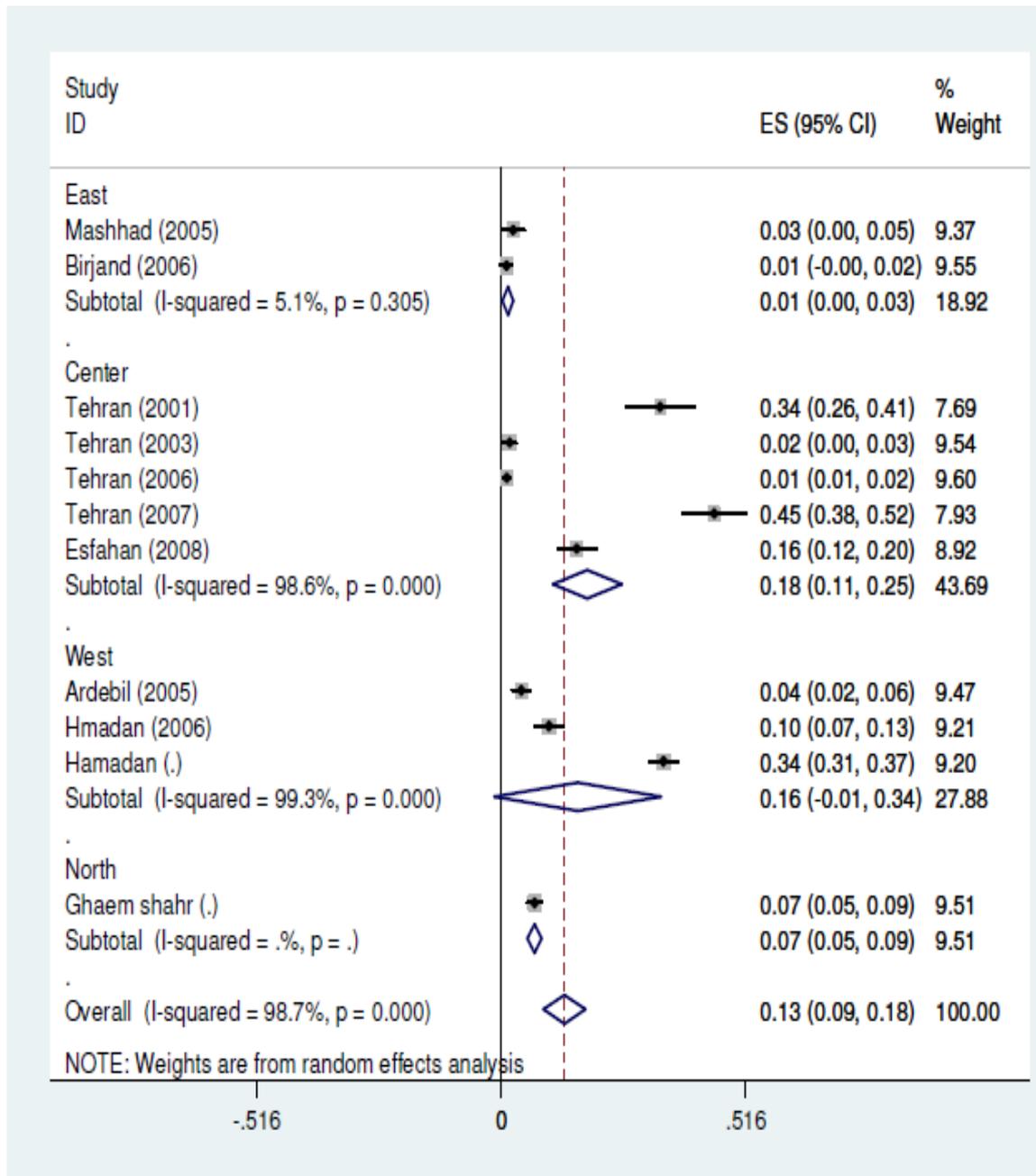
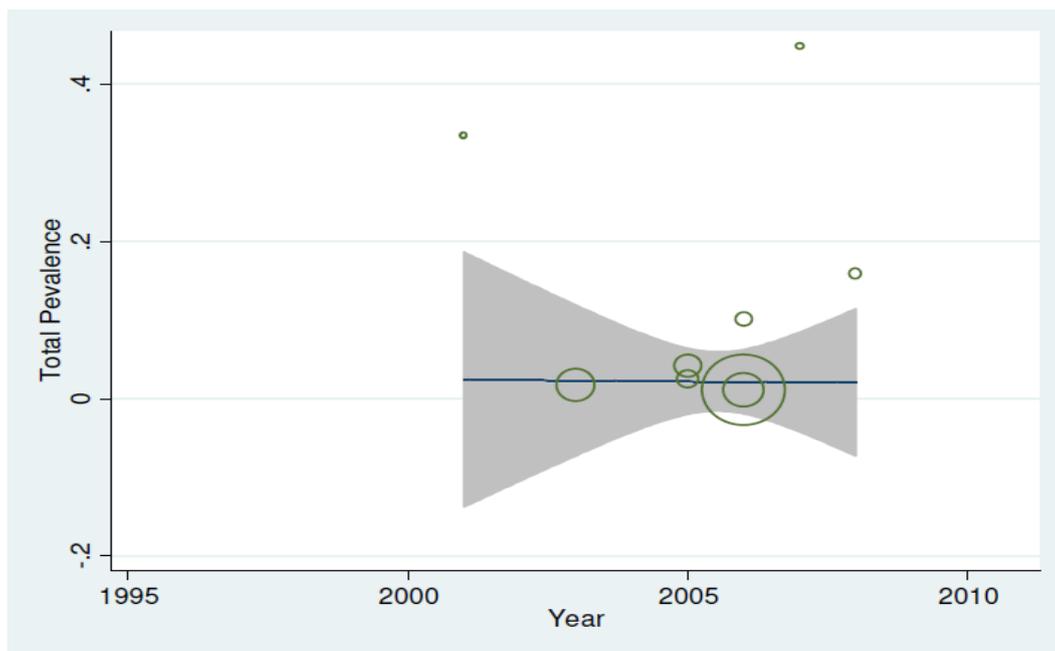


Figure 2: UTI prevalence rate separately based on geographical zone. Each of line segments indicates confidence interval 95%. The lozenge figure shows estimation of prevalence total rate and confidence interval.



**Figure 3:** The relation among UTI prevalence rate with year of conducting study by means of meta-regression. Size of circles indicates the magnitude of the sample. There is no significant relationship with respect to prevalence rate of infection and year of conducting study and prevalence rate has been approximated fixed during years of study in this survey.

*Escherichia Coli* (E.coli) is the most prevalent (62.1%) microorganism, which creates UTI, was explored in these studies. *Candida Albicans* was another organism was ranked at second position as agent for UTI. *Enterobacter* was the least intervening bacterium in occurrence of UTI with prevalence rate of 2.8%. Details of prevalence rate of the creative microorganisms of UTI are given in Table 2.

**Table 2: Prevalence rate of UTI agent microorganisms**

Microorganism	Prevalence percentage	Confidence interval (95%)
Escherichia coli	62.1	55.4-68.9
Candida Albicans	27	0-56
Negative Coagulase Staphylococcus	21.3	5.9-36.6
Klebsiella	14.6	11.7-17.5
Other bacteria	8.2	2.5-13.9
Enterococcus	6.5	4.8-8.1
Epidermidis Staphylococcus	5.9	2.4-9.4
Proteus	5	3-7
Aeruginosa pseudomonas	4.9	3.3-6.6
Aureus Staphylococcus	4.8	3.6-6
Enterobacter	2.8	1.8-3.8

### DISCUSSION

The present aims to determine prevalence rate of Urinary Tract Infection (UTI) and its agent microorganism by meta-analysis during period 1996-2011. Totally, 66448 cases were evaluated and UTI prevalence rate was acquired 13.3% that this rate was 3.15 and 15.5% in males and females, respectively.

The highest and lowest relative frequencies of UTI agent microorganisms were related to E.coli and bacteria from Enterobacter family. In this investigation, UTI prevalence rate was derived 13.3% where this rate was five times greater in females than in males.

In a study that was carried out by Shaikh et al, UTI prevalence rate was reported as 7% in children. In Shaikh study, UTI prevalence rate was reported at high level in female children, especially during first years of their life. The existing difference in two studies is related to the reviewed essays and research population in both studies. UTI prevalence in all age groups from Iran is studied in the current study but in Shaikh investigation, UTI has been addressed among children and also throughout the world. According, difference among the results of both studies can be comprehensible [30].

In another study which was done by Polypetch et al (2013) on patients with cerebrospinal syndrome in Thailand, they reported that 57% of these patients suffered from UTI and the most prevalent bacteria were E.coli (50%), Pseudomonas species (17.3), and Enterococcus (7.7%) [31].

In another study, Kathy et al evaluated UTI prevalence rate in teenagers, who referred to emergency ward. According to results of the research, UTI prevalence rate in these patients was 3.3% while its prevalence was estimated further among Caucasians and girls [32].

Daniels et al in their study about prevalence of catheterization- related UTI and its trend on 70.4 million patients, 3.8 million cases of UTI were reported during years 2001-2010, so UTI prevalence total rate was estimated 5.3%. The relevant UTI prevalence rate was reduced by intubation from 9.4 per 100 patients in 2001 to 5.3 per 100 patients in 2010. In this research, gender has been expressed as an independent risky agent for intubation- related UTI [33].

In another study on 945 febrile newborns by Hoberman et al, UTI prevalence rate was reported 5.3%. In this study, prevalence rate of UTI was greater in girls and Caucasian newborns than in boys and black newborns [8].

### CONCLUSION

Urinary Tract Infection (UTI) has the relatively high prevalence in the Iran and this rate is higher in females than in males similar to the other studies. *Escherichia Coli* (E.coli) bacterium was the most prevalent (62.1%) microorganism creating UTI in the country similar to other conducted research. It is suggested to execute screening programs and holding public health training as well as conducting intervention studies in order to reduce occurrence of UTI. Similarly, it is recommended that people avoid taking antibiotics so that they avoid further incidence of antibiotic resistance more than ever.

### ACKNOWLEDGMENT

All authors thanks to Mohammad Rasool Yasemi to review manuscript and editing this paper.

### Funding Information:

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