ABO-Rh blood groups and type of food are amongst urinary tract infection causatives

Received: 2/3/2011 Accepted: 30/6/2011

Marwan Abdul Raheem Yass* **Suzan Sami Ali *** **Ahang Ali Ahmad***

Abstract

Background and objectives: The urinary tract infection (UTI) occurs in any part of the urinary system. Researches on bacterial adhesions were carried out due to the role of blood group types or the influence of numerous kinds of foods. This study is an attempt to investigate the role of these two factors.

Methods: This work was conducted through; first; investigating the ABO-Rh group distribution of 103 patients with UTI, and second; detecting the optimal pH of the media that might facilitates the attachment of Escherichia coli (*E. coli*) to the lining mucosa layer.

Results: 58.4% of females UTIs patients were between 10- 30 years, and 53.9% of males were more than 51 years. The distribution of blood groups in female UITs patients was as follows;18.2% A^+,22.1% B^+, 7.8% AB^+,44.2% O^+, 3.9% A^- , 2.6% O^-, respectively: and non with B^- and AB^-, while in male UITs patients was as follows;46.2% A^+, 11.5% AB^+, 38.5% O^+, 3.8% O^- respectively, and non with B^+, A^-, B^-, and AB^-. The pH of urine in UTIs female patients was less than 7 and saliva pH was 7, whereas both in males were less than 7. Some acid-yielding and alkaline-yielding foods prevented the growth of *E. coli*. Neutral foods did not.

Conclusions: Patients who are owners of A and O blood groups are more prone to infection at age 10-30 for females and males who are over 51 years. Read phonetically Dictionary - View detailed dictionaryThe pH of both urine and saliva in males and females were neutral and slightly acidic. Some acid and alkaline yielding foods prevented the growth of bacteria.

Key words: urinary tract infection, ABO/Rh blood groups distribution, urine and saliva pH

Introduction

The urinary tract infection (UTI) occurs when bacteria begin to grow in the kidneys, the bladder, and the ureters.[1,2] An infected patient may have: pain or burning sensation during urination, an urge to urinate frequently but usually passing only small quantities of urine, dribbling, inability to control urine release, foul-smelling urine and finally cloudy urine.[3] However, the symptoms may vary with age and the part of the urinary system that is affected. [4]

Researchers make intensive efforts to look for ways to prevent the developing and recurring of (UTI). This is by finding out certain effective vaccine or by another approach for treating the condition. Since women are at great risk of developing (UTI) then are men [3,5], one of these approaches is to test another method which allows women to apply the vaccine directly as a suppository into the vagina. [6]

It has been found that, children, who are prone to infection and women who tend to get UTIs usually lack immunoglobulin protein which fights infection.[7] Another line of investigations has indicated that non–secretory women of certain blood group antigens may be more prone for infection.[8]

*Physiology Department, College of medicine , Hawler medical university, Erbil, Iraq

The influence of P blood group phenotype on susceptibility was investigated also.[9, 10] Urinary tract research suggests that one factor behind chronic UITs, may be the ability of bacteria to attach to cells lining the urinary tract.[11] Moreover, bacterial attachment is an important event in the pathogenesis of UTI. Increased receptivity on the host cells has been suggested to influence proneness to infection.[8] There are several publications that define enhanced bacterial adhesions due to genetic markers such as blood group types[9], and certain factors that facilitate the mechanism of attachment of *E. coli* .[11] It was worth to investigate the pH of the urinary tract content as one of these factors that may facilitate the bacterial attachment. Food may play an essential role. This is because we understand now that we might have a better health if our body's pH is neutral or slightly alkaline. [12] When we tilt toward greater acidity, we have a greater risk of developing many diseases, including kidney disease. According to scientists who have researched "chronic low–grade metabolic acidosis", the solution is by eating a diet that yields more alkaline and less acid.[12]The real problem is one of alkaline deficiency , more than one of too much acid. To prevent tilting toward acidity, scientists recommend eating fruits and vegetables.[13, 14] It is well known that after digestion all foods report to the kidneys as being either acidic or alkaline. The kidneys are responsible for fluid balance and maintaining a relatively neutral pH in the body. When acid–yielding foods lower the body's pH, the kidneys coordinate efforts to buffer that acidity by different means. Low graded acidosis increases the risk of kidney stone and kidney failure.[15] Protection from UTI has attracted significant attention and gained a great deal of scientific research. Recently, it has been shown that higher levels of vitamin D may offer a strong protection against UTI. [16] Therefore, the present study was undertaken as an attempt to demonstrate a proper way that aims minimizing and avoiding UTIs infections. Finding out the local distribution of blood groups-Rh factor of UTI patients (An investigation that are carried out for the first time in Iraq and middle east), the pH of urine and saliva which may interpretate the factors that make some people more subject to infection and meanwhile avoiding UTIs recurrence. In addition, investigating the nature of the media (acidic, alkaline, or neutral) that facilitates the bacterial attachment to the lining mucosa layer in UTIs patients as an essential part of prevention.

Methods

A/ Assessment of, age, blood groups, sex and the pH of both urine and saliva of UTIs patients:

The distribution of patient's blood groups and their ranges of age (10-30), (31-50) and more than 51 were investigated. In addition, sex and the pH of urine and saliva were tested by using pH strip. Those patients were 103 (77 females and 26 males). Data were collected by the research members from three different medical analysis laboratories. This was carried out during the period from October to December, 2010.

B/ The optimal pH of *E. coli* growth in relation to the effect of different types of foods.

The optimal pH of the media that may assist the attachment of bacteria to the lining mucosal layer of the urinary tracts was investigated by finding out the growth of the bacteria on the media, in which covered with acid or alkaline yielding food extracts. To achieve this purpose, this study examined the impact that can be caused by food materials. The following processes were performed:

1. Sixty eight Petri dishes containing sterile nutrient agar were used.
2. One centimeter (1cm) in diameter hole was made in the center of each single Petri dish. Then, the superficial agar's layer of each single Petri dish was swapped with fresh growth of *E. coli* bacteria, and then all Petri dishes were divided into three sets:

Set One: Acid-yielding foods, in which fresh stuffs (lemon, apple vinegar, kiwifruit, egg, cheese, tomato and milk) [12], were poured into the holes of the Petri dishes, consequently. Four replicates for each kind of food were taken.

Set Two: Alkaline-yielding foods. The same procedure as in set one was followed but with

using fresh stuffs of (orange, onion, spinach, celery juice, banana and carrots). [12]
Set Three: Neutral pH, in which pure water [12] was used.
In addition, another two Petri dishes were used to investigate the role of fresh garlic juice and pomegranate which are not included through the classified foods list. [12] Therefore, the impact of these last two stuffs was tested for the first time within the present work.
4. All the Petri dishes were kept in an incubator for 48 hours at 37^0C.
5. The average of four replicates was calculated for each type of food.

Statistical analysis:
Concerning of the inhibition zone diameters, data were expressed as means ± standard error (SE) and statistical analysis was carried out using available statistical soft ware (SPSS version 15). Data analysis was made using one-way analysis of variance (ANOVA). The comparisons among groups were done using Duncan post hoc analysis. P values <0.05 were considered as significant.

Result

A/ Assessment of age, blood groups, sex and the pH of both urine and saliva of UTI patients:
Regarding of females, 58.4% of UTIs patients were between 10-30 years, 28.6% between 31- 50 years, and 13% were over 51 years. For males, 15.4% were between 10-30 years, 30.8% were between 31- 50, and 53.9% were over 51 years. Based upon that, the largest ratio of females patients was at 10-30 years, and men was over than 51 years (Table 1).
The distribution of blood groups in females was as follows;18.2% A^+, 22.1% B^+, 7.8% AB^+, 44.2% O^+,3.9% A^- , 2.6% O^-, respectively: and non with B^- and AB^-. In males were as follows;46.2% A^+, 11.54% AB^+, 38.5% O^+, 3.8% O^-, respectively, and non with B^+, A^-, B^-, and AB^- (Table 2). Among UTIs female patients, the pH of urine was less than7 in 85.2%, equal to 7 was 8.2 % and more than 7 in 6.6%. For males, it was 84% less than 7, 12% equal to 7 and 4% were more than 7 (Table 3). Concerning of saliva pH in females was less than 7 in 37.0%. Similarly for those who were equal to 7 and 26% for those were more than 7. In UTIs male patients, the pH of saliva was 83.3% for whom were less than 7, and 16.7% for whom were more than 7 (Table 4). The pH of both urine and saliva were less than 7 in both males and females (Tables 3 and 4).
B/ The optimal pH of *E. coli* growth in relation to the effect of different types of food:
The semi-antimicrobial effects of different types of food against *E. coli* were examined.
Table (5) presents study groups according to their inhibition zone. There were significant differences of the diameters of inhibition zones between different types of food at
($p< 0.05$) as follows:
Set one: Amongst all different food, lemon showed high significant effect on growth of *E. coli*. at $p<0.05$.
Set two: Orange showed significant effect at $p<0.05$.
The other types of food (apple vinegar, onion, and pomegranates) have the same significant effect, whereas garlic showed a lower effect, significantly (Figure1: A, B and Figure2: A, B, C).

Table 1: Percentages of the numbers of patients on basis of their ages.

Gender	Age (yrs) 10-30	31-50	>51
Females 77	45 58.44%	22 28.57%	10 12.98%
Males 26	4 15.39%	8 30.77%	14 53.85%

Table2: Percentages of the numbers of patients relative to their gender and the type of blood.

Gender	Blood Group							
	A^+	B^+	AB^+	O^+	A^-	B^-	AB^-	O^-
Female 76	14 18.20%	17 22.10%	6 7.80%	34 44.20%	3 3.90%	Nil -	Nil -	2 2.59%
Male 26	12 46.20%	Nil -	3 11.54%	10 38.46%	Nil -	Nil -	Nil -	1 3.85%

Table3: Percentages of the urine pH for both females and males.

Gender	Urine pH		
	< 7	**= 7**	**> 7**
Females	52	5	4
61	85.24%	8.2%	6.55%
Males	21	3	1
25	84%	12%	4%

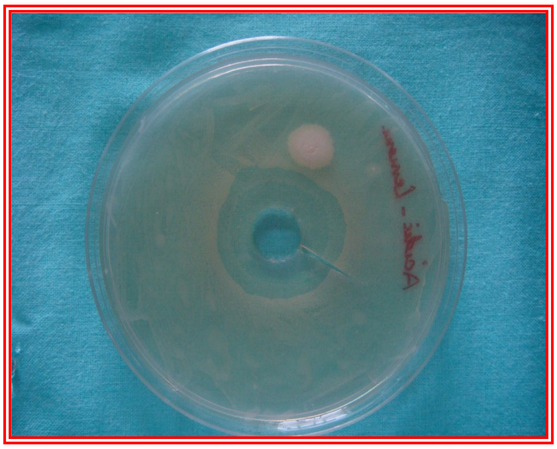
Table 4: Percentages of the saliva pH for both males and females.

Gender	Saliva pH		
	< 7	**= 7**	**> 7**
Females	20	20	14
54	37.04%	37.04%	25.9
Males	5	Nil	1
6	86.33%	-	16.66

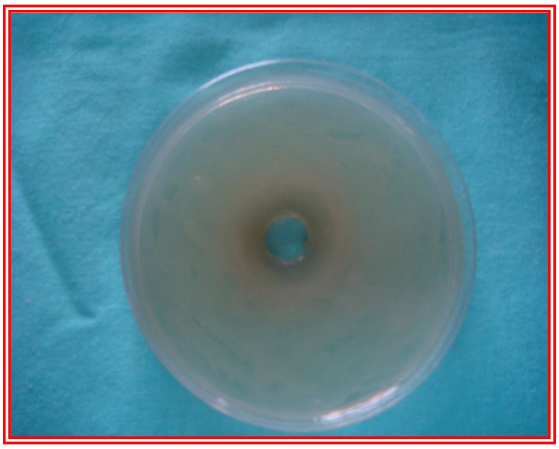
Table 5: Mean and standard error of the inhibition zones produced by different types of food.

Type of food	**Mean ± S. E.**
Lemon	4.000± 0.0707 [a]
Apple Vinegar	3.000±0.0810[c]
Orange	3.500±0.0408[b]
Onion	3.000±0.0408[c]
Garlic	2.500±0.0707[d]
Pomegranates	3.000±0.0707 [c]

-The same letters mean no significant differences
-Different letters mean significant differences at $p<0.05$.

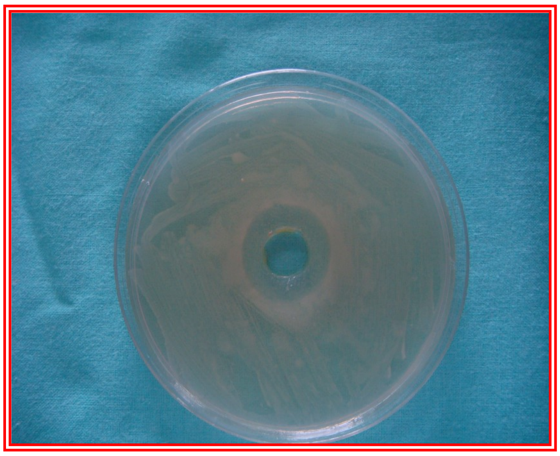


A



B

Figure 1: Inhibition zones in relation to: A-Lemon, B-Apple vinegar



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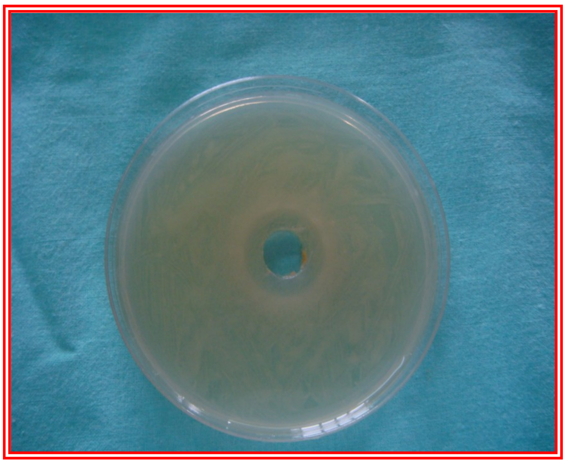

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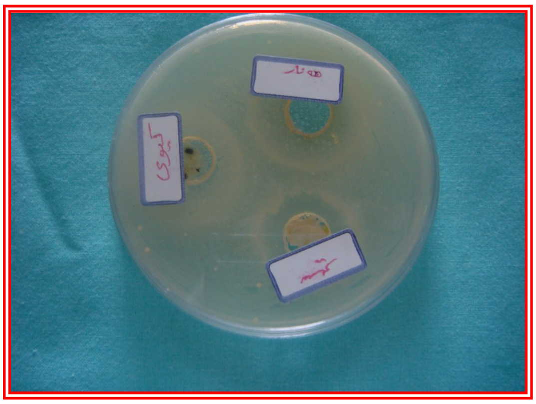

C

Figure 2: Inhibition zones in relation to: A-Orange, B- Onion, C-Pomegranates and Garlic.

Discussion

First of all, we must refer to the congruence in the results of our study and those of the Turkish population. Both showed high proportions for people with UT infection who are holders of A^+ and O^+ blood groups distribution (36.6% and 31.7%, respectively in Turkish study [8] and 46.2% and 38.5%, respectively for the UTIs male patients of the current research). Knowing that the Turkish study was performed for patients as a mixed single group, while in this work a single group of females and another for males were used, separately. Similarly, the O^+ blood group distribution of the UTIs female patients of this work showed a high proportion (44.2%) also. These findings may indicate the influence of A^+ and O^+ blood groups phenotypes on susceptibility to UT infection. [8] Comparing with the Turkish study, the ratios of this work are higher, indicating that the carriers of these blood groups are more susceptible within their ranges of ages (> 51)) for males and (10-30) for females. The variations between the ranges of ages of both males and females are related to anatomical factor (the possibility of contamination because the urethra is very near to the vaginal wall and so women are more likely to get UT infection, or from sex act) or from the sexual intercourse and frequency of sex[17], or other behavioral habits (not drinking enough fluids, cleanliness). Moreover, urinary tract infection in elderly men and women as well is related to many reasons. Elderly men and women experience a weakening of the muscles of the bladder, which leads to more urine being retained in the bladder, poor bladder emptying and incontinence can lead to UTIs. In elderly men, an enlarged prostate may lead to obstructed urinary flow and urine stagnation. The influence of the phenotype is supported by the absence of patients who are carrying AB^- in both studies. Moreover, we did not find male patients who possess B^+, A^-, and B^-. They might be less susceptible of UT infections. The variations between the different communities are related to remarkable genetic factors, taking into consideration the need for health awareness and guidance. The pH of urine and saliva were slightly acidic in all patients, which is normal for urine and may related to another source for saliva such as, bacteria ,fungi and H^+ source, a matter that need further investigation. While recalling a lot of researches to the danger of increased acidity of the blood, others went further to another direction. This is by classifying foods into what changes they could cause in the pH of blood. These are acid–yielding foods, alkaline–yielding foods, and neutral foods. In fact all different types of foods will be reported to the kidneys and in turn will contribute to changing the pH of the final outcome by specific mechanisms. This is evident by the results of this work, in which some acid-yielding foods (lemon and apple vinegar) and alkaline–yielding foods (orange and onion) together prevented bacterial growth. The diameter of the inhibition zone of lemon from the first set (4 ± 0.07), and for the orange from the second set was (3.5 ± 0.04). Meanwhile, onion, apple vinegar and Pomegranate showed a similar effect in which the means of the diameters of their Inhibition zones were 3 ± 0.04, 3 ± 0.08 and 3 ± 0 .07, cm respectively. This clearly highlights an additional role of factors, other than that of the kidneys. It is the nature of the chemical components of these foods and their contents. Foods that prohibited the bacterial growth must include certain components that may be acting in a similar manner to that of the antibiotics. Obviously, acidic and alkaline foods do not usually translate into acid and alkaline-yielding foods. The distinction is subtle but significant. This kind of an unexpected outcome by the kidney appears as a counter–intuitive. The presence of the role of these two possibilities (kidneys and the nature or components of food), may mean that both are playing a role simultaneously, or perhaps one of them is acting without the other. In this regard, we emphasize the importance of the contents of foods and their role in altering the pH of the UT in addition to the role of the kidneys. However, we ensure our belief in the seriousness of the acidity of blood.[12] These results described above being augmented on the basis of the effect of the other types of foods, five acid-yielding foods (kiwifruit, egg, cheese, tomato, and milk) and four alkaline–yielding foods (spinach, celery, banana, and carrots), in addition to pure water as a neutral in which they did not show any noticeable effect.

Conclusions

People receptive to infection are of groups A^+ and O^+ for males and O^+ for females.
The typical age of infection in females is between (10–30) years, and more than 51 years for males.
Both the kidneys and the components of food have a role in changing the pH of the body fluid.

Recommendation:

1. Eating alkaline foods such as; fruits and veggies
2. Care should be taken by both female and males who are within their typical age of infection.
3. Follow up the instructions of doctors and achieving continuous control tests.

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