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Study of bacterial caused by Escherichia coli and Immunological study for UTI Urinary tract infection

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Abstract

Urinary tract infections (UTIs) agree to the attendance of pathogenic microorganisms in the decrease or upper urinary tract. It is frequently careful one of the greatest not unusual subtypes of bacterial contamination in human beings. These infections can affect the decrease a part of the urinary tract, manifested inside the form of urethritis and cystitis, or multiplied, manifested in the shape of pyelonephritis. Urinary tract infections (UTIs) are secret consistent with the place of contagion: urine (asymptomatic bacteriuria), bladder (cystitis), kidneys (pyelonephritis), and blood (bacteremia) even though there are other, broader instances a variety of ratings that are not different.

Escherichia coli is unique of the maximum studied bacteria for its capability to attack the urinary tract. Several research must showed the presence of exact virulence issues or antigen serotypes which can be spoken at the floor of bacteria and are nearby for discovery through using precise antibodies , E. coli isolates from the intestinal microbiota showed a variability in phenotypic profiles, which may be a reflection of the promiscuous relationship of these bacteria in the intestinal environment.

Kew words : Bacterial caused by Escherichia coli , Immunological , UTI Urinary tract infection.

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Introduction

Urinary tract infections (UTI) are considered worldwide as one of the most frequent reasons for medical consultations(Inaguazo and Robert., 2017), Urinary tract infections (UTIs) are considered one of the main causes of morbidity in the world, and uropathogenic Escherichia coli is the causative agent associated with these infections.It is responsible for many uncomplicated UTIs. It is possible that these bacteria consist of intestinal flora and come to the bladder, and reach the kidneys via the urethra by a climbing route. In women, settlement may occur initially in the areas around the urethra and at the opening of the vagina, before bacteria enter the urinary tract.

The onset of infection is owing to an communication amid the pathogen and the host, and UTIs, which typically express a combination of virulence factors, container overwhelmed host resistance devices, leading to the formation of UTIs. It is possible that the study of such virulence factors, for example dissimilar kinds of virulence and toxins, iron uptake systems and cell wall advantages, among many others, may be complicated to elucidate the pathogenesis of disease (Blancoet al., 2016).

Urinary tract infections may be secret as recurring, when the infection develops after resolving a past episode, which may be recurrent or re-infection.

The aim of this study is to participate in the identification of the pathogenesis of UTI that could lead to advanced and important preventive therapeutic effects for UTI patients, and this study is intended to assess urinary virulence factors, antimicrobial susceptibility profile and antibiotic genetic profile (Inaguazo and Robert., 2017). Escherichia coli after the urinary tract and compared by those remote from the intestinal microbiota, for the purpose of identifying a possible source of infection.

The investigation of UTI varies with the age, sex of the affected person, whether or not the suspicion is of excessive or low UTI and whether or not it's miles close to infection. The basic and extraordinarily considerable examination is that of recurring urine for instances of suspected UTI, whose perfect series is that of the medium jet with previous intimate hygiene. In this analysis, the physical characters may additionally display the subsequent changes: the shade of the urine may be stronger; cloudy in look, with a marked smell (due to the manufacturing of

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ammonia); increase in urinary pH in Proteus infections, with transformation of urea into urate. In the assessment of the reagent strip examination, the transformation of nitrite into nitrate (fine nitrite) is essential, which is located in infections via Gran-negative micro organism; wonderful leukocyte stearase represents its lysis and seldom has a false effective end result, being an essential marker of UTI. Hemoglobin screening can be effective. Analysis of urinary sediment may show leukocyturia, haematuria and pyuria. The gold fashionable examination for UTI is urine way of life, which affords the identity of the responsible organism, the variety of colonies gift and offers the sensitivity of the cultivated germ to the numerous tablets, guiding the treatment.

Complementing the evaluation with a whole blood count number, blood subculture biochemistry may be indicated in instances with systemic involvement or the presence of underlying diseases referred to as diabetes and chronic kidney disorder.

The use of an extract from 18 heat-inactivated E.Coli serotypes , known as OM-89, is capable of stimulate both innate and purchased immunity, resulting in greater recruitment of neutrophils and dendritic cells, and inside the production of immunoglobulins G and A, specific for the antigens present inside the E.Coli extract .Such a compound turned into studied by using a couple of clinical trials, and a meta-analysis such as four studies and 891 women verified a great discount within the variety of recurrences (RR = 0.61, 95% CI 0.48 to 0.78) As compared to placebo. In addition, there were no huge unfavorable results compared to placebo.

A vaginal lysate (suppository layout) of six traces of E. Coli, a strain of Proteus, Morganella, K. Pneumoniae and E. Faecalis is being tested. Apparently, it showed a longer reinfection time than placebo and a decrease incidence of UTI in the first 4 weeks, however with no difference at 20 weeks. A second look at with a booster dose after the primary software decreased contamination.

Urinary contamination is the maximum common sickness of the urinary tract and is defined because the microbial invasion of the urinary device that exceeds the host's protection mechanisms, which reasons an inflammatory reaction and morphological or functional alterations, with a medical reaction that impacts extra or less regularly to people of 1 or the opposite intercourse and distinctive population companies (Alvarez., 2008).

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Urinary tract infections (UTIs) are labeled in step with the web page of contamination: urine (asymptomatic bacteriuria), bladder (cystitis), kidney (pyelonephritis), and blood (bacteremia) (Llop et al., 2001), despite the fact that there are other broader classifications that do not they may be special.

Symptomatic urinary tract infections arise in about 1.4 / 1,000 Newborns. They are maximum commonplace in uncircumcised male toddlers, followed in order of frequency by girls. Symptomatic and asymptomatic infections occur in 1.2 to 1.9% of College-age women, within the 7 to eleven-yr-vintage age group, and are rare in boys of this age. In wellknown, urinary tract contamination is more common in ladies, it's miles uncommon in adult males except in the extreme ages of life (breastfeeding and vintage age) or while there is obstruction of the urinary tract or malformations that desire infection and is one of the most commonplace conditions related to pregnancy. There are anatomical differences among the male and woman urethra that make girls greater prone to UTIs. The lady urethra is shorter, is positioned near the vaginal commencing and may gift inflammations and infections that could unfold to the bladder, ureters and kidneys. The latter are commonly free of microorganisms; but the lower urethra, meatus, vagina, and vulva, in adults, are colonized by means of a large quantity of microorganisms (Castillo et al., 2015).

It is rare for the vaginal plants of healthful ladies to contain enteric micro organism, besides in the area of the anus. Fungi of the genus Candida, Torulopsisy Geotrichum and protozoa together with Trichomonas vaginalis, can be located in small numbers, Approximately 15-20% Of pregnant women gift colonization of the vagina with the aid of Streptococcus agalactiae, that is a ability pathogen for the newborn . Staphylococcus epidermidis, non-hemolytic streptococci and diphtheroids, are the organisms that predominate within the distal portion of the girl and male urethra. Urinary tract infections (UTI) are considered one of the primary reasons of morbidity within the international, and uropathogenic Escherichia coli (UPEC) is the causal agent associated with these infections in 80% of instances (Luna et al., 2018).

E. Coli is one of the bacteria that has been studied the maximum for its capability to invade the urinary tract. Numerous research have confirmed the life of precise virulent factors or antigen serotypes which are expressed on the bacterial floor and are handy for detection through unique antibodies.

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Material and Methods

Target population and source of samples : The study included 92 women divided into four groups, as follows:

First group - Colonization Group

Fifteen women who were colonized by *E. coli* in both the urethral / periurethral and intestinal regions were selected after research on 44 volunteers from the Iraqi community who had no recent or recurrent UTI history and who were not using antimicrobials. The material used in the research was the first portion of the urine stream and feces. In addition, for control, as a condition of belonging to this group, a routine urine culture with a medium jet was performed, with a mandatory negative result.

Second group - Group with a history of recurrent UTI

Fourteen women attended at a medical clinic in Iraqi community (Attended at AL- Karama teaching hospital, Baghdad), with symptoms of urinary tract infection, history of recurrent infection (at least two to three episodes per year) and with no identified predisposing causes, were selected and referred to the AL- Karama teaching hospital, Microbiology Laboratory for cultural urine and stool examinations.

Third group - Group with community ITU

48 *E. coli* isolates (one per patient) from routine urine culture were obtained from patients with community UTI who sought the service of the AL- Karama teaching hospital, Baghdad Microbiology Laboratory with medical request for routine urinalysis.

Fourth group - Group with UTI with hospitalization

15 *E. coli* isolates (one per patient) were obtained from routine urine cultures of patients admitted to hospital for various reasons at AL- Karama teaching hospital, Baghdad, performed at the Microbiology Laboratory of this hospital. Thus, of the total of 92 patients involved in this study, 295 *E. coli* isolates were obtained in the years 2019 and 2020, which were distributed as shown in Table 1.

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Table 1: Distribution of 295 Escherichia coli isolates by clinical material from 92 patients divided into four groups.

Colonization group (n = 15)			Group with recurrent UTI history (n=14)			Groups with Community ITU		
						Community (n [a] = 48)	Hospitalization (n [a] = 15)	Grand total *E. coli*
Urethral and peri-urethral [1]	Intestinal [2]	Total *E. coli*	Urine [1]	Intestinal [2]	Total *E. coli*	Urine [2]	Urine [3]	
30	90	120	28	84	112	48	15	295

UTI: urinary tract infection; n: number of patients; n a: number of patients similar to the number of *E. coli* isolates; [1,2and3]:two, six and one *E. coli* isolates per sample, respectively.

Procedures

Location of the research

The clinical samples were sent to the Laboratory of Human Medical Microbiology of the Department of Biomedical Sciences of the AL- Karama teaching hospital, Baghdad, Iraq.

Urine culture

The urine culture for the purpose of diagnosing UTI was processed according to routine techniques, that is, from samples of a medium jet in a sterile flask, after cleaning the genital region. The *E. coli* isolates from the colonization group were obtained from the culture of the first urine stream, considering that they represent urethral / periurethral colonization.

Routine urine culture was performed after homogenization of the medium stream of urine, and seeded 0.001mL of urine with a loop calibrated in MacConkey Agar (Merck®) and Columbia Agar with 5% sheep blood (bioMérieux ®) and incubated in a greenhouse of 35 ± 1 ° C for a period of 18 to 24 hours.

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The first stream of urine from women in the colonization group was enriched in MacConkey broth (Difco ®) for 24 hours at 35 ± 1 ° C and, subsequently, an isolation by inoculation depletion in a MacConkey Agar medium (Merck®).

After the identification of *E. coli* isolates using conventional biochemical tests (glucose and lactose fermentation, indole production, use of citrate, methyl red, Vogues-Proskauer), two isolates per clinical sample were reserved for further tests (AL-Garibawy., 2001)**.**

Cultural examination of feces

Intestinal *E. coli* isolates were obtained by exhausting the inoculum on MacConkey Agar, by suspending a faeces loop in one ml of sterile saline. After incubation at 35 ± 1 ° C for a period of 18 to 24 hours, six lactose positive colonies were chosen arbitrarily by clinical material, which were reserved after biochemical characterization. The choice of six bacterial colonies of feces was made following the results obtained by Amatya et al. (2016), who showed that the probability that an *E. coli* colony isolated from faeces represents the predominant strain was 86.0%; two, 94.0%; three 97.0%, four 99.0% and five 99.3% (Amatya et al.,2016).

Storage of bacteria

All *E. coli* isolates were labeled, identified and stored at a temperature of - 20ºC and - 70ºC in skim milk medium containing 20% (feet / vol) of skimmed-milk powder dissolved in distilled water and autoclaved at 110ºC for 20 minutes (Zahera et al., 2011)**.**

Evidence of *E. coli* virulence factors

Hemolysin production

The production of hemolysin was carried out using 10µL of a culture in LB broth (Luria Bertani), incubated for 18 to 24 hours at 35 ± 1 ° C, being sown in a petri dish containing Columbia agar with 5% sheep blood (bioMérieux ®). These plates were incubated at 35 ± 1 ° C for a period of 18 to 24 hours, with hemolysin production verified by the presence of a hemolysis halo around the colonies after incubation (Segar et al., 2014)(Figure 1).

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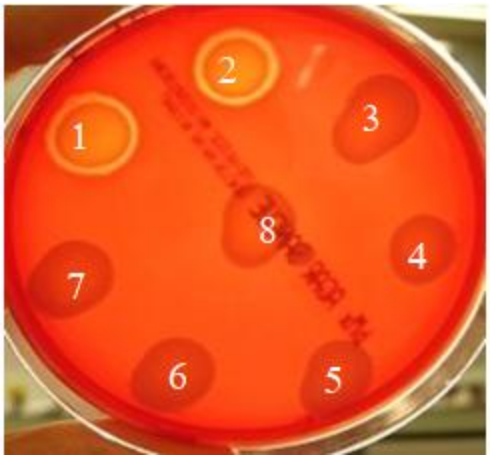

Figure 1: Columbia Agar Plate with 5% sheep blood with hemolytic *E. coli* isolates (1 and 2) from urine and non-hemolytic (3 to 8) of intestinal origin from the same patient

Aerobactin production

Aerobactin production by *E. coli* isolates was verified using the growth of the isolate in LB broth (Luria-Bertani medium), containing 200 µM α-α-dipyridyl and incubated at 35 ± 1 ° C for 24 hours without shaking. Subsequently, 10µL of the culture was sown in holes in the LB medium previously incorporated with the *E. coli* LG 1522 strain, which has a deficient aerobactin phenotype due to a mutation in the aerobactin gene, but without affecting the genes for aerobactin receptors. Petri dishes were kept at 35 ± 1 ° C for 48 hours and aerobactin production was visualized by the presence of a whitish growth halo of the *E. coli* LG 1522 strain around the holes, according to the methodology adopted by Riley, et al . (1993) (Riley, et al .,1993) (Figure 2).

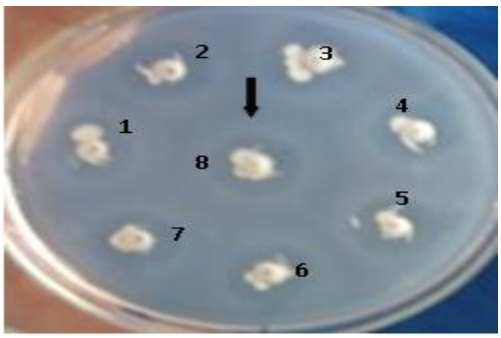

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Figure 2: Plate with Luria-Bertani medium showing a white growth halo (arrow) of the LG 1522 strain around each positive *E. coli* aerobactin isolate (1 and 2 - urine, 3 to 8 - intestinal) from the same patient

Connecting the Congo Red

The connection of the Congo red was performed according to the description of Berkhoff & Vinal (1985). *E. coli* isolates were seeded for 24 hours at 35 ± 1 ° C in LB medium and then seeded by the inoculum depletion method on Congo red agar (supplemented with 0.03% Congo red and 0.15% of bile salts) and incubated for 24 hours at 37 ° C. Positive *E. coli* Congo red was identified by the colony's red color (Figure 3).

Figure 3: Congo red agar plate showing colonies of *E. coli* colored red (arrows) due to the absorption of the dye (1 and 2 - urine) from two patients

Hemagglutination and expression of pili 1 and PA expression of pili of type 1 or type D-mannose sensitive (MS) was determined by the agglutination of human red blood cells of type A without the P antigen, prepared in dilutions of 1: 4 with phosphate buffer (PBS), pH 7.2, with and without 1% D-mannose. *E. coli* isolates were cultured for 18 hours at 35 ± 1 ° C on CFA Agar (Colonization Factor Antigen - 1% casamino acid, 0.15% yeast extract, 0.005% MgSO4, 0.0005% MnCl2 and agar 2 %, pH 7.4). A range of bacterial growth was removed and mixed with 20µL (one drop) of the red blood cell suspension on a glass slide. The positive result corresponded to an instant agglutination after one minute or after observation for another minute with the slide on an ice surface. Pili 1 was considered to be that isolate whose hemagglutination was inhibited in the presence of mannose. The *E. coli* strain ORN 115 was used as a positive control for pili 1.

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The expression of pili P or resistant D-mannose (MR) was determined with human blood with P antigen, with and without the addition of 1% D-mannose, carried out at room temperature and on ice. It was considered with type P pili that the isolate that agglutinated in the absence and presence of mannose (Figures 4A and 4B).

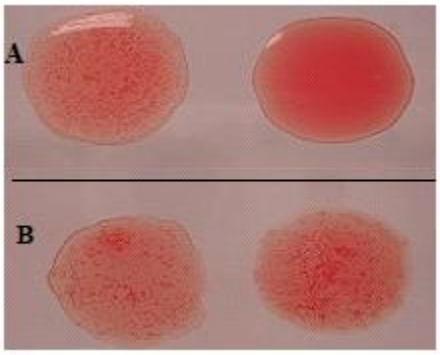

Figure 4: A: Slide showing hemagglutination only in the absence of 1% mannose, characterizing *E. coli* pili 1. B: Slide showing hemagglutination in the absence and presence of mannose at 1 %, characterizing the *E. coli* P *pili.*

Mobility

Mobility was verified with chopped sowing in SIM medium (H_2S, indole and mobility) added with 10 mL per liter of a 1% triphenyltetrazolium solution and incubated at 35 ± 1 ° C for a period of 24 to 72 hours. The presence of red color development in the whole culture medium showed positive mobility, whereas, only in the extension of the bite it characterized a negative mobility (Figure 5).

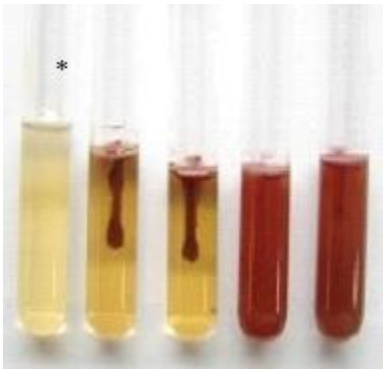

Figure 5: SIM medium plate with 1.0 mL of 1% triphenyltetrazolium showing negative *E. coli* isolates (red color at the bite) and positive (all red tubes) * seedless tube

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Antimicrobial susceptibility test

E. coli isolates were evaluated for sensitivity to eight antimicrobials most frequently used in the treatment of UTI, using the disk-diffusion technique, Kirby-Bauer, as recommended by the Clinical and Laboratory Standars Institute CLSI (2005). On the surface of Müeller-Hinton Agar, after sowing the inoculum on the 0.5 MacFarland turbidity scale, disks with antimicrobials (Oxoid ®) were dispensed, and the inhibition halos were measured after incubation at 35 ° C for one 16 to 18 hours, and the categorization of the samples, that is, the interpretation of the tests in resistant or sensitive, carried out according to the standardization recommended by CLSI (2005). The following antimicrobials were tested: nalidixic acid, ampicillin, ampicillin-sulbactam, cephalothin, gentamicin, nitrofurantoin, norfloxacin and sulfamethoxazole-trimethoprim (Figure 6). Quality control was performed using standard strains of the "American Type Culture Collection" (ATCC) of *Escherichia coli* ATCC 25922.

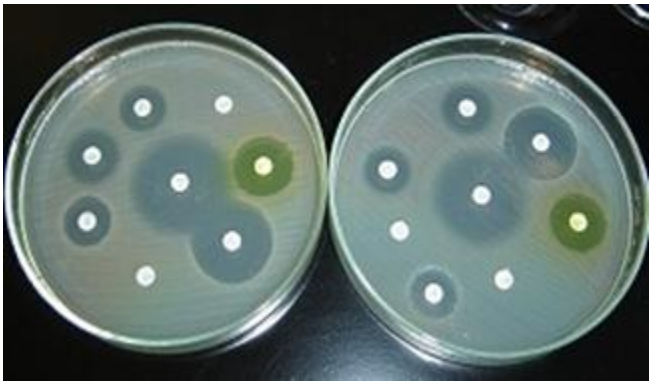

Figure 6: Susceptibility test to eight urine *E. coli* (left) and intestinal (right) antimicrobials from the same patient

Results and Discussion

Urinary tract infection (UTI) is understood as an occurrence, in which bacterial virulence factors overpower the host's resistance mechanisms (Cerovic et al., 2017).

Abstracting the multiple conditions that contribute to the host's susceptibility to UTI, this study focused on some virulence factors that characterize *Escherichia coli* as being uropathogenic, making it capable of overcoming host resistance (Hunstad and Justice., 2010).

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In total, 295 *Escherichia coli* isolates from adult women were analyzed, which were divided into four groups: Colonization group (120 isolates from urethral / periurethral and intestinal colonization), making a total of 15 cases; Group with a history of recurrent UTI (112 isolates from urine and feces), making a total of 14 cases; Group with community-based UTI (48 urine isolates) of 48 cases and; Group with hospital admission UTI (15 urine isolates) of 15 cases.

Research work reports such as those by Dzinic, et al. (2009), suggest that the scourge, a mediator of mobility and chemotaxis, may not be absolutely necessary for virulence, but should contribute to the increase in the upward displacement in the urinary tract of uropathogenic *E. coli* , as well as the ability to establish periurethral and vaginal colonization (Dzinic et al., 2009).

For the hemolysis test, it was found that 18.3% (54/295) of the isolates were hemolytic with a variation from 11.9% to 26.7%. Among UTI patients, it was observed that 20.0% to 25.0% of the isolates produced hemolysin, compared with 15.6% to 26.7% among the isolates of healthy people.

Although low rates of hemolytic isolates were found in this study, values between 60.0% to 85.0% have been observed in *E. coli* isolates among patients with pyelonephritis, in contrast to healthy controls that exhibited 5.0% to 29 , 0% of hemolytic isolates from faeces. According to Nielubowicz, (2010) *E. coli* strains that produce hemolysins are generally isolated from patients with bacteremia, sepsis and pyelonephritis and probably the virulence activity is multifactorial, including in addition to iron uptake from erythrocytes, interference with phagocytic function up to toxicity direct to host tissue, including kidney cells (Nielubowicz., 2010).

When testing aerobactin, it was found that 43.1% (127/295) of the isolates produced aerobactin. Among the patients with UTI, it was observed that in the Group with recurrent UTI, 50.0% of the isolates produced hemolysin, 39.6% in the Group with community UTI and 26.7% in the group with hospital UTI, compared with 13, 3% to 26.7% among those isolated from healthy people. Aerobactin production has been observed in *E. coli* isolates from serious infections, both in the urinary tract and in 75.0% of isolates responsible for urosepsis, probably because it promotes bacterial growth in limited iron concentrations found during. It is known that the severity of a disease is a reflection of the virulence of the infecting strain and the host's propensity to respond to this infection. In patients with asymptomatic bacteriuria, the bladder mucosa remains inert, even despite the amount of bacteria in the urine. On the other hand, patients with acute

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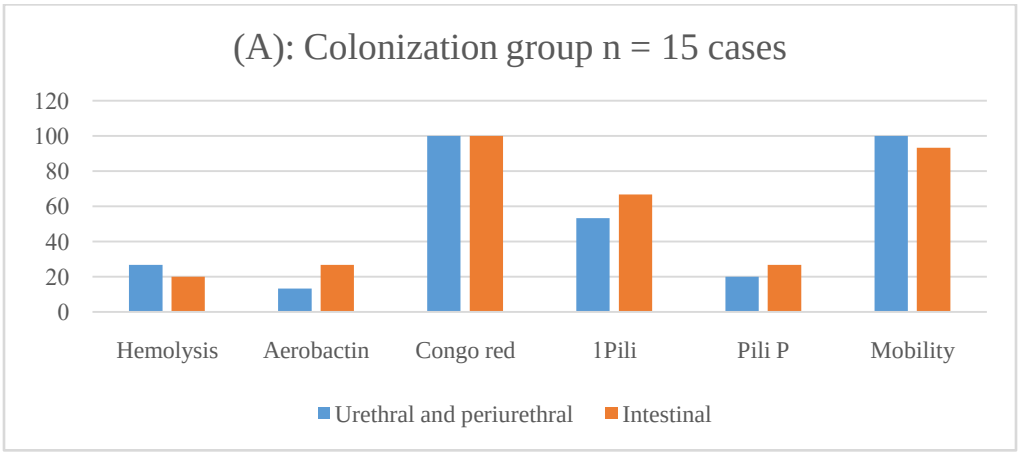
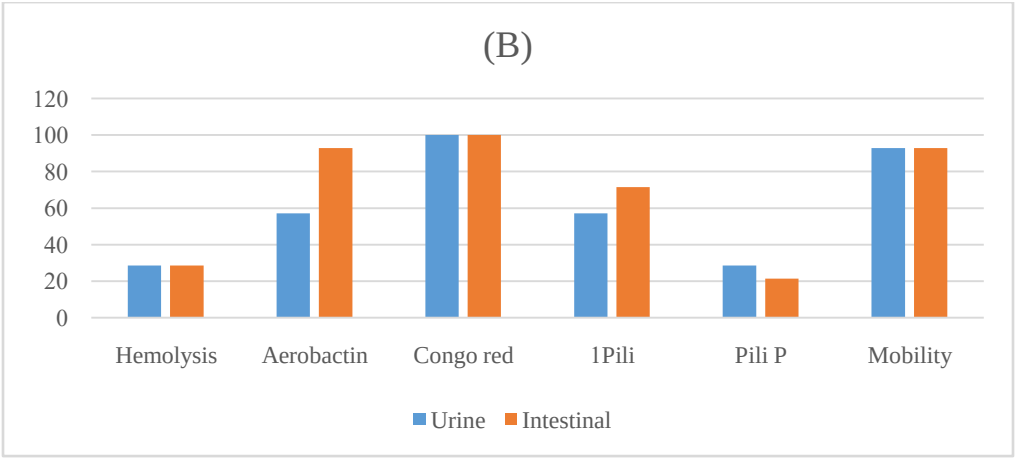
pyelonephritis, both the local and systemic inflammatory response are activated by virulence factors of the microorganism. Uropathogenic strains have properties that contribute to colonization at different stages of the infectious process. For colonization and ascension in the urinary tract, *E. coli* expresses fimbriae that specifically recognize and bind to cell receptors from the periurethral region to the renal parenchyma (Notebaert et al., 2008).

Distribution of virulence factors of *E. coli* isolates per patient in the different groups

In Figure 7, the percentages of patients with *E. coli* isolates are observed separately by virulence factor and by group of women studied. Comparing the groups (Figures 7A, B and C), it is observed that regarding the hemolysis and Congo red tests, the values found were very similar between the groups and clinical materials, that is, they ranged from 20.0% to 28.6% (hemolysis) and 100.0% (Congo red), differently from what was verified in relation to the aerobactin, pili 1, pili P and mobility tests when compared between groups.





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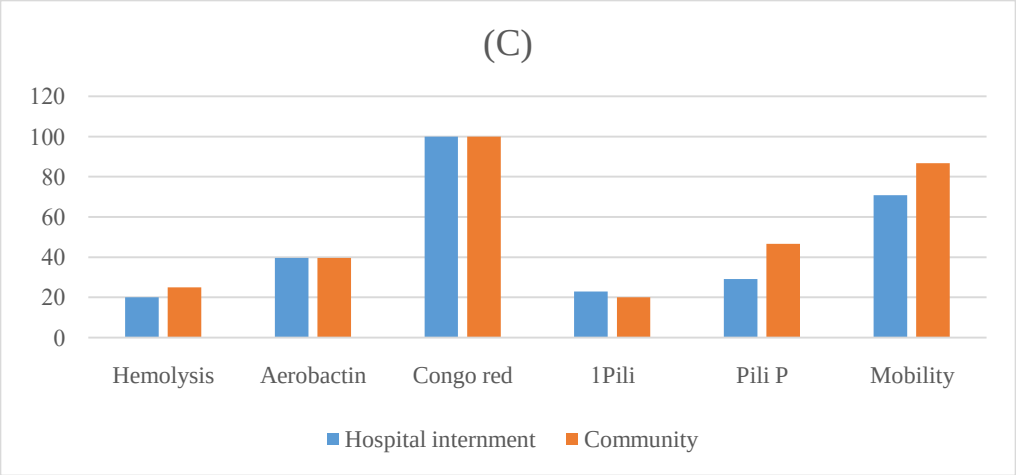

Figure 7: Percentage of patients with *E. coli* isolates by phenotypic test and group. (A): Colonization group; (B): Group with recurrent UTI; (C): Groups with community and hospital admission UTI

Aerobactin production by *E. coli* isolates from the Group with recurrent UTI occurred in 92.8% (intestinal level) and 57.1% (urine) of the cases, while lower values were observed in the other groups. In the colonization group it was 26.7% (intestinal) and 13.3% (urethral / periurethral), in the Group with community UTI 20.0% and 39.6% for the Group with hospitalization.

Regarding the presence of pili 1, it was more prevalent in *E. coli* isolates from patients in the first two groups, that is, the colonization group and with recurrent UTI with rates above 50%, reaching 71%, compared with values around 20% in the groups with community and hospital UTI. On the other hand, for *pili P,* it was found that it was more prevalent in *E. coli* isolates from hospitalized patients with a value of 46.7%, compared with the other groups that showed a variation of 20.0% to 28.6 %.

Phenotypic profiles of *Escherichia coli* isolates

The phenotypic analysis of the 295 *E. coli* isolates evaluated allowed us to show 24 different profiles, which were labeled from A to X. These profiles were characterized by the presence or absence of hemolytic activity, aerobactin production, Congo red fixation, presence of fimbriae (pili) type 1 and P and mobility. Of the total of 24 phenotypic profiles, nine of them (P to X) showed positivity of the hemolysis test in a total of 54 isolates, two of which 14 expressed pili P, that is, 25.9% (14/54) of the hemolytic isolates. Twelve of them tested positive for aerobactin. Of

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the 127 aerobactin-producing isolates, 21.3% (27/127) also expressed pili P and this same percentage occurred for the association of hemolysis and aerobactin. In relation to pili P 18.0% (53/295) isolates of *E. coli* expressed *pili P*, in a total of 10 profiles, while 42.4% (125/295) expressed *pili* 1 in 9 phenotypic profiles.

Several studies describe associations between urovirulence factors, as they are often encoded by mobile genetic elements called islands of pathogenicity (PAI), as seen in Derakhshan et al., (2018) (Derakhshan et al., 2018)**.** Studies have also found that *E. coli* uropathogenic strains can harbor several pathogenic islands, which encode adhesins, toxins, iron uptake systems, secretion mechanisms and capsule production, and that the horizontal transfer of these islands can be a important tool in the evolution of virulence of these *E. coli* strains, according to Clara et al. (2011) (Clara et al.,2011).

An association between the hemolytic activity of uropathogenic *E. coli* and the presence of pili P has been observed with some frequency, according to Rezaee, et al. (2016) (Rezaee, et al., 2016)**.** With the exception of three phenotypic profiles (A, B and C), the others presented combinations of at least two of the characteristics studied, a fact that could suggest the existence of islands of pathogenicity (PAI).

Colonization group

Results shows the distribution of the phenotypic profiles of the *E. coli* isolates from the urethral / periurethral and intestinal colonization group, as well as the number of isolates observed for each type there was agreement of the phenotypic profile between the urethral / periurethral colonization sites and the intestinal microbiota in 10 cases (1, 3, 4, 6, 7, 9, 11, 12, 13 and 14). In eight cases, more than one phenotypic profile was found for *E. coli* isolates of intestinal origin. The most frequent phenotypic profile both at the level of urethral / periurethral and at the intestinal level was the F that has the combination of three virulence factors: binding to Congo red, presence of pili 1 and positive mobility.

Discussion

This is a single group post-test pre-experimental study. The results obtained in women diagnosed with recurrent urinary tract infection were analyzed before the start of treatment with sublingual bacterial vaccine and, subsequently, for a minimum of one year after vaccination.

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Regarding the epidemiological characteristics of our patients, women diagnosed with recurrent urinary infection have been included, understanding as this the presence of 3 or more urinary infections during 1 year and who required medical consultation, study and treatment in our Urology Service. The mean age of the study patients was 62.3 years, verifying that 62.1% of them were older than 60 years. This average age of the sample reflects the most common profile that attends the Urology consultation given that younger patients are usually treated successfully by the Primary Care physician as they present less resistant infections and with a better response to antibiotic treatment. without the need for referral to a specialist doctor. It is calculated that between 20 and 25% of women older than 65 years in the outpatient setting have symptomatic bacteriuria, an incidence that increases to 50% in women older than 80 years. Due to this average age, the existence of a certain degree of information bias can also be considered due to the difficulty that exists in part of the interviewees in answering certain questions related to urinary symptoms. Pediatric patients or patients under 16 years of age were not included since the treatment and follow-up of these patients is carried out by the Pediatric Service. Male patients were not included either because the origin of recurrent urinary infections is usually secondary to prostate disease and their treatment differs from the case of women. However, we have a few male patients being treated with sublingual immunotherapy for the treatment of chronic prostatitis with good results, who despite being excluded from this study, are being followed up to assess the efficacy of the treatment in future studies.

Conclusion

Factors related to the microorganism and the susceptible host must be taken into account in the pathogenesis of urinary tract infections. The first defense mechanisms are constituted by the entire mucosal epithelium, the microbiota that prevents, through the bacterial interference mechanism, the colonization by pathogens of this system, the entrainment mechanism through urination and antimicrobial chemicals released by the cells of the tract. urinary that attack and destroy pathogenic bacteria. On the other hand, the mechanism of fever activated by endogenous and exogenous pyrogens, inflammation and phagocytosis of neutrophils, macrophages and complement activation are also involved. Adaptive or acquired immunity represented by the function of thymus-dependent T lymphocytes and antibody-producing B lymphocytes, which at

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the mucosal level corresponds to IgA. There is a cooperation of the components of the innate immunity and the acquired one are shown in the defense of this apparatus.

Escherichia coli is answerable for the development of numerous styles of sicknesses, one of the maximum well-known in society is urinary tract contamination, which influences both sexes and every age, with a better prevalence amongst ladies. This bacterium can be labeled in keeping with clinical manifestations, epidemiology, virulence factor of the stress and anatomical website online of the infection. This pathology may be asymptomatic or symptomatic. The complexity of this, inside the case of uropathogenic E. Coli , will range in step with the host's immunity, bacterial load and virulence component, with fimbriae being the maximum crucial factor inside the case of UTI, as they gift stop H adhesins that mediate the hyperlink between host receptor glycoproteins and the bacteria.

1. The expression of virulence factors in *Escherichia coli* isolates from female urinary tract infections (UTI) was extremely varied, and it was verified that the vast majority of phenotypic profiles presented combinations of at least two of the studied virulence factors.
2. *E. coli* isolates from the intestinal microbiota showed a variability in phenotypic profiles, which may be a reflection of the promiscuous relationship of these bacteria in the intestinal environment.
3. In the group of women with recurrent UTI, the diversity of phenotypic profiles was greater, which may be a reflection of the routine use of antimicrobials in these infections.

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