

# RESISTANCE OF ESCHERICHIA COLI TO BETALACTAMS IS AGE-DEPENDENT. STUDY OF STRAINS ISOLATED FROM AGE-SPECIFIC GROUPS AT A GENERAL HOSPITAL OF VENEZUELA, 1997-2003\*

## LA RESISTENCIA DE LA ECHERICHIA COLI A LOS BETALACTAMS DEPENDE DE LA EDAD. EL ESTUDIO DE LAS PRESIONES AISLADAS DE GRUPOS CON EDADES ESPECÍFICAS EN UN HOSPITAL GENERAL DE VENEZUELA, 1997-2003

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### ABSTRACT

Older age has been identified as an independent risk factor for antimicrobial resistance of *Escherichia coli* against certain drugs. In this study we tried to demonstrate higher betalactam resistant-*E. coli* strains rates isolated from older individuals, between 1997–2003. For this period, 1947 *E. coli* strains were isolated, 22.86% correspond to children, 11.61% to teenagers, 31.07% to young adults, 19.16% to mature adults and 15.31% to elder adults. Resistance rate to betalactam drugs tested was higher in relation to older groups ( $p < .05$ ). Betalactamases (BLEE) was significantly higher in older groups: 4.04% in children, 4.87% in teenagers, 5.62% in young adults, 6.97% in mature adults and 8.39% in elder adults; with a significant trend association between older age and higher rate of betalactamase (BLEE) producer *E. coli* strains ( $r^2 = 0.98$ ,  $p < .01$ ). Age is related to a higher risk of betalactam resistant-strain infections.

Key Words: *Escherichia coli*, betalactams, resistance, age.

### RESUMEN

La edad ha sido identificada como un factor de riesgo independiente para la resistencia antimicrobiana de *Escherichia coli*. En este estudio intentamos demostrar una mayor resistencia a betalactámicos de cepas de *E. coli* aisladas de individuos mayores, en el período 1997–2003. Para éste período, se aislaron 1947 cepas de *E. coli*, 22,86% correspondieron a niños, 11,61% a adolescentes, 31,07% a adultos jóvenes, 19,16% adultos mayores y 15,1% adultos ancianos. La resistencia a betalactámicos probados fue mayor en grupos de mayor edad ( $p < .05$ ). La presencia de betalactamasas ( $\beta$ LEE) fue significativamente mayor en grupos mayores: 4,04% en niños, 4,87% en adolescentes, 5,62% en adultos jóvenes, 6,97% en adultos mayores y 8,39% en adultos ancianos; con una asociación significativa entre edades mayores y mayores tasas de *E. coli* productoras de  $\beta$ LEE ( $r^2 = 0,98$ ,  $p < ,01$ ). La edad está relacionada con un mayor riesgo de infecciones por cepas resistentes a betalactámicos.

Palabras Clave: *Escherichia coli*, betalactámicos, resistencia, edad.

## INTRODUCTION

Older age has been identified in previous studies as an independent risk factor for antimicrobial resistance of *Escherichia coli* against certain drugs.(1,2) But in Venezuela as well in .

Latin America, there are few studies correlating age with antimicrobial resistance of *E. coli*.

In this study we tried to demonstrate higher betalactam resistant-*E. coli* strains rates isolated from older individuals. This could be guide age-specific considerations in antibiogram-oriented therapies.

## MATERIALS Y METHODS

We evaluated *E. coli* strains isolates collected from patients with suspected infections in a hospital of Caracas, Venezuela (West General Hospital) between 1997–2003.

A total studied population of 3633 individuals from different age-groups, grouped as: children (<12 y -old), teenagers (12-21 y-old), young adults (21-45 y-old), mature adults (45-65 y-old) and elder adults (>65 y -old).

Clinical samples were processed and identified with standard cultures and biochemical tests. In vitro antimicrobial susceptibility of the isolates was assessed by an agar disk diffusion method using Mueller-Hinton agar as recommended by the National Committee for Clinical Laboratory Standards (NCCLS).

Isolates were tested against 8 (eight) betalactam drugs, including: ampicillin/sulbactam, cefotaxime, ceftazidime, cefoperazone, cephalotin, cefepime, imipenem and meropenem. Beta-lactamase activity also was measure (BLEE).

Age-group statistical comparisons were made with Epi Info v.6.0 (95% confidence).

## RESULTS AND DISCUSSION

For this period, 1947 *E. coli* strains were isolated. From this total, 22.86% correspond to children, 11.61% to teenagers, 31.07% to young adults, 19.16% to mature adults and 15.31% to elder adults.

Resistance rate to betalactam drugs tested was higher in relation to older groups (i.e.: cephalotin: 32.6% in children, 35.0% in teenagers, 33.7% in young adults, 39.9% in mature adults and 45.3% in elder adults,  $p < .05$ ) (Graphics 1 and 2).

Betalactamases (BLEE) detection was significantly higher in older groups: 4.04% in children,

4.87% in teenagers, 5.62% in young adults, 6.97% in mature adults and 8.39% in elder adults; with a significant trend association between older age and higher rate of betalactamase (BLEE) producer *E. coli* strains ( $r^2=0.98$ ,  $p < .01$ ) (Graphic 3).

## CONCLUSIONS

Antibiotic resistance is increasing in *Escherichia coli*, the most common cause of urinary tract infections, but its epidemiology has not been well described.(3) The incidence of fluoroquinolone, betalactams and other drugs resistance has increased markedly in recent years.(4) Many risk factors for antimicrobial resistance in these pathogens remain unknown.

One of these factors is age, as has been demonstrated by different studies outside Latin America.(1-4) Older age, as in published studies, was associated with higher resistance rates in this study, including the risk of higher incidence of BLEE producer *E. coli* strains.

Efforts should be directed at recognition and modification of these and other risk factors to curb the rise in betalactams resistance and preserve the utility of these agents in the treatment of *E. coli* infections. Age is related to a higher risk of betalactam resistant-strain infections. Surveillance of antimicrobial activity should be done periodically to guide antimicrobial therapy of clinical infections, especially in older people where many age-associated conditions could affect antimicrobial therapy.

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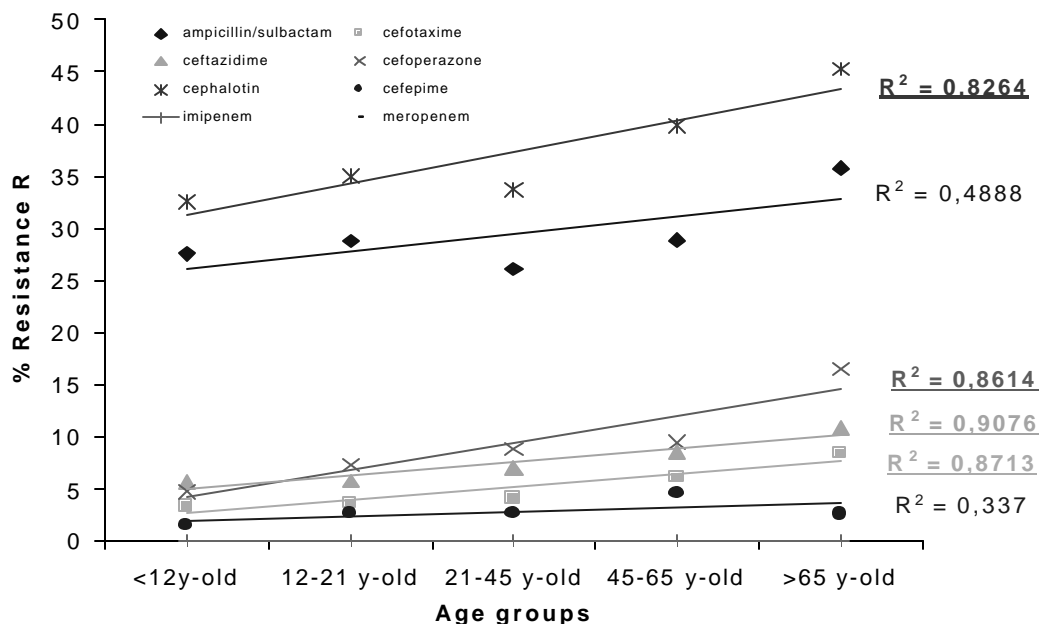
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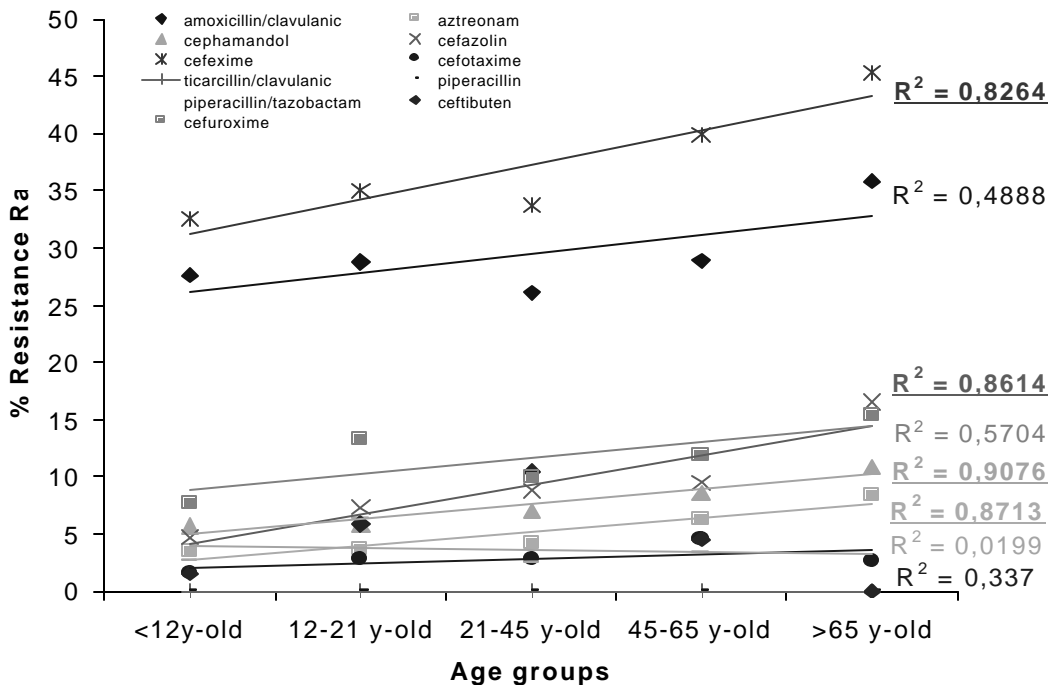
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**Graph 1.** Resistance rate to betalactam drugs tested and relation to age groups.



**Graph 2.** Resistance rate to betalactam drugs tested and relation to age groups.



**Graph 3.** Betalactamases detection in *E. coli* and relation to age groups.

