

Antibiotic Susceptibility of Escherichia Coli Isolated from Diarrheic Children Aged 1 Month to 5 years Admitted to the Kindia Regional Hospital

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Abstract:- Antibiotic resistance in bacteria involved in diarrheal diseases is a major public health concern worldwide. To determine the sensitivity profile of *Escherichia coli* to antibiotics commonly used in the treatment of diarrhea in children aged 1 month to 5 years admitted to Kindia Regional Hospital. This is a prospective cross-sectional and descriptive study that lasted 6 months, from 05 May 2021 to 18 October 2021. A total of 154 diarrheal stool samples were taken, and 50 strains of *Escherichia coli* were isolated (32.47%). *E. coli* was most found in the 2–3-year age group (50%), while the 1 month to 1 year age group was least affected (20%). In this study, 54% of *Escherichia coli* strains were recorded in females and 46% in males. It found that *E. coli* strains were 100% sensitive to Ceftriaxone, Ciprofloxacin and Gentamicin. When Amoxiclav, Cefotaxime, Ceftazidime, Trimethoprim and Nalidixic acid are used, the sensitivity effects on *E. coli* strains are high, with rates of 90%, 78%, 74%, 70% and 86% respectively. Resistance was low in *E. coli* strains to Amoxiclav, Cefotaxime, Ceftazidime, Trimethoprim and nalidixic acid, with rates of 10%, 22%, 26%, 30% and 14% respectively. This study recommends that the health authorities set up a national and regional programmed for effective monitoring of antimicrobial use and integrate it into the objectives for improving the quality of care in all health establishments.

Keywords:- Diarrhea, *Escherichia Coli*, Sensitivity, Resistance, Antibiotics, Kindia.

I. INTRODUCTION

Escherichia coli is a bacterial species that predominates in human digestive flora. As well as being a commensal species of the digestive tract, it can also be pathogenic. This bacterium is one of the species involved in infectious pathology and is mainly responsible for gastroenteritis, urinary tract infections, diarrhea in newborns and septicemia. [1].

Escherichia coli also represents strains that have acquired virulence factors such as enterotoxigenic *Escherichia coli* and enteropathogenic *Escherichia coli*

represent 13% and 16% of frequent diarrhea, most often in children. [2].

E. coli is considered by most antimicrobial resistance surveillance programmes to be a good indicator of the evolution of antibiotic resistance. [3].

According to the World Health Organisation, ciprofloxacin is the antibiotic of choice for all patients with bloody diarrhea. [4].

In the Republic of Guinea, the prevalence of enterobacteria isolated from children's diarrheal stools represents 27.27% for enteropathogenic *Escherichia coli*, 30% for *Salmonella spp* and 8.18% for *Shigella spp* in Kindia, respectively. [5].

According to IRAG Annals No. 12 in 2019, the sensitivity rates of *E. coli* strains were 88% to Ceftriaxone, 96% to Ciprofloxacin, 76% to Gentamicin, 100% to Amoxiclav, 68% to Trimethoprim and 100% to Nalidixic Acid. [6].

➤ Objectives:

• General Objective:

To help improve the health of children with diarrhoea aged between 1 month and 5 years.

• Specific Objectives

- ✓ Determine the prevalence of *Escherichia coli* isolated from diarrheic children aged between 1 month and 5 years.
- ✓ Determine the susceptibility of different strains of *E. coli* to common antibiotics (such as beta-lactam antibiotics, aminoglycosides, etc...). Réalisation du travail et description de la méthodologie.

➤ Carrying out the work and describing the methodology:

• Study Area

The town of Kindia is located 135 km from Conakry. It is one of the 33 prefectures of Guinea, and the administrative

region of Kindia covers a total area of 30,987km². It is situated at an average altitude of 458.18 meters between 12°30 and 13°30 longitude west and 9°5 and 11°15 latitude north.

➤ *Is Limited:*

- To the east by the Mamou region
- To the west by the Atlantic Ocean and Coyah
- To the south by the Republic of Sierra-Leone and the Atlantic Ocean
- To the south-west by Forécariah

The climate is humid, with two alternating seasons of equal length. The dry season runs from November to April and the rainy season from May to October, with an average annual rainfall of 2,500 mm. The average temperature is 25°C. Average relative humidity is 93% in the rainy season and 51% in the dry season.

The commune is watered by a number of streams that feed the Kolenté and Konkouré basins.

➤ *Presentation of Kindia Regional Hospital*

Kindia Regional Hospital is a public administrative establishment (EPA) created in 1940 by the colonial administration. It is in the town centre, between the Abattoir district to the east, the military camp to the west, Manquepas to the south and Fissa Hospital to the north and covers several hundred square meters.

Initially, it was known as the 'Trypano' or major endemic diseases clinic, then as the 'central dispensary' with general medical services and minor surgery (hernia and appendicitis surgery). The maternity and general surgery departments were created in 1952.

In 1998, the centre obtained its status as a Regional Hospital, comprising several departments:

Support services (SAF, maintenance, general surveillance);

Medico-technical services (medical imaging, pharmacy, laboratory) and medical services (surgery, paediatrics, general medicine, maternity, gynaecology-obstetrics, dentistry, otorhinolaryngology, ophthalmology and the Centre for the Treatment and Prevention of Infectious Diseases).

It has a capacity of 113 technical beds and covers a population of 1,607,520, spread across the prefectures of Kindia, Téliélé, Dubreka, Coyah and Forécariah [7].

➤ *Equipment:*

• *Laboratory Equipment*

To carry out this work, we used the basic equipment of the Bacteriology Department of IRBAG/Kindia and the biomaterial collected at the Kindia Regional Hospital. The

materials and equipment used are as follows: pasteurizing oven, autoclave, incubators, petri dishes, microscope and others. Milieux de culture

The culture media used for *Escherichia coli* isolation are: Carry Blair for transport, solid media: Xylose Lysine Deoxycholate Agar (XLD), Endo Agar, Mac-Conkey Agar. Muller Hinton II was then used for antibiotic susceptibility testing.

70% ethyl alcohol and chloramine were also used as disinfectants.

• *Identification Reagents:*

Strain identification is obtained by microscopic and macroscopic examination of colonies on solid media using the Api20E gallery, morphological study, tinctorial character, and fresh observation.

• *Biological Materials*

Our biomaterial consists of diarrheal stools collected from patients aged between 1 month and 5 years attending consultations at Kindia Regional Hospital.

II. METHODOLOGY

➤ *Study Type and Duration*

This is a prospective cross-sectional study running from May 05, 2021, to October 18, 2021.

➤ *Study Population*

The study was carried out on patients attending the Kindia Regional Hospital during the study period.

➤ *Selection Criteria*

• *Inclusion Criteria*

Diarrheic children aged 1 month to 5 years received at the Kindia Regional Hospital laboratory in possession of an examination report for which stool examination was recorded were included in this study.

• *Non-Inclusion Criteria*

Children who did not meet the inclusion criteria were not included in this study.

• *Sampling*

Simple random sampling of 154 diarrheal stool samples from patients aged 1 month to 5 years received for consultation at Kindia Regional Hospital.

• *Working Method*

For this study, we used coproculture, the usual method for collecting, isolating and identifying *Escherichia coli*.

• *Statistical Analysis*

Statistical analysis of parameters was carried out using Excel software for calculation of mean and frequency.

III. PRESENTATION OF RESULTS

Kindia Regional Hospital (HRK) have been analyzed in the table below, then interpreted and discussed.

➤ Results and Interpretation

The results of the study of 154 diarrhoeal stool samples from patients aged 1 month to 5 years seen in consultation at

Table 1 Prevalence of *Escherichia coli* isolated from diarrheic children admitted to HRK's Pediatrics Department

Results	Workforce	Percentage (%)
Positive	50	32,47
Negatif	104	67,53
Total	154	100

This table shows that out of a sample of 154 samples, we recorded 50 positive cases (32.47%) compared with 104 negative cases (67.53%).

Table 2 Breakdown of patients with *Escherichia coli* by sex

Sex	<i>Escherichia coli</i>	
	Workforce	Pourcentage
Masculin	23	46
Féminin	27	54
Totaux	50	100

The table shows that 54% of *Escherichia coli* are found in women, compared with 46% in men.

Table 3 Breakdown of patients by *E. coli* serotype

Sérotypes d' <i>Escherichia coli</i>	Effectif	Pourcentage
O19	4	8
O26	7	14
O55	4	8
O86	3	6
O111	7	14
O112	3	6
O114	2	4
O125	3	6
O126	3	6
O127	5	10
O128	5	10
O142	2	4
O143	2	4
Totaux	50	100

Analysis of the above results shows that out of 50 *Escherichia coli* serotypes isolated, O111 and O26 are in first place with 14% each, followed by O127 and O128 with 10% each.

Table 4 Breakdown of patients with *Escherichia coli* by age group

Tranches d'âges	<i>Escherichia coli</i>	
	Effectif	Pourcentage
1 mois à 1 an	10	20
2 ans à 3 ans	25	50
4 ans à 5 ans	15	30
Totaux	50	100

The results of this table show that all age groups are affected by *E. coli*. However, the 2 to 3 age group is the most affected, with 50%.

Table 5 Distribution of *E. coli* patients by residence

Residence	Feminin	Masculin	Effectif	Pourcentage (%)
Abattoir	10	6	16	32
Manquepas	4	3	7	14
Yeolé	5	4	9	18
Condeta	5	1	6	12
Tafory	3	2	5	10
Ferefou	3	1	4	8
Yabara	3	0	3	6
Total	33	17	50	100

Analysis of this table shows that patients living in the Abattoir district are more affected (32%) and those living in Yabara are the least affected (6%).

Table 6 Frequency of *E. coli* sensitivity to antibiotics (N=50)

Familles	Antibiotiques	Charge des disques	Sensibles (S)		Résistant (R)	
			Effectif	%	Effectif	%
Bêta-lactamines (β -lactamines)	Amoxiclav	30 μ g	45	90	5	10
	Ceftriaxone	30 μ g	50	100	00	00
	Cefotaxime	30 μ g	39	78	11	22
	Ceftazidime	30 μ g	37	74	13	26
Aminosides	Gentamicine	10 μ g	50	100	00	00
Sulfamides	Triméthoprim	25 μ g	35	70	15	30
Quinolones	Acide nalidixique	30 μ g	43	86	7	14
	Ciprofloxacine	5 μ g	50	100	00	00

This table shows that *E. coli* strains are 100% sensitive to Ceftriaxone, Ciprofloxacin and Gentamicin. As for Amoxiclav, Cefotaxime, Ceftazidime, Trimethoprim and Nalidixic acid, the sensitivity effects on *E. coli* strains are high, with rates of 90%, 78%, 74%, 70% and 86% respectively.

In contrast, *E. coli* strains showed low resistance to Amoxiclav, Cefotaxime, Ceftazidime, Trimethoprim and nalidixic acid, with rates of 10%, 22%, 26%, 30% and 14% respectively.

IV. DISCUSSION

During the study, 154 diarrheal stool samples from children aged 1 month to 5 years, 50 strains of *Escherichia coli* were isolated with a prevalence of 32.47%.

The prevalence in our study is lower than that obtained by Yandai and allies in Chad, which was 37.71% in children aged 0 to 1 year [8].

The results of this present study are below that obtained by Jérôme A. and allies in 2015 in Cameroon with an *E. coli* prevalence of 66.6% obtained in children under 5 years of age [9].

Our results are better than the one obtained by Dewa in Chad in 2014, which was 16.70% [10].

During this study, the most frequently isolated serotypes were: O26, O111, O127 and O128.

In 2018 and 2019, an outbreak of 14 and 17 cases occurred in children under 5 years of age. The outbreak was linked to the consumption of raw milk cheeses contaminated with EHEC O26 [11].

Between 1 May and 3 June 2011, more than 1,700 STEC infections including 520 cases of HUS (Haemorrhagic and Uremic Syndrome), and 17 deaths were reported to the Robert Koch Institute (Berlin) in Germany. The occurrence of HUS cases was reported in 2011 in Denmark with 7 cases, Spain with 1 case, Sweden with 15 cases, the Netherlands with 4 cases, the UK with 3 cases and France with 10 cases [12].

The antibiogram results of our study show that the *E. coli* strains isolated are 100% sensitive to Ceftriaxone, Ciprofloxacin and Gentamicin.

These results are superior to those obtained by Yandai and allies in 2014 in Chad, who reported a 35% sensitivity to gentamicin [8].

As for Amoxiclav, Cefotaxime, Ceftazidime, Trimethoprim and nalidixic acid, the sensitivity effects on *E. coli* strains are high, with rates of 90%, 78%, 74%, 70% and 86% respectively.

The sensitivity results for *E. coli* to nalidixic acid are higher than those obtained by Ndoutamia in Chad, which were (63.79%) [13].

In Romania, Italy, Greece and Bulgaria, the study represented a sensitivity rate of between 25% and 50% of third-generation cephalosporin in 2014 [14].

V. CONCLUSION

Diarrheal diseases are a real health problem in Kindia and mainly affect children aged ≤ 5 years, with multiple risk factors broken down into:

- Physical (solid and liquid waste in the environment).
- Biological (micro-organisms that pose a health risk).
- Social (household income, level of education, drinking water supply, hygiene and sanitation in the household).

Our study showed the importance of *E. coli* in infectious diarrhea, with a prevalence of 32.47%.

The 2-3 age group is most affected by *E. coli* infection, with 50%. The least affected age group is 1 month to 1 year, with 20%.

The study shows that 54% of *Escherichia coli* are found in females, compared with 46% in males.

During the study, it was found that *E. coli* strains are 100% sensitive to Ceftriaxone, Ciprofloxacin and Gentamicin. As for Amoxiclav, Cefotaxime, Ceftazidime, Trimethoprim and Nalidixic acid, the sensitivity effects on *E. coli* strains were high, with rates of 90%, 78%, 74%, 70% and 86% respectively. However, low levels of resistance were found in *E. coli* strains to Amoxiclav, Cefotaxime, Ceftazidime, Trimethoprim and nalidixic acid, with rates of 10%, 22%, 26%, 30% and 14% respectively.

In view of these results, it can be accepted that a system for monitoring the germs associated with diarrhea and their antibiotic susceptibility profiles is needed.

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➤ Financial Interests

No funding has been received for this study.

➤ Conflicts of Interest

The authors have no competing interest in declaring that they are relevant to the content of this article.

➤ Authors' Contributions

The contribution of the authors (CONDE Y., KOLIE B., BALDE R.) is not negligible and facilitated the drafting and correction for the publication of this article.

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