

PREVALENCE OF ESCHERICHIA COLI AMONG CHILDREN (<1-5 Yrs) WITH DIARRHEA IN SELECTED HOSPITALS IN SOKOTO METROPOLIS

¹Garba, I., ¹Umar, A.I., ¹Nuhu, A., ²Tijjani, M.B. ²Aliyu, M.S., ¹Salisu, H. ¹Unata, I.M

¹Dept of Medical Microbiology, Faculty of Medical Microbiology Usmanu Danfodiyo University Sokoto

²Department of Microbiology, Faculty of Sciences, Ahmadu Bello University, Zaria

Abstract: Diarrheal disease is a global public health problem causing considerable morbidity and mortality among infants and children especially in the developing countries. Acute diarrhea due to *Escherichia coli* infections is an important cause of Morbidity and mortality in infants and young children in most developing countries including Nigeria. The aim of the study was to determine the prevalence and antibiogram of *Escherichia coli* among children (<1ss-5years) with diarrhea in some selected hospital in Sokoto metropolis. A total of 150 stool samples of children with diarrheal disease were collected (75) from Sokoto Specialist Hospital, (75) from Maryam Abacha Women and Children Hospital Sokoto. Antimicrobial Susceptibility Testing was carried out and diameter of zone of inhibition measured following standard microbiological techniques. Out of the 150 samples analysed, ninety seven (64.7%) yielded growth of *Escherichia coli*. Of the 75 samples collected from Specialist Hospital Sokoto 52 (69.3%) yielded growth of *Escherichia coli*, a total of 75 samples were collected from Maryam Abacha and analysed, 45(60%) showed growth of *Escherichia coli*. The prevalence of *Escherichia coli* among males was (30.93%) while a high prevalence of 69.07% was observed in female children. The highest prevalence of 46.6% was observed in children aged 2-3 years. While the lowest prevalence 10.3% was seen in the age group 3-4 in years. Children aged <1 year had 16.5% prevalence rate, while age group 1-2 years had a prevalence of 11.3% in contrast to children aged 4-5 years that had a prevalence of 15.5%. The highest susceptibility to Nitrofurantoin 95% was observed followed by norfloxacin 92%. The susceptibility to ciprofloxacin and augmentin were 82% and 72% respectively. Intermediate susceptibilities were observed in respect of chloramphenicol 30% and tetracycline 20%, highest resistant to amoxicillin 100% was observed followed by erythromycin 90%, tetracycline 72% and chloramphenicol 60%. Few isolates were resistant to Norfloxacin 8% and Nitrofurantoin 5%. *E. coli* remains one of the major cause of diarrhea among diarrheagenic children in the selected study hospitals in Sokoto.

Keywords: Prevalence, *Escherichia coli*, Children, Diarrhea, Sokoto.

1. INTRODUCTION

Diarrheal disease is a global public health problem causing considerable morbidity and mortality among infants and children especially in the developing countries (Okeke *et al.*, 2000). Infections due to fecal water contamination are caused by a host of enteric infectious agent including bacteria, viruses, fungi and parasites. Among the bacteria, at least six pathogenic diarrheagenic *Escherichia coli* (DEC strains) are frequently detected worldwide. These pathotypes have been described based on the genes mediating the virulence factors associated with the diarrheal disease caused by them (Nataro and Kaper, 1998). The prevalence and other epidemiological features of these pathogens as causative

agents of diarrhea vary from one region to the other, and even between and within countries in the same geographical area (Nguyen *et al.*, 2005; Nataro, 2006). Undernourished children are more likely to suffer from diarrhea and its consequences, which, in turn, increase their chances of worsening nutritional status (UNICEF/WHO, 2009). *Escherichia coli* belongs to a group of bacteria informally known as "coliforms" that are found in the gastrointestinal tract of warm-blooded animals. *Escherichia coli* normally colonizes an infant's gastrointestinal tract within 40 hours of birth, arriving with food or water or from the individuals handling the child. In the bowel, *Escherichia coli* adheres to the mucus of the large intestine (Arifuzzaman *et al.*, 2006).

2. STUDY POPULATION

The study population was diarrheagenic children between the age of <1-5 years attending Sokoto Specialist Hospital and Maryam Abacha Women and Children Hospital Sokoto.

Sample Collection

A total of 150 stool samples of children with diarrheal disease were collected (75) from Sokoto Specialist Hospital, (75) from Maryam Abacha Women and Children Hospital Sokoto. Sterilized wide mouth screw cap containers were given to the parents of the children and proper method of collection of the samples was explained to the parents or care giver.

Macroscopy

Stool samples were examined macroscopically for: Colour, Consistency, presence of blood, mucus. Samples collected were inoculated in to sterilized peptone water for enrichment prior to inoculation on Eosin Methylene Blue (EMB) agar, all inoculated samples were incubated at 37°C for 24 hours. Presumptive *Escherichia coli* isolates on EMB were isolated and kept on Nutrient agar slant for further analysis.

Biochemical Test

Greenish metallic sheen colonies presumptive of *Escherichia coli* were subjected to IMViC (Indole, Methyl red, Voges-Proskauer and Citrate utilization) test.

3. ANTIBIOTICS SUSCEPTIBILITY TESTING

Three similar colonies of identified isolates were touched with a sterile wire loop and emulsified in 3ml of sterile nutrient broth. It was then incubated at 37°C for 3 hours. In a good light match, the turbidity of the suspension was compared to Barium sulphate (BaSO₄) McFarland turbidity standard 0.5 which gives approximately 10⁸ cell/ml/cfu. Using a sterile swab stick, the inoculum was picked and excess was removed by pressing and rotating the swab stick against the wall of the tube. The swab was spread evenly over the surface of a dried Mueller Hinton agar in three directions rotating the plate approximately 60° to ensure even distribution. With the petridish in place it was allowed to stand for 3 minutes to dry. With the aid of a sterile forcep, an octal antibiotic disc (Abtec Lagos, Nigeria) containing Amoxicillin (10µg), Augmentin (30µg), Tetracycline (30µg), Norfloxacin (5µg), Erythromycin (15µg), Ciprofloxacin (5µg), Nitrofurantoin (300µg) and Chloramphenicol (30µg) was placed on the inoculated plate. Within 30 minutes of applying, the disc was inverted and incubated aerobically at 37°C for 24 hours as described by Cheesbrough, (2005).

4. RESULT

Out of the 150 samples analysed 97(64.7%) yielded growth of *Escherichia coli*. Of the 75 samples collected from Specialist hospital Sokoto 52(69.3%) yielded growth of *Escherichia coli*, a total of 75 samples were collected from Maryam Abacha and analysed 45(60%) showed growth of *Escherichia coli* as presented in Table 1. Table 2 shows the distribution of *Escherichia coli* in diarrheagenic children based on gender, the prevalence of *Escherichia coli* among males was (30.93%) while a high prevalence of 69.07% was observed in female children. The age based distribution of *Escherichia coli* among diarrheagenic children is presented in Table 3, the highest prevalence of 46.4% was observed in children aged 2-3 years. While the lowest prevalence 10.3% was observed in the age group 3-4 years. Children aged <1 year had 16.5% prevalence rate, while age group 1-2 years had a prevalence of 11.3% in contrast to children aged 4-5 years had a prevalence of 15.5%. Table 4 shows the antibiotic susceptibility profile of *E. coli* isolated in diarrheagenic

children. The highest susceptibility to Nitrofurantoin 95% was observed followed by norfloxacin 92%. The susceptibility to ciprofloxacin and augmentin were 82% and 72% respectively. Intermediate susceptibilities were observed in respect of chloramphenicol 30% and tetracycline 20%, highest resistant to amoxicillin 100% was observed followed by erythromycin 90%, tetracycline 72% and chloramphenicol 60%. Few isolates were resistant to Norfloxacin 8% and Nitrofurantoin 5%

Table 1: Distribution of *Escherichia coli* in diarrhegenic children according to Hospital

Hospital	No. Screened	No. Positive	% Prevalence
Specialist	75	52	69.3
Maryam Abacha	75	45	60.0
Total	150	97	64.7

Table 2: Distribution of *E. coli* in diarrhegenic children based on gender

Gender	No. Screened	No. Positive	% Prevalence
Male	50	30	30.93
Female	100	67	69.07
Total	150	97	64.7

Table 3: Distribution of *E. coli* among diarrhegenic children based on age

Age (Years)	No. Screened	No. Positive	% Prevalence
<1	28	16	16.5
1-2	18	11	11.3
2-3	60	45	46.4
3-4	19	10	10.3
4-5	25	15	15.5
Total	150	97	64.7

Table 4: Antibiogram of *Escherichia coli* isolated in diarrhegenic children from the selected hospitals (n=97)

Antibiotics	Disc content	% Sensitive	% Intermediate	% Resistant
Ciprofloxacin	5µg	82	0	18
Augmentin	30µg	72	4	24
Norfloxacin	5µg	92	0	8
Nitrofurantoin	300µg	95	0	5
Erythromycin	15µg	8	0	90
Tetracycline	30µg	8	20	72
Amoxicillin	10µg	0	0	100
Chloramphenicol 30µg		10	30	60

5. DISCUSSION

Acute diarrhea due to *Escherichia coli* infections is an important cause of Morbidity and mortality in infants and young children in most developing countries including Nigeria (Adegunloye, 2005). Classification of *Escherichia coli* involved in diarrheal disease in the country is an essential step towards the implementation of effective primary health care activities against the disease (Olowe *et al.*, 2003). The aetiology of diarrhea in young children could be attributed to wide range of factors, but one of the main aetiology of the diarrhea is related to *Escherichia coli* bacterium (Abdullahi *et al.*, 2010). A prevalence of 64.7% was found in diarrhegenic children aged <1-5years. In a similar study in Abuja, Nigeria Ifeanyi *et al.* (2009) reported a prevalence of 65.8%, 63.3% -71.83% in Tanzania and 50-60% in other developing countries (Vargas *et al.*, 2004). The variation in prevalence among the Nigerian cities might be attributed to differences in infrastructural and socioeconomic indices. Of the 150 stool samples collected 53(35.3%) had no *Escherichia coli* suggesting other bacteria such as *Shigella*, *Salmonellae*, viral, protozoan or nonpathogenic strains. A prevalence of 46.4% was observed in the patients age group 24-36 months. This finding is in contrast to the findings of Adegunloye, (2006) who reported the least isolates from age range 37-60months but is in agreement with finding by Korie *et al.* (2012) in Enugu, Nigeria suggesting an association between age and *E. coli* associated diarrhea. Out of 75 diarrhegenic stool samples collected from Maryam Abacha Women and Children Hospital Sokoto,45(60%) shows growth of *Escherichia*

coli. A prevalence of 46.4% was observed in the age group 25-36 months which is attributable to the tendency of this group to eat and drink from sources considered contaminated because at this age children tend to move around in the surroundings and in the process consume whatever they come across including soil. The antibiogram profile of *Escherichia coli* in this study showed resistant to Amoxicillin 100% and Erythromycin 90% which is in agreement with the findings by Sule *et al.*, (2011) in Kaduna, Nigeria who reported 100% resistant to the commonly used β -lactam antibiotics especially penicillins. A similar study by Al-Abri, *et al.*, (2005) in Italy reported Erythromycin and Tetracycline resistance of 81.2% and 76% respectively. The highest sensitivity was observed to Nitrofurantoin (95%), Norflorxacin (92) and Ciprofloxacin (82) which is attributable to their broad spectrum of activity, this finding is in consonance with a work by Anguza and Olila, (2007) who reported high sensitivity for Ciprofloxacin and Nitrofurantoin 82% respectively. Similarly a study in New York showed that more than 95% of diarrheagenic children (<1-5years) do not respond to first line antibiotics treatment such as penicillin and Ampicillin. Resistance of *E. coli* to Amoxicillin and Erythromycin observed in this study is consistent with study by Al-Abri *et al.*, (2005) who reported 70% resistant of *Escherichia coli* to Amoxicillin and Erythromycin. Increased in bacterial resistance to drugs is due to either genetic or non genetic acquired resistance. Indiscriminate use of these antibiotics, Substitution of dose without finishing the initial dose also can lead to increased bacterial antibiotics resistance.

REFERENCES

- [1] Abdullahi, M., Olonitola, S.O. and Inabo, I.H. (2010). Isolation of Bacteria Associated with diarrhea among children attending some hospitals in Kano Metropolis, Kano State, Nigeria. *Bayero Journal of Pure and Applied Sciences*, 3(1):10-15.
- [2] Anguza, J.R. and Olila, D. (2007). Drug sensitivity patterns of bacterial isolates from patients with gastroenteritis in referral hospital in Uganda. *Africa Health Science*, 7(3):148-154.
- [3] Adegunloye, D.V. (2005). Carrier rate of enteric bacteria associated with diarrhea in children and pupils in Akure, Ondo State, Nigeria. *African Journal of Biotechnology*, 5(2):162-164.
- [4] Al-Abri, S.S., Beeching, N.J. and Nye, F.J. (2005). Traveller's diarrhoea. *The Lancet Journal of Infectious Diseases*, 5(6):349-360.
- [5] Arifuzzaman, M., Maeda, M., Itoh, A., Nishikata, K., Takita, C. and Saito, R. (2006). Large-scale identification of protein-protein interaction of *Escherichia coli* K-12. *Genome Research*, 16(5):686-691.
- [6] Cheesbrough, M. (2005). District Laboratory Practice in Tropical countries. ECBS edition. Cambridge University press 2:80-88
- [7] Ifeanyi, C.J., Isu, R.N., Akpa, A.C. and Ikeneche, N.E. (2009). Enteric bacteria pathogen associated with diarrhea of children in Enugu, Nigeria. *Newyork Science Journal*, 2(7):62-69.
- [8] Korie, F.C., Anthony, N.I. and Ibe, B.C. (2012). Bacterial agents associated with acute diarrhea in under-5 children in Enugu, Nigeria. *Journal of Dental and Medical Sciences*, 2(6):40-45.
- [9] Nataro, J.P. and Kaper, J.B. (1998). Diarrheagenic *Escherichia coli*. *Clinical Microbiology Review*, 11(2):142-201.
- [10] Nataro, J.P. (2006). Atypical enteropathogenic *Escherichia coli*: typical pathogens? *Emerging Infectious Disease*, 12(4):696.
- [11] Nguyen, T.V., Le Van, P., Le Huy, C., Gia, K.N. and Weintraub, A. (2005). Detection and characterization of diarrheagenic *Escherichia coli* from young children in Hanoi, Vietnam. *Journal of Clinical Microbiology*, 43(2):755-760.
- [12] Nweze, E.I. (2009). Virulence properties of diarrheagenic *Escherichia coli* and etiology of diarrhea in infants, young children and other age groups in southeast Nigeria. *American Journal of Scientific Research*, 4(3):173-179.
- [13] Okeke, I.N., Lamikanra, A., Steinruck, H. and Kaper, J.B. (2000). Characterisation of *Escherichia coli* strains from cases of childhood diarrhea in provincial Southwestern Nigeria. *Journal of Clinical Microbiology*, 38(1):7-12.

International Journal of Novel Research in Life Sciences

Vol. 3, Issue 5, pp: (1-5), Month: September - October 2016, Available at: www.noveltyjournals.com

- [14] Olowe, O.A., Olayemi, A.B., Eniola, K.I.T. and Adeyeba, O.A. (2003). Aetiological agents of diarrhea in children under five years of age in Osogbo, Osun state. *African Journal of Clinical and Experimental Microbiology*, 4(2):62-66.
- [15] Sule, E.I., Aliyu, A.M. and Abdulaziz, B.M. (2011). Isolation of diarrheagenic bacteria in children attending some selected hospitals within Kaduna metropolis Kaduna state, Nigeria. *Continental Journal of Applied Science*, 6(1):1-6.
- [16] United Nation International Children's Emergency Fund and World Health Organization, WHO/UNICEF.(2009). Joint Statement: Clinical management of acute diarrhea.
- [17] Vargas, M., Gascon, J., Casls, C., Schellenberg, D., Urassa, H., Kahigwa, E., Ruiz, J. and Vila, J. (2004). Etiology of diarrhea in children less than five years of age in Ifakara, Tanzania. *American Journal of Medicine and Hygiene*, 70(5):536-539.