IRAQI Academic Scientific Journals
العراقية المجلات الاكاديمية العلمية
Al-Kut University College Journal
ISSN (E) : 2616 - 7808 II ISSN (P) : 2414 - 7419
www.kutcollegejournal.alkutcollege.edu.iq
Vol. 6, Issue 2 , Dec. 2021

Study the Biochemical Changes of Acute Diarrhea in Child

Lubna S. Mohammed [1], Taghreed H. Al - Saloon [2], Ahmed H. Alanee [3]

Abstract

Diarrhea has received much attention in recent years due to its biodegradable properties that having the second leading cause of death in children under 5 years' age. The current study, involved sampling and analyzing (121) subjects, (71) of them with diarrhea and (50) healthy control 25(50%) female & 25(50%) male at ages ranging from 2 months to 5 years. The electrolyte level (Na, K, Cl, Ca) were measured and complete blood count (CBC) to diagnose conditions, such as anemia, infection, and many other disorders. The modeled of cases classified according to type of feeding and water source. The results showed that combination of two mechanistically distinct of the disease formed are incorporation of significantly increased diarrhea or vomiting (gastroenteritis) can lead to electrolyte disturbances along with dehydration and anemia. Oral-fecal route of infection (contaminated water and food) leads to rapid dehydration and inability to absorb nutrients from food; survivors may have impaired growth and development, malnutrition, long-term GI disorders, reduced immunity and maybe death.

Keywords: Acute Diarrhea, Electrolyte Disturbances, Dehydration, Anemia, Child

Affiliation of Authors

[1] Medicine College, Tikrit University, Tikrit, Iraq, 34001
lopna.s.2015@gmail.com

[2] Dentistry College, Al-Iraqia University, Baghdad, Iraq, 10001
doctor88884@gmail.com

[3] Medicine College, Tikrit University, Tikrit, Iraq, 34001
ah70.tucom@tu.edu.iq

[1] Corresponding Author

Paper Info.
Published: Dec. 2021

دراسة التغيرات الكيموحيوية في حالات الإسهال الحاد لدى الأطفال

الباحثة / لبنى سمير محمود [1] ، أ. م. د. تغريد عبد الحميد السعدون [2] ، أ. د. احمد هاشم العاني [3]

الخلاصة

لقد حظي الإسـهال باهتمام كبير في السـنوات الأخيرة للخطورة الشـديدة التي قد تسـبب الوفاة في حالة الإهمال خاصة عند الاطفال دون سن الخامسة.

الدراسـة الحالية تضـمنت أخذ عينات (121) مريضـا (71) منهم يعانون من الإسـهال و (50) من الأصحاء 25 (50٪) من الإناث و25 (50٪) من الذكور بأعمار تتراوح من شهرين إلى 5 سنوات.

تم التركيز على اضطرابات الإلكتروليت من خلال اجراء فحوصات (الصوديوم، البوتاسيوم، الكلوريد والكالسيوم) التي قد تساعد في الوصول الى التشخيص الدقيق واجراء فحص جسماني شامل واختبارات، بما في ذلك العد الدموي الشـامل (CBC - Complete blood count) لمسـتوى خلايا الدم الحمراء وكذلك مستوى الهيموجلوبين في الدم. وتصنيف الحالات حسب نوع التغذية ومصادر المياه.

أظهرت النتائج أن الإسـهال والقيء (التهاب المعدة والأمعاء) يمكن أن يؤدي إلى اضـطرابات كبيرة في الاملاح مسببا الجفاف وفقر الدم. كما تبين أن السبب الرئيسي للعدوى هو (تلوث الماء والغذاء) بالإضافة الى التلوث الفموي عن طريق البراز خاصـة عند الأطفال الذين أعمارهم أقل من سـنتين مما يؤدي إلى مضاعفات كثيرة منها الجفاف السريع وعدم القدرة على امتصاص العناصر الغذائية من الطعام وبالتالي انخفاض المناعة، ضعف النمو واضطرابات الجهاز الهضمي المزمنة مؤدية الى فقدان الحياة.

الكلمات المفتاحية : الاسهال الحاد، الاضطراب الإلكترو ليتي، فقر الدم، الجفاف، الاطفال.

انتساب الباحثين

[1] كلية الطب، جامعة تكريت، تكريت، العراق، 34001
lopna.s.2015@gmail.com

[2] كلية طب الاسنان، الجامعة العراقية، بغداد، العراق، 10001
doctor88884@gmail.com

[3] كلية الطب، جامعة تكريت، تكريت، العراق، 34001
ah70.tucom@tu.edu.iq

[1] المؤلف المراسل

معلومات البحث
تأريخ النشر : كانون الأول 2021

Introduction

Diarrhea has received much attention in recent years due to its biodegradable properties that having the second leading cause of death in children under age 5 years according to the World Health Organization (WHO, 2013)[1]. Diarrhea is obtained by having three or more loose or liquid stools per day and is produced by having more stools than is normal for that person.it has many possible complications in biomedical field and has also potential leading to dehydration when the body no longer has enough fluids to function properly However, it has been found to be too important learning complications of dehydration include shock, organ damage, and coma. One way to toughen diarrhea is to incorporate of electrolytes imbalance which plays a vital role in maintaining homeostasis within the body [2]. They help to regulate heart and neurological function, fluid balance, oxygen delivery, acid-base balance and much more. However, it has been found to be the major causes are local irritation of the intestinal mucosa by infectious or chemical agents (gastroenteritis). One way to toughen diarrhea is rapid evacuation of water resulting a loss of electrolytes as well as the essential substances and fluid volume depletion [3]. The electrolyte imbalance if it is not corrected, could lead to bone disorders, changes in blood pressure, nervous system disorders, attacks or irregular heartbeat, as the potassium decreases person may experience muscle cramps and weakness, nausea and vomiting, it has many possible biomedical field effect. On the basis of these criteria a complete blood count measurements (CBC) helps to check any symptoms, such as weakness, fatigue, and also helps to diagnose conditions, such as anemia, infection, and many other disorders [4].This combination of two mechanistically distinct of the disease formed to incorporation of significantly increased diarrhea or vomiting (gastroenteritis) can lead to electrolyte disturbances along with dehydration and anemia .[5] The study aims to confirm that early diagnosis of diarrhea in children can save their lives.

Method

The current investigation involved sampling and analyzing (121) subjects, (71) of them with diarrhea and (50) healthy control 25(50%) female & 25(50%) male at ages ranging from 2 months to 5 years.

The total samples were collected and then analyzed for the serum electrolyte level (Na, K, Cl, Ca) were measured in our laboratory using HumaLyte Plus 5 Benchtop ISE Electrolyte Analyzer, brand (Monash international), model (EA-5) (mmol/l). This method obtains the potential difference between two electrodes. Specific electrodes are used for the determination of sodium, potassium and chlorides. The requirement is for an ion selective membrane to separate the solution of known activity from the detecting system. The membrane consists of special glass, a disk of crystalline material or an organic ion exchanger saturating a water-immiscible solvent held in a gel or plastic. The sodium electrode is sensitive to changes in sodium ion concentration and potassium electrode is sensitive to changes in potassium ion concentration the resulting depend on potentiometric techniques can be measured. The current investigation involved sampling and analyzing complete blood count (CBC) by hematology analyzers TOKYO, JAPAN - Nihon Kohden Corporation introduces Celltac Alpha MEK-6400) to diagnose conditions, such

as anemia, infection, and many other disordersThe Statistical Package for Social Sciences (SPSS, version 18) was used for data entry and analysis.

Chi (χ^2) square test of association was used to compare proportions of different factors among different groups of study sample. T-test used for numerical data. Pearson correlation used to test the relation between continuous data. P value of ≤ 0.05 was regarded as statistically significant. Bar and Pie charts used to present the data.

Results

Most of the diarrheal cases were aged 6-12months 31(43.7%), followed by >12 months 22(31%), compared with control group 15(30%), 21(42%) respectively, this relation was statistically not significant, as shown in figure (1).

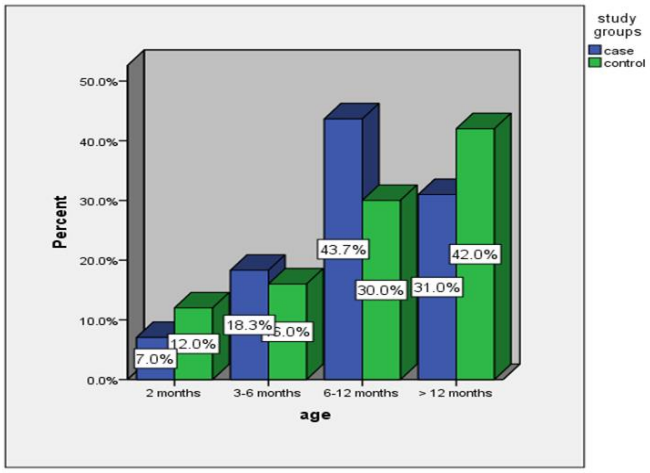

Figure (1): Diarrheal cases were distributed in study groups.

In our study, the modeled of cases according to type of feeding were obtained as showed in table (1). It can be observed that the highest level resulted in bottle feeding 30(42.3%) and mixed feeding of both (breast feeding and bottled feeding) 29(40.8 %)

Table (1) : The distribution of cases according to type of feeding

Type of feeding	case	control	
BF	5(7.0%)	4(8.0%)	8(6.6%)
bottle	30(42.3%)	9(18.0%)	40(33.1%)
Mixed	29(40.8%)	17(34.0%)	46(38.0%)
Solid food	7(9.9%)	20(40.0%)	27(22.3%)
Total	71(100.0%)	50(100.0%)	121(100.0%)

X^2=16.69, df= 3, P value < 0.05 significant

Regarding water supply, tap water was found among 51(71.8%) of the cases and 32(64%) of the controls, this relation was statistically not significant, as shown in table (2). Boiling water was done by 48(67.6%) of cases and 40(80%) of controls this relation was statistically not significant as shown in table (2).

Table 2: The distribution of cases according to water source

Variables		Cases	Controls	P value
		Frequency (%)	Frequency (%)	
Water supply	**Tap**	51	32	0.84, > 0.05
		71.80%	64%	
	synthetically	20	18	
		28.20%	36%	
Water boiled	**yes**	48	40	2.27,>0.05
		67.60%	80%	
	No	23	10	
		32.40%	20%	
Total		71	50	

Acute diarrhea represents about 68(95.77%), of the cases and chronic diarrhea about 3(4.23%), as shown in figure (2).

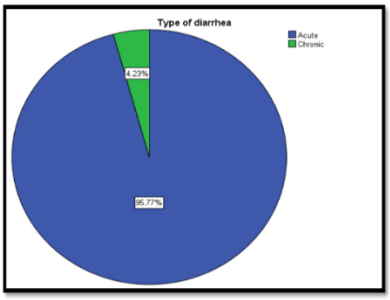

Figure (2): Type of Diarrhea distributed in study groups

Associated diseases were found among 5(7%) of cases vs. none of the controls, as shown in table (3).

Table (3): The distribution of cases according to the associated disease

Associated disease	cases		controls	
	Frequency	Percent	Frequency	Percent
yes	5	7	0	0
No	66	93	50	100
Total	71	100	50	100

X^2=3.67, df= 3, P value < 0.05 significant

Dehydration found among 45(63.4%) of the cases, as shown in table (4).

Table (4): The distribution of cases according to the dehydration and Wasting

Dehydration	Frequency	Percent
yes	45	63.4
No	26	36.6
Total	71	100.0

The measured electrolytes (potassium K, sodium and chloride) among cases was (3.98±0.77), (139.29±6.63), (103.28±7.11) mmol/l while among controls was (4.26±0.74), (139.76±4.93), (100.23±5.76) mmol/l respectively, this relation was statistically significant. The mean serum

calcium (Ca) among cases was (2.4±0.34), while among controls was (2.41±0.32) mmol/l, this relation was statistically not significant. As shown in table (5).

Table (5) The mean serum electrolyte level among the cases and controls

serum electrolyte		Mean	Std. Deviation	t, P value
K(mmol/l)	**case**	3.98	0.77	2.03, <0.05 S
	control	4.26	0.74	
Na (mmol/l)	**case**	136.29	6.63	3.1, <0.05 S
	control	139.76	4.93	
Cl(mmol/l)	**case**	100.23	5.76	2.59, < 0.05 S
	control	103.28	7.11	
Ca (mmol/l)	case	2.40	0.34	0.7, > 0.05
	control	2.41	0.32	

The mean Hb level among sample aged 2 months was (10.08±1.62) for cases vs. (10.05 ±2.07) for controls, this relation was statistically not significant. Among those aged 3-6 months it was (9.81±0.82) among cases vs. (11.45±1.5) among controls this relation was statistically significant. Among those aged 6-12 months it was (9.82±1.27) among cases vs. (11.29±1.09) among controls this relation was statistically significant. Among those aged >12 months it was (10.25±1.44) among cases vs. (11.2975±1.85) among controls this relation was statistically significant, as shown in table (6).

Table (6): The hematological status according to the age group among cases and controls

Age	Hb gm/dl	WBCx10^3/ µl	PCV%	platelet x10^3/µl
	Mean± SD	**Mean±SD**	**Mean±SD**	**Mean±SD**
2 months	10.08±1.62	10.6±4.3	31.20±5.03	382.5±152.6
Control	10.05±2.07	14.6±8.7	27.10±6.46	392.6±196.2
3-6 months	9.81±0.82	11.6±5.3	30.09±2.58	375.6±139.3
Control	11.45±1.50	11.8±5.9	35.09±4.47	400.9±140.6
6-12 months	9.82±1.27	10.5±4.0	29.74±5.78	328.6±106.9
Control	11.29±1.09	11.7±6.3	34.05±3.23	366.3±116.9
> 12 months	10.25±1.44	10.6±4.1	31.49±3.91	343.0±110.7
Control	11.75±1.85	11.6±11.1	35.26±6.53	269.4±76.0
t, P value	2.97,<0.055	0.92, > 0.05	1.15, > 0.05	0.026,>0.05

The mean PCV level among sample aged 2 months was (31.2±5.03) for cases vs. (27.1±6.46) for controls, this relation was statistically not significant.

Among those aged 3-6 months it was (30.09±2.58) among cases vs. (35.09±4.47) among controls this relation was statistically significant. Among those aged 6-12 months it was (29.74±5.78) among cases vs. (34.05±3.23) among controls this relation was statistically significant. Among those aged >12 months it was (31.49±3.91) among cases vs. (35.26±6.53) among controls this relation was statistically significant, as shown in table (3).

The mean Platelet count among sample aged 2 months was (392.6 ± 196.2) for cases vs. (382.5±152.6) for controls; this relation was statistically not significant. Among those aged 3-6 months it was (375.6±139.3) among cases vs. (400.9±140.6) among controls this relation was statistically not significant. Among those aged 6-12 months it was (328.6±106.9) among cases vs. (366.3±116.9) among controls this relation was

statistically not significant. Among those aged >12 months it was (343.0±110.7) among cases vs. 269.4±76.0among controls this relation was statistically significant, as shown in table (4). The dehydration found among 45(63.4%) of the cases, as shown in table (4).

Discussion

The current study enrolled diarrheal and control cases were male 43(60.6%), 25(50%) respectively, compared with female 28(39.4%), 25(50%) respectively as shown in figure (1). This frequency was comparable, to some extent, with that of local previous studies in Iraq [6,7]. This could lead to widespread infection among a population, especially in the absence of water filtration or purification as shown in table (1). These associated with previous findings [8]. Our study focused on acute diarrhea which represents about 68(95.77%) of the cases and chronic diarrhea about 3(4.23%), as shown in figure (2). The associated diseases were found among only 5(7%) of cases vs. none of the controls, as shown in table (3). Moreover, dehydration found among 45(63.4%) of the cases, as shown in table (4). Which leads to electrolyte imbalance and it could lead to bone disorders cause a variety of symptoms, changes in blood pressure, nervous system disorders, seizures or irregular heartbeat, as the potassium decreases a person may experience muscle cramps and weakness, nausea and vomiting [3]. Most of the patients had mild hypernatremia as shown in table (5), which implies the need for the isotonic oral and injectable. On the other hand, due to the significance of hypokalemia and the association between acidosis and diarrhea, it is necessary to provide early and appropriate treatment for these patients. Electrolyte disorders is associated with significant increase in mortality rates with diarrhea, this disorders may remain unrecognized and result in increased morbidity and mortality [9].

Most of diarrheal cases is show that the age effected on the level of Hb as shown in table (6) this frequency is comparable, to some extent with other study [10]. The Hb decreased when compared with that of the controls this result in agreement with previous study [11]. The age from 3-6 month and 6-12 month had low Hb level this result in disagreement with other study that showed [12] The low blood counts are due to nutritional deficiencies or blood loss to total body blood volume or decrease in production of RBC

Most cases shows that age promoted effect on the level of PCV as illustrated in table (6), there was a decreasing in the mean of PCV of the cases when compared with control group this result in agreement with previous study [13] the age from 3-6 month and 6-12 month had low PCV level, this result in disagreement with other study [14] frequency was low PCV level in cases compared with the control group between age from 2 years-6 years. This result may be due iron deficiency in the lumen of the gut and impaired the synthesis of hemoglobin and subsequently the synthesis of red blood cells. The PCV may increase or decrease depending on the individual's health, if they are dehydrated, the measurement will rise and the measurement will decrease if the individual has a condition, such as anemia.

Most cases show that the age have an influence on the level of WBC this show in table (6) there was a decreasing in the mean of WBC of the cases when compared with control group this result in disagreement with previous study which reveals that WBC was higher in cases compared to control [15]. Our results show that slightly low WBC than

control groups which can be explain is due to infections that use active white blood cells faster than they can be produced, also drugs that used destroy white blood cells due to the function of white blood cells, or leukocytes, is to fight infection and help to protect the body by a process called phagocytosis this is when the WBC surrounds and destroys a foreign cell. The Total WBC can be elevated with infection, period or can be decreased due to immune disorders.

The frequency of platelet is slightly decreased when compare with control children as shown in table (6) this result agree with [16] and disagree with [17]. Increase platelet due to recovery from serious blood loss, Platelets are closely involved in homeostasis, inflammation, immunity, tissue regeneration and other physiological and pathological processes, decreased platelet production, results from increased destruction of platelets or increased sequestration, occurring when the spleen captures an excessive number of platelets [18]. Oral-fecal route of infection (contaminated water and food) leads to rapid dehydration and inability to absorb nutrients from food; survivors may have impaired growth and development, malnutrition, long-term GI disorders, reduced immunity.

Conclusions

The study revealed that electrolyte levels decrease in most diarrheal cases, in addition to decrease the concentration of Hb, PCV, WBC also platelet among aged >12 months. This alteration due to infection (contaminated water and food). Leads to rapid dehydration and inability to absorb nutrients from food; survivors may have impaired growth and development, malnutrition, long-term GI disorders, reduced immunity.

Recommendations

Health education is needed to increase awareness of health professionals and public about diarrhea especially in our society and give the mothers advice about proper way of sterilization of bottles and equipment's of baby.

References

[1] World Health Organization. 2014. "Diarrheal disease Fact" . 9 July.

[2] Guarino A, Dupont C, Gorelov AV, Gottrand F, Lee JK, Lin Z, Lo Vecchio A, Nguyen TD, Salazar-Lindo E. 2012. The management of acute diarrhea in children in developed and developing areas: from evidence base to clinical practice; 13(1):17-26.

[3] Lindinger M.I. & Ecker G.L. 2013. Gastric emptying, intestinal Absorption of electrolytes and exercise performance in electrolyte-supplemented horses. Exp. Physiol. 98:193-206.

[4] M Khare, C Mohanty, BK Das, Ravi Shankar, SP Mishra. 2012. Serum Micro-Minerals Levels in Protein Energy Malnutrition in Indian Children. Indian J. Prev. Soc. Med Vol. 43 No. 4, ISSN-0301-1216.

[5] Mingyi Chen, Amrita Krishnamurthy, Ali R. Mohamed, and Ralph Green, 2013. Hematological Disorders following Gastric Bypass Surgery: Emerging Concepts of the Interplay between Nutritional Deficiency and Inflammation, Received 29 April 2013; Article ID 205467, 8 pages.

[6] Aqeel, A. N. 2013. Acute and Chronic Diarrhea among Hospitalized infants aged (1-12) months Vol: 10 No: 1, January 1 ISSN: 2222-8373.

[7] Mohammed J. Shakir and Areej A. Hussein. 2014. Frequency of intestinal parasitic infection

among children under 5 years of age in Baghdad province. Department of Microbiology, College of Medicine, Diyala University. Received: 25 June 2014. Published Online: August 2014. ISSN 2320-5407 International Journal of Advanced Research (2014), Volume 2, Issue 8, 332-337.

[8] Moyo SJ, Gro N, Matee MI, Kitundu J, et al., .2011. Age Specific Aetiological Agents of Diarrhoea in Hospitalized Children Aged Less than Five Years in Dar es Salaam, Tanzania, BMC Pediatrics, 11: 19-24.

[9] Shah GS, Das BK, Kumar S, Singh MK, Bhandari GP 2007. Acid base and electrolyte disturbance in diarrhoea. Kathmandu Univ Med J (KUMJ); 5:60-2.

[10] Marks PW, Glader B. 2009. Approach to Anemia in the Adult and Child. Hoffman F, Benz EJ, Shattil SJ, eds.Hematology: Basic Principles and Practice. 5th ed. Philadelphia, PA: Churchill Livingstone; Chap 34:439-46.

[11] Mohammad A.K, and Omer M.A, 2011. Preva13-Doyle, edited by Basem Abdelmalak, D. John (2013). Anesthesia for otolaryngologic lence of enterobia - sis Enterobiusvermicularis and its Impact on Children in Kalar Town/Sulaimania- Iraq. Tikrit Medical Journ al; 172: 67-77.

[12] Junwal Manju and Bhai Ismail, 2012. Studies on Human Anaemia Haemoglobin Hb assays R.B.Cs. Count in Ujjain, MP, India.

[13] Saba S. Mallouh , Najlaa B. Alawadi ,Abass F. Hasson,. 2015. Serum Vascular Endothelial Growth Factor Levels in Iraqi Patients with Newly Diagnosed Acute Leukemia. Medical Journal of Babylon-Vol.12- No.1.

[14] Mohaisen H Adaay PhD, Moayed M Al-Anzy MSc, Abdul-Monaim H Al-Samarrai Khudair A Al-Tikriti PhD, PhD, Firas A Al-Samarrai MBChB. 2009.Some Observations on the Occurrence of β-Thalassemia in Mosul Published by Al-Nahrain College of Medicine, ISSN 1681-657 Correspondence to: Dr. Mohaisen H. Adaay, Received: 21P Oct. 2009, Accepted: 8hP Dec. 2010. IRAQI J MED SCI, 2011; VOL.9 (3) Page 88 - Iraq JMS.

[15] Jong Duck Kim. 2013. Acute viral gastroenteritis in children hospitalized in Iksan, Korea during December 2010-June. Korean J Pediatr. Sep; 56(9): 383-388.

[16] Re Lee, Jae Il Shin, Se Jin Park, Ji Young Oh, & Ji Hong Kim. 2015. Mean platelet volume in young children with urinary tract infection Article number: 18072 (2015) doi:10.1038/srep18072

[17] Celik Tanju1, MD; Guler Ekrem2, MD; Atas Berksoy Emel1, MD; Arslan Nur3, MD, PhD 2014. Mean Platelet Volume as a Negative Marker of Inflammation in Children with Rotavirus Gastroenteritis. Online Available: Oct 28,

[18] Zturk ZA, Dag MS, Kuyumcu ME, Cam H, Yesil Y, Yilmaz N, Aydinli M, Kadayifci A, Kepekci Y 2013. Platelet could be indices new biomarkers for inflammatory bowel diseases? Eur Rev Med Pharmacol Sci.; 17(3):334-41.