Study of Various Causative Factors of Diarrhoeal Diseases with Special Reference to Bacteriological Profile among 0 to 5 Years Age Group

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Abstract

Introduction: Diarrhoea is leading cause of death in the population of 0-5 years age of the children in developing countries. the purpose of the study was to find out the pattern and bacteriological profile in diarrhoea case.

Materials & Methods: Cross section study of 200 cases of age ranging from 0 - 5 years having diarrhoea without history of taking any antimicrobial drug therapy outside. Detail history, Clinical examination, systemic examination and lab investigation was done.

Results: The maximum number of cases in the study group were upto 1 years (35%), followed by upto 2 years (29%) and upto 3 years (18%). So, the maximum number of cases came under the age of 3 years (82%). In the study group male were 59.5% and female 40.5%. According to socio-economic status, The maximum number of cases i.e. 74.5% were from low socio-economic status. Upto age of 1 year the patients on mixed diet, had maximum i.e. 24% incidence of diarrhoea followed by tin milk (8.5%) and animal milk (cow's milk, buffalo's milk and she goat's milk) 7%. The lowest incidence of diarrhoea was in the babies on mother's milk i.e. 5.5%; upto 2 years of age the maximum cases of diarrhoea observed were in patients on mixed diet i.e. 21%. As the age advances, food habit does not keep any significant value in diarrhoea. Various pathogenic organisms found in study group were bacteria other than M. tuberculosis (74%), Helminths (22.5%), Protozoa (22%) and other miscellaneous cause (7.5%). Two or more pathogens were found in some individuals. Pathogenic organisms were found in 88.5% cases, out of which 63.5% cases had single pathogen and 25% cases mixed pathogens. Among the Helminths, Round Worm was found in maximum number of cases (15.5%) followed by Hookworm (5.5%). 74% (148/200 cases) shown positive stool culture and 26% cases showed no growth. In the study group E.coli were found in maximum number of cases i.e. 39% followed by Shigella (7.5%). Upto age of 1 year, E.coli was the most offending agent isolated (26%). Maximum number of Shigella isolation (3%) was observed in children above 1 year and upto the age of 2 years. Maximum number of Salmonella isolation (4.5%) was observed in children above 2 years and upto 5 years of age. Other organisms more or less equally distributed in all the age groups.

Conclusion: In the present study, maximum numbers of cases were upto age 1 year. Low Socio-economic status and mixed diet had greater impact over incidence of diarrhoea up to age of 2 years. Pathogenic organism were found in 88.5% cases. Among the Helminths, round worm found in maximum cases. Upto age of 1 year, E. coli was the most offending agent isolated. 74% case shown positive stool culture. So author concluded that each and every patient of diarrhoea must be subjected to routine examination of stool and stool culture, it facility prevails and treated accordingly.

Keywords: Bacterial infection, Children, Diarrhoea, Epidemiology, Infant, Stool culture

INTRODUCTION

Diarrhoea is made up of two Greek words 'dia' and 'rhein' meaning 'through' and 'to flow' respectively. Hippocrates (460-370 B.C.) gave his clinical and epidemiological description of the entity of diarrhea.[1] He observed that children from 05-10 years of age were more vulnerable to diarrhoea with a high mortality rate. Diarrhoea may be studied according to age, sex, diet, infection (enternal and parenteral) Bacterial, Viral, Fungal, Protozoal and

Helminthic etc, other various factors like food allergy, bad sanitation, endocrinal, metabolic or psychosomatic[2] etc.

Diarrhoea is the leading cause of death in children younger than 5 years of age; persistent diarrhoea accounts for 30 to 50 percent of those deaths in developing countries. Malnutrition, immunosuppression, young age, and an increase in the preceding diarrhea burdens are risk factors for the development of persistent diarrhoea. Although many viruses, bacteria, and parasites can produce persistent diarrhoea, enteropathogenic Escherichia coli, enteroaggregative E. coli, Giardia, Cryptosporidium, and Cyclospora are the most important of these agents.

O' Ryam M et. al.[3] observed more than one billion diarrhoea episodes occur every year among children younger than 5 years of age in socio-economically developing countries causing 2 to 2.5 million deaths. More than twenty viral, bacterial, and parasitic enteropathogens are currently associated with acute diarrhoea. Rotavirus and diarrhoeagenic Escherichia coli are the most common pathogens responsible for acute diarrhoea episodes in children; Shigella spp., Salmonella spp, Campylobacter jejuni/coli, Vibrio cholerae, Aeromonas spp, and Plesiomonas spp. occur more commonly in poorer areas and infections caused by protozoa and helminthes occur mainly in areas where environmental sanitation is significantly deteriorated. The various bacteria causing diarrhoea are E.coli, Shigella, Salmonella, Vibrio cholerae, Compylobacter jejuni, Bacillus cereus, Staphylococcus faecalis etc.[2] Bacteriological pattern of diarrhoea vary considerably not only from region to region but also in the same region from time to time. This creates necessity for periodic assessment of bacteriological pattern of diarrhoea.

This study was carried because, Diarrhoea still carries high morbidity and mortality due to its high incidence and prevalence, affecting the most vulnerable and valuable group of population 0-5 age group of children, gross environmental insanitation prevalent in the community and the mismanagement of the diarrhoea as such by parents, community elders, quacks and local health administration. The purpose is to study the various causative factors of diarrhoeal diseases with special reference to bacteriological profile among 0-5 years age group of children.

MATERIALS AND METHODS

This was a cross sectional study done in the duration of 2 years (Jan 2008-June 2009). The point of study was R.T.H.C. Kalyanpur, Bihar. This work was carried out on the patient attending R.T.H.C. Kalyanpur. 200 cases ranging from 0-5 years age group of children having diarrhoea without history of taking drug outside were studied. Their parents/guardians were given informed consent.

Exclusion Criteria
1. They should not have any history of treatment with any antidiarrhoeal chemotherapeutic agent
2. They should not have any concurrent serious illness such as HIV, TB, Pneumonia, Kala-azar, Malaria, Cardiac, Renal or hepatic diseases etc.

In all the cases detail history, clinical examination (general examination and systemic examination) and investigation were done. The case sheet was recorded. Macroscopic or Naked eye Examination of Stool, routine examination of stool and stool culture was done.

RESULT

Distribution of diarrhoeal case according to the age was shown in Table 1, it was observed that maximum (70 case or 35%) diarrhoea case of age group 0-1 year followed by 58 case (29%) of age group 1-2 years. In the age group 2-3 years cases were 36 (18%) while 9.5% (19 cases) and 8.5% (17 cases) in the age group of 3-4 year and 4-5 year respectively. From the Table 2 it was also observed that male cases were 59.5% (119 cases) and females were 40.5% (81 Cases).

From the study of Table 3, author found that maximum cases were from low socio-economic status i.e. 74.5% (149 cases) followed by 21.5% (43 cases) from middle socio-economic status and least from high socio-economic status 4% (08 cases). Table 4 showing various types of food habit according to the age of child in study group. It was concluded

Table 1: Distribution of diarrhoea cases according to age

Age group in years	Cases	
	No.	Percentage
0-1	70	35
1-2	58	29
2-3	36	18
3-4	19	9.5
4-5	17	8.5
Total	200	100

Table 2: Distribution of cases according to sex

Sex	Cases	
	No. of cases	Percentage
Male	119	59.5
Female	81	40.5
Total	200	100

that maximum cases of all age group were on mixed diet i.e. 121 case (60.5%) followed by 38 cases (19%) on animal milk and least with breast milk (7.5%).

It was observed from Table 5 that Bacterial other than M.tuberculosis having the maximum (74%) incidence in the cases, Helminthic infestation and Protozoal infestation were near equal 22.5% and 22% while 7.5% were miscellaneous cause. Apart of this from Table 6, author found 75% cases (150 cases) from single pathogen and remaining 25% (50 case) due to mixed pathogen. Authors observed Helminthic etiology from Table 7 and found that H. nana, T. trichiura and F. buski had single etiology and had only 1 case (0.5%) for each. On other hand Round worm and Hook worm had mixed etiology and had 15.5% (31 cases) & 5.5%incidence(11 cases). From Table 8, the protozoal etiology (total 44 cases) was observed and found that mixed etiology of E. histolytica and Giardia lamblia was 19.5% (39 cases) and total cases having E.histolytica were 35 (17.5%) & 09 cases (4.5%) for Giardia lamblia. while studying the mixed etiology in 50 cases, we found that E. coli + E.H. + Round worm were having the maximum incidence

i.e. 6.5% (13 cases) from Table 9. In Table 10, observed that maximum cases (104 cases) 52% had only bactrial infection, 22% (44 cases) had Bacterial mixed with other pathogens while 52 cases (26%) shown negative culture. after observing the bacteriological profile according to age from Table 11, observed that E.coli had maximum incidence in age group 0-1 year age i.e. 52 cases (26%) and in age group 1-2 year age i.e. 15 cases (7.5%). Over all maximum incidence 78case (39%) of E.coli followed by 15 case (7.5%) of Shigella infection. Salmonella, Proteus, Klebsiella, Psedomas, Staph. aureus and Strept. Faecalis were having 13 cases (7.5%), 11 cases (5.5%), 09 cases (4.5%), 07 cases (3.5%), 04 cases (2%) and 03 cases (1.5%) respectively.

DISCUSSION

In the study group the highest incidence of diarrhoea was observed in infants upto 1 year of age (35%) followed by 29% upto 2 years and 18% upto 3 years of age, 9.5% upto 4 years of age and 8.5% upto 5 years of age. Evidently the incidence of diarrhoea was on declining trend with advancing age. Similar observation were made by various researchers like Raizada N et. al,[4] Aidara A et. al.,[5] Ansari S et. al.[6] Contrary to authors observation, Sharma[7] and Huilan S et. al.[8] observed very high incidence of diarrhea

Table 3: Cases of diarrhoea according to socio-economic status

Socio-economic status	No. of cases	Percentage
Low	149	74.5
Middle	43	21.5
High	08	4.0
Total	200	100

Table 4: Types of food habit according to the age of child

Age in years	Type of Feed								Total	
	Breast milk		Tin milk		Animal milk (cow's, buffalo's & she goat's)		Mixed diet			
	No. of cases	%	No. of cases	%	No. of cases	%	No. of cases	%	No. of cases	%
0-1	11	5.5	17	8.5	16	8.0	26	13	70	35
1-2	02	1.0	04	2.0	07	3.5	45	22.5	58	29
2-3	01	0.5	03	1.5	07	3.5	25	12.5	36	18
3-4	01	0.5	02	1.0	05	2.5	11	5.5	19	9.5
4-5	-	-	-	-	03	1.5	14	7.0	17	8.5
Total	15	7.5	26	13	38	19	121	60.5	200	100

Table 5: Various pathogens in study group

Pathogenic organism	No. of positive cases	Percentage
Bacterial other than M.tuberculosis	148/200	74
Helminthic infestation	45/200	22.5
Protozoal infestation	44/200	22.0
Miscellaneous cause	15/200	7.5

Table 6: Single and mixed pathogens

	Etiology		Total
	Single pathogen	Mixed pathogen	
No. of cases	150	50	200
Percentage	75.0	25.0	100.0

Table 7: Helminthic etiology

Etiology	As single etiology		As mixed etiology		Total	
	No. of cases	%	No. of cases	%	No. of cases	%
Round worm	-	-	31	15.5	31	15.5
Hook worm	-	-	11	5.5	11	5.5
H. nana	1	0.5	-	-	1	0.5
T. trichiura	1	0.5	-	-	1	0.5
F. buski	1	0.5	-	-	1	0.5
Total	3	1.5	42	21.0	45	22.5

Table 8: Protozoal etiology

Etiology	As single etiology		As mixed etiology		Total	
	No. of cases	%	No. of cases	%	No. of cases	%
E.histolytica	03	1.5	32	16	35	17.5
Giardia lamblia	02	1.0	07	3.5	09	4.5
Total	05	2.5	39	19.5	44	22.0

Table 9: Various mixed pathogens

	Etiology agents						Total
	E. coli+E.H.+ G.lamblia	E. coli+E.H.+ Hook worm	Shigella+ E.H.	E. coli+ Round worm	Round worm+ Hook worm	E. coli+E.H.+ Round worm	
No. of cases	07	05	07	12	06	13	50
Percentage	3.5	2.5	3.5	6.0	3.0	6.5	25.0

Table 10: Bacterial etiology as single and mixed with other pathogens

Etiology	No. of cases	Percentage
Only bacterial	104	52
Bacterial mixed with other pathogens	44	22
Negative culture	52	26
Total	200	100

in children below 1 year of age. The difference is because of localizing their studies in children below 3 years of age, while author has taken the work in the wide age range.

While studying the sex distribution in the present series of work, male comprised 59.5% and female 40.5%. So male: female ratio was 1.5:1. Sex incidence was almost proportionate in different age groups, which is also statistically highly significant. Similar observations were made by Huilan S et. al.[8] and Raizada N et. al.[4] Majority of cases (68%) were below 2 year of age.

In the present study, highest incidence of diarrhoea was observed in low socio-economic group (74.5%) followed by in middle socio-economic group (21.5%) and least number in high socio-economic group (4%). Similar observations were made by Joshi CK et. al.[9] The author likes to conclude that high incidence of diarrhoea in low socio-economic group are due to malnutrition, living in substandard environment and poor knowledge about hygiene.

While discussing the role of diet in cases of diarrhea in study group, maximum incidence was observed on mixed diet (60.5%) subsequently on Animal milk (19%), Thin milk (13%) and minimum in babies who were on exclusively breast feeding (7.5%). Similar observations were made by Aidara A et. al.[5]

Out of 200 cases in the study group, 63.5% showed single etiology and 25% mixed etiology. Similar observations were made by Mayo SJ et. al.[10] as they found 20.7% cases of mixed infection at Dar es salaam. Out of 200 cases in the study group, helminthic infestation was observed in 22.5% cases. Various helminthes observed were Round worm (15.5%); Hook worm (5.5%); H. nana (0.5%), T. trichuria (0.5%) and F. buski (0.5%). More or less similar observations were made by Ansari S et. al[6] as they found only 1.3% helminthic infestation. This variation might be due to variation in the place.

Out of 200 cases, author observed protozoal infestation in 22% cases. Various protozoa observed were E.histolytica (17.5%) and G.lamblia (4.5%). More or less similar observations were made by Mayo SJ et. al.,[10] Radvin JI et. al.,[11] Nelson WE et. al.[12] and Hasan KZ et. al.[13] Contrary to authors observation Huilan S et. al.[8] and Jarousha AM et. al.[14] observed low incidence of E.histolytica infestation. The low incidence of E.histolytica in their series might be due to geographical variation.

In the present series of work, G. lamblia infestation was observed in 4.5% cases. Similar observations were made by Huilan S et. al.[8] Contrary to author's observation Mirdehghan MM et. al.[15] reported very high incidence of G. lamblia infestation in children in Iran. The variation is again self-explanatory that work has been done in Iran.

In the study group, author observed 74% cases as bacterial etiology other than M. tuberculosis. Similar observations were made by Huilan S et. al.[8] Contrary to author's observation, Aidara A et. al.[5] observed 32% and 20.9% bacterial isolation respectively. The variation in different series might be due to the variation in place, time and season, pattern of feeding and socio-economic status of the cases.

In the study group, various bacteria isolated were E.coli, Shigella, Salmonella, Proteus, Klebsiella, Pseudomonas, Staphylococcus aureus and Streptococcus faecalis. In the present series of work, author observed E.coli in 39% cases. More or less similar observations were made by Bhan MK, Raj P, Levine MM[16] and Craviato A.[17] Contrary to author's observation, a higher as well as lower incidence of E.coli diarrhoea was observed by some authors. Higher incidence was observed by Biswas NK[18] and lower incidence as observed by Aidara A et. al.[5] These variations again seems to be multifactorial.

In the present series of work, author observed Shiegella in 7.5% cases. Similar observations were made by Huilan S.[8] Contrary to these observations, a higher incidence of Shigella infection was observed by Joshi CK, Bhardwaj AK, Vyas BL.[19] These variations can be because of the time and improvement in general sanitation in the general population.

In the present study, author observed Salmonella infection in 6.5% cases. Similar observations were made by

Table 11: Bacteriological profile according to age

Age in years	Bacterial Isolated																		Total	
	E. coli		Shigella		Salmonella		Proteus		Klebsiella		Mixed growth		Psedomas		Staph. aureus		Strept. Faecalis			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-1	52	26	01	0.5	01	0.5	-	-	02	1.0	-	-	01	0.5	-	-	-	-	57	28.5
1-2	15	7.5	08	4.0	02	1.0	03	1.5	04	2.0	05	2.5	04	2.0	01	0.5	01	0.5	43	21.5
2-3	05	2.5	02	1.0	05	2.5	03	1.5	02	1.0	02	1.0	02	1.0	01	0.5	01	0.5	23	11.5
3-4	03	1.5	02	1.0	02	1.0	03	1.5	01	0.5	01	0.5	-	-	01	0.5	-	-	13	6.5
4-5	03	1.5	02	1.0	03	1.5	02	1.0	-	-	-	-	-	-	01	0.5	01	0.5	12	6.0
Total	78	39	15	7.5	13	6.5	11	5.5	09	4.5	08	4.0	07	3.5	04	2.0	03	1.5	148	74

Huilan S et. al.[8] and Raizada N et. al.[4] Contrary to author's observation, a high incidence of Salmonella infection was observed by Joshi et. al.[9] Food factors might be responsible for higher incidence of Salmonella infection and gradual improvement in general sanitation in the society showing declination in incidence.

In the present series of work, author observed Proteus group of organisms in 5.5% cases and Klebsiella in 4.5% cases. More or less similar observations were made by Joshi et al[9] and Raizada N et. al.[4]

CONCLUSION

In the present work author has taken 200 cases in the study group. The age was ranging from 0-5 years of age. The maximum number of cases were upto 1 years (35%), followed by upto 2 years (29%), upto 3 years (18%), upto 4 years (9.5%), upto 5 years (8.5%). So, the maximum number of cases came under the age of 3 years (82%). In the study group male were 59.5% and female 40.5%. According to socio-economic status, cases were studied as low, middle and high. The maximum number of cases i.e. 74.5% was from low socio-economic status and least number i.e. 4% from high socio-economic status. The cases were studied according to type of food habits. Upto age of 1 year the patients on mixed diet, incidence of diarrhoea was maximum i.e. 24% followed by tin milk (8.5%) and animal milk (cow's milk, buffalo's milk and she goat's milk) 7%. The lowest incidence of diarrhoea was in the babies on mother's milk i.e. 5.5% upto 2 years of age the maximum cases of diarrhoea observed were in patients on mixed diet i.e. 21%, and rest of feeds incidence was more or less negligible. As the age advances, food habit does not keep any significant value in diarrhoea. Various pathogenic organisms found in study group were bacteria other than M. tuberculosis (74%), Helminths (22.5%), Protozoa (22%) and other miscellaneous cause (7.5%). Two or more pathogens were found in some individuals.

Pathogenic organisms were found in 88.5% cases, out of which 63.5% cases had single pathogen and 25% cases mixed pathogens. Among the Helminths, Round Worm was found in maximum number of cases (15.5%) followed by Hookworm (5.5%), H. nana, T.trichiura and F.buski each in 0.5%. Among the Protozoa, E.histolytica and G. lamblia were found in 17.5% and 4.5% cases respectively. All the cases in the study group were subjected to stool culture. Out of which 74% cases showed positive culture and 26% cases showed no growth. In the study group E. coli were found in maximum number of cases i.e. 39% followed by Shigella (7.5%), Salmonella (6.5%), Proteus (5.5%), Klebsiella (4.5%), Mixed bacterial growth (4%), Pseudomonas (3.5%), Staphylococcus aureus (2%) and Streptococcus faecalis (1.5%). Upto age of 1 year, E. coli was the most offending agent isolated (26%). Maximum number of Shigella isolation (3%) was observed in children above 1 year and upto the age of 2 years. Maximum number of Salmonella isolation (4.5%) was observed in children above 2 years and upto 5 years of age. Other organisms more or less equally distributed in all the age groups.

Although some of the authorities recommend withholding of antibacterial therapy because of the self-limited nature of the infection, the cost of drugs and the risk of emergence of resistant organisms, there is persuasive logic in favour of empirical treatment with antibiotics to all children in whom bacterial diarrhoea is suspected. Even if not fatal, the untreated illness may cause the child to be quite ill leading to chronic or recurrent diarrhea. There is a risk of development of malnutrition or worsening of the condition during prolonged illness, particularly in children of developing countries. The risk of continued excretion of bacteria leads to social hazard and may cause epidemic of diarrhoea further argue against the strategy of withholding antibiotics in acute diarrhoea. Since other than bacterial cause there is quite a good number of Helminthic, Protozoal and other miscellaneous causes of diarrhoea, the author concludes that each and every patient of diarrhoea must be subjected to routine examination of stool and stool culture, it facility prevails and treated accordingly.

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