

Epidemiological and clinical profiles of children aged 0-71 months suffering from acute diarrhea at Kalembe-lembe hospital in Kinshasa city, Democratic Republic of the Congo

ABSTRACT

Aim: The aim of this study to determine the epidemiological, clinical and etiological profile of children aged 0-71 months suffering from acute diarrhea, consulted and hospitalized at the Kalembe-lembe pediatric hospital in 2015.

Study design: This study used a retrospective design whereby medical records of children aged 0-71 months suffering from acute diarrhea were used.

Place and Duration of Study: This survey was carried out at the Kalembe-lembe Pediatric Hospital in Kinshasa in Democratic Republic of the Congo for a year i.e. between January 1st and December 31st, 2015.

Methodology: This study used a questionnaire to collect the requested information. This is an exhaustive sample of children aged 0-71 months (5 years and 11 months), hospitalized because of acute diarrhea. The information was collected on a case-by-case basis by consulting the patient files. The main focus was on the epidemiology, the clinics, the evolution and the etiology of the disease, which constituted key parameters for the present research. During the study period, 337 cases of children hospitalized at Kalembe-lembe hospital due to acute diarrhea were identified, of which 324 cases of children aged 0-71 months. Data collected were grouped and analyzed using Microsoft Excel 10. The association measures between different qualitative variables under study were evaluated using Chi-square test and the probability threshold used was 0.05.

Results: Out of 324 children aged between 0-71 months consulted or hospitalized at Kalembe-lembe hospital, a predominance of cases (60.49%) was observed in children under 12 months and potentially in males (55.24%) and the majority of deaths was also recorded in this age group. The mean age of hospitalized children for acute diarrhea was 12.4 months. Vomiting was the most common symptom associated with diarrhea (75.61%), followed by hyperthermia (70.37%). Most of children emitted liquid stools, or 65, 12%. The average number of stools issued / day was 6 times, with extremes ranging from 3-45 stools/day. The average hospital stay was 5.26 days with extremes ranging from 1-25 days. Also, we recorded high levels of isolated and/or identified etiologic agents in children with diarrhea compared to those reported in other countries. Isolation and/or identification of etiologic agents of diarrhea were performed only in 56.48% of cases. Rotaviruses, bacteria and parasites were found in 48.08%, 32.78% and 26.77% respectively and we identified the following bacteria: *Salmonella sp*, *Shigella sp* and *Campylobacter sp*.

Conclusion: The political and administrative authorities should promote rotavirus vaccination for children under 12 months of age and sanitation in urban and peri-urban areas. They must also promote population health education through media awareness of preventive measures and the severity of diarrheal diseases. The health staff at Kalembe-lembe hospital or other hospitals must take charge early and correctly children suffering from diarrhea with a particular attention at children under 12 months.

Keywords: Epidemiology, Clinical Profiles, Acute diarrhea, Control, Children, Kalembe-lembe, Democratic Republic of the Congo.

1. INTRODUCTION

Acute diarrhea is the emission of at least three soft or liquid stools per day and that evolved not less than 14 days [1]. Each year, 1.3 billion of acute episodes of diarrhea are observed in children worldwide [2]. Acute diarrhea is more serious in developing countries where malnutrition constitutes a

major factor risk for many diseases including rotavirus infections. More than one-third of hospital beds in these countries are occupied by children suffering from diarrhea [3] [4]. Sanou et al. [2] reported that in 80% of cases, acute diarrhea is due to infectious agents of which epidemiological characteristics vary according to countries, and even in one country, depending on from one region to another one. In 2012, a survey conducted in the Democratic Republic of the Congo (DRC) reported that diarrhea is the third cause of pediatric consultation after malaria and acute respiratory infections i.e. this pathology is responsible for 31.4% of children death under 5 years old. In 2014, the statistics of the Kalembe-lembe Pediatric Hospital revealed that out of 280 children hospitalized during 2014, 70 children had suffered from acute diarrhea. Among these children 42 (15%) had various complications such as severe dehydration, undernutrition, etc. This number clearly shows the scope of the problem and the danger that children are facing against this plague. The current study aims to improve the early control of diarrhea in children and to describe the epidemiological, clinical and evolutive of acute diarrhea in hospitalized children under 5 years at Kalembe-lembe Hospital. The aim of this study to determine the epidemiological, clinical and etiological profile of children aged 0-71 months suffering from acute diarrhea, consulted and hospitalized at the Kalembe-lembe pediatric hospital in 2015.

The procedure was as follows : (1) To identify the number of cases of diarrhea among children aged 0-71 months, consulted or hospitalized, at the Kalembe-lembe pediatric hospital during the study period, (2) describe the epidemiological characteristics (number of cases/month, distribution of cases related to gender and age, isolated causative agent, etc.) and among the clinical and evolutionary characteristics of the respondents, (3) identify various complications that occurred in children suffering from acute diarrhea, as well as the rate of cure and mortality.

2. MATERIAL AND METHODS

2.1. Study design, criteria selection and data collection

This is a retrospective study based on the records of children aged 0-71 months, hospitalized for acute diarrhea between January 1 and December 31, 2015. This study used a questionnaire to collect the requested information. This is an exhaustive sample of children aged 0-71 months (5 years and 11 months), hospitalized because of acute diarrhea. The information was collected on a case-by-case basis by consulting the patient files. For ethical reasons, the identity of the children whose records were the subject of our study was kept confidential. In this study, only children aged 0-71 months hospitalized at Kalembe-lembe hospital for acute diarrhea and children whose stool specimens underwent coprological tests were included. Other children older than 71 months, incomplete or inaccessible patient files were excluded from this study.

2.2 Sample size

During the study period, 337 cases of children hospitalized at Kalembe-lembe hospital due to acute diarrhea were identified, of which 324 cases of children aged 0-71 months (5 years and 11 months). The sample was representative of the study population, 96.14%.

2.3 Parameters studied

The parameters studied are of four types: epidemiological parameters (monthly distribution of cases, death cases, age and sex of patients), clinical parameters (numbers of stools, stool appearance, signs, symptoms and conditions associated with the diarrhea), the evolutionary parameter (distribution of cases by duration of hospitalization) as well as the etiological parameters (isolated and identified etiological agents).

2.4 Data analysis

Data collected were grouped and analyzed using Microsoft Excel 10. The association measures between different qualitative variables under study were evaluated using Chi-square test and the probability threshold used was 0.05. The data analysis was performed using the R software (version 3.2.2). The statistical analysis also used the calculation of the frequency (in %), of class average according to the relation:

$$\% = \frac{n_i}{N} \times 100$$

n_i = total number, N = sample, % = percentage

3. RESULTS

3.1. Epidemiological parameters

3.1.1 Monthly distribution of cases

The monthly distribution of children suffering from acute diarrhea and hospitalized at Kalembe-lembe pediatric hospital is given the figure below.

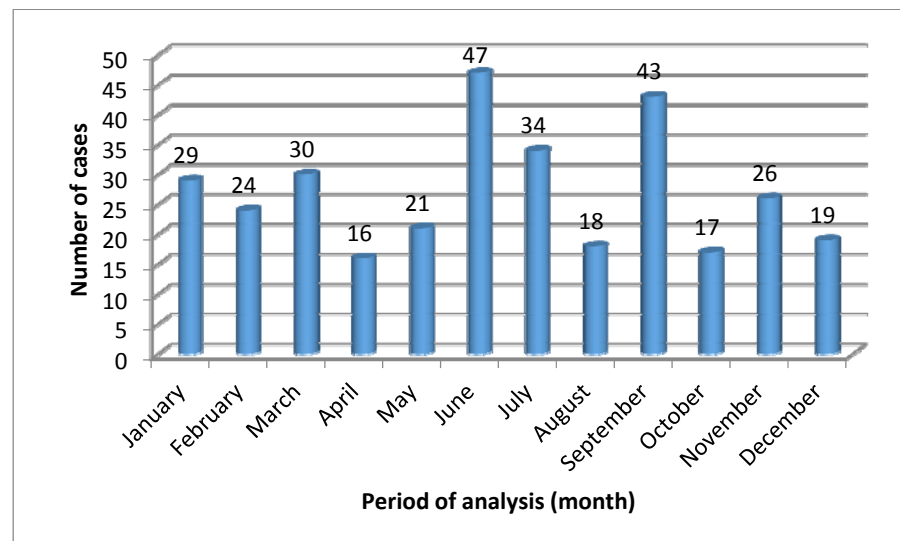


Figure 1. Monthly distribution of cases aged 0-71 months hospitalized at Kalembe-lembe pediatric hospital

The monthly distribution of cases of acute diarrhea in children aged 0-71 months in 2015 (Fig.1) reveals a predominance of cases in June (47 cases) and September (43 cases). There are more male children (179 or 55.24%) than female (145 or 44.75%), with a monthly average of 27 ± 10.14 cases either 8.33%). Despite the peaks observed in June and September, the variation in cases of diarrhea in this population is not statistically significant ($r^2 = 0.0076$).

3.1.2. Monthly distribution of children aged 0-71 months dead due to acute diarrhea

The monthly distribution of children aged 0-71 months who died as result of acute diarrhea at the Kalembe-lembe pediatric hospital during this study is presented in table 1 below.

Table 1. Monthly distribution of children who died due to acute diarrhea

Months	Monthly deaths / group age (months)					
	0-11		12-71		Total	
	N	%	N	%	N	%
January	0	0	0	0	0	0
February	1	3.45	1	3.45	2	6.9
March	2	6.9	1	3.45	3	10.35
April	1	3.45	2	6.9	3	10.35
May	1	3.45	2	6.9	3	10.35
June	4	13.79	0	0	4	13.79

July	0	0	0	0	0	0
August	3	10.35	3	10.35	6	20.69
September	3	10.35	2	6.9	5	17.24
October	0	0	0	0	0	0
November	1	3.45	0	0	1	3.45
December	2	6.9	0	0	2	6.9
Total	18	62.07	11	37.93	29	100

The death rate of children aged 0-71 months further to acute diarrhea at the Kalembe-lembe pediatric hospital is of 8.95%, of which 18 children (5.86%) were aged less than 12 months old. Of the 29 recorded deaths, 11 (3.09%) are children of 12 months and older.

3.1.3. Distribution of patients according to age and sex

The distribution of cases according to sex and age is presented in table 2.

Table 2. Distribution of cases according to sex and age

Age group	Sex				Total	
	Male		Female		N	%
	N	%	N	%		
0-11	101	31.17	95	29.32	196	60.5
12-23	57	17.59	34	10.50	91	28.10
24-35	15	4.63	8	2.47	23	7.10
36-47	4	1.23	5	1.54	9	2.8
48-71	2	0.62	3	0.93	5	1.5
Total	179	55.24	145	44.76	324	100%

The monthly distribution of acute diarrhea cases by age group and sex reveals the prevalence of cases in the age group ranging from 0-11 months of 60.49% and 28.08% in the age group of 12-23 months. As the age increases, the proportions of cases of acute diarrhea decrease: 7.09% (24-35 months), 2.77% (36-47 months), 1.54% (48-71 months), and male children (55.24% of cases) were the most affected. The average age of children hospitalized for acute diarrhea was 12 months and 4 days in the 0-71 month age group.

3.2. Clinical parameters

3.2.1 Frequency of stools

Table 3 presents the distribution of cases according to the frequency of stools per day.

Table 3: Distribution of cases according to the number of stools issued per day

Number of stools/day	Cases	
	Number	%
ND	125	38.58
3- 5	140	43.21
6-13	52	16.05
14-20	5	1.54
>20	2	0.62
Total	324	100

Legend: Not determined

The number of stools issued per day was determined only in 61.42% of cases (i.e. 199 patients) whereby 140 (43.20%) emitted 3 to 5 stools per 24 hours. The average number of stools emitted per day was 6 times per day with extremes ranging from 3-45 stools/day.

3.2.2 Appearance of stools

The distribution of cases according to the appearance of stools is presented in the table below.

Table 4: Distribution of cases according to stool appearance

Physical appearance of stools	Observed Cases	
	Number	Percentage (%)
ND	31	9.57
Liquid	211	65.12
Glairy	30	9.26
Pasty	35	10.80
Soft	6	1.85
Glairo-bloody	11	3.40
Total	324	100

The stool appearance was described only in 293 cases (i.e. 90.43%); the stool consistency was liquid in 211 children (65.12%), glairy in 30 children (9, 26%) and bloody in 11 children (3.40%) as presented in table 5.

3.2.3 Signs, symptoms and conditions associated with diarrhea

Different signs, symptoms and conditions associated with diarrhea are presented in table 5.

Table 5. Distribution of cases according to signs, symptoms and conditions Associated with diarrhea

Clinical signs		Number of observed cases	Percentage (%)
Vomiting		245	75.61
Fever		228	70.37
Physical asthenia		129	39.81
Agitation		9	2.77
Dehydration	A (light)	1	0.30
	B (moderate)	76	23.45
	C (severe)	28	8.64

Vomiting was the most common symptom in 75.61% of cases; fever (hyperthermia) was reported in 70.37% of cases. The dehydration status of the reported diarrheal children was reported in only 32.39% of cases, of which 23.45% had moderate dehydration and 8.64% had severe dehydration. 39.81% of cases had physical asthenia. (Table 6).

3.2.4 Duration of hospitalization

The duration of hospitalization of cases recorded at Kalembe-lembe pediatric hospital is presented in the table below.

Table 6. Distribution of Cases according to the duration of hospitalization

Duration of hospitalization (day)	Frequency (n=324)	Percentage (%)
1-7	272	83.95
8-14	46	14.20
>14	6	1.85
Total	324	100

A significant number of children were hospitalized for 1-7 days (83.95% either 272 cases). The average duration of hospitalization was 5 days and 3 hours with extremes ranging from 1-26 days.

3.3. Aetiological parameters

The search for the etiological agents of acute diarrhea (bacteria, viruses, parasites) was only carried out in 183 children (56.48%) out of the 324 hospitalized children. Bacteria were isolated in 32.78% of cases (60 children) of which 3 species were identified namely: *Salmonella sp* (6 cases), *Shigella sp* (2 cases), and *Campylobacter sp* (1 case). Viruses were responsible of causing acute diarrhea in 128 cases (69.93%); rotaviruses were identified in 48.08% of cases (88 children) and the remaining cases of which 21.85%, viruses could not be identified. The parasitic cause was the major one and the main isolated were roundworms (2 cases), amoeba (2 cases) and other intestinal parasites were not identified and yeasts were found in 11 cases (6.1%).

There were also mixed infections due to two pathogens or more: for example, parasite and rotavirus (17 cases or 9.28%), bacteria and rotavirus (12 cases, or 6.55%), unidentified viruses (VNI) and parasites (18 cases, 9.83%), NIV and bacteria (4 cases, 2.18%), *Campylobacter* or *Salmonella sp.* and parasites (3 cases, 1.63%), NIV + bacteria and parasites (3cases, i.e. 1.63%), *Salmonella sp.* and *Shigella sp.* (1 case, 0.54%), *Salmonella sp.* and *Campylobacter sp.* (1 case, 0.54%).

4. Discussion

4.1. Epidemiological parameters

Concerning the monthly distribution of cases, it was observed that several cases of acute diarrhea were recorded during June (47 cases, 14.50%) and September (43 cases, 13.23%). These results differ from those of Salou [5] in Ouagadougou (Burkina Faso) who reported that the highest case rates occurred between December and March having a rate of 19.0%, 10.6%, 13.2% and 12.2%, respectively. Tougouma [6] in Burkina Faso (Ouagadougou) recorded the highest rates of cases from March to June with rates of: 12.4%, 13.8%, 10.7% and 18.1% respectively. Nevertheless, the studies of Tougouma and Salou, carried out in the same city at 2 different periods far from 10 years, reveal the persistence of the infantile pathology during 7 months of the year (between December and June). This acute, permanent diarrhea represents, on average, 13.96% of the cases studied, with a small standard deviation (3.36). It is well known that more than 80% of cases of acute diarrhea are of infectious origin and the climate offers favorable conditions for the multiplication of infectious agents [5] [7]

In respect with the distribution of patients according to sex and age, it was recorded a predominance of male 179 cases (55.24%) than female (44.76%). Our results are similar to Sanou *et al.* [2] who reported the frequency of 54.7% for male cases and 45.3% of female cases while Salou [5] recorded a frequency of 58.1% of male cases and 41.9% of female cases. Kabuya *et al.* [8] in Lubumbashi (DRC) recorded a frequency of 52.3% female cases and 47.7% male cases. Coulibaly [4], Fohom [9], Konate [10], Bagayoko [11], Rehbindar [12] and Sidibe [13] (2014) also observed in their study that male children were the most represented with following respective frequencies of 56.7%, 56%, 54%, 55%, 59.2% and 60%. In fact, several studies report a vulnerability of male children to infectious diseases and among which acute diarrhea. According to Atakore [7], this observation results from social behavior towards children. If the mother, for example, preferred a female birth, the prevalence of diarrhea is higher among males but in households where there is a preference for male birth, females are more likely to suffer from diarrhea than males. In Asian countries, such as Bangladesh, where male children are favored for breastfeeding and care, there is a prevalence of infectious diseases and excess mortality among female children [7]. But the author also raised the issue of genetic factors as the basis for the prevalence of infectious diseases in male children [7].

As regard to the age of patients, the findings of our study revealed that a prevalence of 0-11 month old children was recorded i.e. 196 cases (60.49%). This significant frequency of acute diarrhea before the age of one year was also reported by Kabuya *et al.* [8]. Sanou *et al.* [2] and Salou [5] reported rates of 55.7% and 73.5% respectively; Coulibaly *et al.* [4] in Côte d'Ivoire and Maaroufi *et al.* [14] in Tunisia reported similar observations of 51% and 46% of frequency respectively. While comparing the average age of children surveyed during this study i.e. 12 months and 4 days (12.13 months) to those reported by Sanou *et al.* [2] (13.12 months), Salou *et al.* [5] (9.92 months) and Kabuya [8] (8.25 months), children identified during our work, although older than those recorded by Salou or Kabuya and younger than those recorded by Sanou, are in the critical period of growth around 12 months, an average of 10.86 months. The child before the age of 1 year seems particularly exposed to the diarrhea for two main reasons which are (i) the period that one develops the immunity peculiar to his

body, while there is a decrease of maternal antibodies; and (ii) the child's dietary diversification begins. When it is badly managed, malnutrition and then diarrhea can occur [2] [5].

Regarding the mortality rate, during the study period 29 deaths (8.95%) were recorded. The majority of death was observed in children under 12 months i.e. 5.86%. Salou [5], Hein [15], Tougouma [6] and Diagne *et al.*, [3] reported case-fatality rates of 1.3%, 19.9%, 7% and 16.9%, respectively, of children under 12 months of age. These data reveal the vulnerability of children of the age.

4.2. Clinical parameters

The findings on stool frequency showed that the majority of children 140 (43.20%) poo 3-5 stools per 24 hours and 52 children (16.05%) emitted 6-13 stools per day. These findings are different from Sanou *et al* [2], of which 51% of the children surveyed had pooped 3-5 stools/day, 45% emitted 6-10 stools/day. Kabuya *et al* [8] found that 48.7% of children had 3-5 stools/day and 51.3% had more than 6 stools/day. Salou *et al* [5] found that 46.8% of the children surveyed had 3-5 stools/day and 43.5% had 6-10 stools/day. These deviations from our results could be explained by the fact that the studies mentioned above were carried out in different environments.

Concerning the stool appearance, this study revealed fewer cases of dysentery (i.e. 3.40%) compared to the results reported by Salou [5] (5.9%) and Sanou [2] (10.4%). The studies of Salou and Sanou revealed the highest frequencies of cases of *Shigella*, an etiological agent of bacillary dysentery. The present study also reports a predominance of liquid stools (211 cases, 65.12%) and this is similar to what Mallan [16] and Haffaf *et al.* [17] reported i.e. the rates of liquid stools around 71.9% and 78% respectively. The high rate of rotavirus isolated in our study justifies this frequency of loose stools.

As regards to various signs, symptoms and conditions associated with diarrhea, vomiting was the most common sign associated with diarrhea as shown in the current study, around 75.61% of the recorded cases. Fever was observed in 70.37% while 39.81% had physical asthenia and 32.39% of children hospitalized for acute diarrhea were dehydrated. Our findings from those of Jihane El Omar [18] who reported fever as the symptom most associated with diarrhea with a rate of 83.6%. The rate of vomiting was 62.4% of cases and 45% of cases of dehydration were also reported. Salou [5] reported that hyperthermia was associated with diarrhea in 75.18% of cases and the rate of 66.58% of vomiting was reported while 58.22% of the children were dehydrated. Kabuya *et al* [8] reported that vomiting was associated with diarrhea in 82.4% of cases and hyperthermia in 81.3% of cases while 93.8% experienced severe or moderate dehydration. Haffaf *et al.* [17] reported vomiting as a symptom most associated with diarrhea in 40% of cases and fever in 40% of cases. 14.25% of the children were dehydrated. Our findings are also similar to those of Sidibé [13], Konate [10] who also reported that vomiting and fever were most frequently associated with diarrhea. Meanwhile, in Rabat, a research carried out at the University Hospital Center of Avicenna reported that diarrhea-vomiting was the most common association with a rate of 87.6% [19]. The occurrence of the above-mentioned clinical signs including, vomiting, and hyperthermia during diarrhea is related to isolated etiological agents. Diarrhea caused by rotavirus, for example, is often accompanied by vomiting and fever as the main clinical signs [5]. There is also evidence that in this study 28.39% of the cases identified simultaneously presented fever and vomiting (gastroenteritis) and 23.14% presented at the same time vomiting, hyperthermia and physical asthenia. This aspect has not been mentioned in other studies.

Concerning the duration of hospitalization, the majority of children diagnosed with diarrhea i.e. 85.95% were hospitalized for 1-7 days, 14.95% of registered cases stayed in hospital for 8-14 days and 6 patients (1, 85%) more than 14 days. The average duration of hospitalization was 5 days and 3 hours with extremes ranging from 0-26 days. Salou [5] reported that 84% of children remained in the hospital more than 7 days. The average duration of hospitalization was 3.94 days with extremes ranging from 0 to 33 days. It seems that children identified in this research stayed longer in hospital than those identified during the Salou study (2004). This observation can be justified as follows: (i) ineffective or inappropriate management, (ii) the fact that hospitalized patients in DRC did not present the same clinical picture as those recorded by Salou [5]. In addition to diarrhea, the management of conditions or other diseases associated with diarrhea (malaria for example) may be at the root of the lengthening of the hospitalization of different cases recorded in DRC and (iii) by the behavior of some parents who are waiting for the deterioration of the child's condition before driving him to a hospital center.

3. Etiological parameters

The present study was able to isolate and / or identify the etiological agents of acute diarrhea only in 56.48% of cases. On the one hand, the search for the etiological agents of diarrhea is not the primary object while managing diarrhea [5] and the acquisition of adequate laboratory equipment and/or the reinforcement of staff building capacity in recent techniques for the identification of pathogens of diarrhea are extremely required on the other hand. This pathology constitutes a significant danger to public health at the same time during the year in this fragile age group.

Since 80% of cases of acute diarrhea are due to infectious agents, the identification of these agents is important for better management of children with diarrhea. The study by Kabuya *et al.* [8], found that rotavirus diarrhea increases the risk of bowel movement by 2-fold and leads to more severe / moderate dehydration than diarrhea caused by other viruses and they have suggested an appropriate care in order to prevent deaths. The identification of etiological agents of acute diarrhea is also important for epidemiological studies (risk of spread of the pathogen, emergence of new microbial strains). Among the pathogens isolated and / or identified diarrheal children during our study, viruses occupy a prominent place (i.e. 69.93% of cases) among which rotavirus (48.08% of cases). This explains the frequency of certain clinical signs observed: vomiting (75.61%), fever (70.37%), liquid stools (62.12%). In infants and young children, rotavirus infection causes watery diarrhea with vomiting and fever, which are the clinical signs of gastroenteritis. Salou [5].

Rotaviruses were identified and isolated at a rate of 48.08% and 21.85% of viruses were not identified. Sanou [2] and Kabuya *et al.* [8] reported following rates of 14.4% and 53.8%, respectively for the rotavirus. Salou (2004) reported a rate of 42.6% of cases. Djénéba [20] in a study conducted in Cameroon reported a rate of 42.8%. The frequency of 26.77% of isolated parasites in the present study is higher than that described in other studies (Sanou *et al.* [2], Salou [5], Gendrel [21] who reported respectively 10%, 7%, 1.02% and 10%. Diouf *et al.* [22] reported a higher rate either 30% in Senegal. The frequency of 32.78% of bacteria isolated during this work is higher than that reported by Salou (2004) in Burkina Faso (6.20%), Tougouma [6] in Burkina Faso, Diouf *et al.* [22] (10.5%), Cowpli-bonny *et al.* [23] in Ivory Coast, (11.2%) and Luki *et al.* [24] to Kinshasa, (12%) and three species of bacteria have been partially identified, including: *Salmonella sp.* (6 cases), *Shigella sp.* (2 cases) and *Campylobacter sp.* (1 case) while other bacteria were not identified.

As noted above, failure to identify the causative agents of acute diarrhea often results from the fact that (i) the search for the etiological agents of diarrhea is not the primary purpose in the management of diarrhea and (ii) the inadequate laboratory equipment and/or ignorance of recent techniques for identifying pathogens of diarrhea. The record of cases of mixed infections was also reported in the current study where there were a mixture of two or more pathogens, among which: parasites and rotavirus (7 cases), bacteria and rotavirus (12 cases), unidentified viruses (NIV) and parasites (18 cases), NIV and bacteria (4 cases), *Campylobacter sp.* or *Salmonella sp.* and parasites (3 cases), NIV + bacteria and parasites (3 cases), *Salmonella sp.* and *Shigella sp.* (1 case), *Salmonella sp.* and *Campylobacter sp.* (1 case). Salou [5] in Burkina Faso (at children 0-36 months) reported associations of the following pathogens: *E. coli* + rotavirus (3 cases); *Salmonella sp.* + rotavirus (4 cases); *Trichomonas intestinalis* + amoeba (1 case); *E. coli* + amoeba (1 case). Djeneba [20], also reported associations: rotavirus and *Hymenolepis nana*; *Giardia lamblia* and *Trichomonas intestinalis*. This possibility of co-infection of etiological agents of diarrhea was also reported by Orland *et al.*, [25] and Cruz *et al.*, [26]: *Shigella sp.*, *Salmonella sp.* and *E. coli*, *Giardia lamblia* and rotavirus.

5. CONCLUSION

The aim of this study to determine the epidemiological, clinical and etiological profile of children aged 0-71 months suffering from acute diarrhea, consulted and hospitalized at the Kalembe-lembe pediatric hospital in 2015. The findings of this survey revealed that the mortality rate for children aged 0-71 months suffering from acute diarrhea was 8.95% while the majority of deaths due to diarrhea occurred in children under 12 months of age and vomiting was the most associated symptom with diarrhea and no many cases of dysentery were recorded. The duration of hospitalization was longer in the hospital than expected. The frequency of the etiological agents (bacteria, parasites, yeasts and viruses) identified and/or isolated during this study is greater than that of most other studies.

Further studies are needed in order to: (i) Investigate clinically on the impact of rotavirus infection and other etiological agents of diarrhea (stool frequency, stool appearance and dehydration status), (ii) to study resistance of these agents that cause acute diarrhea (namely bacteria and parasites) to

commonly prescribed antibiotics and last (iii) isolate using molecular biology techniques new strains of bacteria responsible for acute diarrhea and assess their epidemiological and clinical influence.

Therefore, some recommendations are formulated as follows: The political and administrative authorities should promote rotavirus vaccination for children under 12 months of age and sanitation in urban and peri-urban areas. They must also promote population health education through media awareness of preventive measures and the severity of diarrheal diseases. The health staff at Kalembe-lembe hospital or other hospitals must take charge early and correctly children suffering from diarrhea with a particular attention at children under 12 months. They should also strengthen their technical platforms for the identification of etiologic agents of diarrhea in particular and also promote the training or retraining of their laboratory technicians in the identification of the etiological agents of diarrhea. Parents should consult health facilities immediately in case of diarrhea in a child under 12 months of age. They must also promote compliance with basic hygiene rules (immediate environmental sanitation, hand washing, etc.) and the taking of drinking water.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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