Epidemiological and Clinical Profiles of Children aged 0-71 Months Suffering from Acute Diarrhea at Kalembe-lembe Pediatric Hospital in Kinshasa city, Democratic Republic of the Congo

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Author's contribution:
JMB, CKB and TBN performed the survey in the hospital.

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ABSTRACT

Aim: The aim of this study was to determine the epidemiological, clinical and etiological profile of children aged 0-71 months suffering from acute diarrhea, admitted 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 were used.

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

Methodology: This study used a questionnaire to collect the requested information whereby 337 cases of acute diarrhea diagnosed at Kalembe-lembe Pediatric Hospital was recorded of which 324 cases (0-71 months) were selected.. The information was collected on a case-by-case basis by consulting the patient records. Data collected analyzed using Microsoft Excel 10. The association measures between different qualitative variables were evaluated using Chi-square test and the p-value was 0.05.

Results: A predominance of cases (60.49%) was observed in children under 12 months and potentially in males (55.24%) while the majority of deaths was recorded in this same age group. The mean age of admitted children was 12.4 months and vomiting was the most reported symptom associated with diarrhea (75.61%), followed by hyperthermia (70.37%). Most of children emitted liquid stools (65.12%) and the average number of stools issued per day was 6 times with extremes ranging from 3-45 stools/day. However, we recorded high levels of identified etiologic agents in children with diarrhea compared to those reported in other countries. The 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.

Conclusion: Further studies are needed to study the antibiotic resistance of these pathogens causing acute diarrhea and identify using molecular techniques new strains of bacteria precisely responsible for acute diarrhea and assess their epidemiological and clinical influence.

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, and diarrhea especially acute diarrhea remains a major public health problem in the world [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. Children suffering from diarrhea occupy more than one-third of the hospital beds in these countries [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 between 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 admitted during this period, 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 significance of the current study was to improve the early control of diarrhea in children and to describe the epidemiological, clinical and evolution of acute diarrhea in admitted children under 5 years at Kalembe-lembe Pediatric Hospital. The aim of this study was to determine the epidemiological, clinical and etiological profile of children aged 0-71 months suffering from acute diarrhea, consulted and admitted at the Kalembe-lembe Pediatric Hospital in 2015.

2. MATERIAL AND METHODS

2.1. Study design, criteria selection and data collection

This is a retrospective study based on the medical records of children aged 0-71 months (5 years and 11 months), admitted for acute diarrhea at Kalembe-lembe Pediatric Hospital, Kinshasa, Democratic Republic of the Congo between January 1 and December 31, 2015.. We used a questionnaire to collect the requested information. 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 admitted at Kalembe-lembe hospital for acute diarrhea and children whose stool specimens underwent coprological tests were included. Other children older than 71 months and incomplete patient files were excluded from this study.

The procedure was as follows : (1) to identify the number of cases of diarrhea among children aged 0-71 months, admitted, 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 evolutive characteristics of the respondents, (3) identify various complications which occurred in children suffering from acute diarrhea, as well as the rate of mortality.

2.2 Sample size

During the study period, 337 medical records of children admitted at Kalembe-lembe Pediatric Hospital because of acute diarrhea were identified. Out of 337 cases, only 324 cases were selected. 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 emitted per day, stool appearance, signs, symptoms and conditions associated with the diarrhea), the evolutive parameter (distribution of cases per hospitalization duration) 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 studied were evaluated using Chi-square test and the p value was 0.05. The data analysis was performed using R software (version 3.2.2). Considering the descriptive statistics, the frequency was calculated using the following formula:

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

111 ni = total number, N = sample.

3. RESULTS
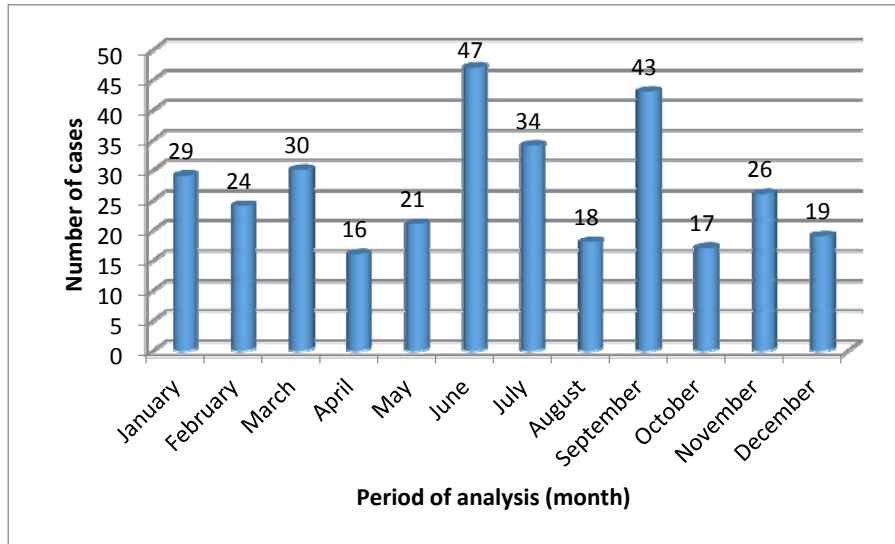### 3.1. Epidemiological parameters
3.1.1 Monthly distribution of cases

116 The monthly distribution of children suffering from acute diarrhea and admitted at Kalembe-lembe
117 Pediatric Hospital is given the figure below.

120 Figure 1. Monthly distribution of cases aged 0-71 months admitted at Kalembe-lembe Pediatric
121 Hospital

123 The figure above revealed a predominance of cases in June (47 cases) and September (43 cases).
124 There are more male children (179 or 55.24%) than female (145 or 44.75%), with a monthly average
125 of 27±10.14 cases i.e. 8.33%). Despite the peaks observed in June and September, the variation in
126 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
129 The monthly distribution of children aged 0-71 months who died as result of acute diarrhea at the
130 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

Monthly mortality rate / 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 <mark>mortality</mark> 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 <mark>high</mark> prevalence of cases in the age group from 0-11 months (60.49%) and 28.08% in the age group <mark>from</mark> 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 <mark>admitted</mark> 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 <mark>emitted</mark> per day.

Table 3: Distribution of cases according to the number of stools <mark>emitted</mark> 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 <mark>frequency</mark> of stools <mark>emitted</mark> per day was determined only in 61.42% of cases (i.e. 199 patients) whereby 140 (43.20%) emitted 3 to 5 stools per <mark>day</mark>. 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	
	<mark>Frequency</mark>	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 glairo-bloody in 11 children (3.40%).

3.2.3 Signs, symptoms and conditions associated with diarrhea

Different signs, symptoms and conditions associated with acute 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 quoted in the records (75.61%); followed by fever (hyperthermia) (70.37%). The dehydration status of the reported diarrheal children was quoted in only 32.39% of cases, of which 23.45% had moderate dehydration and 8.64% had severe dehydration while 39.81% of cases had physical asthenia.

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 admitted 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. Etiological 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 admitted 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%) whereby 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 parasites were roundworms (2 cases), amoeba (2 cases) and other intestinal parasites were not identified and yeasts were found in 11 cases (6.1%).

We have also noticed cases of mixed infections due to two or more pathogens, and it is reported as follows: parasite and rotavirus (17 cases, 9.28%), bacteria and rotavirus (12 cases, 6.55%),

5

203 unidentified viruses (NIV) and parasites (18 cases, 9.83%), NIV and bacteria (4 cases, 2.18%),
204 *Campylobacter sp.* or *Salmonella sp.* and parasites (3 cases, 1.63%), NIV + bacteria and parasites (3
205 cases, 1.63%), *Salmonella sp.* and *Shigella sp.* (1 case, 0.54%), *Salmonella sp.* and *Campylobacter*
206 *sp.* (1 case, 0.54%).
207
208 **4. Discussion**
209
210 Diarrhoeal diseases are a leading cause of morbidity and mortality among young children in low-
211 income countries. Although oral rehydration has been shown to reduce early child mortality, the
212 diarrhea-specific mortality in children less than 5 years of age in Africa has been estimated at about
213 10.6 per 1,000 [27]. Causes of diarrhea in areas of endemicity include a wide variety of bacteria,
214 viruses, and protozoa. Poor food hygiene, water, and sanitation are common in communities with high
215 levels of diarrheal disease. Underlying conditions, such as malnutrition, which modify the risk of
216 contracting diarrhea, are also common in much of sub-Saharan Africa. These factors combine to
217 facilitate the spread of enteropathogens, and epidemics are common in such settings [27].
218
219 **4.1. Epidemiological parameters**
220 Concerning the monthly distribution of cases, it was observed that several cases of acute diarrhea
221 were recorded during June (47 cases, 14.50%) and September (43 cases, 13.23%). These results
222 differ from those of Salou [5], who reported that in Ouagadougou, the highest case rates occurred
223 between December and March with the following frequencies: 19.0%, 10.6%, 13.2% and 12.2%
224 respectively. Meanwhile Tougouma [6], also in Ouagadougou reported that the highest rates of cases
225 were recorded between March and June with the following frequencies: 12.4%, 13.8%, 10.7% and
226 18.1% respectively. Nevertheless, the studies of Tougouna and Salou, carried out in the same city at
227 two different periods far from 10 years, revealed the persistence of the infantile pathology during 7
228 months of the year (between December and June). This acute, permanent diarrhea represents, on
229 average, 13.96% of the cases studied. It is well known that more than 80% of cases of acute diarrhea
230 are from infectious origin and the climate offers favorable conditions for the multiplication of infectious
231 agents [5, 7].
232
233 In respect with the distribution of patients according to sex and age, it was recorded a predominance
234 of male (55.24%) than female (44.76%). These findings are similar to Sanou *et al.* [2] who reported the
235 frequency of 54.7% for male children and 45.3% of female children whilst Salou [5] recorded the
236 frequency of 58.1% of male children and 41.9% of female children. In Lubumbashi, Kabuya *et al.* [8]
237 reported the frequency of 52.3% female children and 47.7% male children. Coulibaly [4], Fohom [9],
238 Konate [10], Bagayoko [11], Rehbinder [12] and Sidibe [13] also observed in their study that male
239 children were the most represented with following respective frequencies of 56.7%, 56%, 54%, 55%,
240 59.2% and 60%. In fact, several studies reported the vulnerability of male children to infectious
241 diseases and among which acute diarrhea. According to Atakore [7], this observation results from
242 social behavior towards children. If the mother, for example, preferred a female birth, the prevalence
243 of diarrhea is higher among males but in households where there is a preference for male birth,
244 females are more likely to suffer from diarrhea than males. In Asian countries, such as Bangladesh,
245 where male children are favored for breastfeeding and care, there is a prevalence of infectious
246 diseases and excess mortality among female children [7]. But the author also raised the issue of
247 genetic factors as the basis for the prevalence of infectious diseases in male children [7].
248
249 As to the age of children, the findings revealed that the predominant age range was 0-11 months ca
250 196 cases (60.49%) where the prevalence of acute diarrhea was high. Kabuya et al. [8] reported this
251 significant frequency of acute diarrhea before the age of one year. Meanwhile Sanou *et al.* [2] and
252 Salou [5] also reported the high frequency (55.7% and 73.5% respectively) of acute diarrhea in
253 children less than a year . Coulibaly *et al.* [4] and Maaroufi *et al.* [14] reported similar observations on
254 the frequency of acute diarrhea in children (51% and 46%) of frequency in Côte d'Ivoire and Tunisia
255 respectively. While comparing the average age of children surveyed in this study i.e. 12 months and 4
256 days (12.13 months) to those reported by Sanou *et al.* [2] (13.12 months), Salou *et al.* [5] (9.92
257 months) and Kabuya [8] (8.25 months), children identified in the current study, although older than
258 those recorded by Salou or Kabuya and younger than those recorded by Sanou, are in the critical
259 period of growth around 12 months. The child before the age of 1 year seems particularly exposed to
260 diarrhea for two main reasons, which are (i) the period that one develops the immunity peculiar to his
261 body, while there is a decrease of maternal antibodies; and (ii) the child's dietary diversification begins.
262 When it is badly managed, malnutrition and then diarrhea can occur [2, 5].

6

263
264 Regarding the mortality rate, 29 deaths (8.95%) were recorded. The majority of death was observed in
265 children under 12 months (5.86%). Salou [5], Hein [15], Tougouma [6] and Diagne *et al.*, [3] reported
266 case-fatality rates of 1.3%, 19.9%, 7% and 16.9% respectively, of children under 12 months of age.
267 These data reveal the vulnerability of children of this tender age.
268

269 **4.2. Clinical parameters**
270 The findings on stool frequency showed that the majority of children 140 (43.20%) emitted 3-5 stools
271 per day and 52 children (16.05%) emitted 6-13 stools per day. These findings are different from Sanou
272 et al [2], of which 51% of the children surveyed had emitted 3-5 stools/day, 45% emitted 6-10
273 stools/day. Kabuya et al [8] found that 48.7% of children had 3-5 stools/day and 51.3% had more than
274 6 stools/day. Salou et al [5] found that 46.8% of the children surveyed had 3-5 stools/day and 43.5%
275 had 6-10 stools/day. These deviations from our results could be explained by the fact that the studies
276 mentioned above were carried out in different environments.
277

278 Concerning the stool appearance, this study revealed fewer cases of dysentery (i.e. 3.40%) compared
279 to the results reported by Salou [5] (5.9%) and Sanou [2] (10.4%). The studies of Salou and Sanou
280 revealed the highest frequencies of cases of Shigella, an etiological agent of bacillary dysentery. The
281 present study also reports a predominance of liquid stools (211 cases, 65.12%) and this is similar to
282 what Mallan [16] and Haffaf *et al.* [17] reported i.e. the rates of liquid stools around 71.9% and 78%
283 respectively. The high rate of rotavirus isolated in our study justifies this frequency of loose stools.
284

285 As regards to various signs, symptoms and conditions associated with diarrhea, vomiting was the
286 most common sign associated with diarrhea as shown in the current study (75.61%). Fever was
287 observed in 70.37% while 39.81% had physical asthenia and 32.39% of children admitted for acute
288 diarrhea were dehydrated. Our findings are different from those of Jihane [18] who reported fever as
289 the most associated symptom with diarrhea (83.6%). The rate of vomiting was 62.4% of cases and
290 45% of cases of dehydration were reported as well. Salou [5] reported that hyperthermia (fever) was
291 associated with diarrhea in 75.18% of cases and vomiting was of 66.58% while the dehydration was
292 observed in 58.22% of children were dehydrated. On the other side, our findings are going along with
293 Kabuya et al [8] who reported that vomiting was associated with diarrhea in 82.4% of cases and
294 hyperthermia in 81.3% of cases while 93.8% experienced severe or moderate dehydration. Haffaf *et*
295 *al.* [17] reported vomiting as a symptom most associated with diarrhea in 40% of cases and fever in
296 40% of cases and 14.25% of children were dehydrated. These results are also similar to those of
297 Sidibé [13], Konate [10] who also reported that vomiting and fever were most frequently associated
298 with diarrhea. Meanwhile, in Rabat, a research carried out at the University Hospital Center of
299 Avicenna reported that diarrhea-vomiting was the most common association with a rate of 87.6% [19].
300 The occurrence of the above-mentioned clinical signs including, vomiting, and hyperthermia during
301 diarrhea is related to isolated etiological agents. Diarrhea caused by rotavirus, for example, is often
302 accompanied by vomiting and fever as the main clinical signs [5].There is also evidence that in this
303 study 28.39% of the cases identified simultaneously presented fever and vomiting (gastroenteritis) and
304 23.14% presented at the same time vomiting, hyperthermia and physical asthenia. This aspect has not
305 been mentioned in other studies.
306

307 Concerning the duration of hospitalization, the majority of children diagnosed with diarrhea i.e. 85.95%
308 were admitted for 1-7 days, 14.95% of registered cases stayed in hospital for 8-14 days and 6 patients
309 (1, 85%) more than 14 days. The mean duration of hospitalization was 5 days and 3 hours with
310 extremes ranging between 0 and 26 days. Salou [5] reported that 84% of children remained in the
311 hospital more than 7 days and the mean duration of hospitalization was 3.94 days with extremes
312 ranging between 0 and 33 days. It seems that children identified in this research stayed longer in the
313 hospital than those identified in other studies [5]. This observation can be justified as follows: (i)
314 ineffective or inappropriate management, (ii) the fact that admitted patients in DRC did not present the
315 same clinical picture as those recorded by Salou [5]. In addition to diarrhea, the management of
316 conditions or other diseases associated with diarrhea (malaria for example) may be at the root of the
317 lengthening of the hospitalization of different cases recorded in DRC and (iii) by the behavior of some
318 parents who are waiting for the deterioration of the child's condition before driving him to a hospital
319 center.
320

321 **4.3. 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 objective 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. 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 suffering from this pathology. The study by Kabuya *et al.* [8], found that diarrhea caused by rotavirus 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 in children during our study, viruses occupy a prominent place (69.93%) among which rotavirus (48.08%). 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 [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: 14.4% and 53.8%, respectively for the rotavirus.. In Cameroon, Djénéba [20] reported a rate of 42.8% of rotavirus identified as causing agent of acute diarrhea. The frequency of 26.77% of isolated parasites in the present study is higher than that described in other studies [2, 5, 21-22].The frequency of bacteria (32.78%) isolated in the current study is higher than that reported by Salou [5] in Burkina Faso (6.20%), Tougouma [6] in Burkina Faso, Diouf *et al.* [22] (10.5%), Cowppli-bonny *et al.* [23] in Côte d'Ivoire (11.2%) and Luki *et al.* [24] in 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 remained unidentified. Thus, the need of using molecular techniques as a diagnostic tool.

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 causing 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.i* (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 lambia* and *Trichomonas intestinalis*. Orland et al., [25] and Cruz et al., [26], also reported this possibility of co-infection of etiological agents of diarrhea: *Shigella sp.*, *Salmonella sp.* and *E. coli*, *Giardia lambia* and rotavirus.

As to what has been observed above, the health staff of Kalembe-lembe hospital or other hospitals need improve their management of children suffering from acute diarrhea with a particular care at children of less than a year. In addition, they should strengthen their technical platforms for the identification of etiologic agents of diarrhea in particular and promote the training of their laboratory technicians in the identification of the etiological agents causing diarrhea. To make this intervention and management easy, parents should consult health facilities immediately in case of diarrhea for children precisely for children of less than a year, knowing that the mortality rate is high at this tender age. They must also promote compliance with basic hygiene rules (immediate environmental sanitation, hand washing, etc.) and the taking of drinking water.

5. CONCLUSION
The aim of this study was to determine the epidemiological, clinical and etiological profile of children aged 0-71 months suffering from acute diarrhea, admitted at the Kalembe-lembe Pediatric Hospital in 2015. The findings of this survey revealed that the mortality rate from acute diarrhea was 8.95% and vomiting was the most associated symptom with diarrhea and no cases of dysentery and cholera were

recorded. ==According to the hospital regulation,== the duration of hospitalization was longer than expected. The frequency of the etiological agents identified during this study is greater than that of previous 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, we recommend to the political and administrative authorities should promote the 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.==

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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