

*Full Length Research Paper*

# Analysis of the incidence of the deficit of sanitation on the health of the populations in a context of urban growth: Case of the municipalities Yopougon, Abobo and Treichville' (Abidjan, Ivory Coast)

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The emergence of pathologies and their impacts on the health of the populations were studied in the municipalities of Yopougon, Abobo, and Treichville. This study highlights the conditions of noxious life and the health of the populations. To achieve this, a transverse investigation with the households was conducted on 300 households in 2013. It is concerned with the sources of water supply. It was noticed that 80% of the households from the municipality of Abobo, 90% from Yopougon, and 85% from Treichville use the water from public adduction network. Besides, in these municipalities, the mode of management of waste water is to eliminate the waste through autonomous works, collective works or nature. So in these municipalities, a retrospective study was made on these sanitary data registered in health centers during these years. So, in the municipality of Yopougon, the data of year 2006 produced 124446 cases of malaria, acute respiratory infections and diarrheic diseases. To Treichville, 28547 cases of morbidity were collected during the year 2008. For Abobo, the sanitary data of the year 2008 showed 89280 cases of morbidity. The children of less than 5 years of these municipalities are exposed to a lot of diarrheic diseases; with 56.58% cases in Yopougon, 40.47% in Treichville and 42.03% in Abobo.

**Key words:** Health of the populations, diarrhea, malaria, acute respiratory infection.

## INTRODUCTION

Most of the big cities in African countries are overcrowded because of the urban attraction. However, this urban

growth is not supported by infrastructures or development yet. This established fact is the problem of sanitation,

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which can put the health of the populaces in danger. Indeed, the degradation of the environment is the main factor that affects health, with a direct and negative incidence on human well-being (Sy, 2014). According to the World Health Organization, the environmental factors are responsible for more than 21% of the global load of diseases (WHO, 2010). In these African cities, household wastes litter the streets. Besides, the bad conception of sanitation work entails foul smells, which is the origin of the acute respiratory infections (Yapo et al., 2013). The city of Abidjan is not left out in this type of development. It is a metropolis of almost 3.6 million inhabitants, with an annual average growth rate of 3.2%. This city represents 43.8% of the urban population of Ivory Coast (United Nations, 2006). This strong growth of the population in Abidjan ended in the production of diverse waste household as industrialists. In this city, waste water is directly rejected in the receiving environment without any treatment. So the water supplied to the populations is of doubtful quality because of the bad conditions of distribution. Indeed, this water is very often contaminated because of the intrusion of waste water in the drinkable water distribution system (Yapo et al., 2013). This increases the risks of development of the diarrheic diseases (Koné et al., 2014). The diarrheic diseases established the second cause of morbidity for those less than 5-year-old children in Africa, in the South of Sahara and more particularly in Ivory Coast (Koné et al., 2014). In addition to this, the bad drainage of waste and pluvial water generates a development of larvae breeding grounds at the origin of the pathologies for malaria (Matubi et al., 2015). According to the report of the National Program of Fight against Malaria (NPFM) in Ivory Coast in 2003, malaria is passed on all year long with an outbreak during the rainy season (Mémain, 2003). The objective of this work is to show the impact of the deficit of sanitation on the health of the populations in the municipalities of Yopougon, Abobo and Treichville. The highlighted diseases concerned are malaria, acute respiratory infections and diarrheic diseases.

## MATERIALS AND METHODS

Sites of study were used to better identify the health of the populations in touch with the management of their living environment, studies were made on the sanitary data of the municipalities of Abobo, Treichville and Yopougon (Figure 1).

### Presentation of the investigation's index cards

With the aim of establishing a link between living environment of the populations and their health, index cards were edited to lead investigations with the households. On these index cards, a questionnaire of investigation was developed. It was structured in six parts, which are:

(1) The identification of the household: variables such as order number allocated to the household, the names and the first names

of the interlocutor;

(2) The socio sanitary equipment of the households;

(3) The water supply for drinking: The various water supplies for drinking (wells, retailers of water, public adduction in water of the Distribution Company of Water in Ivory Coast) were identified.

(4) The waste management of households: variables are relative to the practices of the populations in touch with the management of waste water, household waste and excretion;

(5) The dominant pathologies: variables concerned with the recurring pathologies, the fringes of the population, the most affected and the intentions of care in case of pathology;

(6) The individual characteristics: every member of each family is identified and characterized by its age, its sex, and its professional situation.

### Information system of management (ISM)

To know the pathologies contracted by the populations of the various municipalities, sanitary data were collected by means of the ISM. The ISM contains activities of curative consultations, maternities (maternity hospitals), postnatal consultations, family planning, morbidity, sexually transmitted diseases, financial management, and management of the ISM.

### Sampling of the households

Samples used in this study comprise populations living under the same roof and sharing the same needs. In these households, we had an average of 5 inhabitants. The interlocutors met in parts where there were most women. During the year 2013, inquiries were realized in the municipalities of Yopougon, Abobo, and Treichville. They were allowed to estimate the problems of sanitation which left the populations sick. To do it, the investigators identify at the households random, to interview the occupants on their various nuisances. Once they finished investigation, the households were marked and the next step was consecutively carried out.

The size of the sample depends on rates to be measured and of the desired precision as expressed in the equation (World Health Organization, 1991):

$$N = PQ / (E / L)^2$$

where N: minimal size of the necessary sample; P: estimation of the prevalence rate; Q: the value of (1-P); E: statistical risk in %; L: gap reduced for the accepted statistical risk (1, 96 for the risk 5 %).

By considering malaria, which is one of the diseases caused by a deficit of sanitation, the prevalence rate (30%) at the national level is well known (NPFM, 2003). The application of the equation with an acceptable risk of 5% succeeded in:

$$N P (1-P) / (E / 1.96)^2 \text{ is } N = 0.30 (1-0.30) / (0.05/1.96)^2$$

This application sample was carried out on 323 households. A size of 100 samples for households, using municipality, with a total of 300 households for three municipalities, were retained.

### Methods of sanitary investigation with the households

In the households, index cards were used to lead investigations with the households to understand better causes of the various pathologies, contracted by the populations and their therapeutic routes. The method of reserved investigation is the administration of questionnaires in the form of interview.

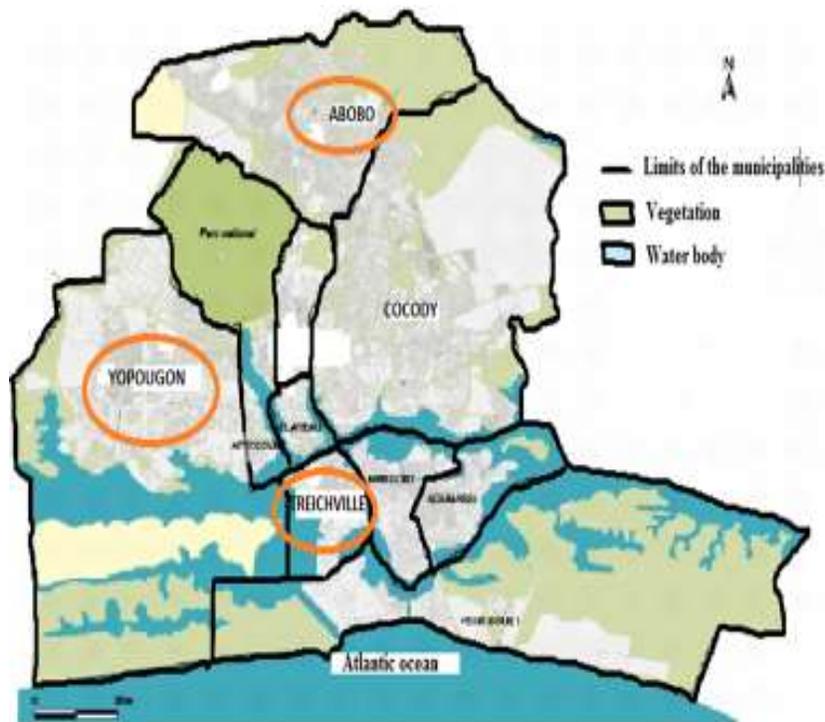


Figure 1. Map of the municipalities of Yopougon, Abobo, and Treichville.

#### Methods of acquisition of the sanitary data (In the sanitary structures)

To identify the pathologies contracted by the populations in these various municipalities, a retrospective study in health centers of these municipalities was made. Indeed, the structures of health monthly register the diverse activities which they lead, and these activities are recorded in the ISM. The diseases with statement compulsory are communicated every month end with the competent structures for the organization of a possible sanitary retort. In these municipalities, it was necessary to make a retrospective study on these sanitary data registered by health centers during various years. For the municipality in Yopougon, the data were of 2006. In this municipality, the sanitary structures supplied 124446 cases of morbidity for malaria, acute respiratory infections, and diarrheic diseases. In Treichville, hazard was used for the data of year 2008 with 28547 cases of morbidity. In Abobo, the data were from year 2008. In this municipality, the data was collected for a total of 89280 morbidity case.

## RESULTS AND DISCUSSION

### Presentation of the sanitation in the municipalities

The results of inquiries led with the households show that, 80% of the households of the municipality of Abobo use water resulting from the network of public adduction in drinking water. This result borders those of the municipality of Yopougon and Treichville; with 90 and 85% respectively. As for the use of the water of the retailers, the investigation showed that there is 7% of the

households which use them in Yopougon, 15% in the municipality of Abobo and 9% in Treichville. Besides, the use of the water of wells for the consumption is very unimportant in these districts. In the municipality of Yopougon there is 3%, to Abobo 5%, and to Treichville 6%. The analysis of Figure 2 shows that the water resulting from the network of adduction is used a lot by the populations.

In the districts of Yopougon, Abobo and Treichville municipalities, excretion of human beings are evacuated in the autonomous works, the collective works or in the nature. According to the results of the investigations, approximately 53% of the households of Abobo use the autonomous works. This result is higher than that of Yopougon (25.87%). On the other hand for Treichville, these works are used much more with 88% of the households.

Figure 3 shows that for the management of waste water in the city of Abidjan, individual works are used a lot.

Therefore the investigation showed that, the percentage of the households which pour excretion in the nature is unimportant.

The evacuation of household waste in the districts of the municipalities of the city of Abidjan is made either in garbage containers, or in wild deposits. According to the results of the investigations, 29% of the households of the municipality of Yopougon use tubs, while 71% of the households pour their household waste in wild deposits.

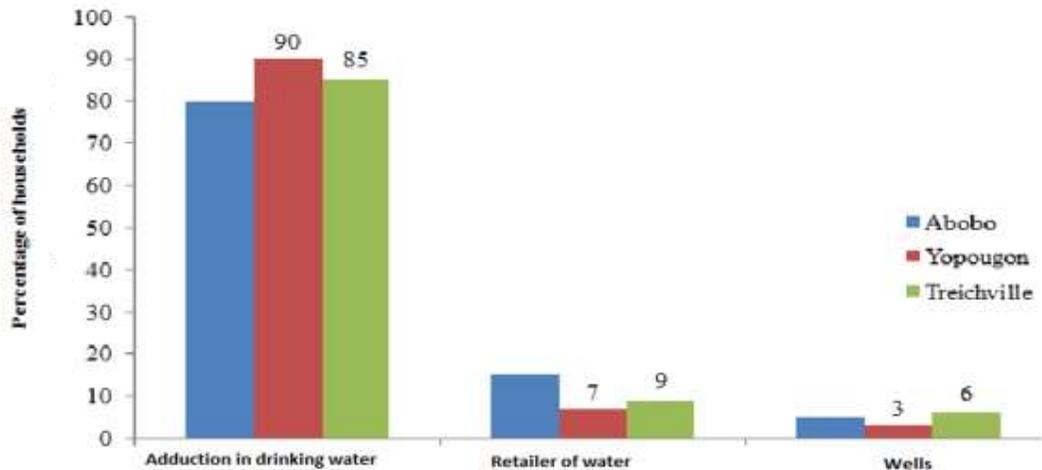


Figure 2. Water supply of drink in the households.

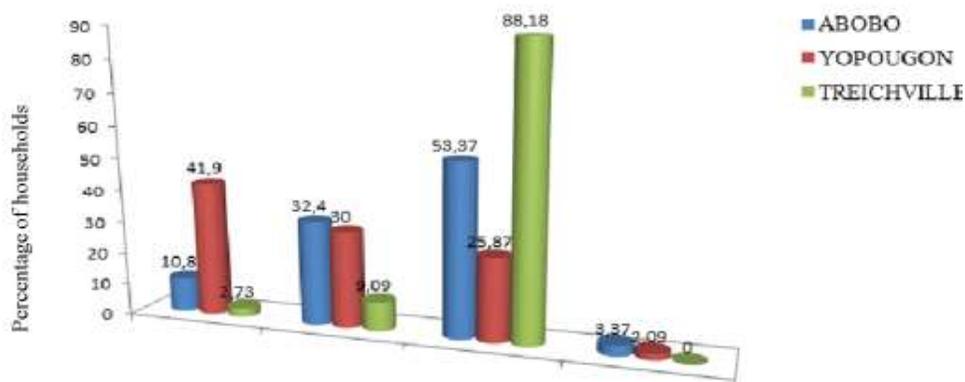


Figure 3. Proportion of use of the works of purification by the households.

In the municipality of Abobo, there are 79% of the households which use wild deposits; while 21% use garbage containers. To Treichville, there are 63% of the households that use wild deposits; while approximately 37% pour their household waste in garbage containers.

Figure 4 shows that there are many wild deposits in districts and fewer garbage containers.

**Sanitary practices of the populations**

Table 1 shows that in the municipality of Abobo, 73% of the households are devoted to auto medication; while 27% of the households opt for hospital care in case of disease. The same report is made in the municipalities of Yopougon and Treichville where there are respectively 68% of households for the auto medication, 22% for the medical consultation and 62% of the households which are interested in the auto medication; while 28% of the

households opt for a medical consultation in case of disease.

In these municipalities, the populations are devoted to the auto medication very often for their medical care.

**Evolution of the morbidity in the municipalities**

Figure 5 shows that the number of people having contracted the malaria in the municipalities of Yopougon, Abobo and Treichville increases from January till July and decreases from July till December, respectively in 2006, 2005, and 2008. June and July is the peak, corresponding to the period of big rainy seasons.

In the municipality of Abobo, the number of people increases the diarrhea growth, where a peak is observed from January till June. After June, a diminution of this number was observed until December. Contrary to the municipality of Abobo, in the municipality of Yopougon, a

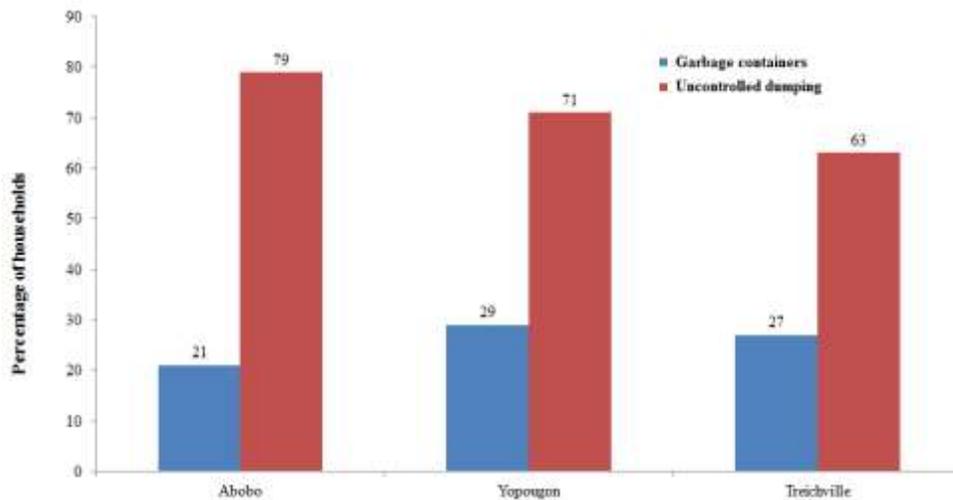


Figure 4. Proportion of households using garbage containers to evacuate their waste.

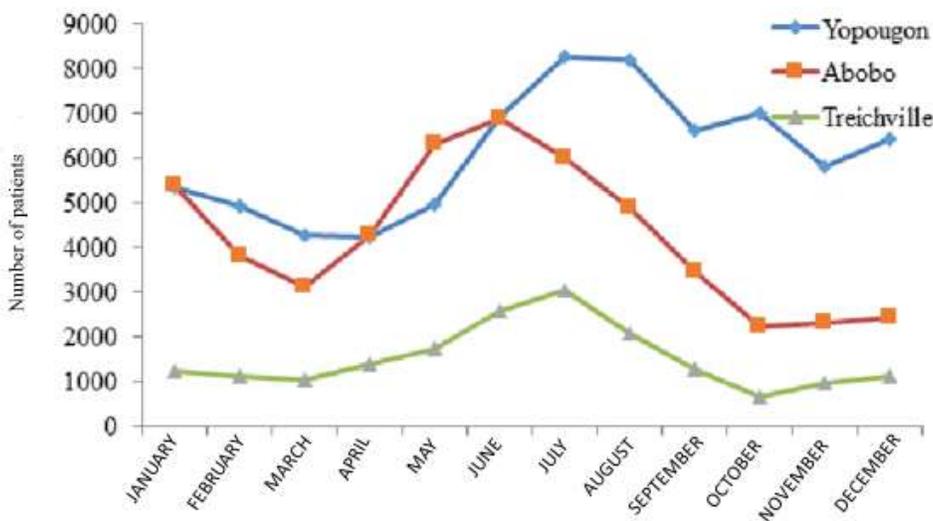


Figure 5. Evolution of the number of cases of malaria in the sanitary structures.

Table 1. Intention of care in case of pathology.

Municipalities	Intentions of care	
	Health centre (%)	Self-medication (%)
Abobo	27	73
Yopougon	22	68
Treichville	62	28

peak in August was observed. This number evolves in the municipality of Treichville, with a small peak observed in June (Figure 6).

As for the diarrhea, the evolution of the number of sick

during the year differs from a municipality in another one. There were three municipalities of the present Treichville with low staff, with cases of diarrhea.

Figure 7 shows that the number of people having

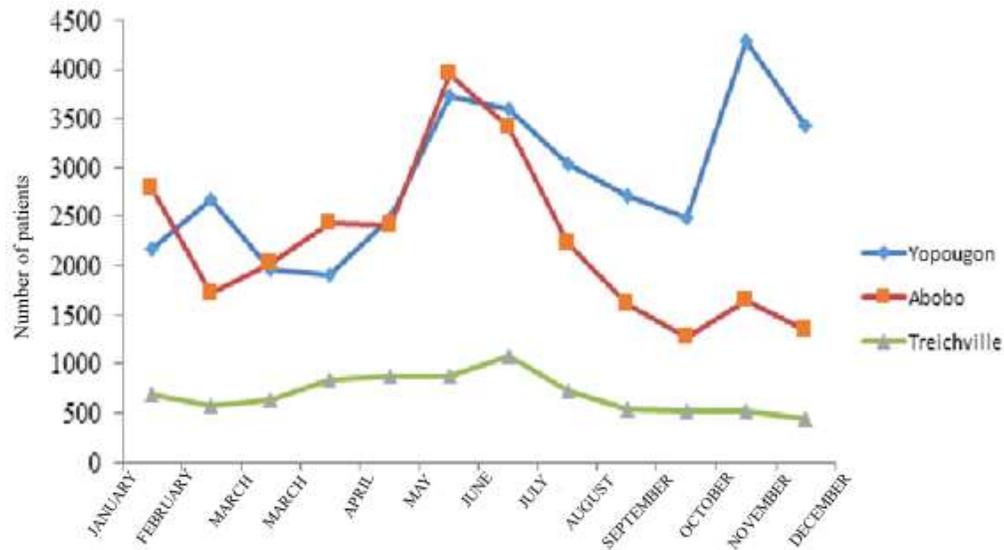


Figure 6. Evolution of the number of cases of diarrhea registered in the sanitary structures.

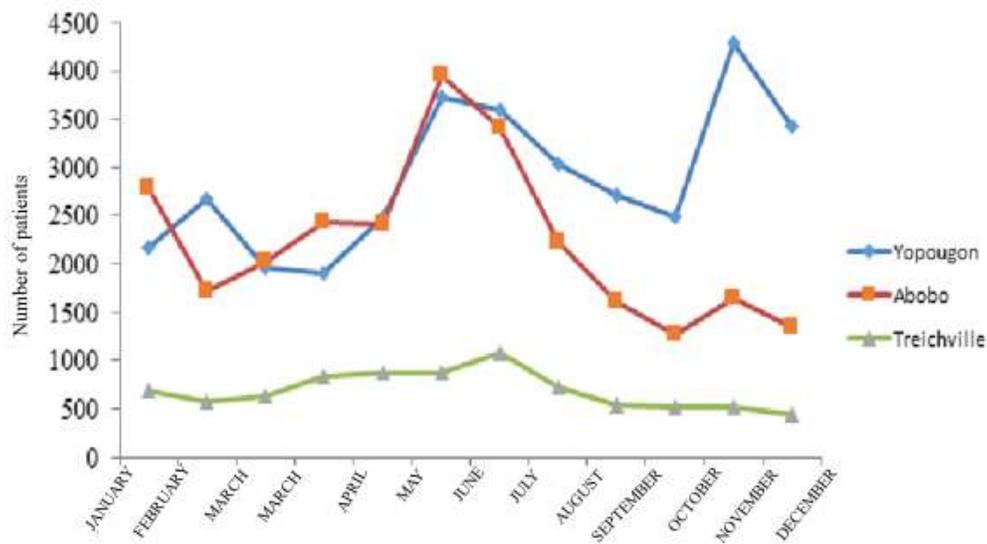


Figure 7. Evolution of the number of cases of IRA (IRAS) in the sanitary structures.

contracted the acute respiratory infections in the municipality of Yopougon increases from January till June, reaches a peak before decreasing until October, to grow again and reach another peak in November. In the municipalities of Treichville and Abobo, the number of consultation evolves up until June, before decreasing till December.

The rate of exposure of children less than 5 years was high in 2005, 2006, and 2008, respectively in the municipalities Yopougon, Treichville and Abobo. In the municipality of Yopougon, there are 56.58% of the children less than 5 years who contracted the diarrhea during the year, as against 36.85% for the malaria and 6.57% for

Acute Respiratory Infections (Table 2). So the municipalities of Treichville and Abobo presented a strong representativeness of diarrheas with respectively 40.47% proportions and 42.03%. In these municipalities, Acute Respiratory Infections occupy an important proportion which belongs to the order of 41.25% for Treichville and 35.31% for Abobo. On the other hand, malaria is less contracted by children of less than 5 years for Treichville (18.28%) and Abobo (22.66%).

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**Table 2.** Rate of exhibition of the children least than 5 years in the pathology.

Communities	Pathologies		
	Malaria (%)	Diarrhoea (%)	Acute respiratory infections (%)
Abobo (Year 2008)	22.66	42.03	35.31
Yopougon (Year 2005)	36.85	56.58	6.57
Treichville (Year 2006)	18.28	40.47	41.25

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## DISCUSSION

This work uses an interdisciplinary approach in the study of the sanitary conditions and the sanitary risks for the public health. It reveals that the accessibility of the populations to the drinking water is very important. According to the studies of Coulibaly et al. (2004), 99% of the households of the municipality of Port-Bouët are connected to the networks of drinking water. This result borders those of the municipality of Yopougon and Treichville, where we are respectively 90 and 85%. On the other hand in Abobo, 80% of the investigated households use water resulting from the public adduction. The water of the retailers is used by 7% of the households in Yopougon, 15% in the municipality of Abobo and 9% for Treichville. Besides, the use of the well water for the consumption is very unimportant in these districts; where 3% of the investigated households are concerned to Yopougon, 5% for Abobo and 6% for Treichville. This difference could give some explanation on one hand by the efforts of setting-up of sources of drinkable waters in these municipalities and on the other hand, by raising sensitization of the population to the importance of the use of a good quality of water for human consumption (Coulibaly et al., 2004). This study also showed that households generally use the autonomous works of purification. In these various municipalities, the results showed that more than 50% of the investigated households use this system of purge for waste water. The use of these autonomous works of purification was postponed in the works realized by Yapou et al. (2013) in the municipality of Yopougon. So, Kuitcha et al. (2008) found in Cameroon that the autonomous works of purification are used a lot by the households. However, the bad conception of these works and their overexploitation contributed to the deterioration of the health of the populations (Dongo et al., 2008). Indeed, the diarrheic diseases are caused by several parasites including the Salmonellas that are seen in unhealthy environments, due to a defective hygiene (Koné et al.,

2014). Besides, according to the World Health Organization (2001), studies carried out on the diarrheic diseases showed that they make 1.5 million deaths in developing countries. Much more, there was 21% of infant mortality in developing countries (UN-WATER, 2006). The investigations led in health centers gave an infantile morbidity of 46% because of the diarrheic diseases. This result is found in the works realized by Yapou et al. (2013) who showed that, the poor circles of developing countries are the most affected by the diarrheic diseases; especially the fringe of the children of less than 5 years.

Besides, the proportion relative to the malaria registered in health centers is higher than that found in the municipality of Yopougon by Dagnan et al. (2002) which is 23.3%. This proportion borders found in the studies was realized in the municipality of Port-Bouët (46%) by Coulibaly et al. (2004). This could be explained by the stagnation of waste water due to the expulsion of these on public highways. This report was made by Dongo et al. (2008), that among the districts of the municipality of Yopougon, that of Doukouré is the most affected by the problems relative to the purification. Besides, the results obtained as for the malaria are similar to those recorded in developing countries where malaria is endemic (WHO, 2001). Also, the report on the state of progress of the National Program of Fight against Malaria in Ivory Coast (2003) indicates that, malaria is passed on all year long with an outbreak during the rainy season. This report was made in a study by Yapou et al. (2013) showing that, malaria is contracted a lot during the rainy seasons.

Concerning the acute respiratory infections, the study shows that peaks are observed in February, July, and November. Peaks observed simultaneously in February, during dry season; whereas the July corresponds with the big rainy seasons. These observations were also told by Guedonon (1987) noticed in Benin that acute respiratory infections are much more pronounced during the hot and wet seasons. Besides, the results show that the acute respiratory infections of less than 5-year-old children are around 27%. This proportion is widely below 88% found in the works of Bakonde et al. (1998) realized in Togo. These results show that the Ivory Coast sanitary policy in favor of the children of this age bracket turns out to be effective, because the acute respiratory infections are the cause of 4.3 million deaths a year less than 5-year-old

children; which represents 21.3% of all the deaths of this age group (WHO, 1991).

As for the recourse to the medical care, inquiries with the households showed that more than 60% of the households of the various municipalities devotes to the auto medication. Studies carried out by Bossart (2002) in Benin shows the important role of the auto medication in the treatment of the pathologies. Indeed, the therapeutic virtues of certain healing plants used by the populations in the treatment of malaria (*Cassia occidentalis*) are scientifically proved (Tona et al., 2004). So, it is necessary to note that the guava is sometimes used for the treatment of the pains gastroenteritis-intestinal and cases of diarrhea. Clinical trials show the efficiency of some substances extracted from guava in the treatment of diarrheas (Lozoya et al., 2002).

Besides, other studies on 200 Indian mothers, whose children suffered from respiratory infections showed that, 25% of the mothers used some honey to handle the cough of their children, while 27% use ginger (Tona et al., 2004). But for Kouadio et al. (2006), a treatment without medical consultation can be more expensive than the treatment after the diagnosis of a modern specialist. So, the ignorance of the households on the choice of an appropriate therapeutic route countered as an economic risk factor for the household in front of pathologies. To do it, a raising sensitization of the populations to a good hygiene by the authorities is necessary, to protect and improve the health of the populations. Thus, it is necessary to recommend the use mosquito nets populations, to protect them from mosquito bites. Besides, the authorities have to improve the quality of the water consumed by the populations. Gutters have to be cleaned and septic tanks should be drained away regularly when they are full.

## Conclusion

Diarrheic diseases, malaria and acute respiratory infections constitute a real problem of public health to Yopougon, Abobo and Treichville. Malaria and respiratory infections are contracted a lot by the populations during the rainy season contrary to the diarrheic diseases which are caused by a defective hygiene of the environment and the bad practices of the populations regarding purification. Among the various pathologies, diarrheic diseases are contracted a lot by children of less than 5 years. To mitigate this problem, one solution of the viable solutions of effective fight against these pathologies is the eco systematic approach in the human health. The results of the study will be useful particularly for the authorities of these various municipalities who manage the problems of sanitation. They will contribute to the design of a new politics concerning the restoration of the living environment for a greater well-being of the populations.

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## CONFLICT OF INTEREST

The authors have not declared any conflict of interest.

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