



## Research Paper

# The Management of the Healthiness to Doukouré (Abidjan): Practice at Risk and Sanitary Impacts

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The diarrheic diseases, the acute respiratory infections and the malaria are responsible for the morbidity in subequatorial Africa and particularly in Ivory Coast. In the optics to establish a link of causality between these pathologies and the living environment of the populations, the pilot project of management of these pathologies by the eco-health approach was introduced in 2013 in a precarious district of the municipality of Yopougon, in Abidjan. The main risk factors identified in the advent of the malaria are the non-existence of trash can (OR=2.5; IC 95% = 1.04-6). As for the diarrhea, it is the cohabitation with puddles (OR=0.22; IC95 % = 0.10-0.48). For somewhere else, the advent of the acute respiratory infections (ARI) seems associated with the purification in a general way. Indeed, the factors which seem to

risks for ARI are among others, the non-existence of trash cans in the households (OR=2.68; IC 95% = 1.43-5.01), the non-existence of latrine in the households (OR=2.57; IC 95% = 1.19-5.55). These results allowed, through an interdisciplinary and participative process including communities and other stakeholders, implementation of actions of strengthening of capacities of the populations of the district Doukouré to face these various pathologies.

**Key words:** Malaria, diarrhea, acute respiratory infections, purification, risk.

## INTRODUCTION

The urbanization not mastered of the African cities in deficit of management services of the urban waste pulled of the interactions multiple and varied between health and environment. Indeed, the urbanization generates in an increasing way needs regarding decent accommodation, regarding access to the drinking water, to the purification, to the health care, etc. While public authorities do not arrange enough ways to face this situation (Hartemann, 2001). Consequently, we attend a degradation of the environment which is the main factor

affecting the health of the populations with a direct and negative incidence on the human well-being (Sy et al., 2014). According to the exogenous World Health Organization, factors are responsible in more than 21% of the global load of the diseases (WHO, 2010). Indeed, in these African cities, the bad design of the works of purification has an impact mattering on the health of the population (Yapo et al., 2013). In these cities, waste water is directly poured in streets without any treatment. Besides, the water supplied to the populations is of

doubtful quality because of the bad conditions of distribution. Indeed, this water is very often contaminated considering the intrusion of waste water in the drinkable water distribution system (Yapo et al., 2013). This established fact can engender diverse diarrheic diseases (Koné et al., 2014). The diarrheic diseases establish the second cause of morbidity of the less than 5-year-old children in Africa, in the South of Sahara and more particularly in Ivory Coast (Koné et al, 2014). Besides, a bad hygiene of the environment has negative impacts on the health of the populations (Ersey et al., 1991). Indeed, the bad drainage of domestic and pluvial waste water generates puddles establishing larvae breeding grounds at the origin of the pathologies as the malaria (Matubi et al., 2015). According to Yapo et al. (2013), the malaria is passed on all year long with an outbreak during the rainy season. The objective of this work is to highlight the sanitary situation in this district regarding purification, regarding sources of waters and their uses by the populations, as well as the health issue of Doukouré (Abidjan).

## MATERIAL AND METHODS

### Study area

In the municipality of Yopougon, a natural channel assures the collection and the sewage disposal and pluvial towards the lagoon. The immediate accesses of this channel shelter numerous precarious districts of which the district Doukouré. This district escapes the programs of urban planning of the municipality. Consequently, crowding and quasi-non-existence of sanitary basic infrastructures carry serious sanitary damages to the populations.

### Sampling of the households

Samples used in this study concern populations living under the same roof and sharing the same needs. In these households we had an average of 5 inhabitants. The interlocutors whom investigators met were for the most part of the women. During year 2013, inquiries were realized in the district Doukouré. The respondents say they are face with challenge of poor sanitation which they are expose to and as result they are sick in the district of Doukoure. To do it, the investigators identify at random the households to interview the occupants on their various nuisances. Once the finished investigation, the households are marked and the next step is consecutively carried out. The size of the sample depends on rates to be measured and of the desired precision, as expresses in the following equation (World Health Organization, 1991):

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

were:

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 reduces for the accepted statistical risk (1, 96 for the risk 5 %).

By considering the malaria which is one of the diseases caused by a deficit of sanitation, the prevalence rate of which (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 ends in a sample of 323 households. So, we retained a size of sample of 100 households by municipality with a total of 300 households for three municipalities.

## Methods of sanitary investigation with the households

In the households, index cards were used to lead investigations with the households to understand better the 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.

### Index cards investigation

With the aim of establishing a link between risk behaviors and living environment of the populations and their health, the index cards were published to lead investigations with the households (Figure 1). On these index cards, a questionnaire of investigation was developed. It was structured in six parts that are:

- (i) The identification of the household: Variables as order number allocated to the household, the names of the interlocutor.
- (ii) The individual characteristics: Every member of family is identified and characterized by its age, its sex, its professional situation.
- (iii) Equipment socio sanitary of the households (latrines, trash cans ...).
- (iv) The water supply of drink: Identification the various water supplies of drink (wells, retailers of water, public adduction in water).
- (v) The waste management of households: Variables concerning the practices of the household management of waste water, household waste and excreted were collected.
- (vi) The dominant pathologies: Variables concerning the

recurring pathologies, the fringes of the household and how they take care of case of pathology were collected.

### Statistical analysis of data

The data collected were seized under Epi Info on 2010. They were then imported in the software excel where they were treated. The frequencies of health problems and risk factors were calculated.

A multivariate analysis by logistic regression was made to clear the most significant risk factors. P – value of each test is compared with a limit value (level of meaning) whose default value for the most part of the software of statistical analyses is 5%.

## RESULTS

### Supply of drinking water

Most of the households made a deprived subscription to the Distribution Company of Water in Ivory Coast (DCWIC). Figure 2 shows that 60.8% of the households use the water of the Distribution Company of Water while 39.2 % use the water of the private retailers.

### Management of liquid and solid waste

The figure 3 shows that 71.75% of the questioned households health lifestyle is bound to household waste management, 17% think that it is bound to the presence of domestic waste water and household waste and 11.25% consider that it is connected to domestic waste water.

### Existence of puddles

The figure 4 shows that 80.8 % of the questioned households think that the sanitary problems with which the inhabitants are confronted are bound to the existence of puddles while 19.2 % hint at other causes.

### Use of the sceptical pits

In this district, it was observe that 98.2% of the households do not arrange a septic tank while only 1.8 % use it (Figure 5).

### Collection of the household waste

For the management of household waste in the district, according to the research findings, it was observed that 69.2% use trash cans of fortune while 30.8 % do not use it (Figure 6).

## Influence poor waste management on the health of the populations

The health of the local residents Doukouré was estimated by the malaria, diarrhea and Acute Respiratory Infections (ARI). On a staff of 276 investigated households, 84.4 % declare to present very often symptoms of the malaria, 43.8% of the symptoms of the diarrhea and 60.9% those of the Acute Respiratory Infections (ARI) (Table 1).

### Multivariate analysis

#### Causes of the malaria

The multivariate analysis which was made by the multiple logistic regressions allowed us to judge better interactions between the factors of exposures and the advent of the pathologies. The results of the multivariate analysis of the causes of the malaria are presented in the (Table 2). The factor of exposure which was significantly associated with the advent of the malaria within the framework of the analysis remains the same. It is about the existence of trash can in the households. According to the (Table 2), the households which do not arrange trash cans in the district are at greater risks for the malaria than the households which have it (P-value=0.04) (OR=2.5; CR95 % = 1.04-6).

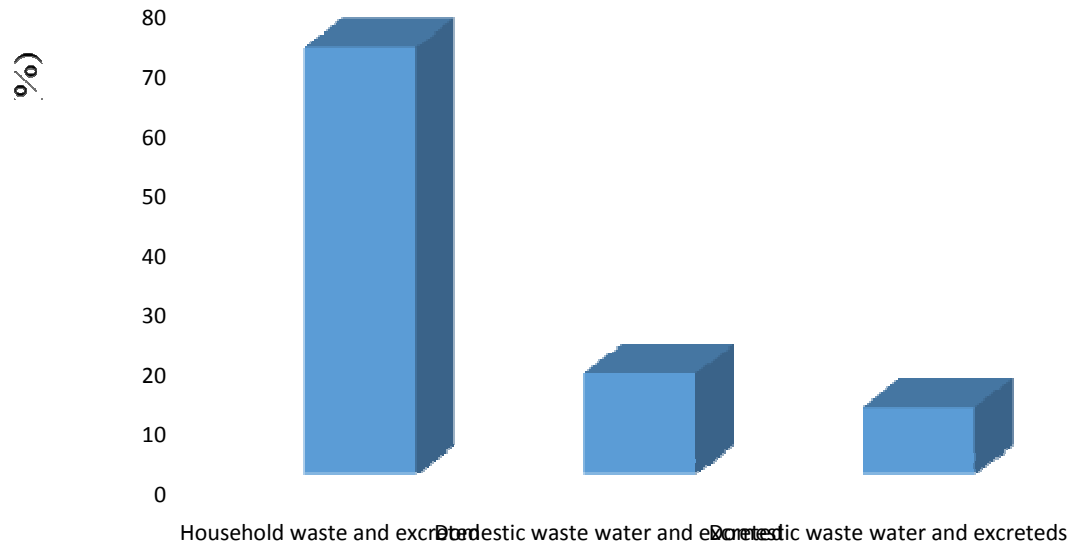
#### Causes of the diarrhea

The Table 3 presents the synthesis of multivariate analysis of the advent of diarrheas according to the factor of exposure. The factors of exposure which seem associated to the advent of the diarrhea is the existence of puddle in the district (p - value = 0.008). The procedure of logistic regression step by step ends in a variable which is significantly connected to the advent of the malaria which is the existence of puddle (p - value = 0.0001). So the households which do not live with puddles in the district are much more protected against the diarrhea than the households which have it (OR=0.22; IC95 % = 0.10-0.48). In other words, the existence of puddle is a factor at risk for the households because these puddles can be the place of development of vector of disease of which the diarrhea.

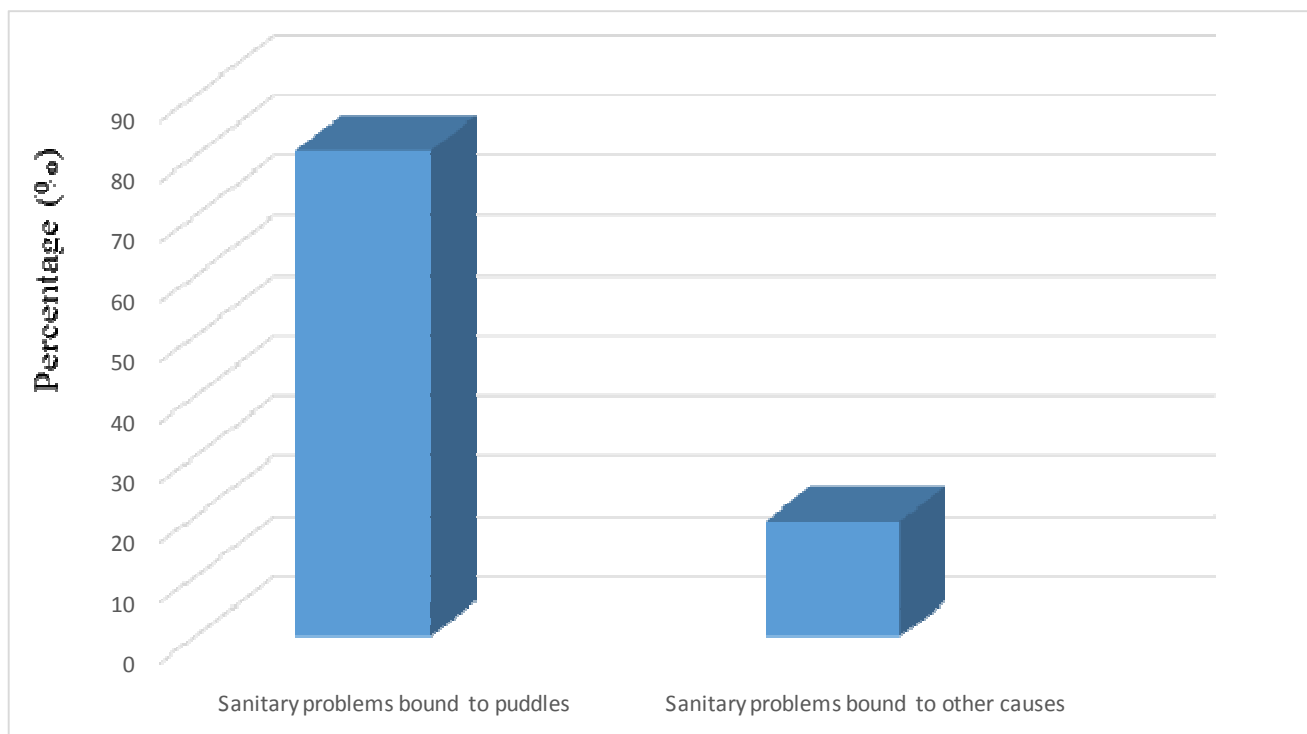
#### Causes of acute respiratory infection (ARI)

As for acute respiratory infection (ARI), the Table 4 presents the synthesis of multi- analysis of the advent of ARI according to the factors of exhibition. Three factors of exhibition seem associated to the advent of ARI. It is in the source of the water supply (p- value = 0.002), the existence of trash can (p-value=0.002), the qualification of the populations (p- value = 0.03).The procedure of





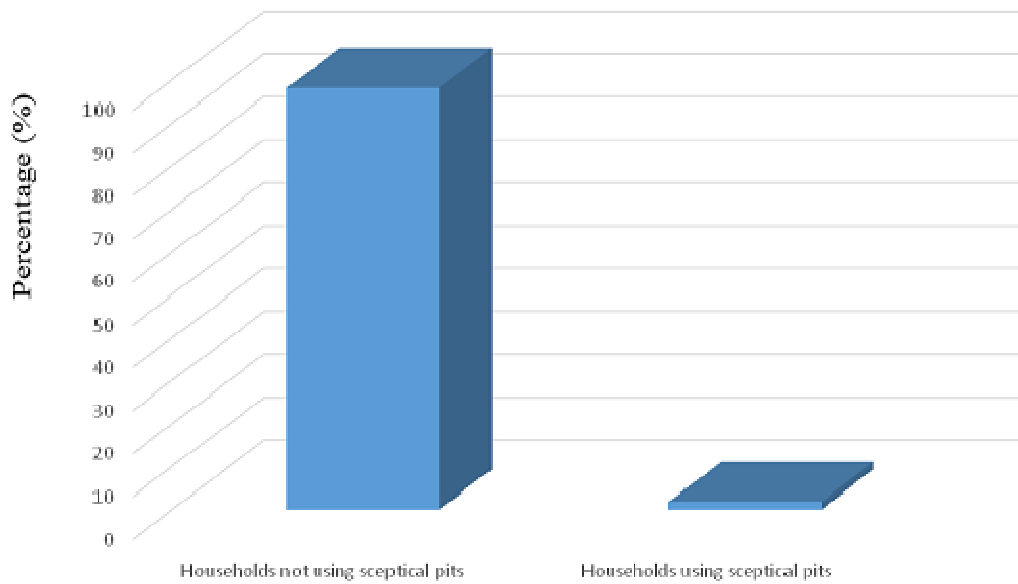
**Figure 3.** Mode of waste management.



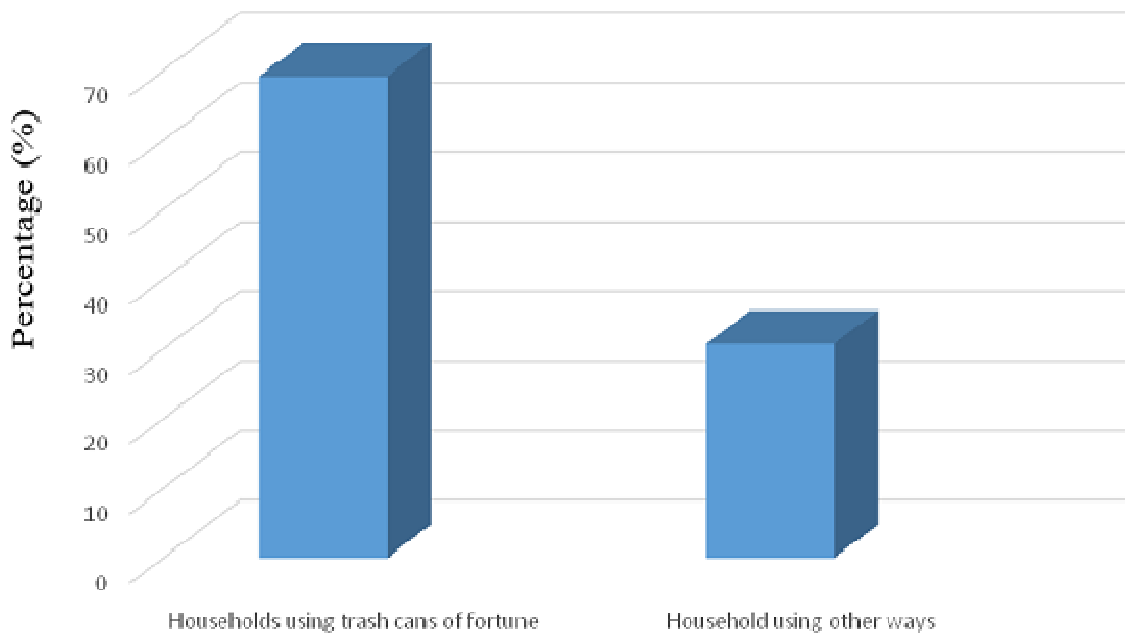
**Figure 4.** Existence of puddles.

endemic disease and the first cause of infant mortality (NPFM, 2003). Studies carried out by Dongo et al. (2008) showed that among the districts of the municipality of

Yopougon, that of Doukouré is the most affected by the problems relative to the insufficiency of management of the environment. This district concentrates the strongest



**Figure 5.** Use of septic pits.



**Figure 6.** Mode of management of household waste.

occupation rates of streets by the overflows of waste water, stagnant waters and the wild deposits, (Yapo, 2014). Results of this study show that the households which do not arrange trash cans in the district are at greater risks for the malaria than the households which have it (OR=2.5; IC95 % = 1.04-6). According to WHO (1985), the bad drainage of waste and pluvial water leads to the proliferation of puddles which establish biotopes of

vector mosquitoes of diverse diseases of which the malaria.

The diarrheic diseases establish the second cause of morbidity of the less than 5-year-old children in Africa, in the South of Sahara and more particularly in Ivory Coast (Koné et al., 2014). It is admitted in numerous studies that the diarrhea develops more in spaces where the sanitary conditions are bad or disastrous (Curtis et al.,

**Table 1.** Prevalence of the most frequent diseases in the households of the district Doukouré of the municipality of Yopougon, Abidjan (2013).

Health Status		Staff	Percentage
Malaria	Yes	233	84.4
	No	43	15.6
Diarrhea	Yes	121	43.8
	No	155	56.2
ARI	Yes	168	60.9
	No	108	39.1

**Table 2.** Factors associated to the malaria. Inquiries in the households of the district Doukouré of the municipality of Yopougon, Abidjan (2013).

Variables		Initial model		Final model	
		OR [CR <sub>95%</sub> ]	P-value	OR [CR <sub>95%</sub> ]	P-value
Drinking water	*Public adduction	1.16 [0.52-2.59]	0.71	NSS	NSS
	*Tailor				
Existence of puddles	*No	1.42 [0.39-5.17]	0.59	NSS	NSS
	*Yes				
Existence of trash cans	*No	2.51 [1.04-6]	0.04	2.45 [1.04-5v79]	0.04
	*Yes				
Latrine	*No	1.03 [0.33-3.20]	0.94	NSS	NSS
	*Yes				
Qualification	*No	1.39 [0.65-2.96]	0.39	1.42 [0.69-2.91]	0.32
	*Yes				
Sex	Female	0.98 [0.47-2.05]	0.97	NSS	NSS
	Male				
Vector of disease	Yes	1.71 [0.56-5.23]	0.34	1,71 [0.58-5v05]	0v32
	No				

OR : Odds Ratio ; CR : Confidence Range; NSS: Not Statistically Significant

2001; Yapo, 2014). Our study shows the deficit of drainage of domestic waste water in this district. The multivariate analysis showed that the risk factor which remained statistically significant is the existence of puddles. Indeed, the households which do not live with puddles in the district are much more protected against the diarrhea than the others (OR=0.22; IC95 % = 0.10-0.48). According to Assé et al. (2013) the insufficiency of purification could be a factor of diarrheic diseases. So the works of Hykpo, (2001) showed that the risks of infections gastroenteritis - intestinal are bound to the water pollution. For Assé et al., (2013), the improvement of the forecast of the diarrheic diseases rests on the promotion of the vaccination as well as individual and collective hygiene.

The Advent of the acute respiratory infections (ARI) seems associated with the purification in a general way. Indeed, the factors which seem to risks for ARI are among others drinking water from the retailers (OR=0.33; IC95 % = 0.18-0.62), the non-existence of trash cans in the households (OR=2.68; IC95 % = 1.43-5.01), the non-existence of latrine in the households (OR=2.57; IC95 % = 1.19-5.55) and finally, lack of qualifications of the households (OR=2.03; IC95 % = 1.09-3.79). According to Koné, (2008), stagnant waters could play the role of reservoirs of viruses responsible for the Acute Respiratory Infections. In another study by Tuo (2010) showed that the exposure to dusts emanating from the soil pollution favors the irritation of respiratory tracts, the lung diseases (chronic bronchitis, asthma) and the

**Table 3.** Factors associated to the diarrhea Inquiries in the households of the district Doukouré of the municipality of Yopougon, Abidjan ( 2013 ).

Variables	Initial model		Final model		
	OR [CR <sub>95%</sub> ]	p	OR [CR <sub>95%</sub> ]	P	
Drinking water	Public adduction Retailer	0.65[0.36-1.16]	0.14	0.65[0.37-1.13]	0.13
Existence of puddles	No Yes	0.26[0.10-0.70]	0.008	0.22[0.10-0.48]	0.0001
Existence of trash cans	No Yes	1.06[0.61-1.83]	0.82	2.45 [1.04-5.79]	0.04
Latrine	No Yes	0.79[0.33-1.87]	0.59	NSS	NSS
Qualification	No Yes	1.52[0.84-2.73]	0.15	1.49[0.84-2.65]	0.16
Sex	Female Male	1 [0.50-1.47]	0.59	NSS	NSS
Vector of disease	Yes No	0.80[0.31-2.07]	0.65	NSS	NSS

OR : Odds Ratio; NSS: Not Statistically Significant

**Table 4.** Factor associated to ARI Inquiries in the households of the district Doukouré of the municipality of Yopougon, Abidjan ( 2013 ).

Variables	Initial model		Final model		
	OR [CR <sub>95%</sub> ]	P	OR [CR <sub>95%</sub> ]	P	
Drinking water	Public adduction Tailer	0.36 [0.19-0.70]	0.002	0.33[0.18-0.62]	0.0006
Existence de flaques d'eau	No Yes	1.75 [0.55-5.55]	0.33	NSS	NSS
Existence de poubelles	No Yes	2.66 [1.42-4.99]	0.002	2.68[1.43-5.01]	0.002
Latrine	No Yes	1.90 [0.71-5.04]	0.59	2.57[1.19-5.55]	0.01
Qualification	No Yes	1.97 [1.05-3.67]	0.03	2.03[1.09-3.79]	0.02
Sexe	Female Male	0.62 [0.34-1.14]	0.13	0.62[0.34-1.14]	0.12
Vector of disease	Yes No	1.12[0.41-2.97]	0.82	NSS	NSS

OR : Odds Ratio; NSS: Not Statistically Significant

cancer of respiratory tracts. To remedy it, studies carried out by Tona et al. (2004) showed that the use of honey

and gingers could relieve this infection. 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.

## Conclusion

The diarrheic diseases, the malaria and the acute respiratory infected constitute has real public health challenge to Doukouré. The malaria is bound to the bad drainage of waste and pluvial water which constitute biotopes of mosquitoes. Besides, the bad drainage of waste water entrains a proliferation of germs and the flies at the origin of the diarrheic diseases. So, the deficit of latrines and inadequate trash cans entrain an important release of foul smells at the origin of the acute respiratory infections. To mitigate this problem, one viable solution is the effective fight against these pathologies using the ecosystematic approach in the human health. The results of this 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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## REFERENCES

- Assé KV, Plo KJ, Akoua-Koffi CG, Sié K, Yenan JP, Kouamé M (2013). Acute diarrhea Rotavirus in children at the General Hospital of Abobo North (Abidjan/Côte d'Ivoire): epidemiology, clinical, virology and outcome aspects. *Rev. Int. Sc.Méd.*15(1):15-19.
- Curtis V, Kanki B, Cousens S, Diallo I, Kpozehouen A, Sangaré M, Nikiema M (2001). Signs of evolution of the behavior further to a program of promotion (class) of the hygiene in Burkina Faso. *Bulletin of the World Health Organization*. 79: 518-527.
- Dongo K, Koffi KF, Kone B, Biemi J, Tanner M, Cissé G (2008). Analysis of the situation of the sanitary environment of districts disadvantaged in the urban fabric of Yopougon in Abidjan, Ivory Coast. *J. Vert.* 8: 3.
- Ersey SA, Potash JB, Robert L, Shiff C (1991). Effects of improved water supply and sanitation on ascariasis, diarrhoea, and trachoma. *Bulletin of the World Heal Organization*. 69: 609-621.
- Hartemann P (2001). Water supply and purification in tropical environment (middle). *Tropical medicine*. 61: 210-213.
- Hykpo ER (2001). Physico-chemical and microbiological Characterization of the pollution of the lagoon Ebrié and the evaluation of the sanitary risk. Doctorate of Medicine. University of Cocody, Abidjan, p. 134.
- Koné B, Doumbia M, Sy I, Dongo K, Agbo-Houenou Y, Houenou PV, Fayomi B, Bonfoh B, Tanner M, Cissé G (2014). Study of diarrheas in outer-urban environment in Abidjan by the approach eco health. *J. Vert.* p. 19.
- Koné B (2008 ). Lagoon pollution, sanitary and environmental risks in three outer-urban villages of the municipality of Yopougon (Abidjan, Ivory Coast). Doctoral thesis, University of Abobo-Adjamé. Abidjan. p. 201.
- Kouadio AS, Cissé G, Obrist B, Wyss K, Zinsstag J, Yao YJ, Tanner M (2006 ). Economic Burden of the malaria on the households deprived of districts disadvantage of Abidjan. *J. Vert.* 3 (3).
- Matubi EM, Bukaka E, Luemba TB, Situakibanza H, Sangaré I, Mesia G, Dieudonné M , Maniania NK, Akikwa CN, Kanza BJP, Tamfum MJJ , Sudi JNB (2015). Determination of Anopheles bioecological and entomological parameters Gambiae sl in the transmission of malaria in Bandundu-ville, Democratic Republic of Congo. *Pan Afr. Med. J.* 22:108-108.
- NPFM (2003 ). National Program of Fight against the Malaria. Annual reports of activities 2001, 2002, 2003. Technical document 27p. (Sy, on 2014).
- Sy I, Keita M, Traoré D, Koné B, Bâ K, Wedadi OB, Fayomi B, Bonfoh B, Tanner M, Cissé G (2014). Water, hygiene, sanitation and health in the precarious districts in Nouakchott (Mauritania): contribution to the approach eco health to Hay Saken. *J. Vert.* p. 19.
- Tuo P (2010). Purification and management of the environment in the municipality of Adjamé: the case of Williamsville (Abidjan-official list of Ivory). Institute of Geography National Tropicale-university of Abidjan-Cocody - Memory of Geography Option: environment and Health. p.132.
- Tona L, Cimanga RK, Mesia K, Musuamba CT, Bruyne TD, Apers S, Hernans N, Van-Miert S, Pieters L, Totte J, Vlietinck AJ (2004). In vitro antiplasmodial activity of extracts and fractions from seven medicinal plants used in the Democratic Republic of Congo. *J. Ethnoph.* 93: 27-32.
- World Health Organization (WHO) (2010). The dark side of cities: bring to light and overcome the disparities of health in urban zones. Report (WHO), Geneva, p. 145.
- World Health Organization (WHO) (1991). Manuel of epidemiology for the management of the health at the level of the district. Ed. Jouve. p.186.
- World Health Organization (WHO) (1985). Manuel of the development of the environment with the aim of its control of mosquito, World Health Organization, Genève; p.291.
- Yapo TW, Mambo V, Yapo OB, Seka MA, Houenou PV (2013). Effects of poor sanitation on public health: Case of Yopougon town (Abidjan). *Afr. J. E. Sc. Tech.* 7(3), pp. 87-92.
- Yapo TW (2014). Risk assessment toilets dregs in the defects of purification: case of three municipalities of Abidjan (Abobo, Treichville, Yopougon). Doctoral thesis, University of Abobo-Adjamé. Abidjan, p.160.