

# Morbidity and Mortality in Adolescents at the University Hospital of Brazzaville

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## Abstract

**Introduction:** Adolescent morbidity and mortality is a health concern. **Objective:** To determine morbidity, identify the causes of morbi-mortality and the factors associated with adolescent mortality in Brazzaville. **Patients and Methods:** A retrospective, descriptive and analytical study was carried out at the Brazzaville Hospital and University Center between January 2015 and December 2016. Adolescents hospitalized in clinical services whose records were workable were included. The Epidemiological, clinical and evolutionary variables were analyzed. The statistical test used was the khi-two, the significance level set at 0.05. **Results:** In total, Out of 67,488 hospitalized patients, 2062 were adolescents: 3% including 891 (43.2%) boys and 1171 (56.8%) girls mean age  $14.8 \pm 2.92$  years, seen in average 9.38 days after the onset of symptoms. Childbirth 415 (20.1%), malaria 309 cases (14.9%), major sickle cell crisis 223 (10.8%) and traumatic injuries 166 cases (8.05%) are the main causes of morbidity. One death was recorded in  $n = 193$  (9.4%), of which  $n = 104$  (5.0%) in the first 48. Tumors, malaria and status epilepticus are the leading causes of death. The female sex, the age between 15 and 19 years, the young age of the father, the higher level of education of the adolescent and the low socio-economic level of the parents are associated with the death. **Conclusion:** Adolescent morbidity is worrying and mortality is significant. It is important that policies on this issue be developed with an emphasis on the main causes of morbi-mortality, including malaria control and sex education.

## Keywords

Adolescents, Morbidity, Mortality, Brazzaville University Hospital

## 1. Introduction

Adolescence, the period of life from 10 to 19 years, is a journey from childhood to adulthood [1]. It is a period of transition marked by progressive physical, sexual, psychological and social maturation as well as by the acquisition of autonomy. A set of events that make the child an adult [1] [2]. The number of adolescents is estimated at 1.2 billion, or one-fifth of the world's population, four out of five of whom live in developing countries by the World Health Organization (WHO) [1] [3]. About 1.2 million adolescents have died worldwide, two-thirds of them in the regions of Africa and Southeast Asia, making adolescent health a major public health concern [3] [4]. Among the causes of death, road accidents are the first and, the other so-called secondary causes, are attributable to respiratory tract infections, suicide, diarrhoeal diseases and drowning [3]. In developed countries, suicide attempts, traffic accidents, AIDS, and the use of toxics are the main causes of hospitalizations [5]-[11] and road accidents, suicides and cancers are the leading causes of death [12] [13] [14] [15] [16]. In Africa, a continent where adolescent health needs are poorly defined [17], in addition to the causes of the disease, infectious diseases and childbirth are the main causes of morbi-mortality [3] [18] [19] [20] [21]. Also, in order to lay the foundations for a constructive transition to adulthood, various resolutions have been adopted by WHO [22]. And, to guide programmatic actions for adolescent health, the WHO World Assembly has chosen to promote five areas designated "HELPS" [22]. The aim of this study was to contribute to the improvement of adolescent health and to determine the socio-demographic aspects of the adolescent hospitalized at the Brazzaville Hospital and University Centre (CHUB), to identify the causes of morbidity and mortality as well as the factors associated with death.

## 2. Patients and Methods

We reviewed the files of patients hospitalized between January 2015 and December 2016 in the medical and surgical departments of the CHU-B and selected those of adolescents, who constituted the target population of the study. Teenagers whose files were actionable were included. Those whose files were not workable were not included. This was an exhaustive sampling. The study variables were: age, sex, place of residence, provenance, level of education, hospitalization, consultation time, adolescent education level and level of parent education, reason for hospitalization, nutritional status; the cause of hospitalization, length of hospitalization, evolutionary profile and cause of death.

### Statistical Analysis

The data analysis was done using SPSS 20 software. Percentages, averages and standard deviations were calculated. The statistical influence between two variables was assessed by Pearson's khi-two test with a meaning threshold of less than 0.05.

Confidentiality was respected and a favorable opinion from the ethics committee obtained.

### 3. Results

#### 3.1. Descriptive Study

##### 3.1.1. Characteristics of the Study Population

Out of 67488 patients hospitalized during the study period, there were 2062 adolescents: 3% including 891 (43.2%) boys and 1171 (56.8%) girls, *i.e.* a sex ratio of 0.76. The mean age was  $14.82 \pm 2.92$  extreme years (10 and 19 years): it was 14 years for boys versus 15 years for girls. They were between 10 and 14 years old  $n = 1162$  (56.40%) of which  $n = 498$  (24.2%) boys and  $n = 0.402$  (19.5%) between the age of 15 and 19 (43.60%) of which  $n = 0.393$  (19%) boys and  $n = 769$  (37.3%) girls. They came from home without prior recourse to a health center  $n = 1854$  (89.9%); from a Level II hospital  $n = 0.120$  (5.8%); from a medical practice  $n = 27$  (1.3%); from a clinic  $n = 16$  (0.8%) and another locality in Congo  $n = 0.45$  (2.2%). They were in school  $n = 1891$  (91.7%) Secondary  $n = 1326$  (64.3%), Primary  $n = 562$  (27.2%) and at the university  $n = 3$  (0.2%). One hundred and seventy-one adolescents were out of school  $n = 171$  (8.3%). The reception services were pediatrics  $n = 885$  (42.9%), obstetric gynecology  $n = 448$  (21.7%), surgery  $n = 430$  (14.5%) medicine  $n = 299$  (14.5%).

The average consultation time was 9.38 extreme days (1 and 180 days). This period ranged from one to two days  $n = 1581$  (70%), three and seven days  $n = 312$  (15.10%), seven and 14 days  $n = 60$  (2.9%) and plus 15 days  $n = 109$  (5.3%).

The reason for consultation varied according to the pathology responsible was fever  $n = 0.489$  (23.7%), low-pelvic pain  $n = 390$  (18.9%), functional impotence  $n = 113$  (5.5%), convulsive seizure  $n = 98$  (4.98%), pallor  $n = 94$  (4.6%), cough  $n = 87$  (4.2%), consciousness disorder  $n = 78$  (3.8%), vomiting  $n = 69$  (3.5%), abdominal pain  $n = 67$  (3.3%), asthenia  $n = 47$  (2.3%), headache  $n = 47$  (2.3%), genital bleeding  $n = 42$  (2.0%), otalgia and joint pain  $n = 40$  (1.9%) everyone, abdominal bloating  $n = 35$  (1.7%), ingestion of toxics  $n = 35$  (1.7%), convulsive disease  $n = 34$  (1.7%), diarrhea  $n = 28$  (1.4%), anemia  $n = 21$  (1.6%), Vulvar discharge  $n = 16$  (0.8%), a burn  $n = 13$  (0.6%), psychomotor agitation  $n = 9$  (0.4%), traumatic wound and hemoptysis  $n = 7$  (0.34%) each, hematuria  $n = 6$  (0.29%), hematemesis, jaundice, coca cola urine and neck pain three cases each (0.2%) and a case of epistaxis.

Teenagers were eutrophic  $n = 1904$  (92.33%), emaciated  $n = 106$  (5.14%), severely emaciated  $n = 44$  (2.15%) and overweight  $n = 8$  (0.38%).

Causes of hospitalization are recorded in **Table 1**.

##### 3.1.2. On the Nosological Level

The Infectious Causes  $n = 452$  (21.9%) were malaria 309 (68.4%) of which 152 (49.19%) simple form and 157 (50.81%) severe form, tuberculosis  $n = 38$  (8.4%), sepsis  $n = 29$  (6.4%), encephalitis  $n = 12$  (2.7%), tetanus, gastroenteritis and meningitis  $n = 11$  (2.4%) each HIV infection  $n = 9$  (1.9%), erysipelas  $n = 7$  (1.6%), meningoenzephalitis  $n = 6$  (1.3%). The Other pathologies were measles, hepatitis and chickenpox  $n = 8$  (1.8%) and a case of trypanosomiasis.

**Table 1.** Causes of hospitalizations.

Causes	Cases	
	N	%
Infectious	452	21.9
Gyneco-obstetrics	448	21.7
Diseases of the blood and blood-forming organs	228	11.1
Traumatic	166	8.1
Respiratory	138	6.7
Digestive	118	5.7
Uro-nephrologic	105	5.1
Neurologic	75	3.6
Psychiatric	75	3.6
Tumor	63	3.1
ENT	53	2.6
Endocrine, nutritional and metabolic	51	2.5
Osteoarticular	51	2.5
Dermatological	20	1.0
Cardiovascular	19	0.9
Total	2062	100

Gyneco-obstetric causes were: n = 415 (92.63%), vaginal delivery n = 303 (73%) and n = 114 (27%) high-births; hematological causes n = 228 (11.1%) major sickle cell disease n = 223 (97.8%) and medullary aplasia n = 5 (2.19%); accidental causes n = 166, were noted in 112 boys (67.46%) and 54 girls (32.53 per cent), they were the result of a road accident n = 136 (81.92 per cent) and sports n = 30 (18.07%) inducing a fracture n = 109 (65.66%), a head injury n = 27 (16.27%), a burn n = 13 (7.83%) and a wound n = 7 (4.22%); osteoarticular causes n = 51 (2.5%): arthritis n = 29 (56.86%) and acute osteomyelitis n = 22 (43.13%); respiratory causes n = 138 (6.7%): acute respiratory infection n = 124 (89.9%), asthma exacerbation n = 13 (9.4%) and a case of respiratory failure; digestive causes n = 118 (5.7%): surgical n = 107 (90.7%) n = 11 (9.3%); uro-nephrological causes n = 105 (5.1%): urinary tract infection n = 53 (50.5%), nephrotic syndrome n = 15 (14.3%), inguino-scrotal hernia n = 14 (13.3%), kidney failure n = 12 (11.4%), hydrocele n = 7 (6.8%) and acute glomerulonephritis n = 4 (3.8%); neurological causes n = 75 (3.6%): epilepsy n = 66 (88.0%), cerebral abscess n = 5 (6.7%) stroke n = 0.4 (5.3%); psychiatric causes n = 75 (3.6%); tumor causes n = 63 (3.1%): nephroblastoma n = 18 (28.6%), leukemia n = 10 (15.9%), brain tumors n = 10 (15.9%), Hodgkin lymphoma n = 9 (14.3%), retinoblastoma n = 8 (12.7%), primary liver cancer n = 4 (6.3%), osteosarcoma n = 3 (4.7%) and a case of neuroblastoma; otolaryngological causes n = 53 (2.6%): acute otitis of otitis n = 40 (75.47%), mastoiditis n = 10 (18.86%) and a tympanic perforation n = 3 (5.66%); endocrine, nutritional and metabolic causes n = 51 (2.5%); dermatolog-

ical causes n = 20 (1.0%): cellulite n = 14 (70%), phlegmon n = 5 (25%) and a case of Lyell syndrome; cardiovascular causes n = 19 (0.9%): heart failure n = 9 (47.4%), pericarditis n = 4 (21.1%), arterial thrombosis n = 3 (15.8%), high blood pressure n = 2 (10.5%) and a case of valvulopathy.

### 3.1.3. Evolution

The average length of hospitalization was 6.96 days, extreme (1 and 365 days). The trend was favorable n = 1881 (91.2%), an exit against medical advice n = 30 (1.5%) and two health transfers. One death was recorded n = 193 (9.4%), of which n = 104 (5.0%) in the first 48 hours. The main causes of death are recorded in **Table 2**.

**Table 2.** Causes of death and case fatality.

Causes	Death	Survival	Lethality
	N (%)	N (%)	(%)
Tumor	27 (13.98)	63	42.86
Severe malaria	24 (12.43)	157	15.28
Epilepsy	18 (9.32)	66	27.27
Bacterial lung disease	11 (5.69)	81	13.58
Anemia	6 (3.10)	64	9.37
Medullary aplasia	5 (2.07)	5	100
Encephalitis	4 (2.07)	12	33.33
Cerebral abscess	4 (2.07)	5	80.00
Nephrotic syndrome	4 (2.07)	15	26.66
Tuberculosis	4 (2.07)	38	10.52
Sepsis	3 (1.55)	29	10.34
Tetanus	3 (1.55)	11	27.27
HIV	3 (1.55)	9	33.33
Renal failure	3 (1.55)	12	25.00
Lower limb fracture	2 (1.03)	84	2.38
Deep vein thrombosis	2 (1.03)	3	66.66
Burns	2 (1.03)	13	15.38
Heart failure	2 (1.03)	9	22.22
gastrointestinal hemorrhage	2 (1.03)	5	40.00
Cholecystitis	2 (1.03)	15	13.33
Vaso-occlusive crisis	2 (1.03)	121	1.65
Stroke	2 (1.03)	3	66.66
Meningitis	2 (1.03)	11	18.18
Others*	56 (29.01)	1038	5.39
Total	193	1869	10.32

\*n = 1. Lyell syndrome, cellulitis, hypertension, appendicitis, peritonitis, intoxication, undernutrition, diabetes, respiratory failure, head trauma, digestive hemorrhage, upper limb fracture.

### 3.2. Analytical Study

Factors associated with morbidity were the female sex, the 10 - 14 age groups, and the adolescent's secondary education level. Those associated with the risk of death were the female sex, the age between 15 and 19 years, the young age of the father (<30 years), the higher level of education of the adolescent and the low socio-economic level of the parents.

**Table 3** shows determinants of adolescent mortality at the CHUB.

**Table 3.** Shows the determinants of adolescent mortality at the University Hospital of Brazzaville.

Determinants	Clinical evolution					OR (IC à 95%)	p-value
	Total N = 2062	healed N = 1869		Death N = 193			
		n	%	n	%		
Sex (of the adolescent)							
male	891	821	92.14	70	7.86	1.37 [1.01 - 1.87]	0.04
female	1171	1048	89.50	123	10.50	1	
Age (year-old) of the adolescent							
10 - 14	1162	1097	94.41	65	5.59	1	0.000
15 - 19	900	772	85.78	128	14.22	2.79 [2.04 - 3.82]	
Education							
Elementary school	224	217	96.87	7	3.13	3.49 [1.6 - 7.5]	0.0006
Secondary	898	886	98.66	12	1.34	13.50 [7.5 - 24.5]	0.0000
High education	315	245	77.77	70	22.22	0.26 [0.19 - 0.36]	0.0000
Unschoolled	625	521	83.36	104	16.64	0.33 [0.24 - 0.44]	0.0000
Age (year-old) of mothers							
11 - 20	224	42	18.75	182	81.25	0.001 [0.0007 - 0.002]	0.00000
21 - 30	896	895	99.88	1	0.12	17.4 [24.6 - 26.1]	0.000
31 - 40	936	930	99.36	6	0.64	30.8 [13.6 - 69.9]	0.0000
41 - 50	4	1	25	3	75	0.03 [0.003 - 0.32]	0.0000
51 and higher	2	1	50	1	50	0.10 [0.06 - 1.6]	0.04
Education of mothers							
Elementary school	219	217	99.09	2	0.91	12.5 [3.0 - 50.8]	0.0006
Secondary	890	886	99.55	4	0.45	42.5 [15.7 - 115.1]	0.0000
Higher education	247	245	99.19	2	0.81	14.4 [3.5 - 58.40]	0.0000
Unschoolled	706	521	73.80	185	26.20	0.01 [0.008 - 0.03]	0.0000
Socio-economic level							
Low	1940	1755	90.46	185	9.53	1	0.000
Medium	118	111	94.07	7	5.93	135.1 [64.9 - 281.2]	
High	4	3	75	1	25		
Time to admission (days)							
1 - 7	1893	1718	90.76	15	9.24	1	
8 to ≥14	169	151	89.35	18	10.65	1.17 [0.7 - 1.9]	0.54

## 4. Discussion

### 4.1. Methodology Analysis

In order to determine the adolescent's hospital morbidity, identify the causes of hospitalization and deaths, and identify factors associated with adolescent mortality in Brazzaville, we reviewed the hospital records of the CHUB between January 2015 and December 2016. The benefits of this study are the completion of this study in Congo's largest hospital, the sample size and duration. But its retrospective nature is undoubtedly a source of bias.

### 4.2. Epidemiological Aspects

The hospital morbidity of adolescents is 3.4%, frequency close to that reported by Souour in Tunisia 5% [5]. Higher frequencies are reported by Timité-Konan in Abidjan: 11.3 [21], Djadou: 9.7 [6] and Balaka in Togo [18]: 8.85%. The study framework and population type explain the disparity in these frequencies. Hospitalized teens have an average age of 14.8 years, those aged 15 to 19 (56.4%) being most represented, as reported by Djadou [6] where the average age is 13 years and 15 years respectively and the frequency peak between 15 and 19 years (72.8%) and that of Souour [5], Benallal [23] and Okoko [24] [25] respectively 15.1 years; 14.4 years; 14 years old; 13.5 years and 13.4 years of average age.

A female predominance is reported by some as in our study [6] [16] [19] and male by others [26] [27]. According to African authors, the high number of early pregnancies explains the female predominance, and in developed countries male predominance is due to road-related injuries [28].

The most sought-after services are paediatrics (42.92%), obstetric gynaecology (21.73%) and paediatric surgery (9.45%) as Nzamé reports in Gabon [21]. In Ivory Coast [20], the services of gynaecology, paediatric surgery and paediatrics are in descending order and, in Tunisia, the services of paediatrics and hematology [5].

### 4.3. Clinical Aspects

The main morbid entities at University Hospital of Brazzaville are infectious diseases, obstetrical pathologies and childbirth, blood diseases and traumatic injuries. The causes of morbidity vary from one study to another. Timité-Konan [20] notes that infectious diseases are the leading cause of hospitalization among adolescents aged 10 to 14 and deliveries and postpartum infections in those aged 15 to 19. This is also the case with the prevalence of infectious diseases and deliveries for Djadou [6]. Gynecological-obstetric and infectious pathologies for Nzame [22] and Balaka [18] and diseases of the genitourinary, endocrine, nutritional and infectious diseases for Souour [5].

In terms of infectious diseases, malaria is the leading cause of adolescent morbidity and mortality in Brazzaville and Abidjan [6] [29] [30] [31]. However, this is not the case in Lomé [18] and Libreville [20] where malaria is the second leading cause of hospitalizations for adolescents, which are the second leading

cause of obstetric gynaecology-obstetric pathologies [18] [20].

In terms of gynaecological and obstetrics, our study confirms African data that, childbirth is the leading cause of adolescent hospitalization in obstetric gynecology services [8] [20] [21]. The precocity of sexual intercourse, the lack of sex education and the lack of knowledge of contraceptive methods for some [32] and the low purchasing power of parents, the source of the girl's out-of-school education for others [6] are the source of the precocity of unwanted pregnancies.

Traumatic pathology is dominated by fractures, contusions, bruises and wounds, the main causes of hospitalizations of adolescents in surgical services [6] [20] [27]. These injuries are readily caused by a road accident and more in male adolescents due to hyperactivity [6] [20] [26] [27].

The frequency of voluntary poisoning, mental disorders and behaviour is higher in this study compared to the studies of the authors consulted [33] [34]. Beyond the difference in frequency, adolescence, a period characterized by an impulse irruption with an easy passage to action and a tendency to impulsiveness explains why attempts to suicides are more common. But their psychological vulnerability is largely related to environmental attitudes and reactions [25].

#### **4.4. Evolution**

A death was recorded in 9.4% of cases, of which 5.0% were reported in the first 48 hours in Brazzaville. In developing countries, as reported in Ghana and Togo, adolescents pay heavy prices for the disease, although at varying rates [18] [19] [21] [35] [36]. It was noted a relationship between the female sex, the age group of 10 to 14 years and the secondary education level of the adolescent and morbidity. And between the female sex, the age between 15 and 19 years, the young age of the father, the higher level of education of the adolescent and the low socio-economic level of the parents and mortality.

#### **5. Conclusion**

The adolescent hospitalized at the Brazzaville Hospital and University Center has high morbidity and mortality. The main morbid entities are infectious and parasitic diseases, pregnancies, sickle cell disease and traumatic injuries. And, tumors and infectious diseases including severe malaria, the main causes of death. The female sex, the high age of adolescents, the young age of the father, the adolescent's higher level of education and the low socio-economic level of the parents are associated with death.

#### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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