Prevalence and factors related to antibiotic prescription in Benin: A school-based study

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ABSTRACT

Rational use of antibiotics in poor-resource settings countries is challenging. In order to assess the factors related to antibiotic prescription, a cross sectional study was carried out in four school infirmaries from February to June 2008 in the district of Allada in Benin. For each patient, socio-demographic characteristics, symptoms motivating medical visits, diagnosis and therapeutic prescriptions were collected. A malaria rapid diagnostic test was used in case of fever. Data were entered and validated with Epidata® software, and analysed with STATA 11® software. One thousand six hundred and thirty medical visits occurred during the study period. Fever was reported by 57% of children. Malaria was the leading diagnosis (32%), followed by respiratory infection (17.5%). Antibiotic was prescribed to 40% of the children. Respiratory infection and skin disorders were positively related to antibiotic usage [OR = 59.5 (33.4–105.7); $P < 10^{-3}$ and OR = 6.4 (4.6–8.8); $P < 10^{-3}$ respectively]. Malaria [OR = 0.11 (0.03–0.11); $P < 10^{-3}$] and fever of unknown origin [OR = 0.05 (0.03–0.11); $P < 10^{-3}$] were negatively related to antibiotic usage. Further clinical surveys and trials aimed at rationalizing antibiotics usage in this area should focus on the management of acute respiratory illnesses.

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1. Introduction

In countries where malaria microscopic diagnosis is not available or reliable, the World Health Organization has recommended rapid diagnostic tests (RDT) for all patients with suspected malaria before treatment is started (World Health Organization, 2010). The aim of this policy is to encourage rational use of antimalarial treatment. However, several studies have shown that using RDT leads to an increase in antibiotic prescriptions (Bastiaens et al., 2011; D'Acremont et al., 2011). This finding reinforces the need to address the issue of rational use of antibiotics in low and middle income countries. Additionally, the reasons for this trend need to be further explored.

A first step in the understanding antibiotic usage in low and middle income countries is to describe their use in different care settings, and to define its determinants. Previously, data from four school infirmaries in Southern Benin were collected in order to study the consequences of antimalarial prescriptions. The

study was restricted to cases confirmed by parasitological analysis (Faucher et al., 2010a,b). On the occasion of the study, we had the opportunity to describe the antibiotic usage and to investigate its determinants in this Beninese site.

2. Methods

2.1. Study site and study population

A cross-sectional study was performed from February to June 2008. Full details of the survey have been described elsewhere (Faucher et al., 2010a,b). The study was conducted in the district of Allada, a semi-rural area located 50 km north of Cotonou, the economic capital of Benin. The district is made of 12 sub-districts, 84 villages with a total of 91,778 inhabitants. There are several ethnic groups living in the district of Allada, the most important being Aïzo, a local ethnic group. Malaria transmission is perennial and *P. falciparum* is the most common species. There are two high transmission peaks from April to July, and October to November. Transmission is low during the rest of the year. The study participants were recruited from four school infirmaries: Allomey, Centre, Dankoli, and Dogoudo. All children who attended at any of the four

school infirmaries on their own, or led by their parents/guardians between February and June 2008 were included.

2.2. Data collection

Each child was examined by a study nurse, who collected information on socio-demographic characteristics, symptoms motivating medical visits, diagnosis and drugs prescriptions. The temperature and the weight were measured with a tympanic thermometer and an electronic scale (SECA®, ±100 g), respectively. In the case of fever, malaria diagnostic was performed using a RDT (Paracheck®, Orchid Diagnostics) (Guthmann et al., 2002).

2.3. Outcome variable

The prescription of at least one antibiotic was our outcome variable.

2.4. Independent variables

The following variables were collected from each child: age, gender, weight, level of education, symptoms (fever defined by tympanic temperature at 37.8 °C or above, headache, digestive symptoms, respiratory symptoms, skin lesions and others reasons) and diagnosis (malaria, respiratory infection, enteric infection, cutaneous infection, fever of unknown origin and other diagnosis).

2.5. Statistical analysis

We first described the symptoms motivating medical visits, the diagnoses considered by the study nurses and the antibiotics prescription. Then, the association between our dependent variable (at least one antibiotic prescribed) and potentially related factors was tested by univariate logistic regression and, thereafter a multivariate logistic regression was performed. In order to meet this objective, we excluded children who had more than one diagnosis and received more than one antibiotic. Variables with P-values less than 0.20 in the univariate analysis were taken into account in the multivariate model. Statistical significance was set at a P-value below 0.05. Statistical analyses were performed with Stata, version 11.0 (StatCorp LP, College Station, TX).

2.6. Ethics

The study protocol was approved by the University of Abomey-Calavi institutional review board and the IRD Consultative Ethics Committee. Signed informed consent was obtained from each child or their parent/guardian before enrolment in the study.

3. Results

3.1. Children's characteristics

One thousand six hundred and thirty medical visits occurred during the study period. The percentage of missing data did not exceed 1% for the variables studied. The baseline characteristics of children are shown in Table 1. We compared the characteristics of participants for the four school infirmaries. Significant differences were found in characteristics such as age, gender, temperature, weight (data not shown). In multivariate analyse, adjustment on school infirmaries have been performed in order to take into account these differences.

Table 1
Characteristics of children presenting at school nursery.

Variables	$N = 1630$	%
Mean age (SD)	9.1 (2.7)	
Age		
≤5	111	6.9
6–10	1018	62.9
≥11	489	30.2
Mean weight (SD)	25.5 (9.0)	
Gender		
Female	764	46.9
Male	866	53.1
Grade[a]		
Year 1	399	24.5
Year 2	275	16.9
Year 3	260	16.0
Year 4	227	14.0
Year 5	197	12.1
Year 6	269	16.5
Schools		
Allomey	424	26.0
Centre	441	27.1
Dankoli	315	19.3
Dogoudo	450	27.6
Inclusions per month		
February	98	6.0
March	240	14.7
April	397	24.4
May	500	30.7
June	395	24.2

[a] Mean age in each grade from year 1 to year 6 was respectively: 6.4 (SD 1.5), 7.5 (SD 1.5), 8.9 (SD 1.5), 9.9 (SD 1.5), 11.1 (SD 1.4) and 12.5 (1.5).

3.2. Symptoms

The proportions of the most frequent symptoms are detailed in Table 2. Respiratory symptoms included odynophagia, rhinorrhea, fast breathing and cough. Abdominal symptoms included abdominal pain, diarrhoea, nausea and vomiting.

3.3. Diagnoses

One thousand three hundred eighty-three children had a single diagnosis (84.9%). Two and three diagnoses were identified in 188 (11.5%) and 2 (0.12%) children respectively. There was no diagnosis for 57 (3.5%) children. Proportions of the most frequent diagnoses are detailed in Table 3. Respiratory infection included sore throat, bronchitis and pneumonia. Skin disorders included mainly wounds and eruptions of putative infectious cause.

3.4. Antibiotic usage

At least one antibiotic was used in 643 children (39.4%). Among these children 628 (97.7%), 14 (2.2%) and 1(0.1%) received one, two, and three antibiotics respectively. Among the children who

Table 2
Description of the symptoms motivating medical visits.

Variables	$N = 1630$	%
Number of symptoms		
1	844	51.8
2	576	35.3
3	191	11.7
4	19	1.2
Fever	931	57.1
Digestive symptoms	439	26.9
Headache	430	26.4
Respiratory symptoms	396	24.3
Skin lesions	286	17.5
Others reasons	163	10.0