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Request for Antibiotics by Guardians for Children Aged 0 To 5: Analysis of Dispensation in Private Pharmacies in Commune I of BAMAKO

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Abstract

In Mali, antibiotics are used excessively and inappropriately, particularly when self-medicated in children. The aim of this study was to identify the causes likely to increase the request for antibiotics for self-medication. This was a descriptive, observational study conducted over a period of 3 months in 10 private pharmacies. Among 301 guardians who took part in our study, the majority of guardians (35.55%) had a superior level of instruction. Over 47% of the children were between 25 and 60 months old. Sellers dispensed 45.18% of antibiotics and 38.21% of antibiotics were dispensed following a request for self-medication. Fixed combination Amoxicillin-clavulanic acid, Amoxicillin and Flucloxacillin were dispensed with 21.05%, 12.28% and 10.82% respectively. Fathers requested more antibiotics without a prescription than mothers and difference was statistically significant ($p<0.05$). In addition, the relative risk was 1.24, which means that there is an association between children's self-medication with antibiotics and requests for antibiotics by parents. With regard to the level of instruction of the guardians, the relative risk was 1.1 for out-of-school guardians. Thus, there is an association between the parents' no schooling and the request for antibiotics for self-medication. The proportion of self-medication requests by superior instruction guardians (28.97%) was lower than that of primary instruction guardians (46.94%), and difference was statistically significant ($p < 0.05$). Relative risk (0.78) confirmed that being aged between 0 and 6 months is a protective factor against antibiotic self-medication. This study showed that self-medication in children is influenced by factors linked to the instruction levels of guardians, the trivialization of children's complaints. Being less than 6 months of age is a protective factor against children self-medication.

Keywords: Antibiotics; Self-Medication; Children; Factors Linked to Parents

Introduction

Antibiotics are used in the treatment of many infectious diseases. The term antibiotic is defined as: A chemical compound developed by a microorganism or produced by hemisynthesis or synthesis, whose therapeutic activity manifests it at very low doses in a specific way, by inhibiting certain vital processes with respect to susceptible microorganisms [1]. In recent decades, the incidence of antibiotic resistance has increased worldwide, especially

antibiotics used against bacteria that cause common infections in children [2].

In West African countries, the endemicity of respiratory infections, bacterial meningitis, diarrhea and other infectious diseases has increased the consumption of antibiotics for both symptomatic treatment and prophylaxis [3]. In these countries, the rational use of antibiotics must be encouraged in order to reverse the increasing of antibiotic resistance. However, they are used excessively and inappropriately throughout the world by self-medication. Several studies have shown that self-medication is one of the key factors in the emergence of bacterial resistance to antibiotics [4]. Moreover, surveys have shown that a lower socio-economic status and level of education are linked to a lack of knowledge about antibiotic use [5-7].

Mali is a country with a high rate of poverty and lack of schooling, self-medication with antibiotics is very common in all age categories, especially among children under 5 years [8]. Thus, the aim of this study was to identify the causes likely to increase the use of self-medication antibiotics in children aged 0-5 years and identify possible drug interactions.

Materials and Methods

The study took place in 10 private pharmacies in commune I of Bamako. A random sampling method was used to randomly pull 10 out of 47 private pharmacies with the same probability of being selected. The study was descriptive and observational, conducted over a 3-month period. The study focused on requests for antibiotics in private pharmacies and intended for children aged 0 to 5 years. Any antibiotic request following a prescription or by self-medication for a child from 0 to 5 years old whose guardian has presented himself and given his verbal consent has been included in this study. Anonymity and data confidentiality were guaranteed for the information collected during our study.

Data Analysis

The characteristics of the guardians and children and the demand for antibiotics by prescription or self-medication were compared using Fisher's exact test. The threshold for statistical significance was set at less than 5% ($p<0.05$). The analysis was carried out using Graph pad prism version 5.

Results

Sociodemographic Characteristics of the Children and Their Guardians

Of the 301 guardians who took part in our study, 139 (46.18%) were the children's fathers, and those with 1-3 children (45.51%) were in the majority. Guardians with a superior level of instruction represented 35.55%. The 25 to 60 months age group was the highest, with over 47%. The sex ratio was 1.1 in favor of males (Table 1).

Profile	Frequency	Percentage
Children		
Age		
0 to 6 months	57	18.94
7 to 24 months	102	33.89
25 to 60 months	142	47.18
Total	301	100
Sex		
Male	158	52.49
Female	143	47.51
Sex ratio Male/Female	1.1	
Guardians		
Guardians' relationship with the child		
Mother	127	42.19
Father	139	46.18
Brother/Sister	23	7.64
Uncle/Aunt	12	3.99
Total	301	100
Number of children in guardian's care		
1 to 3 children	137	45.51
4 to 6 children	108	35.88
More than 6 children	7	2.33
Unidentified	49	16.28
Total	301	100
Education level		
Superior	107	35.55
Out of school	81	26.91
Primary	49	16.28
Secondary	41	13.62
Koranic school	18	5.98
Unidentified	5	1.66
Total	301	100

Table 1: Socio-demographic characteristics of children and guardians.

Dispensing Quality, Dispensing Modalities and Motivations for Self-Medication

Antibiotics were mostly dispensed by sellers, in 45.18% of cases. During the study, 38.21% of cases of self-medication

were motivated more by the trivialization of the disease, lack of time and a financial problem in 28.70, 18.26 and 14.78% of cases respectively (Table 2).

Provider status	Frequency	Percentage
Sellers	136	45.18
Pharmacist	106	35.22
Pharmacy student	59	19.6
Total	301	100
Dispensation modalities		
Prescription	186	61.79
Self-medication	115	38.21
Total	301	100
Motivations for self-medication		
Trivialization of the disease	33	28.7
Lack of time	21	18.26
Financial problems	17	14.78
Easy access and trust in pharmacists	16	13.91
High cost of health centers	11	9.57
Lack of trust in health workers	11	9.57
Urgent cases	4	3.48
Similar case	2	1.74
Total	115	100

Table 2: Provider status, dispensation modalities and motivations for self-medication.

Antibiotics Dispensed and Drug Interaction

A total of 19 molecules from 9 families were dispensed. The beta-lactam family was the most widely dispensed (8 molecules), followed by macrolides (4 molecules) with 61.69% (n=211) and 16.08% (n=55) respectively. The three most dispensed molecules were Amoxicillin + clavulanic acid, Amoxicillin and Flucloxacillin, with frequencies of 72 (21.05%), 42 (12.28%) and 37 (10.82%) respectively. Furthermore, it appears that children aged 25 to 60 months received the greatest number of antibiotics, with a frequency of 157 (45.91%) of antibiotics dispensed. Moreover, antibiotics were dispensed in 6 pharmaceutical forms. The syrup form was the most dispensed with a frequency of 246 (71.93%), followed by the injectable form with 11.11% (Table 3).

Chemical families	Antibiotics	Children's age in months			Frequency	Percentage
		0 to 6	7 to 24	25 to 60		
Beta-lactams	Amoxicillin + clavulanic acid	10	22	40	72	21,05
	Amoxicillin	12	10	20	42	12,28
	Flucloxacillin	6	16	15	37	10,82
	Cefixime	6	10	16	32	9,36
	Ceftriaxone	3	6	9	18	5,26
	Cefalexin	0	6	1	7	2,05
	Cefadroxil	0	0	2	2	0,58
	Cefuroxime	0	1	0	1	0,29

Macrolides	Erythromycin	4	13	10	27	7,89
	Lincomycin	1	2	13	16	4,68
	Azithromycin	3	1	3	7	2,05
	Josamycin	2	3	0	5	1,46
Aminosides	Gentamycin	10	4	9	23	6,73
Sulfonamides	Cotrimoxazole	4	7	9	20	5,85
Imidazoles	Metronidazole	4	6	4	14	4,09
Cyclins	Tetracycline	5	3	1	9	2,63
Polypeptides	Polymixin B + Neomycin	0	2	3	5	1,46
Quinolones	Ofloxacin	0	0	1	1	0,29
Rifamycins	Rifamycin	2	1	1	4	1,17
Total					342	100
Pharmaceutical forms of antibiotics	Syrup				246	71,93
	Injectable				38	11,11
	Suspension				29	8,48
	Eye drops				14	4,09
	Pomade				9	2,63
	Drop				6	1,75
Total					342	100,00

Table 3: Antibiotics dispensed according to children's age, and their pharmaceutical forms.

17 synergistic interactions were identified, including 13 between beta-lactams and aminoglycosides, 4 between two beta-lactams. In addition, the dispensation of flucloxacillin and paracetamol was identified twice, with simultaneous administration likely to lead to an increased risk of metabolic acidosis (Figure 1).

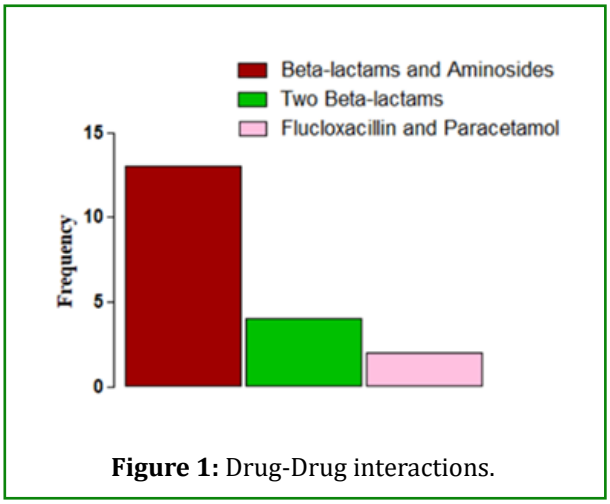

Figure 1: Drug-Drug interactions.

Association Between the Type of Antibiotic Request and the Guardian's Relationship with the Child, the Guardian's Level of Education and the Child's Age

A higher proportion of fathers (46.04%) requested antibiotics without a prescription than mothers (33.07%), the difference was statistically significant ($p<0.05$). In addition, the relative risk (RR) for the demand for antibiotics for self-medication by fathers and mothers was 1.24, therefore the association between self-medication of children with antibiotics and requests for antibiotics by direct parents exists (Table 4).

Characteristics	Total	Antibiotic Dispensation		RR‡ (95% CI)	*p* value
		Prescription	Self-medication		
Mother	127	85 (66.93)	42 (33.07)	Ref.	
Father	139	75 (53.96)	64 (46.04)	1.24 (1.02-1.51)	0.03*
Brother/Sister	23	17 (73.91)	6 (26.09)	0.91 (0.69-1.19)	0.63
Uncle/Aunt	12	9 (75)	3 (25)	0.89 (0.63-1.27)	0.75
Primary	49	26 (53.06)	23 (46.94)	Ref.	
Secondary	41	23 (56.10)	18 (43.90)	0.95 (0.65-1.38)	0.83
Superior	107	76 (71.03)	31 (28.97)	0.75 (0.56-1.00)	0.03*
Koranic school	18	11 (61.11)	7 (38.89)	0.87 (0.55-1.37)	0.59
Out of school	81	39 (48.15)	42 (51.85)	1.10 (0.79-1.56)	0.72
25 to 60 months	142	85 (59.86)	57 (40.14)	Ref	
7 to 24 months	102	54 (52.94)	48 (47.06)	1.22 (0.97-1.52)	0.08
0 to 6 months	57	47 (82.46)	10 (17.54)	0.78 (0.66-0.93)	0.02*

Table 4: Association between the type of antibiotic request and the guardian's relationship with the child, the guardian's level of education and the child's age.

With regard to the level of guardian, the relative risk was less than 1 when primary school level was taken as the reference, except for guardians who had not been to school (RR of 1.1). This implies that there is an association between out-of-school guardians and demand for antibiotics for self-medication. The proportion of requests for self-medication by guardians with a superior level (28.97%) was lower than that of guardians with a primary level (46.94%), and the difference was statistically significant ($p<0.05$) (Table 4).

When children were compared according to age group and type of antibiotic request, we observed a slightly lower proportion of antibiotic requests for self-medication for children aged 25 to 60 months (40.14%) than for children aged 7 to 24 months (47.06%) but no significant difference was observed between children in these two groups. Children aged 0 to 6 months showed a lower proportion (17.54%) of antibiotic demand for self-medication compared to children aged 25 to 60 months. The difference was statistically significant ($p<0.05$). The relative risk of 0.78 means that being between 0 and 6 months is a protective factor against the request for antibiotics for self-medication (Table 4).

Discussion

In order to identify how antibiotics are dispensed to children aged 0-5 years in private pharmacies in a defined population of Bamako, we analyzed data about prescription and self-medication requests. As access to antibiotics is not regulated in developing countries, overuse and bacterial resistance to antibiotics are frequently reported in these countries [9,10]. Among the 301 guardians requesting antibiotics for their children, 115 (38%) were requested antibiotics without a prescription. This result is lower than that of Ekambi, et al. who found 47% in Cameroon [4]. This difference could be explained by the fact that a large proportion of the Malian population is covered by mandatory health insurance. Self-medication was motivated by the trivialization of illness in 38.21% of cases. This reflects ignorance of the benefits of a medical consultation.

Drug sellers are less qualified than pharmacists. However, in "low-income countries", this scenario is coupled with the availability of prescription medicines over the counter [11]. Moreover, drug sellers have no formal training in pharmaceutical sciences [2]. In this study, 78.4% of antibiotics were dispensed by drug sellers. This confirms the weakness of the drug monitoring system, which has been reported to be very poor in developing countries. Moreover, dispensing medicines to patients is an act for which pharmacists are directly responsible. This confirms the weakness of the drug monitoring system, which has been reported to be very poor in developing countries. Moreover, dispensing medicines to patients is an act for which pharmacists are directly responsible [7,12]. Consequently, the inappropriate dispensing of medicines and self-medication are key factors in promoting the irrational use of medicines [13].

In this study, beta-lactams and macrolides were dispensed the most, with 61.69% (n=211) and 16.08% (n=55) of dispensations respectively. The results of other authors confirm the predominance of beta-lactam antibiotics in antibiotic therapy [8,14,15]. Out of the 19 drugs dispensed, Amoxicillin and clavulanic acid ranked first, followed by

Amoxicillin and Flucloxacillin (Table 3). The predominance of an antibiotic depends on the diversity of infections, which vary from one environment to another, and on the sensitivity of the strains constantly encountered [16].

13 synergistic interactions between beta-lactams and aminoglycosides have been identified. This association has been described for both Gram-positive and Gram-negative bacteria. When molecules from these two families are associated, the Beta-lactam, by inhibiting wall synthesis, facilitates the entry of the aminoglycoside, resulting in rapid bactericidal action [17-19]. Moreover, 4 synergistic interactions between two beta-lactams were identified. In fact, this interaction results from the action of the two beta-lactams on the various penicillin-binding proteins (PBPs). Authors have obtained 50% saturation of PBPs 4 and 5 with amoxicillin at concentrations of 0.12 and 0.5µg/ml respectively, whereas cefotaxime resulted in 50% saturation of PBPs 2 and 3 at concentrations of less than 1µg/ml [20]. In addition, the dispensation of flucloxacillin and paracetamol was identified twice (Figure 1). Previous studies have mentioned that the simultaneous administration of flucloxacillin and paracetamol is likely to lead to an increased risk of severe metabolic acidosis (with 5-oxoprolinuria). Paracetamol is an over-the-counter product that is always available to parents. Every time flucloxacillin, a narrow-spectrum beta-lactam used to treat various infections, is dispensed. The pharmacist must inform the guardian of this adverse event, which could result from this combination, which is not uncommon [21-23].

Several studies have pointed out that none or few of the parents' characteristics are significantly related to antibiotic self-medication. Nevertheless, some articles have found a significant association between parental characteristics and antibiotic self-medication. In this study, the main characteristics of the guardians, such as the relationship with the child, the level of instruction and the age of the children, were examined. A higher proportion of fathers (46.04%) than mothers (33.07%) requested antibiotics for self-medication from private pharmacies, and the difference was statistically significant ($p < 0.05$). This corroborates the results of other studies which also revealed that the risk of children self-medicating with antibiotics was higher among fathers than mothers [24-26]. In contrast, the proportion of parents who requested antibiotics for self-medication was higher than in a Saudi study where Al-Ayed et al. found a prevalence of 69% of parents buying antibiotics for their children without a prescription [27]. This difference could be due to the trivialization of children's complaints and poverty. The proportion of requests for self-medication by guardians with a higher level of instruction was lower than that of guardians with a primary level of instruction, and the difference was statistically significant ($p<0.05$) (Table 4). This confirms the result observed in a Jordanian study where parents who attended university had a reduced risk of antibiotic self-medication [24].

Children aged 0 to 6 months had a lower proportion of self-medication antibiotic requests by parents compared with children aged 25 to 60 months, and the difference was statistically significant ($p < 0.05$). The relative risk of 0.78 shows that being aged between 0 and 6 months is a protective factor against self-medication with antibiotics. The relative risk was 1.22 (0.97 - 1.52) for children aged 7 to 24 months (Table 4). Other authors have found a similar relationship between children's age and self-medication with antibiotics [5,26].

Conclusion

In conclusion, the demand for children's antibiotics for self-medication in private pharmacies is a recurrent phenomenon in low-income countries. This study showed that self-medication in children is influenced by factors linked to the instruction levels of guardians, the request for antibiotics by parents, the trivialization of children's complaints and poverty. Being less than 6 months of age is a protective factor against children self-medication. Finally, emphasizing the regulation of antibiotic dispensation could act as a brake on self-medication.

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