



Association between the delay in seeking medical attention and the severity of fever in children entering the emergency service.

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Abstract

Introduction: Delay in seeking medical attention (DSMA) is defined as a time greater than 48 hours before consulting a professional that can influence the severity of pediatric illnesses.

Methods: In this prospective cohort study, structured interviews were conducted on caretakers of children who came into the Baca Ortiz Hospital emergency room with a fever. The patient health status was verified five days later through a telephone call. Variables included demographic, time of care, and condition severity. Chi-square test and relative risk (RR) were used to find the relationship between these variables.

Results: 304 patients were included in this study, 41.1% presented DSMA. The leading cause of DSMA was due to the administration of medication without a prescription in 48% and the lack of detection of alarm signs in 26.4%. Patients with DSMA had a higher risk of requiring hospitalization RR 1.88; (95% CI 1.53-2.13), intensive care RR 2.86; (95% CI 1.00 - 8.17), presenting a severe bacterial infection RR 2.36; (95% CI 1.81 - 3.07), systemic inflammatory response syndrome RR 2.47; (95% CI 1.80 - 3.38), hospitalization on the fifth day after evaluation RR 2.63; (95% CI 1.94 - 3.57), and remaining hospitalized for more than five days RR 1.46; (95% CI 1.15 - 1.85).

Conclusions: DSMA significantly influences the severity of children with fevers, and the administration of medication without a medical prescription was determined to be the leading cause.

Keywords:

International Classification of Primary Care; Referral and Consultation; Fever; Procastination; Medical Care; Bacterial Infections.

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Introduction

Fever is one of the leading causes of medical consultations in pediatrics and represents 20-70% of healthcare requirements involving private pediatric consultations, family doctors, or hospital emergency services [1, 2]. A fever is defined as a core body temperature above the upper limit of the normal human body temperature, i.e. $\geq 38.3^{\circ}\text{C}$, and is independent of the cause [3]. A fever can manifest from severe infections such as urinary tract infection, meningitis, pneumonia, sepsis, or osteomyelitis and is a significant cause of morbidity and mortality in children amongst developing countries. The probability of contracting severe bacterial infections is 7%. Its early recognition is essential for timely treatment and a favorable outcome; in meningococcal disease, for example, its initial presentation could be unusual, and a delayed diagnosis increases the mortality up to 4.5 times [4].

Children who are sick can develop serious pathologies at an early stage which is not evident, especially for the parents, and can lead to a rapid deterioration in health. Any delay in medical care can lead to severe disease complications that require hospitalization, the need for pediatric intensive care, or even death [5].

There are cultural, geographical, and economic reasons that delay medical attention, and among these, one of the leading causes is the administration of drugs without a medical prescription [6]. Antipyretics are the primary medications sold freely in the pharmacy and are a strong reason why caregivers do not seek medical attention. The administration of drugs without a prescription generates several health risks, including the alteration of the course, masking of the disease, adverse effects, intoxication, drug interactions, increased drug resistance (especially antibiotics), and increased dependency on this form of assistance. The reasons for this practice include insufficient education, lack of financial resources to purchase certain medications or go to a doctor, doubts about the diagnosis, and the promotion and sale of drugs by the pharmaceutical industry in an inappropriate or unethical way [7]. Therefore, the present study aimed to determine if a delay in seeking medical attention (DSMA) was associated with the level of health severity in children with fevers who attend the emergency services.

Population and methods

Study design

This prospective, observational cohort study was carried out in the Emergency Service of the Baca Ortiz Children's Hospital (Ministry of Public Health, Quito-Ecuador). The study period was from November 1, 2018, until February 28, 2019. The follow-up of the results concluded five days after the first consultation with the patient and their parents. The final results were compiled on March 6, 2019.

Participants

Patients included in this study were between two months until 14 years old who attended the institution's emergency service with a temperature equal to or greater than 38°C . Patients were excluded if they required invasive devices to treat chronic conditions, had congenital heart disease, were immunodeficient, or had cancer.

Variables

The demographic variables recorded in this study were: age, sex, type of caregiver, caregiver ethnicity, level of education of the caregiver (no education, primary, secondary and higher), type of family composition, income family level, number of family members, the maximum temperature recorded, accompanying symptoms, determining diagnoses, presence of severe bacterial infection, number of days of fever before medical consultation, cause in the delay of medical attention, and the patient condition on the day of attendance and the fifth day.

Data acquisition

Demographic information was acquired by providing the guardians/parent(s) a questionnaire to fill out, which was the same form provided to general admission patients of the same emergency department. The clinical results were followed until a definitive diagnosis was announced. The PedCAST Triage scale was used to determine the severity of each patient. For patients discharged without requiring hospitalization, telephone monitoring was used on the fifth day using the contact details registered in the emergency information sheet.

Medical records which contained incompletely filled out or not completed by the fifth day of the evaluation were excluded. Care was taken to control the entry of incomplete cases and information continuity until the fifth day of care. Further, all laboratory results required for each patient's diagnosis were checked before entering our data analysis.

Study size

The patients who were included in this study were based on probabilistic selection. The sampling was based on the number of cases of children with fever who attended the emergency service (6,796 cases). The sample size estimated in the Epidat 3.1 program [Dirección Xeral de Innovación e Xestión da Saúde Pública de la Consellería de Sanidade (Xunta de Galicia)] was 300 patients, with a confidence level of 95% and a 5% prevalence of children with severe bacterial infections. The data precision was 3%.

Statistical Analysis

The quantitative variables in the scale are represented as means with standard deviation (SD). Nominal quantitative variables are presented with frequencies and percentages. Confidence intervals for proportions are determined for all main variables.

Data for the analysis was divided into two groups: patients with a Delay in Seeking Medical Attention (DSMA) and patients who came without DSMA. Both groups were treated as dependent variables. A chi-squared test and the relative risk (represented with a 95% CI) were used to determine group associations. The IBM® SPSS® Statistics version 21 software package was used for data analysis (Armonk, NY).

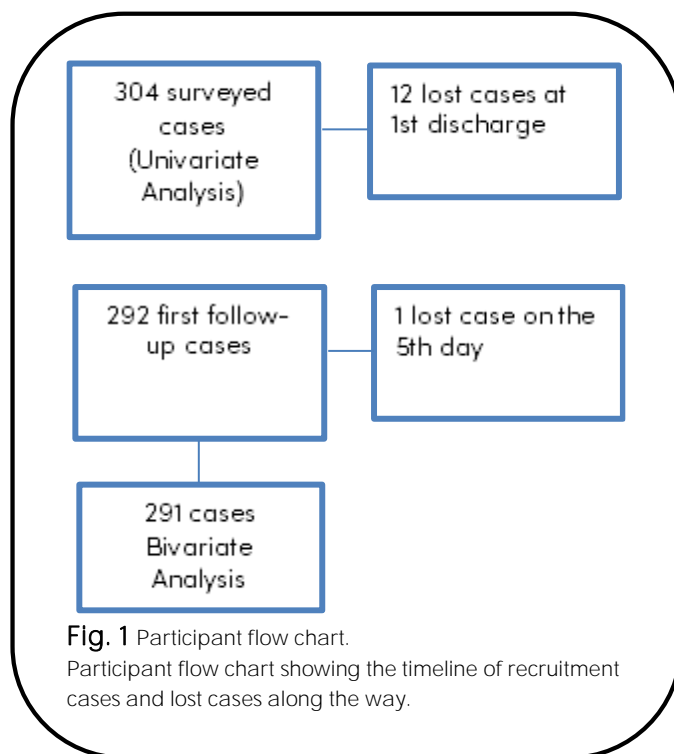
Results

Number of participants

The number of participants in the 3 stages of the study is detailed in Figure 1.

Univariate Analysis

This study included 304 patients (Figure 1), of which 154 were men (50.7%) and 150 were female (49.3%). Patients were aged between two months to 14 years, 11 months and 29 days old, with a mean age of 2.55 years, and an interquartile range of 3 years. The highest proportion of patients, 30.6%, were in the age



group of infants, classified as under one year of age. The infant group was found to have a median of 6 months of age. We identified that 238 (78%) patients presented completed immunizations required for their period. Only 27 (9%) patients showed some comorbidity.

Caregivers were aged between 15 and 74 years with an average of 32.3 years. The mother was the main caregiver in 78% of the cases (Table 1). Overall, there were 291 (95.7%) female and 13 (4.3%) male caregivers. The predominant ethnicity of the caregivers identified in this study was 92.1% hispanics.

The caregivers' level of schooling was 2% no education, 25% primary, 50% secondary and 23% higher. The patients lived mainly in a nuclear family or a single parent in a family of 3 to 5 people (Table 1). When referring to their income level, 147 (48%) families of the patients had a basic income salary, 94 (31%) reported living with less than a basic wage, and only 63 (21%) families lived with more than a basic salary. Most families lived in urban areas (237 families, 78%) and 67 (22%) families lived in rural areas.

Symptoms of patient illness

The temperature range of 38 to 38.9 ° C occurred in 57% of the cases, the temperature range of 39 to

39.9°C occurred in 32% of the cases, and the range of 40°C or more occurred in 11% of the cases. Of all the patients, 73.4% presented with respiratory symptoms, and 64.1% did not have symptoms of a systemic inflammatory response. Consequently, of the highest frequency of respiratory symptoms among the studied patients, 75.8% presented with some respiratory pathology, including pneumonia, and was the most diagnosed pathology in this study. Severe bacterial infections occurred in 132 (43.4%) cases (Table 2).

Table 1 Type of caregiver of the children in the study.

	Frequency n=304	Percentage	Cumulative percentage
Type of caregiver			
Mother	237	78	78
Grandparent	40	13.2	91.2
Other	15	4.9	96.1
Father	12	3.9	100
Family typology			
Nuclear	203	66.8	66.8
Single parent	86	28.3	95.1
Simple assembled family (SAF)	11	3.6	98.7
Complex assembled family (CAF)	2	0.7	99.3
Other	2	0.7	100
Number of members in the family			
3-5 people		81.0	
2 people		13%	
6 people		6%	

SAF: Family with a member of the couple who has children from a previous relationship. CAF: Family with both members of the couple who have children from a previous relationship.

Characteristics of delay in seeking medical attention (DSMA) of children

DSMA was present in 125 (41.1%) children admitted in this study, versus 179 (58.9%) who attended without DSMA. The number of days that elapsed from the onset of fever to the doctor's visit was a mean of 2.44 ±1.24 days (mode of 2 and a range of 6 days). The occurrence of DSMA was due to the inability to either detect the key alarm signs of fever in 33 (26.4%) cases, the administration of drugs without a prescription in 60

(48%) cases, and caretakers who sought advice in pharmacies in 27 (21.6%) of the 125 cases.

Table 2 Symptoms and diagnoses found

Pathology	Frequency	%	Cumulative percentage
Accompanying Symptoms			
Respiratory	224	73.7	73.7
Digestive	45	14.8	88.5
Urinary	12	3.9	92.4
Mucocutaneous	11	3.6	96.1
Others	11	3.6	99.7
None	1	0.3	100
Diagnoses found			
Pneumonia	115	39.2	39.2
Upper respiratory infection	81	27.6	66.9
Diarrheal illness	28	9.6	76.5
Diarrheal illness	15	5.1	81.6
Bronchiolitis	15	5.1	86.7
Acute otitis media	5	1.7	88.4
Laryngotracheitis	3	1.0	89.4
Bronchitis	3	1.0	90.4
Cellulitis	3	1.0	91.5
Eruptive of childhood	3	1	92.5
Bacteremia	2	0.7	93.2
Sinusitis	2	0.7	93.9
Kawasaki	1	0.3	94.2
Periodontitis	1	0.3	94.5
Neck abscess	1	0.3	94.9
Ox wound infection	1	0.3	95.2
Appendicitis	1	0.3	95.6
It is unknown	13	4.4	100.0

Main Results-Bivariate Analysis

Demographic and social variables Versus DSMA

No age differences were found between patients with DSMA and without DSMA (Table 3). There were no differences between the caregiver in charge ($P=0.273$) and the caregiver's ethnicity ($P=0.306$) between the groups assessed. The type of family and the number of family members did not significantly differ concerning DSMA. Patients from families with fewer resources presented a higher proportion of DSMA than those with a higher level of income, as well as caretakers with less education (Table 3).

Clinical Variables and DSMA

Patients with temperature of 38-38.9°C presented with a lower DSMA proportion than patients with a higher temperature (see Table 3). Regarding the triage categorization in the emergency service, it was observed that the majority of patients with DSMA received the

category of urgent than those within the non DSMA group, which received a triage categorization of minor urgency (see Table 3).

Association between DSMA, severity level, and demographic variables

The DSMA group had a higher risk of hospitalization from the emergency department, a higher risk of entering an intensive care unit, and a higher risk of remaining hospitalized five days after admission (see Table 4). In addition, children with DSMA were at a greater risk of presenting with severe bacterial diseases and were at greater risk of giving with a systemic inflammatory response syndrome (see Table 3).

Table 3 Comparisons in patients with delay in seeking medical attention (DSMA) and Not DSMA.

	DSMA n=125	No DSMA n=179	<i>P</i>
Age of the patient			
Minor infant	34 (27.2%)	59 (32.96%)	0.685
Older infant	34 (37.2%)	40 (22.35%)	
Preschool	32 (25.6%)	40 (22.35%)	
School	16 (12.8)	28 (15.64%)	
Teen	9 (7.2%)	12 (6.70%)	
Caretaker schooling			
No school	6 (4.8%)	2 (1.12%)	0.012
Primary	37 (29.6%)	39 (21.79%)	
Secondary	63 (50.4%)	88 (49.16%)	
Higher	19 (15.2%)	50 (27.93%)	
Monthly family income			
<\$ 400 USD	54 (43.2%)	40 (22.35%)	0.0001
\$400 USD	55 (44.0%)	92 (51.4%)	
>\$400 USD	16 (12.8%)	47 (26.26%)	
Category in triage			
Not urgent	11 (8.8%)	26 (14.53%)	0.0001
Minor urgency	35 (28%)	88 (49.16%)	
Urcengy	70 (56%)	59 (32.96%)	
Emergency	8 (6.4%)	6 (3.35%)	
Critical	1 (0.8%)	0%	
Temperatura			
T° 38-38.9°	50 (40.0%)	122 (68.16%)	0.001
T° 39-39.9°	56 (4.8%)	41 (22.91%)	
T°40 or more	19 (15.2%)	16 (8.94%)	

Discussion

This work was carried out 304 children who presented with a fever to the primary public children's hospital in Ecuador. It is described that 79% of families who attended were living on a basic wage or less, which is above the 49% reported by the national institute of statistics and censuses (Ecuador, INEC 2016). From the

families included in this study, 66.8% of families were made up of both parents and their children, and 92.1% were of hispanic heritage. Our data exceeds that reported by the Social Observatory of Ecuador (2016), which identified 57% and 73%, respectively [8]. Of the caregivers, 50% had obtained secondary schooling versus 39% determined by the Social Observatory of Ecuador [8].

In this study, fever presented in a higher incidence of pneumonia cases had urinary tract infections, which may be due to the year in which this study took place. This study was carried out during the winter months, where there is an increased respiratory disease occurrence [4, 9]. The immunization status did not influence the need for admission into intensive care. However, the absence of a completed immunization for a particular age leads to an increased risk (1.35 times) of requiring hospitalization, increased hospitalization for five days after the emergency admission (1.7 times), and increased risk of severe bacterial infections and SIRS (1.5 times). It should be considered that children under 2 years of age have received fewer vaccines than children between 4 and 9 years of age and therefore presents a greater risk of contracting a severe bacterial infection. Regarding DSMA, 41.1% who were within the DSMA group recorded not knowing factors to detect severe health symptoms, the risks involved in administrating medicines without a prescription, or the risks in receiving pharmacy prescriptions without medical consultation, or were involved in other activities such as the use of traditional medicine.

In a study carried out in Rwanda by Umuhoza et al. 35% of patients were part of DSMA [6], which is a lower percentage than the findings presented in this study. This may be due to the different public health policies adopted in our studies country, such as improved quality of care in health centers, which lead to a decrease in mortality of children younger than five years. In addition, the percentage reported by Umuhoza et al. reflects the proportion of patients who delayed hospitalization and not in the emergency room. In another investigation similar to the present study [10], they agreed that the main factors promoting DSMA are administering drugs without a prescription, going to traditional healers, and not recognizing warning signs.

Table 4 Association between DSMA and demographic and clinical variables.

Delay in seeking medical attention (DSMA)	n	RR	95%CI	P
Demographic variables				
Type of caregiver (Mother vs. Others)	304	0.78	0.58-1.05	0.125
Sex of the caregiver (Woman vs Man)	304	0.65	0.41-1.02	0.126
Schooling of the caregiver (Primary education or less Vs the rest)	304	1.35	1.03-1.77	0.037
Urban Housing Vs Rural Housing	304	0.69	0.53-0.92	0.017
Clinical variables				
Presence of comorbidity	304	0.60	0.31-1.16	0.093
Incomplete Immunizations	304	1.34	1.01-1.79	0.052
Requires admission to hospitalization (serious) * Vs Sent home	292	1.88	1.53-2.13	0.001
Requires admission to ICU (very serious) ** Vs hospitalized / home	292	2.86	1.00-8.17	0.036
Hospitalized / deceased on the 5th day Vs discharge at home	291	2.63	1.94-3.57	0.001
Severe vs. non-severe bacterial diseases	293	2.36	1.81-3.07	0.001
Days of hospitalization (more than five days) vs <5 days	163	1.46	1.15-1.85	0.001
Systemic inflammatory response syndrome	304	2.47	1.80-3.38	0.001

RR: Relative risk. 95%CI: 95% confidence interval

Only the study carried out by Gálvez et al. [11] showed that 80% of mothers recognized warning signs for pneumonia and that 94.6% sought immediate medical help. Importantly, in the location that this research was carried out (Lima, Peru), health programs were implemented before the study commenced to reduce morbidity and mortality, which used the local media to encourage its citizens to seek timely medical care suffering from pneumonia.

The present study was carried out in Quito, Ecuador's capital, a westernized city where most of the participants came from urban areas. Compared to the study carried out in Rwanda, the cultural factor, defined as administering local natural medicines, prayers, or consulting traditional healers, plays an important role when seeking professional help for a sick child [6]. The most crucial reason for DSMA in this study was administering drugs without a medical prescription (35% of cases) which, when added to consultations made at pharmacies, represents 48% of total cases. A previous study in Quito, located at a pediatric emergency at a second-level hospital [12], reported 64.1% of patients who attended the emergency department had received drugs without a medical prescription. This behavior was more frequent among patients who presented with increased symptoms upon arrival at the emergency department.

Antipyretics are the most common drugs sold without a prescription from pharmacies and maybe the

reason these erroneous measures continue on the part of caregivers. The administration of drugs without a prescription generates several health risks, leading to the alteration of the disease course, masking of the disease, increased adverse side effects, intoxication, drug interactions, increased drug resistance. The reasons for these activities include insufficient education, lack of financial resources to purchase certain medications or seek medical attention, doubts about the diagnosis, and the promotion and sale of drugs by the pharmaceutical industry in an inappropriate or unethical way [7].

In this research, some individual cases that initially went to primary care centers before going to the hospital could be related to mistrust in these hospitals and are observed in several Latin American studies and other developing countries [10]. This study concluded that 56.8% of patients with DSMA presented some health severity degree; that is, they required hospitalization. The data presented in our study is higher than that reported by Umuhoza et al., in which 35% of patients admitted to the hospital presented DSMA [6].

In addition, it was evidenced that arriving late represents a 2.6 times risk of staying hospitalized for more than five days or dying, and 2.86 times increased risk of being hospitalized in the intensive care unit. No other studies were found linking length of hospitalization or the need for intensive care with DSMA. It was also evidenced that a higher temperature level was

associated with a more significant DSMA and with greater severity, these findings being contrary to the results of the meta-analysis carried out by Van den Bruel et al. [13], which asserted that the temperature level was poorly correlated with the severity of the clinical picture. The findings presented in Van den Bruel et al. do not agree with what is stipulated by other studies. Another study [14] suggests that the opinion of parents who consider that a higher temperature means a more severe progression of the disease and that those who understand the severity of this will become anxious can lead to parents seeking professional help to feel secure. This is especially true when they cannot attend an appointment in the future. This is related to a well-known concept known as fever phobia. In a study carried out in the Netherlands where parents have easy access to the internet and increased education levels, it was observed that they do not gain access to adequate information on fever management before, during, or after they carried out personal research. Therefore, the main motivation for going to the doctors was not the fever itself but its presence with accompanying symptoms [14]. This, together with the study by Giachetto et al. [15] in which the knowledge of pediatricians about fever is valued, indicates that, although it is a frequent and well-studied symptom, there is a lack of ability in the transfer of this knowledge to parents in the best possible way.

The proportion of patients with severe infections in this study was 43.3%, which is higher than that of other studies, especially infants. The prevalence of severe infections in infants was between 5-29.3%, according to the meta-analysis by Van den Bruel et al. [13]. This may be related to the fact that it is a specialty hospital where, although it receives cases involving a good proportion of simple diseases, it also welcomes patients for whom the first and second-level hospitals could not treat successfully. Furthermore, as mentioned in previous paragraphs, the study presented here was carried out during the peak of respiratory diseases, which skews the true annual prevalence of patients with pneumonia who go to the hospital. Therefore, the main reason for fever is identified in this study. The actual mortality data and the average hospitalization of the patients who remained for more than five days are unknown since the follow-up was not done until their illness's culmination.

Conclusions

The delay in seeking medical attention occurred in 125 patients, representing 41.1% of those who came to the Baca Ortiz hospital's emergency service for fever. The leading causes for administration included medication use without a prescription, the lack of detection of warning signs, and the use of practices or consultation with traditional healers. The delay in seeking medical attention was associated with greater severity of an acute febrile illness, a greater risk of presenting a severe bacterial infection, requiring hospitalization, entering intensive care, and a greater chance of staying hospitalized five days after the patient was admitted into the hospital.

Abbreviations

DSMA: Delay in seeking medical attention. ICU: Intensive care unit. RR: relative risk. PedCAST: Pediatric canadian triage and acuity scale.

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Authors' contributions

GCMC and AMSV: They worked equally on the research idea, data collection, article writing, statistical analysis, editorial corrections.

AA: Research idea, study design, critical analysis, research direction.

HPO: Research idea, critical analysis, research direction.

All authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due participant confidentiality but are available from the corresponding author on reasonable request.

Ethical statements

The protocol of this study was approved by the Institutional Teaching Committee and by the Bioethics Committee of the Faculty of Medicine of the Pontifical Catholic University of Ecuador.

Protection of persons

The authors declare that the procedures followed were in accordance with the ethical standards of the responsible human experimentation committee and in accordance with the World Medical Association and the Declaration of Helsinki.

Confidentiality of the data**References**

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