Research Article

iMedPub Journals
www.imedpub.com

Pediatric Infectious Diseases: Open Access
ISSN 2573-0282

2019
Vol.4 No.2:4

Evaluation of Febrile Presentation among Children under Five-Years in a Ghanaian District Hospital

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Citation: Mensah KT (2019) Evaluation of Febrile Presentation among Children under Five-Years in a Ghanaian District Hospital. Pediatric Infect Dis Vol.4 No.2:4.

Abstract

Background: Limited confirmatory tests are routinely performed in Ghanaian District hospitals for febrile illnesses beyond the malaria Rapid Diagnostic Test (RDT) and the Complete Blood Count (CBC). Recent surveys demonstrate a declining role of malaria as the prominent cause of childhood fever. This study evaluates febrile presentations among children under five years (U-5) on arrival at the pediatric unit of the Dormaa Presbyterian Hospital (DPH), making comparison with the GDHS 2014 report. The potential role of the Complete Blood Count (CBC) in evaluating childhood febrile presentation is also examined.

Methods and Findings: Multiple data entry forms were used to retrospectively obtain patients' clinical parameters. Patients enrolled for the study comprised children from 6 months to 5 years (children U-5), presenting with fever (temperature ≥ 37.5°C) to the DPH pediatric unit between March and June 2014. Data was analyzed using descriptive statistics. 61.9% (57.76%-66.04% at 95% CI) of all the febrile children tested Rapid Diagnostic Test (RDT)-positive for malaria at presentation. 58.6% (51.52%-65.68%, at 95% CI) of non-malaria febrile children had normal White Blood Cell (WBC) counts.

Conclusion: The high prevalence of malaria-related febrile illnesses among children U-5 in DPH does not reflect the declining national estimate reported for the same period. Such a high local U-5 malaria prevalence may warrant not only the allocation of appropriate resources but an epidemiological re-evaluation of peculiar malaria patterns in this district. The WBC count alone is unlikely to be reliable for the diagnostic evaluation of non-malarial febrile illness in children U-5.

Keywords: Febrile; Illness; Malaria; Non-malarial; Infection

Received: November 04, 2019; **Accepted:** November 11, 2019; **Published:** November 21, 2019

Introduction

Febrile illnesses are common clinical presentations in most tropical countries and microbial infections form the most important etiology [1,2]. Fever is often a troubling manifestation of microbial infection in children U-5. The clinical signs of infectious illnesses are often non-specific and so diagnosis made only on the basis of clinical presentation could be misleading [3]. Febrile presentations occur in the U-5 population all year round and malaria has proven to be the leading cause of hospital admissions in previous national surveys in Ghana [4,5]. In many district hospitals, the malaria-RDT is carried out as part of the fever management routine even when the history and examination findings may not be suggestive of the diagnosis.

It is essential, however, that the proportion of febrile illnesses that are not malaria-related is appropriately investigated, especially, with the dip in dominance of malaria as the leading cause of febrile illnesses in some tropical studies [6]. In the 2008 GDHS report, malaria accounted for 61 percent of hospital admissions of children under five years [5]. According to the 2014 GDHS, however, 36 percent of children U-5 tested RDT-positive for malaria after having experienced fever in the two-weeks preceding the community-based survey [4]. The GDHS 2014 findings suggest that a reasonable population of febrile children under-5 may not have malaria and could require, perhaps, further investigations to ascertain their diagnosis. This resonates with

the downward trend of malaria prevalence around Africa [7-9] and in that regard, possibly, an increasingly important need for improved diagnostics for non-malaria-related U-5 febrile illness. In many of these studies, coinfections were discovered and these have to be regarded as the realities of febrile presentations among the U-5 population [2,7,10].

In the tropics, majority of non-malarial febrile illnesses among children have been demonstrated to have infectious causes [2,7]. Bacterial and viral Infections are the commonest causes of non-malarial childhood fevers and also of an elevated WBC count-a parameter that is only suggestive but not definitive for the presence of infection [7]. Some studies have gone ahead to attempt confirmatory tests without very convincing results as the vast majority of febrile childhood illnesses tend not demonstrate an identifiable causative agent [2]. The WBC count can be confusing for physicians when there is an obvious discrepancy between the value and the child's general condition. The consensus remains that the clinical condition of the patient, in such an instance is more important than a simple laboratory result. Notwithstanding its simplicity and diagnostic controversy, the ability to demonstrate a consistently elevated WBC in association with non-malarial febrile illnesses could be the initial step toward a therapeutic protocol development for common childhood infections.

In the face of these developments, it is important to determine in the Dormaa Presbyterian Hospital (DPH), what proportion of arriving febrile children tested positive or negative for the malaria-RDT and how the pattern in this facility compared with the most recent national estimate, the GDHS 2014. This could be helpful in providing relevant information for the decision on continuing to routinely administer the malaria-RDT to all febrile children presenting to DPH. With DPH lacking adequate confirmatory tests for febrile illnesses like most other low-income countries, the potential role of the Complete Blood Count (CBC), the next readily available blood test in DPH aside the malaria RDT, in predicting an infection as the cause of a non-malarial febrile illness, warranted a re-evaluation as well.

This study sought to determine what proportion of U-5 febrile presentations to DPH in that stated period in the past were associated with malaria. It also attempts to find out if there could be any relationship between non-malarial U-5 fevers and the WBC counts.

Methodology

Study design

This is a cross-sectional retrospective study using data from the records of febrile children reporting to DPH between 01st March and 30th June 2014. This period coincides with the period during which the GDHS 2014, the most recent of this 5-yearly survey, was organized and could serve as a reliable reference for analysis.

Study population

The data was obtained from the laboratory and clinical records of patients between the ages of 6 months and 5 years reporting to the pediatric unit of DPH with a temperature of 37.5°C and above. These patient records also contained a minimum of the malaria-RDT and CBC results. Those folders with incomplete data were excluded.

Sampling and data collection

Using the entry legers at the records division of the pediatric unit, all folders falling within the desired period were retrieved and those meeting the inclusion criteria were enrolled in the order in which they have been recorded in the leger. The records of all febrile children between 6 months and 5 years, meeting the criteria, were entered from the beginning of March till the end of June 2014 to obtain a total of 527 entries. The entries were made using tabulated data collection forms developed and piloted for this study.

Data analysis

The data was analyzed using SPSS 20 software and the results of study have been presented using tables and descriptive statistical values.

Ethical considerations

Appropriate permission was sought from the authorities of DPH and the pediatric unit before accessing the data. Ethical approval was subsequently obtained from the Committee on Human Research, Publication and Ethics (CHRPE) of the Kwame Nkrumah University of Science and Technology (KNUST) with the reference CHRPE/AP/469/19.

Results

The study results employed descriptive statistics to illustrate the proportions of febrile U-5 children falling within the research categories of interest.

A febrile U-5 child who tested malaria-RDT positive was identified as having a malaria-related or malaria-associated fever. Those testing negative for the malaria RDT have been described as having a non-malarial febrile illness or presentation.

58.6% (51.52%-65.68%, at 95% CI) of non-malaria U-5 fevers had a normal range WBC counts. For the purpose of this analysis, also, the WBC counts of severely anemic patients (Hb<7.0 g/dl) were assumed to be potentially inflated by reticulocytosis and thus excluded from the above WBC comparative analysis.

Discussion

Of all the children U-5 febrile presentations to DPH over the study period, those which were malaria-related stood at 61.9% **(Table 1)**. This finding resonates with the GDHS 2008 observation that 61% of all U-5 hospital admissions were also malaria-related [5]. However, the DPH prevalence for malaria-related U-5 fevers is at variance with the estimated 36% community-level prevalence of malaria for children U-5 reported in the GDHS 2014 [4]. Arguably, the national estimate being only an aggregate may not reflect the exact statistic in every local context. However, recording close to twice as high the national estimate of malaria-RDT-positive febrile illness in children U-5, probably, suggests the hyper-endemicity of malaria in the DPH catchment area. In other words, when a child U-5 presented to DPH with a fever, it was almost twice as likely to

Table 1: Proportion of Malaria-associated U-5 fevers.

	Frequency	Percent (%)
RDT Positive	326	61.9
RDT Negative	201	38.1
n=527; 95% Confidence interval		

Table 2: WBC count and RDT status (patients with Haemoglobin less than 7.0 g/dl excluded).

	WBC<12,000/µL	WBC ≥ 12,000/µL	Total
RDT Negative	109	77	186
RDT Positive	186	60	246

be malaria-related compared to another similar febrile child U-5 encountered in the general Ghanaian community. With this new knowledge, it would be expedient to probe further and initiate programmes to address the epidemiology of malaria in the Dormaa district accounting for the particularly high proportion of U-5 febrile hospital presentations.

In all possibilities, this finding draws attention to the issue of small pockets of relentlessly high malaria prevalence on the African continent-a contrast to the falling prevalence suggested by prominent studies in the region [11-13]. In order that 'major victories' in malaria control are not celebrated prematurely, and for these resilient malaria hyper-endemic niches not to be totally ignored in key strategic plans, the literature needs to give a balanced representation of the reality.

Majority (58.6%) of malaria-RDT negative febrile children in the study were found to have normal WBC counts **(Table 2)**, contrary to the initial assumption that, perhaps, demonstrating an elevated WBC in acutely febrile patients could have been the foundation for further inquiry into the role of the CBC in screening U-5 febrile presentations. As such, a WBC count used independently for evaluating fevers in children U-5, will likely fail to indicate any capacity to reliably predict the presence of an infectious disease process. This goes to support the general consensus and evidence regarding the inadequacy of the WBC count as a reliable marker of an ongoing systemic or local infection [14-16]. Perhaps, in combination with other clinico-laboratory parameters, its sensitivity could be improved but further local research would be required to elucidate this possibility. Meanwhile, health facilities in Ghana could institute measures to obtain more reliable confirmatory tests, such as cultures of body fluids, to evaluate U-5 febrile presentations beyond the CBC and malaria-RDT.

The 38.1% (33.96% - 42.24%, 95% CI) of U-5 febrile presentations who tested RDT-negative for malaria still form a quite substantial population. This is the very group that often poses considerable diagnostic challenges for clinicians in our resource-limited settings. By uncovering this significant population, this study seeks to renew the advocacy for more diagnostic aids for the effective management of childhood febrile illnesses. Hence, not every U-5 febrile presentation is malaria and in DPH, this study has shown that this assertion is true in almost 2 out of every 5 such cases. Policymakers, in setting global targets for the U-5 population, should be mindful of this fact.

Conclusion

Malaria remains hyper-endemic in the DPH catchment area and it is still the dominant cause of febrile illnesses among children-under-5-years (U-5) reporting to the Dormaa Presbyterian Hospital. Though a lower RDT-positive U-5 malaria population prevalence has been depicted in the GDHS 2014, institution-based prevalence could be much higher as this study has shown. U-5 febrile presentations to health facilities in Ghana are, probably, more likely to be malaria-related than U-5 fevers encountered in the general community. The WBC count alone is unlikely to be reliable for the diagnostic evaluation of U-5 non-malarial febrile presentations.

Acknowledgment

Much gratitude goes to Mr Frederick Ahordzor and Dr Adoma Dwomo-Fokuo of DPH for assisting with obtaining the data. Much appreciation also goes to the Rev Dr Appiah, the General Manager of DPH for his interest and permission which allowed the study to proceed.

Funding

There was no external funding for this research.

Conflict of Interest

The author has no competing interests regarding this research.

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