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OVER DIAGNOSIS OF TYPHOID AND MALARIA CO-INFECTION BY HEALTH CARE WORKERS IN NORTH CENTRAL NIGERIA: A CROSS-SECTIONAL STUDY.

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ABSTRACT

Introduction: Typhoid and malaria are significant causes of morbidity and mortality, especially in sub-Saharan Africa. Typhoid and malaria co-infection may occur as superinfection or even simultaneous infections. However, it appears to be rather rare. It is imperative to accurately make an accurate diagnosis of typhoid and malaria co-infection. The study set out to determine the practice among healthcare workers in the diagnosis and treatment of typhoid and malaria co-infection.

Methods: This descriptive cross-sectional study was carried out in Jos North Local Government Area in North-Central Nigeria. The sample population consisted of health care workers (HCWs) who were involved in the management of typhoid and malaria. Data were analysed using STATA version 14.0 College station, Boston, USA.

Results: Seventy-five HCWs were interviewed. Typhoid and malaria were diagnosed by 67 (89%) HCWs at least once weekly, and by the other 11% at least once every month. The Widal test was used to make a diagnosis of typhoid in greater than 70% of the cases. There was no statistical difference in the rate of typhoid diagnoses between medical doctors and other HCW.

Conclusion:

There is a high rate of false diagnosis of malaria and typhoid co-infection. This informs the crucial need for quality training and re-training of health care workers in the diagnosis of these conditions.

Keywords: False, typhoid, malaria, co-infection

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INTRODUCTION

Typhoid and malaria are frequently diagnoses in patients presenting with fever in resource-limited settings. Fever, whether it is real or imaginary, is of great concern and is a major reason for medical consultation in tropics and subtropics.¹ Typhoid and malaria constitute a significant cause of morbidity and mortality worldwide, especially in Sub-Saharan Africa. According to the World Health Organisation (WHO), in 2014 alone, approximately 21 million cases and 222,000 typhoid-related deaths occurred annually worldwide.² Likewise, in 2015, it was reported that malaria resulted in about 429,000 deaths globally.³ The conjoint diagnoses of typhoid and malaria might have stemmed from a historical misconception when Woodward JJ, an Army doctor in 1862 first used the term typho-malaria to describe a combination of clinical features seen in soldiers during the American civil war.⁴ Woodward and his colleagues thought a hybrid pathogen caused the signs and symptoms they saw in soldiers.⁴ It is now known that both exist as separate diseases and are caused by different pathogens.

Typhoid is caused by a Gram-negative bacterium, *Salmonella enterica serovar typhi* while malaria is caused by a parasitic protozoan of the genus plasmodium. The commonest species of plasmodium causing fatal malaria in Africa is *Plasmodium falciparum*. Other species also known to cause malaria in the tropics include *P. malariae*, *P. ovale* and *P. vivax*. Interestingly, typhoid and malaria have a predilection for people within the same social strata. Additionally, both diseases share similar geographic distribution and climatic conditions which facilitate their transmission.

Nonetheless, typhoid and malaria may occur as superinfection or even as simultaneous co-infections. Although such coinfections have been reported in the past, it appears to be rather rare. However, there are usually concerns about typhoid and malaria infection in both the clinics and in the community. Despite this huge concern on the challenges of typhoid and malaria, it appears there is a wide knowledge gap, especially in the diagnosis of typhoid or malaria in developing countries like Nigeria. This knowledge gap has led to the frequent wrong diagnoses of typhoid and malaria co-infection on any patient presenting with fever to many clinics in Nigeria. Factors that could contribute to such a knowledge gap might include lack or suboptimal training and retraining of health workers, poor patient education and poor organisation and planning of care. Additionally, it could be further compounded by a high patient to health care ratio and inadequate diagnostic facilities which affect the

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quality of health care delivery. In this study, we set out to determine the practice of health workers on 'typhoid and malaria' diagnoses in Jos North Local Government Area of Plateau state.

Methodology

This cross-sectional descriptive study was carried out in Jos North Local Government Area (LGA) of Plateau State, North-central Nigeria, between 1st and 30th June 2017. The study LGA has an estimated population of 429,300 across the 20 wards with about 30 primary health care centres.⁵ Data regarding the profile of health workers, method of diagnosis and treatment of typhoid and malaria co-infection were collected using a self-administered. The study population were health care workers involved in the diagnosis and treatment of typhoid fever and malaria, including doctors. Medical doctors who have completed or in residency training were excluded. The participants were recruited from primary and secondary healthcare centres from three randomly selected wards of the Local Government by balloting, and a tertiary health centre was purposively selected. Data were analysed using STATA version 14.0 College station, Boston, USA.

Result

A total of 75 HCWs with a mean (SD) age of 31(9) years were enrolled in the study. This includes 32(42.7%) community health workers; 19(25.3%) nurses/midwives; 5(6.7%) medical doctors; 7(9.3%) pharmacists and 12(16%) pharmacy technicians and attendants. Sixty-one percent (61.3%) of respondents were females, and 56% of the HCWs are working in a primary health care setting. In terms of years of practice, the median (IQR) years of practice was 6 (3-11) years, and this is shown in table 1. From the responses, the majority (90%) of respondents made a diagnosis of typhoid and malaria co-infection at least once in a week, and only about 16% of them used laboratory investigations in making the diagnosis (Figures 1 and 2). In those who used laboratory investigations, 70% of the diagnosis were by the Widal tests. (figure 3). There was no statistically significant difference in mean (SD) of weekly typhoid and malaria diagnosis made by doctors 5(2) and other health care workers 5(3) (P-value 0.93). The frequency of diagnosis of typhoid and malaria and the pattern of laboratory diagnosis are presented in figures 1 and 2, respectively.

Discussion:

This study presents the knowledge gap in the diagnosis of typhoid and malaria co-infection in a resource constraint setting. The main finding of the study is the overdiagnosis and treatment of typhoid and malaria co-infection by health care workers. This is mainly due to the frequent use of the Widal test in the diagnostic workup of patients presenting with fever to the clinics. The study showed high inappropriate diagnosis of typhoid and malaria. Studies in South Eastern Nigeria using Widal test for typhoid fever diagnosis found the prevalence of typhoid and malaria co-infection of 36-41%.^{6,7} However, studies done in Northwest, Southwest Nigeria, Cameroun and Ethiopia using blood culture for typhoid fever diagnosis found 0-0.5% malaria and typhoid co-infection.^{1,8-10} Typhoid fever diagnosis using Widal test is known to have high false positivity.^{11,12} Ohanu et al. in their study demonstrated that a positive Widal test is influenced by the presence of malaria parasite

in the blood.¹³ They demonstrated that after malaria treatment, most did not have rising Widal titre, and 50% had become Widal test negative two weeks post antimalarial treatment.¹³ Mathematical modelling done in 2015 of typhoid and malaria co-infection showed that TM coinfection could be as high as 30%.¹⁴ It, however, showed 60% (in the base case) false diagnosis of typhoid due to the cheap and convenient diagnostic test, Widal. The model also demonstrated the possibility of 5 million in base case false diagnosis of TM.¹⁴ A systematic review on typhoid and malaria co-infection, demonstrated the misleading diagnosis due to similar clinical features and poor diagnostic methods especially due to Widal test¹⁵ The practice of overdiagnosis of typhoid and malaria co-infection cuts across all categories of health workers. In this study, there was no statistical difference in practice between junior doctors and other categories of health workers. This situation is worrisome knowing that in this setting and other resource-constrained settings; similar medium cadre health workers provide medical care for most patients. Nsutebu et al. reported an equally poor capacity of health workers in making typhoid fever diagnosis in a Cameroun study.¹⁷ This underscores the need for re-training of health care workers on the diagnosis of typhoid and malaria. Assessment of health care workers capacity to accurately diagnose and manage typhoid and malaria co-infection is of significant importance. However, another challenge is the ability to distinguish between patients with real fever from those with factitious fever.¹⁶ It is clear that Widal test often leads to the misleading diagnosis of typhoid fever. It is imperative to create awareness locally and nationally through robust and improved continuing medical education of health care workers at different levels of healthcare. This may be achieved through update training and focused training on malaria and typhoid diagnosis and treatment.

Most importantly, the observed diagnosis of typhoid malaria co-infection has far-reaching implications. First, it would lead to antibiotic abuse and ultimately, antimicrobial resistance. Secondly, it would delay accurate diagnosis and consequently increasing morbidity and mortality. Thirdly, it would further add to the financial burden of patients who are already poor as they are placed on medications for both conditions. The out of pocket payments for health services in developing countries such as Nigeria is high.¹⁸ Ultimately, this makes patients to keep patronizing lower-cost health care delivery service outlets with resultant poor outcomes. Additionally, patients are also exposed to the increased adverse drug reactions that may follow therapy for a condition they may not have. Therefore, this study has shown some evidence for the need for re-training of health care workers and provision or access to reliable diagnostic facilities for typhoid and malaria diagnoses. Furthermore, setting up of management guidelines for typhoid and malaria in primary and secondary care facilities in resource-poor settings are needed.

In conclusion, there is a high rate of false diagnosis of malaria and typhoid co-infection. Most of the diagnoses were done clinically and using Widal test in some cases, which has very low sensitivity and specificity. This

situation calls for an urgent need of training and re-training and development of treatment guidelines that can easily be used by low and medium cadre health workers. However, being a self-reported knowledge assessment, there may be poor recall which might

underestimate the actual knowledge and practice amongst respondents. Although these limitations exist, the study has provided a basis for further discussion on the over-diagnosis and the subsequent over-treatment of typhoid and malaria in these settings.

Table 1: Baseline parameters of health workers in Jos North LGA, Plateau state who consult patients with diagnosis typhoid and malaria

Variable	Frequency (%) n=75
Mean age(SD)	31(9)
Age group	
15-25	22 (29.3)
26-35	33 (44.0)
36-45	12 (16.0)
46-55	7 (9.4)
>55 years	1 (1.3)
Gender	
Females	46 (61.3)
Males	29 (38.7)
Profession	
Doctors	5 (6.7)
Nurses/Midwives	19 (25.3)
Community Health Extension Workers (CHEW)	32 (42.7)
Pharmacists	7 (9.3)
Others *	12 (16)
Level of health care facility	
Primary	42 (56)
Secondary	19 (25.3)
Tertiary	14 (18.7)
Duration of practice median (IQR) years	6(3-11)

* Lab technologists, Pharmacy technicians and attendants

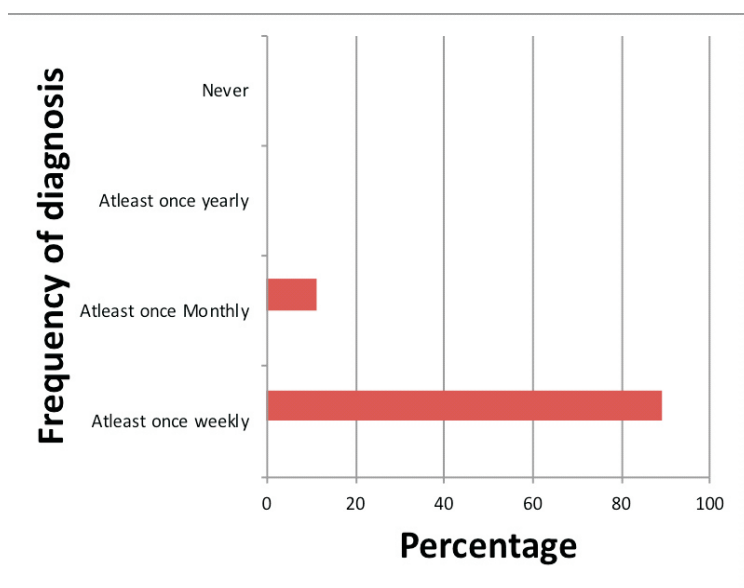


Figure 1: Frequency of diagnosis of typhoid and malaria co-infection by health workers in Jos North LGA, Plateau State

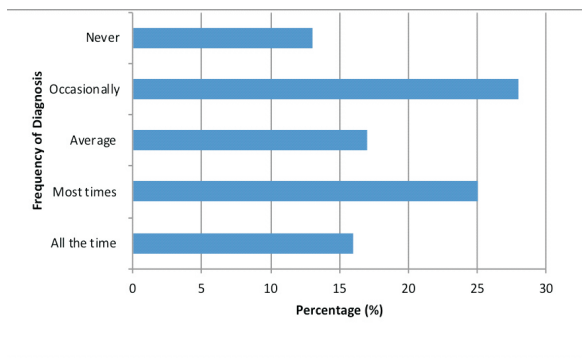


Figure 2: Utilisation of laboratory diagnosis of typhoid and malaria by health workers in Jos North LGA, Plateau State

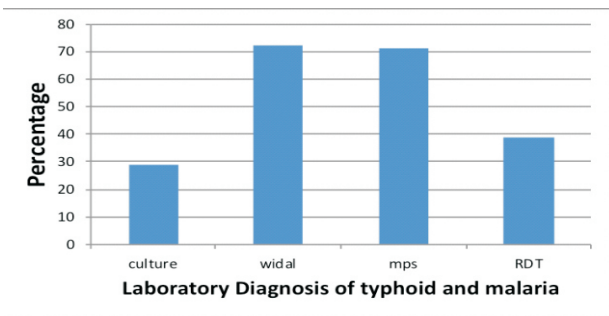


Figure 3: Pattern of specific laboratory requests for diagnosis of typhoid and malaria coinfection by health workers in Jos North LGA, Plateau State

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