ORIGINAL ARTICLE

Prevalence and Factors associated with prompt diagnosis and treatment of fever among Under-Five Children in Zambia: Evidence from a Country-Wide Cross-Sectional Survey

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ABSTRACT

Background: Prompt diagnosis and appropriate treatment of fever can prevent severe disease and mortality. Delayed diagnosis and treatment of infections contribute significantly to the high under-five mortality ratio especially in sub-Saharan Africa. This study assessed the prevalence and associated factors to prompt diagnosis and treatment of fever among under-five children in Zambia.

Methods: The study used secondary data from the Malaria Indicator Survey of 2021. Descriptive statistics using measures of frequencies, medians and interquartile ranges were done, and cross-tabulations and logistic regression were used to assess measures of association. The significance level was set at a P-value of 0.05 and a confidence level of 95%. The data was analysed in STATA 14.

Results: A total of 3003 under-five children were included, 728 (19.5%) had a fever in the two weeks preceding the survey. The prevalence of prompt health-seeking behaviour was 57.3% which raises concerns that 42.7% of the children with fever did not have prompt treatment within the same of the next day of fever onset. Male sex aOR = 1.52 (95%CI 1.10 – 2.12) and the use of IRS aOR 1.8(1.30 – 2.50) were associated with increased odds of prompt health-seeking behaviour.

Conclusion: This study found that the prevalence of fever among under-five children in Zambia was comparable to other sub-Saharan African countries. Health-seeking behaviour among children with fever was sub-optimal, as a considerable proportion did not seek treatment. Factors associated with health-seeking behaviour among children with fever included sex and staying in a house with indoor residual spraying.

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INTRODUCTION

Fever is a common symptom of various illnesses, especially among children, and is often a sign of an inflammatory response or an underlying infection such as malaria.[1] Timely diagnosis and appropriate treatment are crucial in managing febrile illnesses, as delays can lead to complications and worsened outcomes.[2] Children, especially those under the age of five, are particularly vulnerable to the adverse effects of fever due to their developing immune systems. Untreated fevers can become serious illnesses like bacterial infections, viral diseases, and severe malaria.[3] Prompt diagnosis and appropriate treatment reduce the risk of complications, alleviate parental anxiety, and improve the child's quality of life.[3]

One of the primary determinants of prompt diagnosis and treatment of fevers, including malaria infection, is the accessibility and quality of healthcare services.[4] Inadequate access to healthcare facilities, particularly in rural and remote areas, can lead to delays in seeking medical attention.[5] Distance, transportation availability, and healthcare infrastructure are pivotal in these delays.[6,7] Over burdened healthcare systems and long waiting times can discourage parents from seeking immediate care for their febrile children.[8] Socioeconomic status significantly influences a family's ability to seek prompt medical care for a child with a fever.[9] Families with lower income levels may face financial barriers that prevent them from accessing healthcare services promptly.[10] Whilst health primary health care services in Zambia are free, associated costs, such as transport costs, diagnostic tests, and medications, can deter parents from seeking early medical attention and prioritise immediate needs such as food.[11]

Parental knowledge and awareness of fever-related illnesses and their potential complications are crucial in determining how promptly medical care is sought.[12] Educated parents are more likely to recognise the seriousness of fever and seek medical attention earlier.[12] Conversely, a lack of understanding about the significance of fever, its potential causes, and appropriate treatment options can result in delayed healthcare-seeking behaviour.[13] Cultural beliefs and practices within communities can significantly influence healthcare-seeking behaviours. Some cultures may prioritise traditional remedies or alternative therapies over conventional medical interventions.[14] This can lead to delays in seeking professional medical care, allowing the underlying illness to progress. Bridging the gap between traditional beliefs and modern healthcare practices through culturally sensitive education can encourage families to seek prompt diagnosis and treatment.[15] Other factors include language barriers, fear of medical procedures, and distrust in healthcare providers, all contributing to delays in seeking care.[16]

This study aimed to find the prevalence of prompt health-seeking behaviour among children with fever and associated factors. This will help program managers and policymakers to understand why children continue to bear the highest burden of morbidity and mortality of treatable fever-associated diseases such as malaria in Zambia.

MATERIALS AND METHODS

Study Design

This is a secondary analysis of data collected during a survey called the Malaria Indicator Survey.

Study Settings

The study covered all the ten provinces of Zambia. Zambia has a tropical climate with high temperatures and annual rainfall, especially in the country's north. Savannah grasslands, river valleys and forested plateau land cover it. The climate and landscape are conducive to breeding and proliferating malaria mosquito vectors.

Sample Size

The main study was powered to detect malaria prevalence in Zambia at a 95% confidence level and power of 80% at the provincial level and urban

versus rural strata. It was not designed to detect fever prevalence. Based on the 41% prevalence of fever detected in the Zambia Demographic and Health survey of 2018, we used the survey sample size minimum of 557.

Sampling Procedure

We included all children in the primary study who met our criteria based on age six to 59 months and who had slept under a net the night before the survey. The survey used multistage computer-generated random sampling by statistical enumeration areas (SEAs) as clusters and households within the SEAs. All children aged six to 59 months within selected households were included in the study.

Ethics Approval

This study was approved by the ERES Converge Institutional Review Board (Ref 2022 Dec 007) in accordance with the Declaration of Helsinki.

Consent to Participate

All the participants gave informed consent, for the children under the age of five years, their parents or guardians gave informed consent. The data is anonymised and aggregated, it cannot be traced to the individual respondents.

Data Collection

We extracted the data from the Malaria Indicator Survey database at the National Malaria Elimination Centre into Microsoft Excel and then imported it into Stata for cleaning and analysis. The primary survey used a questionnaire that trained research assistants administered.

Data Analysis

The data was analysed in Stata software version 14 using complex data analysis to account for the multistage sampling. We conducted descriptive statistics using counts, percentages, mean or median and confidence intervals depending on the distribution. We did parametric or non-parametric hypothesis tests to compare among sample groups. We used logistic regression using stepwise forward model building for associations by conducting univariate and multivariable analysis. Variables with a P value of 0.1 or less in the univariate model were included in the multivariable regression model. A P value of 0.05 was considered significant, and the Akaike and Bayesian information criteria were used to assess model fitness.

RESULTS

This study found that 728 children under the age of five had a fever in the two weeks preceding the survey, indicating a prevalence of fever of 19.5% (95%CI 16.6 – 23.4%). Out of these, 57% sought treatment. There is a huge gap of 42.7% of children who run fevers but did not seek treatment and, therefore, run the risk of developing complications such as severe malaria. While the main survey that used the general population of children below the age of five years had reported a malaria prevalence of 39%, our sub-analysis using only children who had a fever in the past two weeks indicated a higher malaria prevalence of 54% (95%CI 49.1 – 58.9%). This indicates that if a child runs a fever, there is more than a 50% likelihood that he or she has malaria. The sex distribution was at par; the median age was 33 months, but there were older children than those below one year (89.7%). For those who ran a fever, the majority came from rural areas (93%) and came from the lowest socioeconomic status. Over half of the households were sprayed with Indoor Residual Spraying, with the median being about five months before the survey, and 45% used insecticide-treated nets. Over 60% of the children had anaemia; the median haemoglobin count was 10.5 mg/dl. Table 1 summarises the descriptive statistics and estimates of some key variables.

Table 1: Summary of the Descriptive Statistics

Summary of Categorical Variables

Variable	Categories	Number (n = 728)	Percentage (95% CI) *
Sex	Male	365	50.1 (45.0 - 52.2)
	Female	363	49.9 (44.8 - 55.0)
Age (Years)	Below 1 Year	77	10.6 (3.6 - 17.3)
	One year	133	18.3 (11.7 - 24.9)
	Two year	174	23.9 (17.6 - 30.2)
	Three Years	156	21.4 (15.0 - 27.8)
	Four Years	188	25.8 (19.5 - 32.1)
Education Household Head	No or Primary	376	51.6 (46.5 - 56.7)
	Secondary	229	31.4 (23.4 - 37.4)
	Tertiary	21	2.9 (-4.3 - 10.1)
Residence Type	Rural	677	93.0 (92.2 - 95.8)
	Urban	51	7.0 (5.8 - 8.3)
Wealth Quintiles	1 (Lowest)	218	30.0 (23.9 - 36.1)
	2 (Upper Low)	148	20.3 (13.8 - 26.8)
	3 (Middle)	143	19.6 (1.1 - 26.1)
	4 (Lower High)	156	21.4 (15.0 - 27.8)
	5 (Highest)	63	8.7 (7.9 - 9.5)
House Indoor Residual Spray	Sprayed	420	57.7 (53.0 - 62.4)
	Not Sprayed	308	42.3 (36.8 - 47.8)
ITN Use	Use ITN	333	45.7 (40.3 - 51.1)
	Not Use ITN	62	8.5 (1.6 - 15.4)
Anaemia	Anaemic	457	62.8 (58.3 - 67.3)
	Not Anaemic	251	37.2 (31.2 - 43.2)
Malaria (RDT)	Positive	393	54.0 (49.1 - 58.9)
	Negative	335	46.0 (40.7 - 51.3)
Ill with Fever	Yes	728	19.5 (16.6 - 23.4)
	No	3003	80.5 (79.1 - 81.9)
Sought Treatment	Yes	417	57.3 (52.6 - 62.0)
	No	311	42.7 (37.2 - 48.2)

Summary of Continuous Variables

Variable	Units	Median	Inter Quartile Range
Age	Months	33	(20 - 48)
Last IRS	Months	5	(5 - 6)
Last Fever	Days	3	(2 - 7)
Haemoglobin	mg/dl	10.5	(9.2 - 11.5)

*A test of proportions was used to calculate the confidence intervals for point estimates

Table 2 Health-Seeking Behaviour by Different Variables

Variable	Categories	Sought Treatment Not Sought Tx n(%)	Sought Tx n(%)	P-Value *
Sex	Male	132 (36.4)	231(63.6)	0.001
	Female	179 (49.0)	186 (51.0)	
Age (Years)	Below 1 Year	40 (52.0)	37 (48.1)	
	One year	45 (33.8)	88 (66.2)	
	Two year	67 (38.5)	107 (61.5)	0.02
	Three Years	78 (50.0)	78 (50.0)	
	Four Years	81 (43.1)	107 (56.9)	
Education Household Head	No or Primary	160 (42.6)	216 (57.5)	
	Secondary	90 (39.3)	139 (60.7)	0.034
	Tertiary	3 (14.3)	18 (85.7)	
Residence Type	Rural	286 (42.3)	391 (57.8)	0.346
	Urban	25 (49.0)	26 (51.0)	
Province	Central	13 (40.6)	19 (59.4)	
	Copperbelt	42 (51.2)	40 (48.8)	
	Eastern	37 (28.9)	91 (71.1)	
	Luapula	114 (48.5)	121 (51.5)	
	Lusaka	11 (64.7)	6 (35.3)	
	Muchinga	17 (30.4)	39 (69.6)	0.006
	Northern	23 (43.4)	30 (56.6)	
	North-Western	20 (40.0)	30 (60.0)	
	Southern	6 (42.9)	8 (57.1)	
	Western	28 (45.9)	33 (54.1)	
Wealth Quintiles	1 (Lowest)	97 (44.5)	121 (55.5)	
	2 (Upper Low)	66 (44.7)	82 (55.4)	
	3 (Middle)	61 (32.7)	82 (57.3)	0.8
	4 (Lower High)	60 (38.5)	90 (61.5)	
	5 (Highest)	27 (42.9)	36 (57.1)	
House Indoor Residual Spray	Sprayed	162 (38.6)	258 (61.4)	0.008
	Not Sprayed	149 (48.4)	159n(51.6)	
ITN Use	Use ITN	128 (38.4)	205 (61.6)	0.218
	Not Use ITN	29 (46.8)	33 (53.2)	
Anaemia	Anaemic	203 (44.4)	254 (55.6)	0.282
	Not Anaemic	101 (40.2)	150 (59.8)	
Malaria (RDT)	Positive	175 (44.5)	218 (55.5)	0.285
	Negative	136 (40.6)	59.4 (59.4)	

*Pearson's Chi -Square Test of Association was used to calculate P values except for the education levels of household heads, where some cells were below five, and Fis her's Exact Test was used instead.

Regarding health-seeking behaviour by various variables, there was a statistically significant difference between male and female children. This finding may be incidental; however, there was a significant difference among children aged below one year and those older than one year. Different education levels of household heads were also statistically different regarding health-seeking behaviour. Those with tertiary and secondary were more likely to seek treatment for their children with fevers than those with no or primary education. Other variables that showed significant differences in health-seeking behaviours for children with fevers included provinces and those whose houses were sprayed with indoor residual chemicals. The variables that showed no statistical differences included where one's house was located, whether rural or urban, wealth quintiles, use of Insecticide Treated Nets, whether one had anaemia or not and whether one tested positive for malaria using Rapid

Diagnostic Tests. Table 2 summarises the findings of the cross-tabulation between health-seeking behaviour and different variables.

Further analysis using logistic regression to measure factors associated with health-seeking behaviour among children aged below five years who had a fever in the two years preceding the survey showed that three variables met the inclusion criteria of P-Value less than 0.2 using the univariate model, namely sex, highest education of the head of the household and living in a house that was sprayed with Indoor Residual chemicals. When the multivariate model was fitted with the three included variables, one variable (highest educational level of the head of the household) became statistically insignificant, whilst sex and IRS remained significant. When the highest educational level of the head of the household was removed, the other two variables, sex and IRS,

Table 3: Factors Associated with Health-Seeking Behaviour Among Under-Five Children with Fever

Variable	Category	Unadjusted OR	95%CI	P-Value	Adjusted OR	95%CI	P-Value
Sex	Female	1			1		
	Male	1.68	1.25 - 2.27	0.001	**1.52**	**1.10 - 2.12**	**0.011**
Age	0	1					
	1- 4 years	0.97	0.87-1.08	0.557			
Residence	Rural	1					
	Urban	0.76	0.43 - 1.34	0.347			
Education	No &Primary	1			1		
	2°& 3°	1.33	1.00 - 1.79	0.049	1.3	0.97 - 1.74	0.085
Province	10 Provinces	1	0.94 - 1.06	0.927			
Wealth Quintile	Poorest Q	1					
	2 - 5 Q	1.05	0.94 - 1.18	0.342			
IRS	No IRS	1			1		
	IRS Yes	1.49	1.11 - 2.01	0.008	**1.8**	**1.30 - 2.50**	**< 0.001**
ITN Use	No ITN Use	1					
	ITN Use	0.71	0.41 - 1.23	0.22			
Anaemia	Anaemia (< 11 mg/dl)	1					
	No Anaemia (= 11 mg/dl)	1.19	0.87 - 1.62	0.282			
Malaria (RDT)	Positive	1					
	Negative	1.17	0.87 - 1.58	0.285			

remained statistically significant. However, the coefficient of determination (pseudo-R^2) reduced from 0.0275 in the full model to 0.0192 in the reduced model, and the Akaike Information criteria increased from 829.42 to 980.61 whilst the Bayesian Information criteria increased from 847.18 to 994.39 respectively. Based on this model fitness assessment, the three-variable model (sought treatment, sex and IRS) was discarded, and the four-variable model (sought treatment, sex, highest education and IRS) was maintained because it had the lower Akaike and Bayesian Information criteria and a higher coefficient of determination. Table 3 presents the measures of association of health-seeking behaviour among children with fever in this study.

DISCUSSION

This study set out to determine the prevalence of fever among under-five children in Zambia and assess the factors associated with prompt diagnosis and treatment of children with fever. The findings are that about a fifth (19.5%) of the children had an episode of fever within the two weeks preceding the survey. One study in Zambia found a fever prevalence of 1.5%; however, this was a health facility survey, not a community survey like ours.[17] Another study, a household survey, found the prevalence of fever to be 13.4% among under-five children in Zambia.[18] This study may have found a lower prevalence because it only had data from 28 districts from eight of the provinces in Zambia, which did not include high malaria prevalence provinces like Luapula. In contrast, our study included all ten provinces. Our study findings are comparable or even lower to studies elsewhere in sub-Saharan Africa, which found the prevalence of fever in under-five children to be 16% in Nigeria, 20% in Ghana, 25% in Kenya and 26% in Sierra Leone.[19]

Among those with a fever, it was equally common in both male and female children. This is similar to another multi-country study, which found no sex differences in Africa.[20] In the study of four sub-Saharan countries, only children from Ghana had shown that there were significant sex differences in the prevalence of fever in under-five children; the other three countries, Nigeria, Kenya and Sierra Leone showed no such sex differences. In the under-five children age group, there is no biological plausibility of unequal exposure to infections among the sexes; however, boys are more prone to injuries than girls, especially among older children.[21] Boys tend to engage in outdoor and adventurous activities such as combative sports.[21] With age, our study found that older children had a higher prevalence of fever than children below one year. This may be because children below one year are more likely to be cared for by their caregivers, whilst older children may receive less care, such as warm clothing, sleeping under insecticide-treated nets and receiving full vaccinations.[22] Fever prevalence was also higher in those in the lowest wealth bracket, rural areas and those from households whose heads had no or only primary education. Other studies supported these findings.[23,24] Children from wealthier families, urban areas and educated caregivers are likely to receive better nutrition and care, full vaccination and other prevention interventions such as insecticide-treated nets, better housing and water sources.[19]

Further, fever was more common in those who did not use preventive interventions like indoor residual spraying and insecticide-treated nets than those who used them. It was also more common in those who tested positive for malaria than those who tested negative. This implies that malaria contributes significantly to the occurrence of fever in Zambia. However, as can be seen, not all fevers were malaria; some with no malaria evidence still had fevers. Our study was corroborated by other studies elsewhere in Africa and Asia.[25,26,27] Fever was also more common in those who were anaemic than those who were not. Our observational study does not elicit causal relationships. However, this may be due to a dual role-play where those with lower blood indices have weaker immunities to infections, and those

with infections have haemolysis and show lower blood indices such as haemoglobin.

Almost two-thirds (57.3%) of the children who had experienced fevers sought treatment from health facilities. However, It is worrying that a good proportion (42.7%) did not seek treatment because lack of or delayed treatment of febrile childhood illnesses can lead to severe disease manifestation and mortality within very short periods.[28]Cross-tabulations of associated factors for seeking treatment using the chi-square test of association and Fisher's exact test indicated that sex, age, education levels, province and indoor residual spraying were significant. In contrast, area of residence (rural versus urban), wealth status, ITN use, malaria status and anaemia were not significant factors in seeking treatment among children with fever. Further analysis using logistic regression to adjust for confounding revealed that only sex and use of indoor residual spraying were significantly associated with seeking treatment among children with fevers. This analysis demonstrates that merely running descriptive statistics and cross-tabulations with hypothesis tests in observational studies may lead to making false observations and conclusions due to confounding if the analyses are not adjusted for confounders.[29,30]The education level of the household head was found to be statistically significant in the bivariate regression, but in the multivariable analysis, it became insignificant. The main multivariable model with sex, education level of the household head and the use of IRS had a higher coefficient of determination (pseudo-R^2) and lower Akaike and Bayesian Information Criteria than the model where educational level was removed. This indicates that though the educational level was not statistically significant, it was still an important predictor in improving model fitness. The higher odds ratio concerning the base (no or primary education) indicates that more education is associated with better outcomes in health-seeking behaviour. The higher educational level of the household head has been found in other studies to be

an important predictor of health-seeking behaviour, as educated caregivers are more likely to identify danger signs, make quicker decisions, and have the means and access to health services.[31]

The sex of the child was found to be a significant predictor of health-seeking behaviour. African societies, including in Zambia especially in rural areas, are patriarchal and consider male children more as they carry the family name and continue with family legacies, whilst female children are married off and bear the names of their husbands.[32,33] On the other hand, some African cultures value women more as they enhance family wealth when the family charges the bride price at the time of marriage.[34]In this study, we do not know whether these cultural factors influenced our findings on why male children were associated with better health-seeking behaviour compared to female children, as this was an observational study with no qualitative explanatory inquiry. Indoor Residual spraying was also significant in our study; we did not find a direct association between deployment of IRS and health-seeking behaviour. The indirect relationship is that those who accessed the IRS were also more likely to access other interventions, including access to health services.[35]

CONCLUSION

This study has found that the prevalence of fever among under-five children in Zambia is comparable to other sub-Saharan African Countries. Fever was found to be associated with age, education, area of residence, wealth status and use of malaria prevention interventions like insecticide-treated nets and indoor residual spraying. Further, fever was found to be associated with the presence of anaemia and malaria. Health-seeking behaviour among children with fever was sub-optimal, as a considerable proportion did not seek treatment. Factors associated with health-seeking behaviour among children with fever include sex, education levels of the head of the household and staying in a house with indoor residual spraying.

RECOMMENDATIONS

This study recommends that more interventions be given to caregivers of under-five children, such as sensitisation on danger signs such as fever and provision of interventions such as ITNs and IRS. More research is needed in order to understand disparities in health-seeking behaviour based on the child's sex in order to address gender equity.

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COMPETING INTERESTS

The authors declare no competing interests.

AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. The first draft of the manuscript was written by Khumbuso Elizabeth Phiri and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

LIST OF ABBREVIATIONS

CHW   Community Health Workers

IRS   Indoor Residual Spraying

ITN   Insecticide Treated Nets

MIS   Malaria Indicator Survey

MoH   Ministry of Health

RDT   Rapid Diagnostic Tests

WHO   World Health Organization

ZDHS   Zambia Demographic Health survey

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