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# Malaria infection: Prevalence among Bangladeshi children at a medical college hospital

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## Abstract

**Background:** Malaria infection among children under 10 years of age continues to be a serious health concern for these who are at-risk populations. This study's goal was to determine the prevalence of malaria infection among kids at the Shahid Syed Nazrul Islam Medical College in Kishoreganj, Bangladesh, who were 2 to 10 years old.

**Method:** Utilizing the outcomes of microscopic exams (thick drops) recorded in the laboratory registers of the medical center, a descriptive and cross-sectional survey was carried out among children between the ages of 2 and 10 who visited the college hospital between July and December 2022.

**Results:** According to the study, 68 of the 400 children aged 2 to 10 years who were registered throughout the study period tested positive for malaria, translating to a 17% overall prevalence. Males were more likely to contract the disease than females (55 cases, or 13.75%) (figure 1). The majority of cases of malaria infection were found in children aged 8 to 9 (20.75%, 22 cases), followed by children aged 10 and older (17.72%, 14 cases). With 13.6% of instances, the age group with the lowest representation was 5-7 years. The age range of 2-4 years has 15 cases, that was 16.67%.

**Keywords:** Malaria; Children; WHO; Prevalence; Bangladesh

## 1. Introduction

Malaria, a potentially fatal disease in humans that is spread by parasites through the bites of infected female Anopheles mosquitoes, is both preventable and treatable [1]. According to the most recent World Health Organization (WHO) reports, there were roughly 229 million cases of malaria worldwide in 2019 and 409,000 deaths.

Malaria occurs in two ways: mildly or severely, and it is common in tropical and subtropical areas[2]. The identification of asymptomatic Plasmodium infection is crucial for malaria control strategies. One of the biggest challenges in Asia as malaria transmission has declined is the high frequency of asymptomatic and sub-microscopic infections. People who have this disease but have no symptoms are not usually treated, so the parasites remain in these people and continue to spread locally. It is generally acknowledged that asymptomatic Plasmodium carriers pose a special difficulty for elimination operations because they offer a transmission reservoir capable of maintaining malaria endemicity[3,4].

13 out of the 64 districts in Bangladesh have a history of endemic malaria transmission. In the late 1990s, there were reports of up to 900 000 clinical cases and 70 000 laboratory-confirmed cases, with more than 500 fatalities annually[5-7]. The World Health Organization (WHO) recommended the use of the first malaria vaccine for children in children at risk by late 2021, following years of research and clinical trials. We are one step closer to living in a world without mosquito nets thanks to the new malaria vaccine. A rollout in Bangladesh could build on the success of the nation's

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smallpox eradication operation. Or it might run into the same difficulties that prevented the COVID-19 vaccine's introduction[8].

Southeast Asia saw a 54% decrease in malaria deaths between 2010 and 2017[9]. The widespread use of efficient artemisinin combination treatments (ACTs) as first-line antimalarial medications has significantly contributed to this [10, 11]. For reasons that are still unknown, antimalarial resistance has frequently emerged in Southeast Asia and spread through human migration throughout the region before reaching Africa throughout the history of the fight against malaria[12-14]. Bangladesh has a large population and endemic malaria [15] in its bordering areas with Myanmar and India. Around 90% of malaria in Bangladesh is due to Plasmodium falciparum and around 85% of cases occur in the malaria-endemic Southeast[15, 16, 17]. The inland Chittagong Hill Tracts (Khagrachhari, Bandarban, and Rangamati Districts) have the greatest malaria transmission rates and, while being sparsely inhabited, account for almost 90% of all malaria cases in Bangladesh [18]. Cox's Bazar, a seaside town near Bandarban in the southern Chittagong Division, is located on a major highway that many people use to travel north and inland. It is believed that the movement of people inside Bangladesh between the more populated coastal regions around Chittagong and the remote Hill Tracts for forestry, farming, and plantation labor poses a serious risk for the spread of malaria. These areas could serve as potential hotspots for the spread of malaria and serve as a significant breeding ground for parasites that could evolve resistance, as has happened in Southeast Asia[19].

There is little information available on the migration and travel habits of infected people from Bangladesh. Studies on international travel and malaria have only been conducted in Bangladesh at the national level, using reported numbers of imported cases [20] or data from airlines and shipping for the general public [21], despite the fact that the majority of international travel in malaria-endemic regions takes place overland between neighboring nations. Statistical information on population mobility has been used in other studies [22, 23]. Several methodologies have been developed for creating a source-sink map of the spread of malaria that models the effects of human mobility on the disease using data from mobile phones and travel surveys [24, 25]. There haven't been many studies done in Asia up to this point, and the majority of them [25–31] have focused on African children. According to the WHO surveillance plan, nations on the verge of eradication should consistently use active case detection to monitor high-risk populations like migrants[32].

Because of limited use of laboratory diagnosis among the large low-income population in Bangladesh, presumptive treatment is the norm and causes of illnesses are generally not confirmed. This research is part of a larger study to investigate various causes of illness in patients coming to tertiary level hospitals in Bangladesh. This study focuses on the prevalence of illness on child caused by malaria. The main goal of this study is to determine the prevalence of malaria infection in children between the ages of two and ten who visited the Shahid Syed Nazrul Islam Medical College hospital for consultation. This study has started a contribution to combat and eradicate this malaria infection, as desired by the WHO.

## 2. Material and methods

This was a cross-sectional and descriptive study, conducted from July to December 2022. The study was conducted at the Shahid Syed Nazrul Islam Medical College hospital located in Kishoreganj, a town that is 121 kilometer far away from Dhaka city.

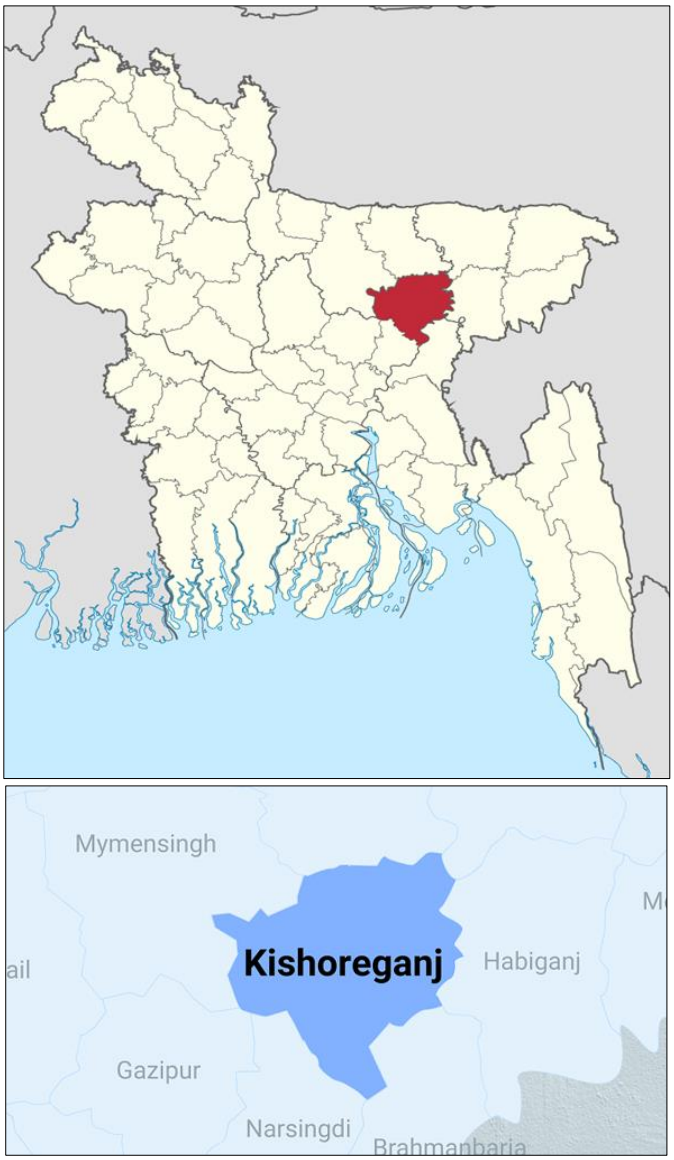


**Figure 1** Study location

### 2.1. Study population

The study population consisted of all 400 children aged 2 to 10 years including 244 boys and 156 girls. In order to locate those clinical cases in accordance with the case definition and criteria, they first went to the inpatient department on the days set out for specimen collection. The remaining children from the outpatient department were enrolled into the trial when there weren't enough inpatients to reach the desired enrollment.

### 2.2. Exclusion & inclusion criteria

All children between the ages of 2 and 10 who visited the medical analysis laboratory of the aforementioned center for a thick drop (GD) examination to check for malaria infection were included in the data. Those without laboratory results or those with probable malaria infection were not included.

### 2.3. Sample analysis

Purposive sampling was utilized to target and concentrate only on socio-demographic traits of children, such as age, sex, place of residence, and malaria test results documented in the laboratory records during the study period. This was done with the Chief Medical Officer of the center's approval. The sample size was determined by how many cases were noted in the hospital's registries, which helped to guarantee that the study was representative.

### 2.4. Statistical analysis

All the data were analyzed using Microsoft excel software including measurement and rates. The variables linked to the prevalence of malaria infection were identified using a binomial test. A p-value of less than 0.08 was regarded as statistically significant, and a confidence interval of 90% was estimated.

### 2.5. Ethical consideration

This study was carried out in accordance with the required research ethics. Prior to the start of the participants' involvement in the study, the agreement from their parents was also sought. All information was gathered and examined anonymously.

## 3. Results

**Table 1** Demographic parameters of children

| Variable | Variable | Number | Percentage (%) |
|---|---|---|---|
| Gender | Boys | 244 | 61 |
| | Girls | 156 | 39 |
| Age group (years) | 2-4 | 90 | 22.5 |
| | 5-7 | 125 | 31.25 |
| | 8-9 | 106 | 26.5 |
| | 10 | 79 | 19.75 |
| Hospital department | Paediatrics inpatients | 102 | 25.5 |
| | Paediatrics outpatients | 95 | 23.75 |
| | Medicine inpatients | 203 | 50.75 |

**Table 2** Among the study's children the distribution of malaria infection by sex

| Variable | Variable | Total number | Number of cases | Percentage (%) |
|---|---|---|---|---|
| Gender | Boys | 244 | 55 | 13.75 |
| | Girls | 156 | 13 | 3.25 |

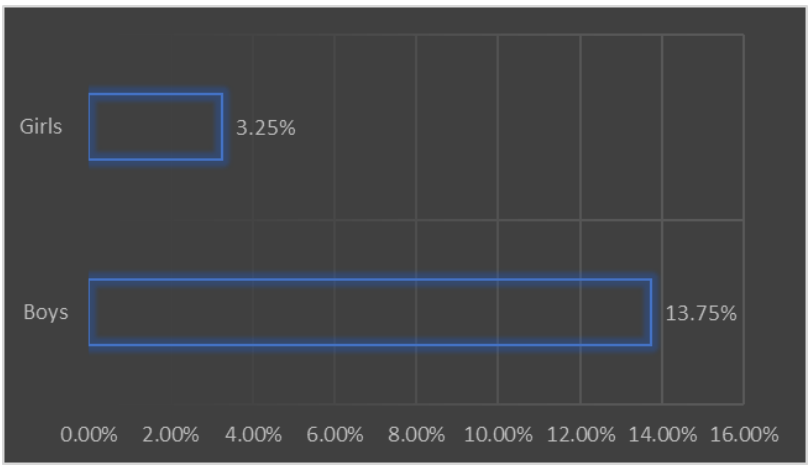


**Figure 2** Malaria infection percentage by total number

**Table 3** Distribution of malaria infection by age group in the study population

| Variable | Variable | Number | Number of cases | Percentage (%) by group |
|---|---|---|---|---|
| Age group (Years) | 2-4 | 90 | 15 | 16.67 |
| | 5-7 | 125 | 17 | 13.6 |
| | 8-9 | 106 | 22 | 20.75 |
| | 10 | 79 | 14 | 17.72 |

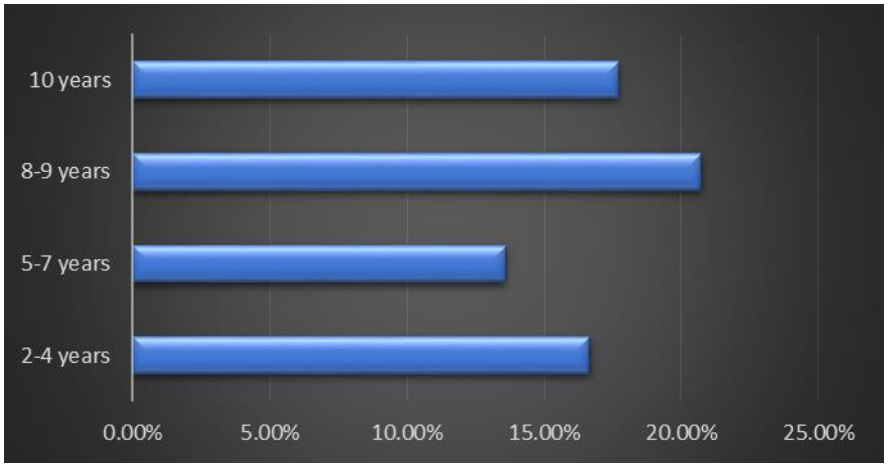


**Figure 3 P**revalence of malaria between age group through grouping percentage

**Table 4** The relationship among the study, children's age groups, sexes, and malaria infections

| Age group (years) | Boys | Girls | Total | Binomial test | | |
|---|---|---|---|---|---|---|
| | | | | P(G) | IC 90% | P value |
| 2-4 | 10 | 5 | 15 | 0.39 | 0.42-0.62 | 0.345 |
| 5-7 | 16 | 1 | 17 | 0.45 | 0.38-0.60 | 0.102 |
| 8-9 | 17 | 5 | 22 | 0.54 | 0.36-0.55 | 0.543 |
| 10 | 12 | 2 | 14 | 0.44 | 0.48-0.64 | 0.198 |
| Total | 55 | 13 | 68 | 0.455 | 0.41-0.61 | |

The synthesis of the data collected allowed us to identify a total of 400 children aged 2 to 10 years between July and December 2022. It was noted that the 5-7 years age group was the most represented, with 125 children (31.25%) coming for consultation. A total of 400 children comprising 244 boys and 156 girls coming from different background. During the study period, the children came from two different types of medical departments namely Pediatrics inpatients, Pediatrics outpatients and Medicine inpatients (Table -1).

(Table-2) represents that out of 400 children aged 2 to 10 years, registered during the study period, 68 were positive for malaria infection, i.e. a total prevalence of 17%. Male (55 cases or 13.75%) were more likely to be infected than Female (13 cases or 3.25%) (figure-2).

The 8-9 years age group was in the majority with cases of malaria infection (22 cases) 20.75%, followed by the 10 years age group with 14 cases (17.72%). The age groups with the lowest representation were 5-7 years, with 13.6% cases. The 2-4 years age group was with 15 cases that means 16.67% (Table-3).

The exact binomial test with a 90% confidence interval was used to analyze the level of significance of the observed variations in the percentages of malaria infection in boys versus girls according to age groups. If the test's p-value was less than 0.08, it was deemed significant. (Table - 4) demonstrates that there was no statistically significant relationship between malaria infection and gender or age categories.

## 4. Discussion

According to the study, 68 of the 400 children aged 2 to 10 years who were registered throughout the study period tested positive for malaria, translating to a 17% overall prevalence. Males were more likely to contract the disease than females (55 cases, or 13.75%) (figure 1). The majority of cases of malaria infection were found in children aged 8 to 9 (20.75%, 22 cases), followed by children aged 10 and older (17.72%, 14 cases). With 13.6% of instances, the age group with the lowest representation was 5-7 years. The age range of 2-4 years has 15 cases, that was 16.67%.

One investigation was conducted in 2013 at the Panda Hospital in the Democratic Republic of the Congo city of Likasi. They discovered that 221 of the 1653 children under the age of five who were hospitalized had malaria, representing a 13.4% prevalence[33], that is pretty close in comparison with the present study. According to a different study conducted at the Sikasso hospital in Mali, of the 2565 children aged 0 to 5 who were admitted, 1432 (or 55.82% of the population) had malaria[34], and it was too different by findings. Our findings can be explained by the fact that children in this age range are still weak and consequently more vulnerable to contracting malaria. particularly if the mother had malaria throughout her pregnancy. The under-integrated (disadvantaged) communities have severe sanitation issues, as found in a prior study, placing the residents' health at great risk. Every day, they must deal with the dual burdens of disease and economic distress[35].

Bangladesh is now implementing the national strategy plan 2017–2021 [36], in accordance with the WHO technical recommendations [37], and has set a target of eradicating malaria by the year 2030. Clean environment and green utilizing of chemicals may help in eradicating malaria causes [38]. This study fills an important gap in knowledge and presents approaches to analyzing the socio-demographic characteristics of malaria patients over the urban region of Bangladesh. Bangladesh currently conducts eradication programs (started in 2012) in four districts in its northeast. The programs keep track of each district's annual malaria cases. By more precisely directing resources, monthly malaria maps at the lowest administrative level (mauza) could further assist control programs in becoming more cost-effective.

## 5. Conclusion

Male and female children infected with malaria in the research area did not differ significantly, according to this study. As a result, Bangladeshi health authorities should inform and motivate the parents of these kids to safeguard their kids from the disease's mosquito vectors so that they don't contract malaria. The development of programs in other malaria-endemic nations will benefit from field experiences from countries like Bangladesh that are actively battling the disease. The results of this survey may be useful for a future update of the epidemiological profile of malaria infection in children aged 2-10 years. This may be essential to guide resource allocation, evaluation and prioritization of malaria interventions at Bangladeshi hospital.

## Compliance with ethical standards

### *Acknowledgments*

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### *Disclosure of conflict of interest*

There is no conflict of interest regarding this paper.

### *Statement of ethical approval*

This study was carried out in accordance with the required research ethics. Prior to the start of the participants' involvement in the study, the agreement from their parents was also sought. All information was gathered and examined anonymously.

*Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

*Author contribution*

All author contributed significantly to design and development of this work.

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