



Review Article

A systematic self-study and analysis in prevalence of malaria across the world

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ABSTRACT

Introduction: Malaria is a febrile mosquito borne infectious disease which is caused by plasmodium. Malaria is one of the most deadliest and serious tropical disease ever witnessed by humanity. There are five species of plasmodium which are reported to infect humans. Out of the five species plasmodium falciparum has been reported to be the most deadliest form of plasmodium.

Materials and Methods: A systemic self-study was planned to analyze and study the current prevalence of malaria globally. With the application of electronic databases we searched PubMed, Google Scholar, Web of Science, WHO website, Medline Plus, Health line & Cleveland Clinic web which were published in English language. This systemic self-study have reviewed the facts which were published earlier to determine the current scenario by vast study of statistics and derivation of facts. Vast analysis and along with proper examination of data were made to evaluate with final conclusion.

Observation: We observed and analyzed various surveys and studies conducted by World Health Organization which has stated that malaria have affected 90 countries and also territories in tropical and subtropical regions. In 2019 World Malaria Report documented over 96% of malarial death has occurred in African region. According to World Malarial Report, India also accounts for 3% of global burden of malaria. We also have observed in over 50% of estimated cases of malaria in India Plasmodium vivax have been the most infectious type of plasmodium. Irrespective of any country in the world India has by far the greatest plasmodium vivax incidences.

Conclusion: We hereby conclude our systematic self-study and vast analysis by stating these following facts that malaria is a mosquito borne infectious disease which is highly infectious and is caused by a unicellular microorganism known as plasmodium. Malaria is one of the most serious and fatal tropical disease ever witnessed by humanity. We analysed several studies and found that World Health Organization have estimated globally about 241 million clinical cases of malaria followed by 6,27,000 deaths of people. We also derive the fact that most of this death related malaria occurred in the African region. In 2019 World Malarial Report also confirmed that 96% of global death has occurred from the African continent. We further studied that India have also accounted 3% of total global burden of malaria. We further inferred based on our observational analysis that over 50% of urban malaria in India is caused by plasmodium vivax. We studied that there are five types of malaria along with the prevalence and inferred that plasmodium falciparum is the most fatal form of malaria and have accounted over 95% of death caused due to malaria in African region at 100% in sub-Saharan African region. We hereby positively conclude our self-study on prevalence of malaria across the world by drawing a report given by World Health Organization stating that global mortality rate has significantly reduced by 90% in the end of 20th century.

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1. Introduction

Malaria is an acute febrile mosquito borne disease which is caused by a parasite known as plasmodium which infects humans and other animals. Malaria is serious and one of the most fatal tropical disease known and suffered by humanity over ages. In 2020, World Health Organization (WHO) have estimated globally that 241 millions clinical cases of malaria had occurred and fatal rate included 627,000 deaths, majority of them were indicated in Africa.¹ In humans malaria is infected by a single cell plasmodium group, which is spread through bite of female anopheles mosquito. There are five species of plasmodium has been reported to infect humans which includes plasmodium vivax, plasmodium falciparum, plasmodium ovale, plasmodium malariae, plasmodium knowlesi. Out of the five species of plasmodium, it have been indicated that plasmodium falciparum have high reported to be the deadliest ones, plasmodium vivax is recorded to be the most common ones in India which is then followed by the rarest form of plasmodium infecting humans known as plasmodium knowlesi.² It has been confirmed that only female Anopheles mosquito can transmit malaria. According to one report by Buck E, he stated that 2 billion peoples are at high risk of acquiring malaria annually which includes about 90 endemic countries and over 100 million travelers.^{2,3}

2. Materials and Methods

A systemic self-study was planned to analyze and study the current prevalence of malaria globally. With the application of electronic databases we searched PubMed, Google Scholar, Web of Science, WHO website, Medline Plus, Health line & Cleveland Clinic web which were published in English language. This systemic self-study have reviewed the facts which were published earlier to determine the current scenario by vast study of statistics and derivation of facts. Vast analysis and along with proper examination of data were made to evaluate with final conclusion.

3. Observation

Based on our systematic self-study and vast analysis on prevalence of malaria we derive this following facts. We studied the reports by World Health Organization which stated that India has accounted 3 percent of total global burden of malaria. World Malaria Report have stated that India has kept it mark in history by showing significant reduction in the incidence of Malaria.

World Malaria Report (WMR) has further documented that there is remarkable decline by 24 percent reported in 2017 as compared to data of 2016. In 2018, it have been reported that 28 percent have reduced in the incidence of

Malaria.⁴

In another study by Anup Kumar R he stated that it has been widely reported from India that plasmodium vivax has accounted for 53% of estimated cases of malaria in India. He also has stated that Indian urban malaria are predominantly caused by plasmodium vivax. Irrespective of any country in the world, India has by far the greatest plasmodium vivax incidence.⁵

According to World Health Organization in 2014 they have confirmed that 2.14 million plasmodium vivax cases where reported globally, Out of which 18% of them where found in India.⁶

In India most of the malarial burden is borne by economically productive age groups. According to one study by Murray, he stated that malaria imposes greater socioeconomic burden on humanity with six other deadliest disease. Another very recent study conducted by World Health Organization in 2021 which documented that India have accounted for about 82% of all malarial deaths in World Health Organization South East Asian region. In accordance with Global Technical Strategy (GTS), India has kept a vision of malarial free nation by 2027 and elimination of malaria from country by 2030. World Health Organization have also provided full support to India to accelerate malarial elimination activities in few states in the consecutive year 2017 to 2022.

World Health organization's high burden to high impact strategy has been initiated in form of consecutive endemic states of India the following states including:-

1. West Bengal
2. Jharkhand
3. Madhya Pradesh
4. Chhattisgarh

Malaria has affected 90 countries and also territories in tropical and Sub-tropical region. It has also been recorded that malaria happens most often in developing countries and areas with warm temperatures and high humidity including this the following regions:-

1. South Asia
2. Eastern Europe
3. Central and South America
4. Africa
5. Dominican Republic, Haiti and other areas in Caribbean
6. Islands in central and South Pacific oceans.

According to World Malaria Report they have confirmed that Africa is the most accountable reason in the world to get affected by malaria. In 2019, it has been reported that 96% of all global deaths from malaria has occurred from the continent of Africa.

According to another study by UNICEF, which marked malaria as third largest killer of children between the age

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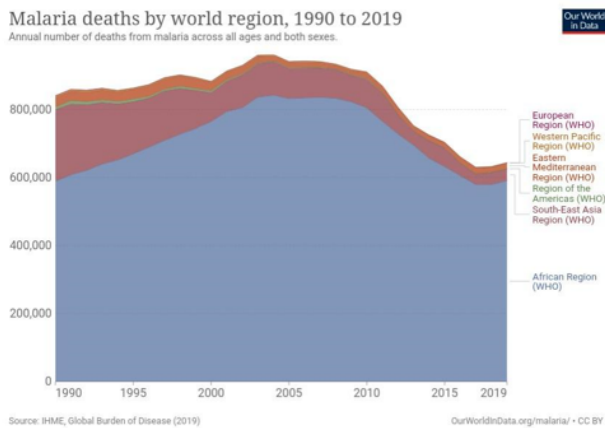


Fig. 1:

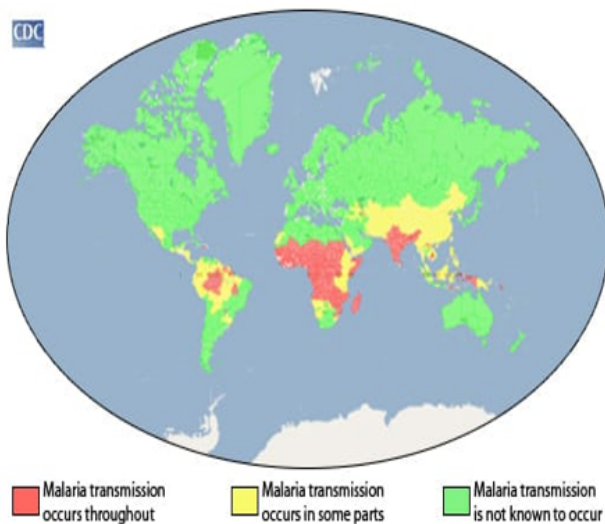


Fig. 2:

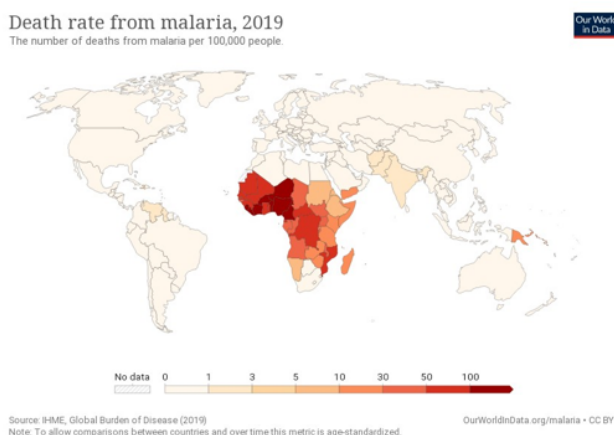


Fig. 3:

group of 1 - 5 years across the world. This was followed by life threatening diseases such as pneumonia and diarrhea. It has also been reported in 2016 that nearly 300,000 children's under the age group of five have died of malaria.⁷ Pregnant woman and the newborn are particularly very vulnerable to malaria due to decrease in immunity levels. About 350 to 500 million people are diagnosed with malaria each year.

Between the year 2020 and 2022 World Health Organization have documented and certified 12 countries as malaria free nation across world. These countries are listed as following:⁸

1. Sri Lanka
2. Kyrgyzstan
3. Uzbekistan
4. Algeria
5. Argentina
6. China
7. Morocco
8. El Salvador
9. United Arab Emirates
10. Turkmenistan
11. Paraguay
12. Armenia

4. Discussion

The etiology of the world malaria originated from medieval era in Italy, mala aria meaning 'bad air'. This disease was earlier termed as marsh fever or ague due to its close association with swamp and marshland. Malaria is a mosquito borne infection disease of humans and other animals caused by protist of genus plasmodium. There are documented five types of malaria known which are followed as:-

1. Plasmodium falciparum
2. Plasmodium malariae
3. Plasmodium vivax
4. Plasmodium ovale
5. Plasmodium knowlesi

4.1. Plasmodium falciparum

Plasmodium falciparum is the most deadliest and serious form of species of plasmodium which causes the most dangerous form falciparum malaria. Plasmodium falciparum have also been accountable for over 50% of all malarial cases.⁹

According to one report in 2021 World Health Organization have stated that 241,000,000 cases of malaria occurred worldwide resulted in 627,000 deaths out of which 95% death occurred due to plasmodium falciparum in African region. In Sub-Saharan African region almost 100% of cases are result of plasmodium falciparum. Our study also

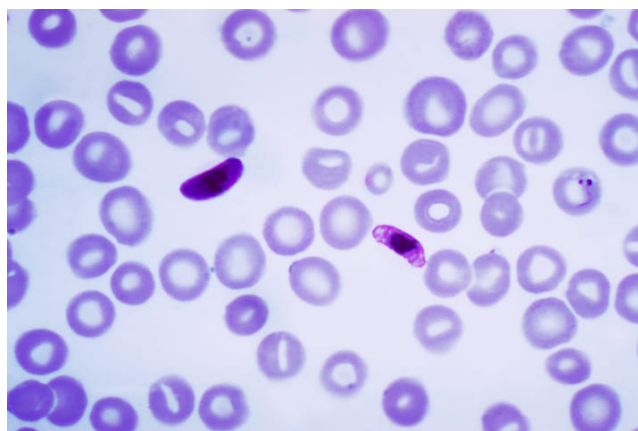


Fig. 4:

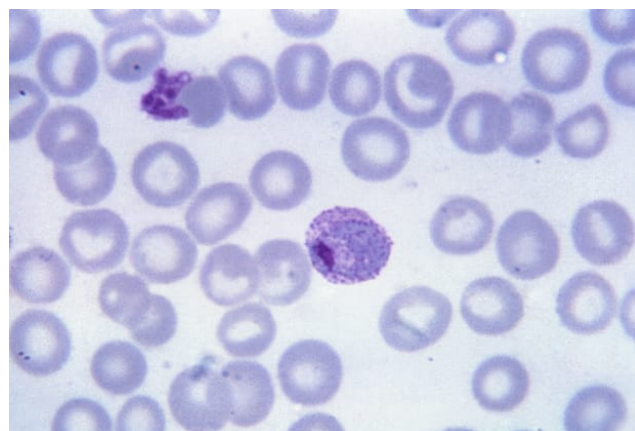


Fig. 6:

indicated that cases are now being reported in areas of world where this type was thought to be completely eradicated.

4.2. *Plasmodium malariae*

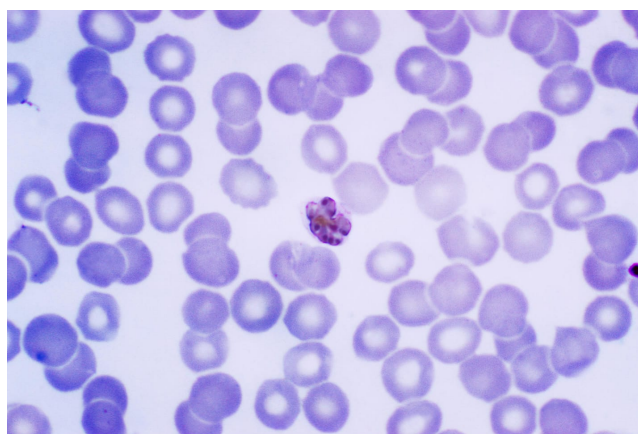


Fig. 5:

Plasmodium malariae is known to cause benign malaria in milder form of malaria not usually fatal produced by *plasmodium falciparum* or *plasmodium vivax*. *Plasmodium malariae* have the potential to infect several species of mosquito which could cause malaria in human and other animals.¹⁰ It has also been observed that *plasmodium malariae* is one of the least study of the six species that infects humans. In endemic regions prevalence of malaria ranges from less than 4% to more than 20% there are evidences which has showcased that *plasmodium malariae* has been vastly under reported.¹¹ This type of parasite has been known to inhabit in blood of some people for several decades.

4.3. *Plasmodium vivax*

Plasmodium vivax is the most frequent form and widely distributed causes of recurring malaria. About 60% of all malaria infections in India occur due to *plasmodium vivax*. This type has the widest geographic distribution globally. This parasite has the body for prolonged duration without showing any significant signs and symptoms. *Plasmodium vivax* malarial infections often leads to severe complications often due to splenomegaly and sometimes death also.¹²

Plasmodium vivax was earlier believed to have originated from Asia but recent studies have found that chimpanzees are endemically infected with parasite throughout central Africa, which were closely related to human *plasmodium vivax*. These findings indicate that human *plasmodium vivax* took its birth in African region.¹³ There has been some studies which we accounted that evident has proved *plasmodium vivax* also have the potential to infect itself by other viruses.¹⁴ Also some study shows that *plasmodium vivax* has horizontally acquired genetic materials from humans.¹⁵ In 1917 Julius Wagner received Nobel Prize for his discovery malarial therapy which uses *plasmodium vivax* to create very high fever to combat certain diseases such as tertiary syphilis.¹⁶

4.4. *Plasmodium ovale*

Plasmodium ovale is that less dangerous species of *plasmodium* which causes tertian malaria. *Plasmodium ovale* has been primarily documented in the region of Sub-Saharan Africa.¹⁷ According to one study conducted by Sutherland CJ in Journal of infectious disease where he reports that about 15 million cases of infection each year are documented every year with this following parasite.¹⁸

4.5. *Plasmodium knowlesi*

Plasmodium knowlesi is that category a *plasmodium* which are known to infect not only humans but other primates

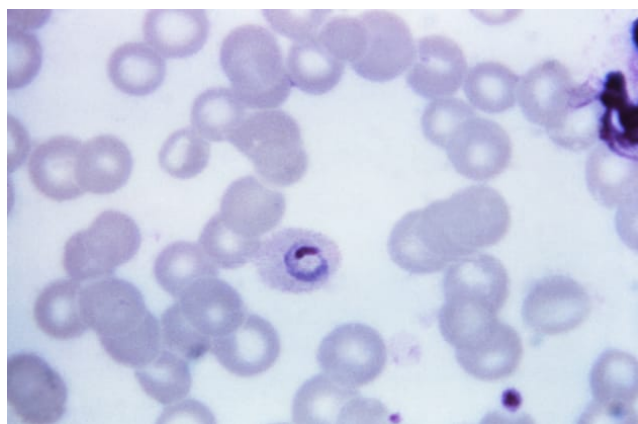


Fig. 7:

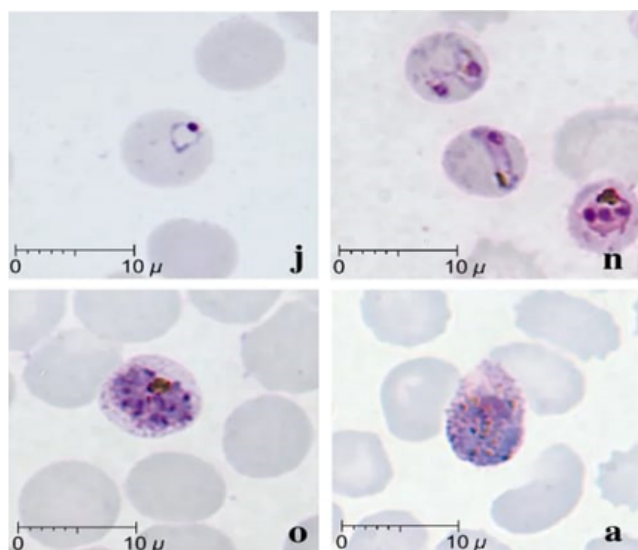


Fig. 8:

too. Humans who are infected with plasmodium knowlesi has the possibility to develop severe form of malaria with similar signs and symptoms caused by plasmodium falciparum. Also diagnosis of plasmodium knowlesi is very challenging task because it has resembled other groups of species which infects humans. According to one study and survey conducted by Collins where he documented that plasmodium knowlesi were found in Southeast Asia.¹⁹ Another study by Miller B it states that 10% of people who are infected with plasmodium knowlesi develop severe forms of malaria. In Malaysia plasmodium knowlesi is the most common causes of malaria to occur.

5. Conclusion

We hereby conclude our systematic self study and vast analysis by stating this following facts that malaria is a mosquito borne infectious disease which is highly infectious and is caused by a unicellular microorganism known as

plasmodium. Malaria is one of the most serious and fatal tropical disease ever witnessed by humanity. We analysed several studies and found that World Health Organization have estimated globally about 241 million clinical cases of malaria followed by 6,27,000 deaths of people. We also derive the fact that most of this death related malaria occurred in the African region. In 2019 World Malarial Report also confirmed that 96% of global death has occurred from the African continent. We further studied that India have also accounted 3% of total global burden of malaria. We further inferred based on our observational analysis that over 50% of urban malaria in India is caused by plasmodium vivax. We studied that there are five types of malaria along with the prevalence and inferred that plasmodium falciparum is the most fatal form of malaria and have accounted over 95% of death caused due to malaria in African region at 100% in sub-saharan African region. We hereby positively conclude our self study on prevalence of malaria across the world by drawing a report given by World Health Organization stating that global mortality rate has significantly reduced by 90% in the end of 20th century.

6. Source of Funding

None.

7. Conflict of Interest

None.

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