

# Trends of Malaria Cases From 2018 to 2019 in East-Sumba, East Nusa Tenggara, Indonesia

*By Piusa Selasa*

## ORIGINAL ARTICLE

# Trends of Malaria Cases From 2018 to 2019 in East-Sumba, East Nusa Tenggara, Indonesia

Pius Selasa<sup>1</sup>, Heru Santoso Wahito Nugroho<sup>2</sup>, Margaretha Teli<sup>1</sup>, Israfil<sup>1</sup>, Saidah Rauf<sup>3</sup>, Sandeep Poddar<sup>4</sup>

<sup>1</sup> School of Nursing, Health Polytechnic of Kupang, Liliba, Oebobo, Kupang City, East Nusa Tenggara. 85111, Indonesia

<sup>2</sup> School of Nursing, Health Polytechnic of Surabaya, Jl. Pucang Jajar Tengah No.56, Kertajaya, Kec. Gubeng, Kota SBY, Jawa Timur 60282, Indonesia

<sup>3</sup> School of Nursing, Health Polytechnic of Maluku, Maluku, Indonesia

<sup>4</sup> Lincoln University College, Wisma Lincoln, No, 12-18, Jalan SS 6/12, 47301 Petaling Jaya, Selangor, Malaysia

## ABSTRACT

**Introduction:** The Province of East Nusa Tenggara is one of the provinces with a high malaria prevalence reaching 1.99% from the national prevalence of 0.37%. East Sumba Regency is one of the regencies in East Nusa Tenggara Province, with the highest prevalence of 7.01%. This study aimed to determine trends in malaria cases in East Sumba Regency of East Nusa Tenggara Province from 2018 to 2019. **Methods:** This research is a descriptive study with all population data recorded in East Sumba Regency between 2018 and 2019. The sample size is 3,506 cases collected by purposive sampling that is taken from the total positive cases. **Results:** 1,811 cases per 246,295 inhabitants were recorded in 2018 (0.73%) and 1,695 cases per 260,950 inhabitants in 2019 (0.64%). In 2018, males were 54.50 percent, while the females were 45.50 percent, and in 2019, the male is 53.27 percent, and the female is 46.72 percent. Age is >15 years 40.36 percent in 2018, >15 years 41.65 percent in 2019, *Plasmodium falciparum* 74.82%, *Plasmodium vivax* 15.07%, *Plasmodium malariae* 1.21%, *Plasmodium ovale* 0%, Mix 8.89% in 2018, *Plasmodium falciparum* 71.91%, *Plasmodium vivax* 13.27%, *Plasmodium malariae* 1.65%, *Plasmodium ovale* 0%, Mix 13.15% in 2019. In 2018 the ACT malaria treatment was opted by 97.57% of patients, 97.52% in 2019. **Conclusion:** Most positive cases are found at age <15 years. The gender is generally male. Mostly *Plasmodium falciparum* is abundant. Almost all patients are following favourable treatment according to government programs.

**Keywords:** Malaria, East Sumba, East Nusa Tenggara

## Corresponding Author:

Pius Selasa, MSc

Email: piusselasa@gmail.com

Tel: +62 813-5324-7976

## INTRODUCTION

Malaria is a public health problem in the world (1,2). Malaria is a tropical infectious disease caused by a protozoan species called *Plasmodium* (3,4). As a chronic and recurrent disease spread by saliva or mosquito bites (5), malaria is a leading cause of death and morbidity, particularly among young children and pregnant women (3).

The World Health Organization (WHO) in 2014 stated that around 3.2 billion people in the world live in malaria-endemic areas (6,7). Indonesia is one of the ten malaria-endemic countries in the world (8). The results of the Basic Health Research, Ministry of Health of the Republic of Indonesia in 2018 showed that the prevalence of malaria in Indonesia still accounts for around 0.37% (6). The highest majority occurred in five provinces: Papua, West Papua, Maluku, North Maluku,

and East Nusa Tenggara (9).

Malaria prevalence has reached 1.99% in East Nusa Tenggara Province. East Sumba Regency has the highest malaria prevalence area in this province, at 7.01% (7). East Sumba Regency has established several strategies for malaria prevention and conducts regular assessments to eliminate this disease (7,10). As an endemic area, it was evident that identifying malaria case patterns in East Sumba Regency is necessary to develop an accurate strategy. This study aims to determine trends in malaria cases in East Sumba Regency from 2018 to 2019.

## MATERIALS AND METHODS

This research was a descriptive study with all residents recorded in East Sumba Regency in 2018 and 2019. The research sample was purposive with a large size total of 3,506 positive cases. Data on malaria in East Sumba Regency was collected in 2018 and 2019 as a retrospective study. The data were then presented as a frequency table and descriptively analyzed to demonstrate trends in malaria cases in East Sumba Regency, East Nusa Tenggara Province, from 2018 to

2019.

This study was approved by Health Research Ethics Committee of Kupang Health Polytechnic Ministry of Health, Indonesia No LB.02.03/I/0072/2019, 13 August 2019.

**RESULTS**

The map in Figure 1 depicts data collected in the Indonesian state level, specifically in East Nusa Tenggara Province (1a) and East Sumba Regency (1b). Geographically East Sumba Regency is located between 119°45 – 120°52 East Longitude (E) and 9°16 – 10°20 south Latitude (LS) with the following regional boundaries. East Sumba regency has an area of 7,000.5 Km<sup>2</sup>, while the sea area covers 8,373.53 Km<sup>2</sup> with a coastline length of 433.6 Km.



**Figure 1: Location Map of East Sumba Regency East Nusa Tenggara Province - Indonesia**

Table I displays data on the population of East Sumba Regency's positive malaria cases from 2018 to 2019. The positive point of malaria was higher in 2018 compared to 2019. The trend of malaria cases based on population in East Sumba Regency in 2018 to 2019 decreased by 0.64%, where 1,811 cases per 246,295 people in 2018 decreased by 1,695 cases per 260,950 people in 2019.

**Table I: Trends in Positive Malaria Cases by Population of East Sumba Regency in 2018 to 2019**

Years	Total population	Positive Case	%
2018	246.295	1.811	0.73%
2019	260.950	1.695	0.64%
Total		3.506	

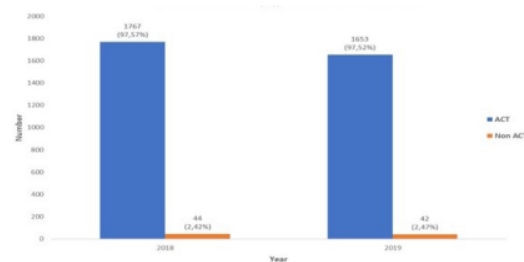
Table II compares the trends in malaria cases by the demographic characteristics among *Plasmodium* type, and the types of treatment in East Sumba Regency from 2018 to 2019. It is shown that the highest prevalence of malaria was among >15 years old, male, *Plasmodium falciparum* (Pf), and treatment with ACT.

Figure 2, 3, 4 and 5 compares the trends in malaria cases by the demographic characteristics, the plasmodium type, and the types of treatment in East Sumba Regency from 2018 to 2019. It is shown that the highest prevalence of malaria were >15 years old, male, *Plasmodium falciparum* (Pf), and treatment with ACT.

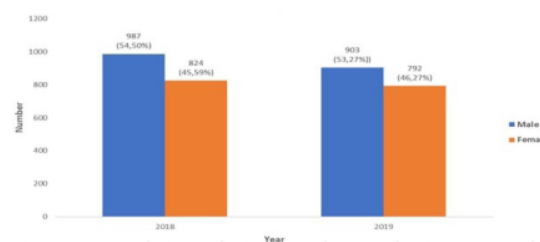
Figure 2 shows that cases of malaria in infants 0-11 months, infants 1-4 years, and school children 10-14

**Table II: Trends in Malaria Cases by Age, Gender, Type of Plasmodium Malaria, and Types of Treatment in East Sumba Regency in 2018 to 2019**

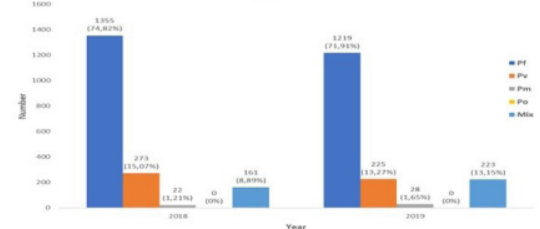
Trends	Year 2018	%	Year 2019	%
<b>Patient age</b>				
0-11 months	32	1.76	18	1.06
1-4 years	289	15.95	245	14.45
5 – 9 years	388	21.42	390	23.00
10 – 14 years	371	20.48	336	19.82
>15 years	731	40.36	706	41.65
<b>Gender</b>				
Male	987	54.50	903	53.27
Female	824	45.59	792	46.72
<b>Type of Plasmodium</b>				
Pf	1355	74.82	1219	71.91
Pv	273	15.07	225	13.27
Pm	22	1.21	28	1.65
Po	0	0	0	0
Mix	161	8.89	223	13.15
<b>Type of treatment</b>				
ACT	1767	97.57	1653	97.52
Non ACT	44	2.42	42	2.47



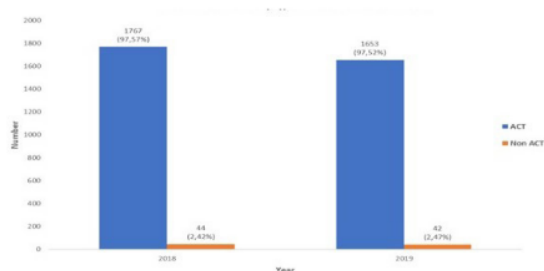
**Figure 2: Trends in Malaria Cases by Age in East Sumba Regency in 2018 to 2019.**



**Figure 3: Trends in Malaria Cases by Gender in East Sumba Regency in 2018 to 2019.**



**Figure 4: Trends in Malaria Cases by type of Plasmodium malaria in East Sumba Regency in 2018 to 2019.**



**Figure 5: Trends in Malaria Cases by type of treatment in East Sumba Regency in 2018 to 2019.**

years decreased by 0.7% in infants, 1.5% in infants, and 0.66% in school children 10-14 years, while cases of malaria in school children aged 5-9 years and aged > 15 years experienced an increase of 1.58% in children aged 5-9 years and 1.29% at age > 15. Most positive cases of malaria in 2018 and 2019 were found at > 15 years of age.

Figure 3 shows that Malaria cases in male decreased by 1.23%, an increase in cases occurred in women reached 1.13%. Most malaria cases in 2018 and 2019 were found in males.

Figure 4 shows that the most infectious type of plasmodium was *Plasmodium Falciparum* which reached 74.82% of cases in 2018, 71.91% of cases in 2019. This condition showed that *Plasmodium falciparum* infection had reached 2.91%.

Figure 5 shows that most malaria patients participated in the ACT treatment program namely 97.57% in 2018 and 97.52% in 2019.

In 2018 and 2019, most malaria positive cases were detected in people over the age of 15. Males accounted for the majority of malaria cases in 2018 and 2019. The most infectious type of Plasmodium was *Plasmodium falciparum* which reached 74.82% of cases in 2018, 71.91% of cases in 2019. This condition showed that *Plasmodium falciparum* infection had increased by 2.91%. Most malaria patients participated in the ACT treatment program, namely 97.57% in 2018 and 97.52% in 2019.

## DISCUSSION

This research reveals that the trends in malaria cases in East Sumba Regency from 2018 to 2019 decreased by 0.64%. Additionally, we discovered that people over the age of 15 and males had higher malaria prevalence. Most malaria cases were caused by *Plasmodium falciparum* (Pf), and they were treated with ACT.

Malaria cases in the district of East Sumba have continued to decline since 2009. Kasim and Pratama's

research (2011) reported that a decrease in the annual malaria index, which reached 104% in 2009, was due to the existence of the East Sumba district government program, which is reasonable and following the central government program (11). The implementation of central government policy is carried out through case finding, management of treatment according to standards, epidemiological surveillance, prevention and control of risk factors, and improvement of human resources (12,13,14).

Reducing malaria cases is also due to the community's awareness regarding malaria prevention and treatment (15,16). The East Sumba government has continued to conduct health worker training and community education (17).

This study found most malaria cases were patients aged >15 years, followed by ages 5 – 9. This result was inconsistent with the previous research (18,19). They reported that children were a vulnerable risk group infected with malaria, especially infants (0-12 months), toddlers (1 - 5 years), and school children (6-14 years) (18,19). The young children seem to have high play activities (20) precisely; playing outdoors nearly all throughout the day. As a result, they are more exposed to mosquito bites, which become vectors of malaria infection (21). A high prevalence of patients more than 15 years remains uncertain, but this may be related to a different type of *Plasmodium*. A study conducted in Tanzania discovered that the highest age-specific prevalence of Pf was found among people aged 12–15 years (22). Malaria also reduced the economic growth of different malaria-endemic countries by as much as 1% per year (23). However, *Falciparum* was the most frequently infected *Plasmodium* in malaria in East Sumba Regency.

The highest prevalence of Pf in East Sumba might be influenced by climatic factors, namely dry and rainy climates (20). These results were in line with previous research (24,25,17,26). The East Sumba region has low rainfall. Another research explains that in East Sumba, high rainfall occurs in December-March (4 months) with average solar radiation ranging from 47-66%, while in April-November (9 months), there is low rainfall with average solar radiation ranges from 76-95% (27x,28). Mosquito habitat will increase in the dry season as there is less rain than the rainy season as standing water is an ideal place for the propagation of malaria vectors (28). By the study's findings, males made up the majority of malaria-positive patients. These findings in line with the previous studies (19). These conditions are related to behavioural factors and high male activities outside the home either for work (men >15 years) or play (men <15 years). Every day, males in East Sumba generally have work in the farm and cattle herding as both primary and additional work (18,29), thus allows a man to be

exposed to mosquito bites.

Artemisinin Combination Therapy (ACT) was the most common therapy used to treat malaria in East Sumba. ACT is the first-line of treatment for uncomplicated falciparum malaria (30). Despite the resistances issued by ACT in treated Pf, these combination drugs have contributed significantly to reducing malaria morbidity, mortality, and transmission (31).

Malaria remains a lethal threat that a government authority must acknowledge avoiding an increase in the number of cases of this preventable and treatable disease (1). The findings of this study are provided in a descriptive manner, making judgments regarding the connections impossible. The study's findings should be followed up with additional research using analytical methods.

## CONCLUSION

The present study is a prospective surveillance report that provides a means of checking the consistency of the findings across various. But the paper must be clear regarding the understanding of this menace among the public. The daunting diversity of transmission dynamics must be dealt to understand the control and elimination strategy. Although East Sumba Regency remains a malaria-endemic area, our study found that the prevalence of malaria decreased from 2018 to 2019 (0.64%). The majority of patients were male and over the age of 15. *Plasmodium falciparum* was the most common type of Plasmodium that causes malaria, and it was treated according to standard malaria treatment. This is necessary to fill gaps and to represent achievable steps for the malaria elimination in Indonesia.

## ACKNOWLEDGMENTS

The authors are grateful to the Malaria staffs in District Health Office of East Sumba regency for obtaining data and for contributing their time and effort toward the success of the study.

## REFERENCES

1. Shanks GD. Malaria-associated mortality in the Australian Defence Force during the twentieth century. *The American journal of tropical medicine and hygiene*. 2017 Aug 2;97(2):544. doi: 10.4269/ajtmh.16-0748.
2. Ghosh SK, Rahi M. Malaria elimination in India—the way forward. *Journal of vector borne diseases*. 2019 Jan 1;56(1):32. doi: 10.4103/0972-9062.257771
3. World Health Organization WHO. *Malaria Case Management- Operations Manual*, WHO Press. Geneva. Switzerland., 2009
4. Gowda D, Wu X. Parasite recognition and signaling mechanisms in innate immune responses to malaria. *Frontiers in immunology*. 2018 Dec 19;9:3006. doi: 10.3389/fimmu.2018.03006
5. Resi EM, EKAWATI CJ. Effect of Antimalaria Herbal Sambiloto (*Andrographis paniculata* Nees) on Morphology Changes of Development and Parasite Plasmodium falciparum. *Jurnal Info Kesehatan*. 2014 Jun 29;12(1):661-9.
6. World Health Organization, *Assessment and Monitoring of Antimalarial Drug Efficacy for the Treatment of Uncomplicated Falciparum*. 2003.
7. Selasa P. Implementasi Kebijakan Eliminasi Malaria Di Pusat Kesehatan Masyarakat Kota Kupang. *Jurnal Info Kesehatan*. 2017 Jun 30;15(1):97-109.
8. Brachman PS. *Control of Communicable Diseases Manual*. *American Journal of Epidemiology*. 2001 Oct 15;154(8):783-4. doi.org/10.1093/aje/154.8.783-a
9. Harijanto PN. *Malaria*. Buku Ajar Ilmu Penyakit Dalam. Jilid III, edisi IV. Fakultas Kedokteran Universitas Indonesia. Jakarta, Hal: 1754-60, 2006.
10. Kristina RH. *Screening Test penderita Malaria Dengan Gold Standar Uji Laboratorium Untuk Validasi Kasus Malaria Positif Di Wilayah Puskesmas Lewoleba Dan Puskesmas Waipukang Kabupaten Lembata, Propinsi Nusa Tenggara Timur Tahun 2016*. *Jurnal Info Kesehatan*. 2018 May 31;16(1):164-77.
11. Kasim, F, Pratama, I. *Manajemen Penanggulangan Malaria Di Kabupaten Sumba Timur Tahun 2011*. Undergraduate thesis, Universitas Kristen Maranatha. 2011
12. Santy S, Fitriangga A, Natalia D. Hubungan Faktor Individu dan Lingkungan dengan Kejadian Malaria di Desa Sungai Ayak 3 Kecamatan Belitang Hilir, Kabupaten Sekadau. *eJournal Kedokteran Indonesia*. 2014 Apr. 2(1) 21-8
13. Mading M, Willa RW. Pengetahuan, Sikap Dan Perilaku (Psp) Ibu Hamil Terhadap Penularan Malaria Di Wilayah Kabupaten Sumba Barat Daya. *Indonesian Journal of Health Ecology*. 2014;13(4):279-88.
14. Johan A, Natalia A, Djauhari W, Effendi RF. Clinical and hemoglobin profile of malaria patients in Karitas Hospital, Southwest Sumba, period of year 2017. *Indonesian Journal of Tropical and Infectious Disease*. 2020 Mar 19;8(1):1-8. doi: 10.20473/ijtid.v8i1.11455
15. Ahmad RA, Ferdiana A, Surendra H, Sy TR, Herbianto D, Rahayujati TB, Rejeki DS, Murhandarwati EE. A participatory approach to address within-country cross-border malaria: the case of Menoreh Hills in Java, Indonesia. *Malaria Journal*. 2021 Dec;20(1):1-9. doi: 10.1186/s12936-021-03673-7
16. Hutchins H, Power G, Ant T, da Silva ET, Goncalves A, Rodrigues A, Logan J, Mabey D, Last A. A survey of knowledge, attitudes and practices regarding

- malaria and bed nets on Bubaque Island, Guinea-Bissau. *Malaria Journal*. 2020 Dec;19(1):1-5.doi: 10.1186/s12936-020-03469-1
17. Hasugian AR, Purba HL, Kenangalem E, Wuwung RM, Ebsworth EP, Maristela R, Penttinen PM, Laihada F, Anstey NM, Tjitra E, Price RN. Dihydroartemisinin-piperaquine versus artesunate-amodiaquine: superior efficacy and posttreatment prophylaxis against multidrug-resistant *Plasmodium falciparum* and *Plasmodium vivax* malaria. *Clinical Infectious Diseases*. 2007 Apr 15;44(8):1067-74.doi: 10.1086/512677
  18. Wibowo W. Risiko Kejadian Malaria di Wilayah Kerja Puskesmas Kecamatan Cikeusik. *Media Kesehatan Masyarakat Indonesia Universitas Hasanuddin*. 2017 Jun 18;13(2):139-46.
  19. Purwanto DS, Ottay RI. Profil penyakit malaria pada penderitawatinap di rumah sakit umum daerah kota bitung. *Jurnal Biomedik*. 2011;3(3).doi: 10.35790/jbm.3.3.2011.872
  20. Daysema SD, Warouw SM, Rompis J. Gambaran Prevalensi Malaria pada Anak SD YAPIS 2 di Desa Maro Kecamatan Merauke Kabupaten Merauke Papua. *e-Clinic*. 2016;4(1).doi: 10.35790/ecl.4.1.2016.10830
  21. Willa RW, Mading M. Maternal and child health determinants in West Manggarai District East Nusa Tenggara Province. *Buletin Penelitian Sistem Kesehatan*. 2014;17(3):20903.
  22. Peprah S, Dhudha H, Ally H, Masalu N, Kawira E, Chao CN, Genga IO, Mumia M, Were PA, Kinyera T, Otim I. A population-based study of the prevalence and risk factors of low-grade *Plasmodium falciparum* malaria infection in children aged 0–15 years old in northern Tanzania. *Tropical Medicine & International Health*. 2019 May;24(5):571-85.doi: 10.1111/tmi.13225.A.
  23. Das S, Saha TR, Poddar S, Das S. Malaria in India: A Predictive Study. *Malaysian Journal of Medicine and Health Sciences*. 2020;16(110).
  24. Alamudi MY. Skrinng Malaria Pada Remaja Di Surabaya Dengan Menggunakan Metode Hapusan Darah. *Medical and Health Science Journal*. 2018 Apr 28;2(1).
  25. Khariri K, Muna F. The proportion of parasite species that are the cause of malaria infection in Indonesia base on result of Basic Health Research (Rikesdas). In *Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia 2019* (Vol. 5, No. 1, pp. 38-41).doi: 10.13057/psnmbi/m050108.
  26. Price RN, Hasugian AR, Ratcliff A, Siswantoro H, Purba HL, Kenangalem E, Lindegardh N, Penttinen P, Laihada F, Ebsworth EP, Anstey NM. Clinical and pharmacological determinants of the therapeutic response to dihydroartemisinin-piperaquine for drug-resistant malaria. *Antimicrobial agents and chemotherapy*. 2007 Nov;51(11):4090-7.doi: 10.1128/AAC.00486-07
  27. Tulak N, Handoko H, Hidayati R, Hadi UK, Hakim L. Karakteristik dan Distribusi Spasial Habitat Positif Larva Nyamuk *Anopheles* spp. Berdasarkan Curah Hujan. *Media Kesehatan Masyarakat Indonesia Universitas Hasanuddin*. 2018 Sep 20;14(3):285-96.doi: 10.30597/mkmi.v14i3.3307.
  28. Mau SS, Mulatsih M. Perubahan jumlah limfosit pada penderita malaria *falciparum* dan *vivax*. *Indonesian Bulletin of Health Research*. 2017 Jun;45(2):97-102.doi: 10.22435/bpk.v45i2.6288.97-102.
  29. Hanida SF. Potensi tingginya faktor lingkungan fisik dan biologis terjadi di penularan malaria di wilayah kerja Puskesmas Pandean Trenggalek. *Jurnal Kesehatan Lingkungan*. 2018;10(1):82-91.
  30. Menard D, Dondorp A. Antimalarial drug resistance: a threat to malaria elimination. *Cold Spring Harbor perspectives in medicine*. 2017 Jul 1;7(7):a025619.doi: 10.1101/cshperspect.a025619.
  31. Fairhurst RM, Dondorp AM. Artemisinin-resistant *Plasmodium falciparum* malaria. *Microbiology spectrum*. 2016 Jun 10;4(3):4-3.doi: 10.1128/microbiolspec.ei10-0013-2016

# Trends of Malaria Cases From 2018 to 2019 in East-Sumba, East Nusa Tenggara, Indonesia

---

ORIGINALITY REPORT

---

7%

SIMILARITY INDEX

---

PRIMARY SOURCES

---

- 1 B O Nababan, Y Christian, A Afandy, A Damar. "Integrated Marine and Fisheries Center and priority for product intensification in East Sumba, Indonesia", IOP Conference Series: Earth and Environmental Science, 2020  
Crossref 47 words — 2%
- 2 psasir.upm.edu.my  
Internet 23 words — 1%
- 3 jurnal.globalhealthsciencegroup.com  
Internet 22 words — 1%
- 4 repository.president.ac.id  
Internet 13 words — 1%
- 5 I.E. Cock, M.I. Selesho, S.F. van Vuuren. "A review of the traditional use of southern African medicinal plants for the treatment of malaria", Journal of Ethnopharmacology, 2019  
Crossref 10 words — < 1%
- 6 researchonline.lshtm.ac.uk  
Internet 10 words — < 1%
- 7 ris.cdu.edu.au  
Internet 10 words — < 1%

8	<a href="http://medic.upm.edu.my">medic.upm.edu.my</a> Internet	9 words — < 1%
9	<a href="http://eprints.ums.ac.id">eprints.ums.ac.id</a> Internet	8 words — < 1%
10	<a href="#">Treatment and Prevention of Malaria, 2012.</a> Crossref	6 words — < 1%

EXCLUDE QUOTES ON

EXCLUDE SOURCES OFF

EXCLUDE BIBLIOGRAPHY ON

EXCLUDE MATCHES OFF