

Malaria: promoting awareness and prevention of a critical crisis in a remote area of Papua New Guinea through community involvement



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SUMMARY

- This paper describes a community project to promote awareness and prevent malaria in remote Papua New Guinea.
- Malaria is a significant public health issue world wide. Up to 2.7 million people per year die from malaria.
- It is the second most prevalent cause of death in Papua New Guinea however, critical care facilities essential for treatment of severe malaria are not available to people living in remote communities.
- Critical care nurses can use their knowledge of the disease process and preventive measures to influence the development of initiatives to help people in remote communities.
- Members of remote communities can and will engage in developing and implementing preventive strategies if they are included in the development of the project.

Background

Malaria is an acute and sometimes chronic infectious disease of the red blood cells. It is caused by protozoan parasites of the genus *Plasmodium*. It is transmitted to humans by the bite of an infected female *Anopheles* mosquito as she takes a blood meal. Four species of *Plasmodium* can cause the disease in its various forms:

- *Plasmodium falciparum*
- *Plasmodium vivax*
- *Plasmodium ovale*
- *Plasmodium malariae*

P. falciparum is the most widespread and dangerous of the four, if left untreated it can lead to fatal cerebral malaria (Microbiology at Leicester, 2006).

Having entered the human host the parasite undergoes changes as part of its complex life-cycle. Its various stages allow plasmodia to evade the immune system and infect the liver and red blood cells. It finally develops into a form that is able to infect a mosquito again when it bites an infected person. Inside the mosquito, the parasite matures until it reaches the sexual stage where it can again infect a human host when the mosquito takes her next blood meal, 10 to 14 or more days later (WHO, 2006). Thus, man and mosquito play complementary roles in the malaria cycle (see

Figure 1; WHO, 2006).

Malaria is endemic in the developing country of Papua New Guinea (PNG). Approximately 300-500 million people world wide are affected by the disease and between 1.5 and 2.7 million die per year. 800,000 of these are children. Today the disease is largely confined to Africa, Asia and Latin America (Trampuz et al., 2003). The Save the Children organisation argue that malaria is the second most significant cause of death in PNG (Save the Children, 2006). Felger et al. (1994) estimated that 47% of the population of two villages in PNG were positive for the *plasmodium falciparum* parasite which causes the most dangerous form of malaria. In 2005 Mueller et al. (2005) undertook a study in eleven villages in PNG, between 1,400 and 1,700 metres above sea level. They found that following the 2002 rainy season, 53% of the inhabitants had symptomatic malaria. In addition, in comparison with previous studies, they reported a 6-10-fold increase in parasite prevalence and a 12-fold increase in enlarged spleens.

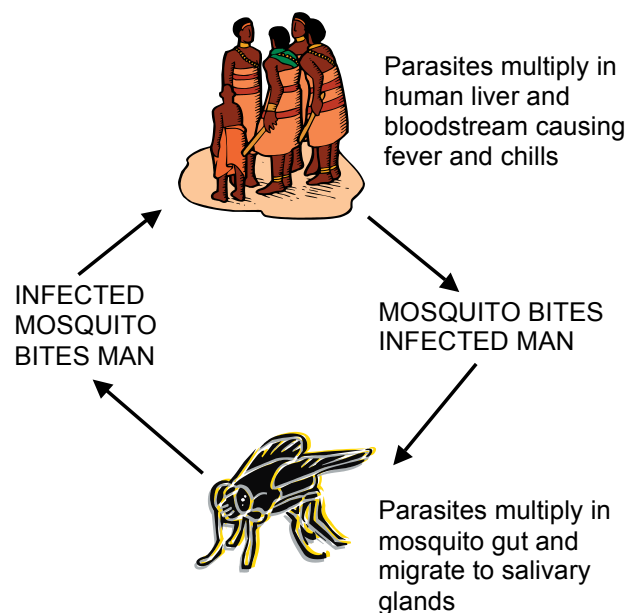


Figure 1. The malaria cycle

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History of Malaria

Malaria has been known about for centuries. Indeed, the Chinese used quinghao (*Artemisia annua*), the precursor to artemisinin which has been recently scientifically identified, as a treatment. It was not until the late nineteenth century that Laveran discovered the malaria parasite in 1889 and in 1897 Ross showed that the mosquito was the vector. These discoveries, coupled with the invention of dichlorodiphenyltrichloroethane (DDT) during the Second World War led to the campaign to eradicate malaria world wide. During this time inexpensive drugs from the chloroquine group were also synthesised and proved effective in treatment (Microbiology at Leicester, 2006). However, the goal to eradicate malaria has never been achieved. In countries such as PNG inadequate health structures and poor socio economic conditions coupled with the tropical climate impede effective control. With increasing resistance to drug therapy the picture is becoming even bleaker for countries like PNG.

The general public in industrialised countries often assume that malaria is an insignificant disease. People often refer to the symptoms of periodic shivers and general malaise associated with the illness. I have been present on a number of occasions where people working in PNG are berating taking their anti-malarial drugs. A significant number discontinue them because they do not care for the side effects of medication and believe these false assumptions about the disease. However, staff in critical care units in industrialised countries may encounter people suffering from severe complications of malaria. These are usually travellers who have returned from countries where it is endemic. Approximately 10,000 to 30,000 travellers from industrialised countries contract malaria per year. Trampuz et al. (2003) recommend that malaria should be included in the differential diagnosis of any person presenting with a febrile illness who has recently returned from travel to a malaria endemic area.

Malaria: a medical emergency

Malaria represents a medical emergency since it can very rapidly progress to death without appropriate treatment (WHO, 2006). The incubation period prior to the onset of symptoms is generally 6-11 days. This period can be prolonged if the infected person has built up an immunity due to prior exposure. The most common severe clinical presentation is of cerebral malaria which contributes to most deaths from the disease.

Management and ventilatory support

The patient may present with generalised convulsions, followed by a coma, which may last for several days. The diagnosis is confirmed by the presence of *P. falciparum* parasitaemia and a Glasgow Coma Score of 9 or less. Other complications include acute lung injury. The patient may present with tachypnoea and dyspnoea followed by hypoxaemia and respiratory failure requiring intubation and artificial ventilation. Acute renal failure may also be an added complication often requiring support with renal replacement therapies (Trampuz et al. 2003). Hypoglycaemia is also a common feature of the condition. This occurs as the host and growing parasites consume more glucose. As the victim suffers from impaired liver function resulting in acidaemia and hyperinsulinaemia hepatic gluconeogenesis and glycogenolysis occur. Stimulation of pancreatic insulin secretion, by drugs such as quinine, also contributes to the secretion of pancreatic insulin

and thus compounds the problem. Several of these factors may be affecting the patient (Malaria site, 2006). This may be overlooked because the clinical features are similar to those of severe malaria itself including anxiety, dyspnoea, tachycardia, sweating, coma, abnormal posturing and generalised convulsions. Hypotension and shock may also occur. This can result in massive haemorrhage from rupture of the spleen or from the gastro-intestinal tract. Severe anaemia is also a complication which occurs in endemic regions. This is most common in children due to repeated or recurrent infection (Trampuz et al. 2003).

These complications of malaria are at worst life-threatening and at best severely debilitating. The World Health Organisation (WHO) recommends that if there is to be a successful outcome for the patient presenting with signs of malaria he or she must be admitted to an intensive care facility with the equipment, drugs and personnel with the knowledge and skills to treat the patient (WHO, 2006). Such an option is not open to the people living in remote rural areas of PNG. It might take 48 hours to get to an aid post. These are not resourced with the equipment, drugs and personnel to administer the critical care necessary to save lives in this situation.

How can critical care nurses engage with communities in promoting awareness and prevention of medical emergencies resulting from malaria?

I am a British nurse and researcher with the University of the West of England in the UK and I have been working on an empowerment research project with members of a community who live in a settlement in Port Moresby, PNG. The project is fondly titled Research in Our Front Yard since the project takes place at the home of some of the participant members. I have been working with members of the community since July 2004, to explore how they can affect some of their health experiences (see Photo 1). We met weekly during a three month period in 2004 and again over four months in 2005. Using an empowerment approach to research, we used an inclusive partnership approach to negotiating the topics for discussion and the subsequent action(s) we wished to take to improve the situation. In order to explore issues most relevant to the community the dialogue includes negotiating the topics for discussion. One of the topics chosen to explore was malaria and its effects on the community.



Photo 1. Jane with members of the community in Port Moresby, PNG

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The project is unfunded and so I bring no resources, other than my professional knowledge and expertise as a nurse and health visitor. This means delving deep into my knowledge base to review alternative strategies which might have some impact on the experience of the people participating in the project. In discussions on malaria this has meant acknowledging the life-threatening implications of malaria whilst going back to basics, considering a public health approach and reviewing the dynamics of vector control. This included exploring access to and provision of WHO-approved mosquito nets, which are impregnated with insecticide to facilitate effective preventive control. They act as a physical barrier to the mosquito and have the added benefit of killing the mosquito (Roll Back Malaria Partnership, 2006).

In 2004 members of the community living in the settlement advised the research team that their extended families in Batri, a remote village in the Southern Highlands of PNG, could not get WHO-approved mosquito nets although they suffer from malaria. Five deaths from cerebral malaria had occurred in the village every year. Approximately 139 cases of malaria were reported to the aid post each month in a community of about 1400 people. However, these figures may be an underestimation since, for some, the aid post takes 24-48 hours to reach and not everyone with symptoms attends.

As described above, severe malaria results in a number of life threatening and debilitating conditions. For example, chronic malaria results in anaemia as the spleen enlarges. This leads to chronic illness. As illustrated in the example below it also contributes to an increased likelihood of critical conditions such as post-partum haemorrhage following childbirth. This often results in maternal death.

The people of the *Research in our Front Yard* project shared stories with me of how malaria affects their community (Fitzpatrick, 2006). One elder shared his family story:

My father died very suddenly of cerebral malaria in the village when I was about 8 years old. He collapsed and died after a short fever. With no medical help or drugs available in the village there was no way of saving him. This left my mother with the responsibility of trying to bring up three young children. Finding some way to find money to send us to school in a remote area was very difficult. She used to try and grow things in the 'garden' and sell what she could so that she could pay our school fees. I was very lucky because it was very difficult after my father died. She made sure that I got to school and later to university.

Another gentleman sitting with his three year old twins told of how his wife had died following childbirth in the village.

My wife was ill for a long time in the village. She often had fevers and shivering before she had the twins. She bled a lot when they were born. She passed away. Now I live in the city and I look after them. My Wantoks (members of the extended family) help so that I can work to feed us and make sure the twins have a better life.

The intermittent fevers and shivers that this father described are a classic sign of chronic malaria. A likely cause of this mother's death was post-partum haemorrhage in which anaemia would have been a contributory factor.

Other people described the village context of carrying out basic chores. The Batri villages are spread out. Unlike in the UK where village communities are often in close proximity and often grouped around local churches, homes in Batri are scattered over a wide area. There are no amenities such as piped water or local supermarkets to buy produce and basic necessities. The people talked about the vast distances they travel to find clean water, usually about one to two kilometres. They then carry it back to the home for cooking and drinking. They also go long distances to tend their 'gardens', bringing produce back to the home to cook and feed the family. They told of how if the adults have malaria they cannot do basic things such as go and get water and food. Since malaria is spread by mosquitoes it does not usually present in isolated cases. When it affects the community it has a dramatic effect on the quality of life of those who live there.

All of the participants told of how in the village there is no access to immediate medical and nursing care and no prospect of critical care intervention. It would take at least 24 to 48 hours to get to the local aid post and there they were unlikely to get medicine. It was very unlikely that they would get treatment for cerebral malaria quick enough to save the person affected.

Faced with these dramatic stories of how malaria impacts on people's lives and the reality that in a poor economy the emphasis could not be on developing an air ambulance or a critical care facility, I therefore shared examples of how we can prevent malaria. This included exploring how mosquito nets can provide an effective means of preventing the mosquito biting people and so prevent them infecting people with the malaria parasite. Trials of insecticide-treated nets (ITNs) in the 1980s and 1990s demonstrated that they reduced deaths in young children by an average of 20%. However, families at risk of malaria are among the poorest in the world and ITNs are expensive; but cost is not the only barrier to their effective use. People unfamiliar with the effectiveness of ITNs need to be convinced of their usefulness and persuaded to use them appropriately (Roll Back Malaria Partnership 2006).

Members of the community told me of how their Wantoks live in an area that is so remote that there are no roads and even the Mission Aviation Fellowship (MAF, 2006) do not make regular landings at the air strip due to bad weather and the cost. In response, I asked, "What can we do to help the people there?" "Well, we have been talking about prevention but they cannot get mosquito nets to the village, it is so remote" was the reply.

This led to myself and Dr. Ako, who is the In Country Adviser to the project, approaching the British High Commissioner, for 400 WHO-approved insecticide treated mosquito nets and the costs to get them safely to the remote Batri village in the Southern Highlands.

Participants in the project communicated with their Wantoks in the remote village by two-way radio. Messages were passed by the elders of the community to ensure people understood why the nets were being sent to them. They also identified the families who were to receive them. Women and children were targeted as they are most at risk of severe complications of malaria.

To ensure the safe delivery and promote ownership of the initiative, Dr. Ako escorted the mosquito nets to Batri in November 2004. He was party to a ceremonial receiving of the nets and long discussions about their use and potential to affect health in the village (see Photo 2).

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Photo 2. Traditional thanks for the safe arrival of the mosquito nets to the Batri village in the Southern Highlands of PNG. The bamboo is filled with drinking water, a very scarce resource, signifying the importance of the initiative

A year on, in September 2005, the people of the village sent a message saying thank you for the WHO-approved mosquito nets to those involved in this enterprise. They reported that there had been no deaths from cerebral malaria since receiving them. They also stated that the nets kill head lice, cockroaches, fleas and bed bugs and that “the rats do not get underneath to nibble the children’s feet!” Also, “The people are generally looking better as they walk around the village.”

Conclusions

This initiative has improved the quality of life in a remote village in PNG. It has prevented members of the community experiencing critical events that in the past would ultimately result in death since there is very little likelihood of accessing a critical care facility if you are taken ill in a remote village. In February 2006 I received a phone call to say:

Since you sent the mosquito nets to the village we have had no deaths and we have not had to send anyone to hospital. It shows that malaria was a significant illness in our community. We are so grateful that you and the British High Commissioner have been able to think of us and help us.

I have never been to this remote village in the Southern

Highlands of PNG. However, this is a real example of how nursing and health care knowledge of the aetiology and complications of malaria can be shared with a remote community. This initiative demonstrates that through effective networking and mobilisation of community and strategic resources the people of remote communities in PNG can implement low-tech and inexpensive strategies to prevent malaria and its associated complications. In reality, we could not build, equip and staff a critical care facility, but in partnership with the community we can put our knowledge and skills to good use in developing a preventive initiative which has contributed to improving the quality of life in a remote Highlands village in PNG.

Jane Fitzpatrick is a Senior Lecturer in the UK. Her clinical background is in nursing and health visiting and she is currently working as a lecturer and researcher. Her focus is on the application of empowerment research in developing capacity amongst disadvantaged groups.

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