The serial killer that has moved into Tanzania's idyllic highlands

JODY CLARKE - May 24 2010 12:31

Hasahan Dafa was just two years old when he died of malaria. He got a fever, started shivering, and within three days was dead.

In sub-Saharan Africa, where almost 800 000 people die every year from malaria, his is hardly an unusual tale. But in the Usumbura Mountains, "Tanzania's Switzerland" as the tourist guides describe it, it is.

"There was no malaria here back in the 1960s," says his 65-year-old grandfather, Ramadhan. "Now, it's becoming a serious problem. People are dying. I've already lost a son and now a grandson to it."

Malaria is breaking out in most of the region's highlands, exposing the non-immune population to epidemics where there was none before. Many reasons have been put forward for the problem, from changes in farming methods to increased drug resistance among mosquitoes. But another far more controversial reason has been advanced -- climate change.

In the past 20 years warmer temperatures have created more favorable conditions for mosquito populations that carry the malaria parasite. Until the late 1980s the majority of malaria deaths were restricted to Africa's tropical lowlands, where temperatures are warm enough for the malaria parasite to mature rapidly inside its mosquito host (vector). But now cases are being reported at higher altitudes.

Rainfall has also become more erratic, falling over shorter periods but more heavily. This puts pressure on already creaking water-drainage systems, allowing the latent pools of water that mosquitoes thrive in to develop.

To make matters worse, rapid deforestation in Tanzania's Usumbura Mountains means more water is gathering on the ground, creating more sunlit pools than usual. In short, if mosquitoes were looking for the ideal breeding ground, they could hardly find a better place than the highlands.

And climate change, although not wholly responsible, seems to be one of the main reasons behind the malaria outbreaks that first started taking scientists by surprise in the early 1990s.

Rising temperatures

Malaria isn't new to the highland regions. As critics of the idea that climate change is fuelling malaria outbreaks point out, Nairobi (which at 1068m is at the upper limits for the disease in the area) was notorious for outbreaks in the war years. The town was surrounded by marshes thick with mosquitoes and it wasn't until 1927, when the government agreed to spend £40 000 to eradicate breeding sites, that it was finally brought under control.

But with temperatures on the rise, earlier efforts to do away with the disease are steadily being chipped away at, say researchers. Temperatures in the highlands have risen by 0,5°C in just 50 years. But as any visitor to Tanzania will tell you, it doesn't take brains or money to figure that out.

Back in 1936 Ernest Hemingway could write about a "snow-covered mountain 19710ft high" in his book, *The Snows of Kilimanjaro*. As late as 1990 ice could be seen at heights as low as 2700m on the 5895m-high Mount Kilimanjaro, but by 2001 the ice had retreated to 5685m, according to a report by Greenpeace. Africa, it seemed, was warming.

Indeed, talk to old hands in the region and they can tell you that weather patterns are very different today than they were half a century ago. Take 79-year-old Father Peter Mitchell. He can still remember the morning the bananas turned black.

"It was 1962 and it was if a fire had rushed through the forest," says the Irish Catholic priest. A Rosminian father, he has spent much of his time on the continent in Tanzania, and specifically the Usumbura Mountains, where he is now retired in Lushoto, the leafy mountain town where Hasahan lived.

"We were at 6 000ft [1800m] and I remember waking up and seeing that the bananas had turned black. It was freezing cold. But then in those days you could wake up and see frost on the ground. Not any longer."

Relatively cool and breezy, the highlands were a favorite spot for European settlers to put down roots. Free of the malaria and cholera found on the coast, the British set up along the Rift Valley in Kenya where they grew tea, whereas the Germans came to the Usumburas in the late 1800s, to grow coffee and build holiday homes away from their colonial capital Bagamoyo.

Until the early 1990s the mountains were still considered an oasis of good health. Mosquitoes that carried malaria couldn't tolerate the highlands' long-term average temperatures of 18°C. Any lower, and the mosquito would die before the parasite inside it had fully developed.

But since the beginning of the 1990s temperatures have been rising, making way for the parasites. Indeed, according to Dr Andrew Githeko of the Kenya Medical Research Institute (Kemri) in Nairobi, it was in 1993 that he first witnessed temperatures in western Kenya and northern Tanzania rising above 18°C. "That's when we began to hear about malaria cases in highland areas."

What followed was malaria outbreaks after freak weather events.

In 1997-98, during an El Niño weather pattern, average temperatures in Kenya's highlands were four degrees higher than usual. Incidences of malaria then increased 300% over the average for 1995 to 2002. During the same period, in Tanzania and Uganda, malaria

incidence in highland areas increased by 146% and 256% respectively.

"There was a clear link between these El Niño events and the number of malaria cases," says Githeko, who says that temperatures normally rise by two to four degrees when El Niño arrives. This leads to an increase in malaria cases, he says, which he followed closely, looking at how rising temperatures and increased rainfall affected rates.

He and colleagues at Kemri and the State University of New York at Buffalo found that a 1°C increase in the minimum and maximum monthly temperature would lead to an 8% to 95% increase in the number of malaria outpatients; a temperature increase of 3,5°C would result in a 27% to 332% increase in malaria incidences.

The findings mean that malaria outbreaks can be predicted up to four months before they occur, an enormous advantage given the increasing frequency with which the disease is hitting the highland regions.

But no matter how effective the computer program he helped put together was, it wouldn't be able to put a stop to the El Niño-type events themselves, which are now coming more often than ever.

Immunity
"In 2003, 2006 and 2009," says Githeko, "these El Niño events are coming every three years now, instead of the usual seven." And because the highlands have been cool for such a long time, people have not been exposed to malaria.

"So people living in the highlands have no immunity against it," he says.

This means that when malaria breaks out in high-altitude areas, the population is more vulnerable to an epidemic than those in the lowlands where malaria has long been common. This creates a domino effect, as children in low-lying regions are more likely to get the disease than adults who have been exposed to it before. But in the highlands, adults and children have an equal chance of being affected. And, because people of all ages are vulnerable, the epidemic moves faster and the impact is more widespread.

Patrick Tungu, a medical entomologist at Amani Medical Research in the Tanzanian highlands, says that, even though Lushoto and the surrounding towns were once free of malaria, now they have almost the same malaria prevalence as lowland areas.

Like most researchers in the field, Tungu believes that climate change is behind many of the recent malaria outbreaks, although he urges caution on drawing a direct link between the two.

"I think the impact of global warming/climate change on malaria is overstated, because when people speak about highland malaria they speak of global warming as if it is the only factor which led to the increase in temperature ranges and therefore malaria prevalence.

"They forget other factors," he says, "like the extensive clearance of forest for crop cultivation, building houses, roads and logging, which has caused deforestation and led to an increase in temperatures and therefore malaria."

Dr Manisha Kulkarni of HealthBridge Canada, an NGO that works on health projects in developing countries, supports this.

Although scientists agree that, if there is an increase in temperatures, you will see mosquitoes breeding further and further up mountain slopes, "we don't have evidence from weather stations that shows a direct link", he says.

Trekking through the Usumburas, the impact that people have had on the landscape, and therefore malaria rates, is evident. Deforestation is rife and charcoal, made from the burnt wood of local hardwood trees, can be bought anywhere, even though it is illegal.

Potatoes and cabbages grow where trees once did, in valleys of terraced fields carved out along the mountains sides.

When the Germans first arrived in Lushoto in 1886, 75% of the surrounding area was covered in forest. Today it is just 5%, with a rapidly expanding population putting severe pressure on the land.

Across Tanzania there has been a 50% reduction in forest cover between 1954 and 1978, and in Uganda 29% of the forest area was chopped down between 1954 and 1991. In western Kenya's highlands in Kakegema deforestation may partly explain why temperatures have risen 1,2°C to 1,8°C degrees in recent years.

And with the populations of Uganda, Tanzania and Kenya likely to double by 2050, the problem is set to get worse. This doesn't just affect the wildlife in the woodlands -- which is so diverse that the Usumburas have earned the title of Africa's Galapagos -- it also means higher temperatures, as treeless habitats have warmer midday temperatures than forested areas.

This allows mosquitoes to develop and lay their malarial eggs earlier. Open, treeless habitats shorten the gonotrophic cycle (egg production / laying cycle of the female mosquito) by 2,6 days (52%) and 2,9 days (21%) respectively during the dry and rainy seasons, compared with forested sites.

Rising temperatures and man-made incentives makes for an ugly cocktail. And once you factor in increasingly erratic rainfall, the picture doesn't get any prettier.

Rainfall

Pauline Kilele doesn't have to point to show the destruction caused by heavy rainfall in early March. It's to be seen everywhere. Roads have been eroded and mud huts washed away, leaving just the wooden beams that once held them together.

In one night in March, as a flash flood rushed down from the surrounding mountains, six lives were lost and 260 homes were destroyed, leaving 89 families in Mwanza in northwestern Tanzania displaced.

"The people blame El Niño," says Kilele, the local coordinator for the Tanzanian Red Cross. "They say that it's never rained as heavily as it has these past weeks. It's just become more unpredictable than ever."

Mwanza is not in the highlands but, as evidence for erratic rainfall goes, it is as good an example as any. Flash floods and the risk of mudslides have become a real threat to East Africans. But the immediate threat is just an ominous indicator of what is to come -- heavy rainfall inevitably leads to malaria outbreaks. For example, in Eldoret in western Kenya, if rainfall increases by 22%, malaria tends to rise by 118%, according to Githeko's research.

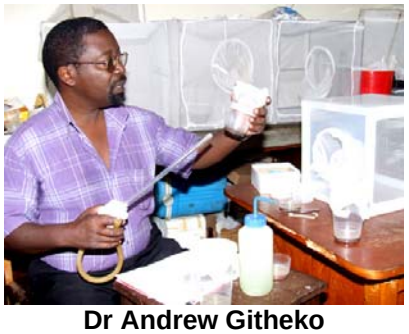
In Mwanza the Red Cross is now handing out free mosquito nets.

"If you look at patterns over the past 10 to 20 years, there have been a lot of extremes. We've had prolonged droughts and very dense rainfall," he says, which have led to crops and even animals being swept away. And these kind of extremes are forecast to become more frequent in the highlands areas.

Whether it comes down to climate change or not, Kilele says, "it depends who you ask. But looking at how things used to be and how they are now, it is difficult to see it as anything else."

Some people are still sceptical though. Dressed in shorts and a tight linen shirt, the owner of a hotel in Lushoto says that, in the 12 years he has lived in the town, he has never had malaria. "I don't even use a mosquito net," he says, although some of his workers have begun complaining about getting malaria. "But I think that's just an excuse for them to bunk off work," he says.

Specialists searching for solutions


Dr Andrew Githeko

Dr Andrew Githeko is a senior researcher at the Kenya Medical Research Institute, where he has specialised in malaria studies for 28 years. When Githeko first began working within the institute his work was mainly focused around malaria vaccines. But following a serious epidemic of malaria in the early 1990s the focus of his work changed.

"In the early 1990s we saw a very serious epidemic, we didn't know why it was happening," he says. "At that time there was talk of climate change and we thought maybe this could affect malaria in the Tanzanian Highlands. We then gathered very strong evidence that that was the case. It has to do with variations in rainfall patterns, so sometimes the weather is particularly good for the mosquitoes and malaria. Rainfall increases mosquitoes by two to three times."

Githeko's work has led to the development of an early warning system for malaria.

"We have managed to come up with a way to predict malaria epidemics for two to three months in advance using weather data. We can now inform the health ministries and they can spray houses with insecticides and provide nets to help prevent it."

A specialist in the field of malaria vector control research, Dr Patrick Kungu first became interested in science when he was at school.

But after studying veterinary medicine and getting a masters in infectious disease in

parasitology and entomology, he went back to get his PhD specifically in the "chemical control of malaria vector". "With my ambition I came to find that malaria is one of the primary predicaments affecting the society I am living in," he says.

"Seeing that I have the knowledge and skills required to fight against malaria I am doing some research on finding new and better tools of preventing and controlling malaria."

His work has had some significant breakthroughs. Kungu and his team have come up with several findings regarding malaria chemotherapy and malaria vector control that have led to the change in the policing of drugs used in malaria treatment.

Source: Mail & Guardian Online
Web Address: http://www.mg.co.za/article/2010-05-24-the-serial-killer-that-has-moved-into-tanzanias-idyllic-highlands