Assignment 1: Managerial Briefing on a Selected Global Health Need

Malaria: Vector Borne Illness Impeding Growth and Development of Countries and Populations at Risk

Malaria: a preventable mosquito- borne illness that infects *Anopheles* mosquitoes which feed on humans, resulting in an illness presenting initially with high fevers and flu-like illness. Types of malarial parasites that infect humans are known to be: *Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae,* and *Plasmodium knowlesi*.

Disease transmission:

1) *Anopheles* female mosquito injects sporozoite (pre-erythrocytic) stage parasites into bloodstream of human. (BVGH, 2013).
2) Replication of parasites in liver
3) *P.falciparum* parasites enter bloodstream (now called merozoites: daughter parasites) after 7-14 days from time of infecting liver cells which then infect red blood cells (referred to as erythrocytic stage) leading to clinical symptoms of fever, chills, anemia.
4) *P. vivax* and *P. ovale* parasites can process into a dormant stage where they become "hypnozoites" and can persist in the liver and cause relapses by invading the bloodstream after weeks to years.
5) Once parasites have begun to infect red blood cells, eplication continues and reinvasion of red blood cells continues.
6) *Anopheles* mosquito picks up "gametocytes" or blood stage parasites from human host.
7) 10-18 days pass and parasites are found as "sporozoites" in mosquitoes' salivary glands which are then injected into the human host to start cycle again. (CDC, 2013).

Malaria Comorbidities
Women with HIV and malaria are at higher risk of severe anemia and adverse birth outcomes due to their immunocompromised state (Gender, Health, and Malaria, 2007). Pregnant women (due to their immunocompromised state) are at greater risk of severe malaria in most endemic areas. These women are at increased risk of abortion, stillbirth, premature delivery, and giving birth to low-birth weight infants. In addition, tuberculosis is also a comorbid condition associated with malaria given a TB patient's immunocompromised. Of note, in Africa, the sickle cell trait confers a protective advantage to malaria.

Affected populations:

- In 2010, malaria caused an estimated 660 000 deaths (with an uncertainty range of 490 000 to 836 000), mostly among African children.
- Endemic in tropical and subtropical regions of Africa, Asia, and Central and South America
- Affects 250 million people per year and results in more than 800,000 deaths
- 89% of all malaria deaths occur in Africa, majority of deaths in children under age 5
- Estimated at risk population in high burden countries of close to 670 million
- 108 countries with endemic malaria (BVGH, 2013).

Treatment:

Many treatment options exist today for malaria in endemic regions. Based on countries, treatment can be geared towards targeting resistance patterns within specific countries. However, given resistance patterns of many anti-malarial drugs, there is growing concern for resistance to newer therapies as well including artemisinin. Artemisinin combination therapies (ACTs) have been recommended by WHO since 2002 as first line treatment for uncomplicated malaria in endemic regions. There are five ACT therapies approved for use: Artesunate-amodiaquine, Artemether-lumefantrine, Artesunate-mefloquine, Dihydroartemisinin-piperaquine, and Pyronaridine-artesunate. Severe malaria is treated with IV artesunate per WHO recommendations. In pregnancy, quinine is recommended for use during the first trimester. ACTs are used in 2nd and 3rd trimesters. Pregnant women may intermittently obtain sulfadoxine-pyrimethamine for preventive therapy (BVGH, 2013). There are concerns for shortage of artemisinin and researchers are attempting to find ways to combat a possible shortage of *Artemisia annua*, the wormwood plant. (SciDevNet, 9/2013).

There is growing research and development for a malaria vaccine. The vaccine was developed and tested in the U.S. and is pending further clinical trials in Africa. It has currently only passed phase 1 safety trial in a study of 40 volunteers (SciDevNet 9/2013).

Prevention:

The Roll Back Malaria Partnership, the global framework for coordinated action against malaria, hopes to prevent and curb spread of malaria by 2015. Prevention and treatment mechanisms are divided into the following: insecticide-treated nets, indoor residual spraying, accurate diagnosis and treatment with artemisinin combination therapies, and intermittent preventive therapy for infants and pregnant women (BVGH, 2013).

Inequities/Challenges:

Women are at higher risk for illness due to malaria due to gender inequality, especially women who are unemployed and women living in poor neighborhoods. In addition, women in malaria endemic regions may have lower educational and literacy rates than men, thus their knowledge and practices associated with malaria may be less as well as their ability to recognize symptoms of malaria. In a family affected by malaria, a male affected is likely to be the main economic provider, thus causing increased stress for the female caregiver to provide for and care for the family (Gender, Health, and Malaria, 2007). In order to prevent and provide appropriate malaria treatment, there needs to be increased malaria awareness and education amongst all members of families. In addition, there needs to availability of anti-malarial medications to patients, operational clinics that diagnose malaria with rapid diagnostic testing or microscopy testing, and availability of symptomatic control with intravenous fluid hydration and blood products for those with severe malaria. The timing of treatment is essential for malaria. If *P.falcipurum* patients do not receive treatment within 24 hours, they will likely die. Complications from malaria include cerebral malaria, severe anemia, respiratory distress, and multisystem organ failure. Artemisinin combination therapies are in high demand and there is concern for future and current resistance as well as possibility of shortages of artemisinin. Vector control is critical to curb spread of the disease with insecticide treated nets and indoor residual spraying.

Malaria causes decreased labor productivity for populations affected, increases risk of prolonged illness, and in Africa, an estimated loss to GDP of US $12 billion in lost annual gross domestic profit. In high malaria endemic areas, the disease may cause the GDP to decrease by up to 1.3% per year. In order to continue with current efforts and future efforts, spending towards malaria will need to increase by US $5 billion (BVGH, 2013).

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Fall 2013