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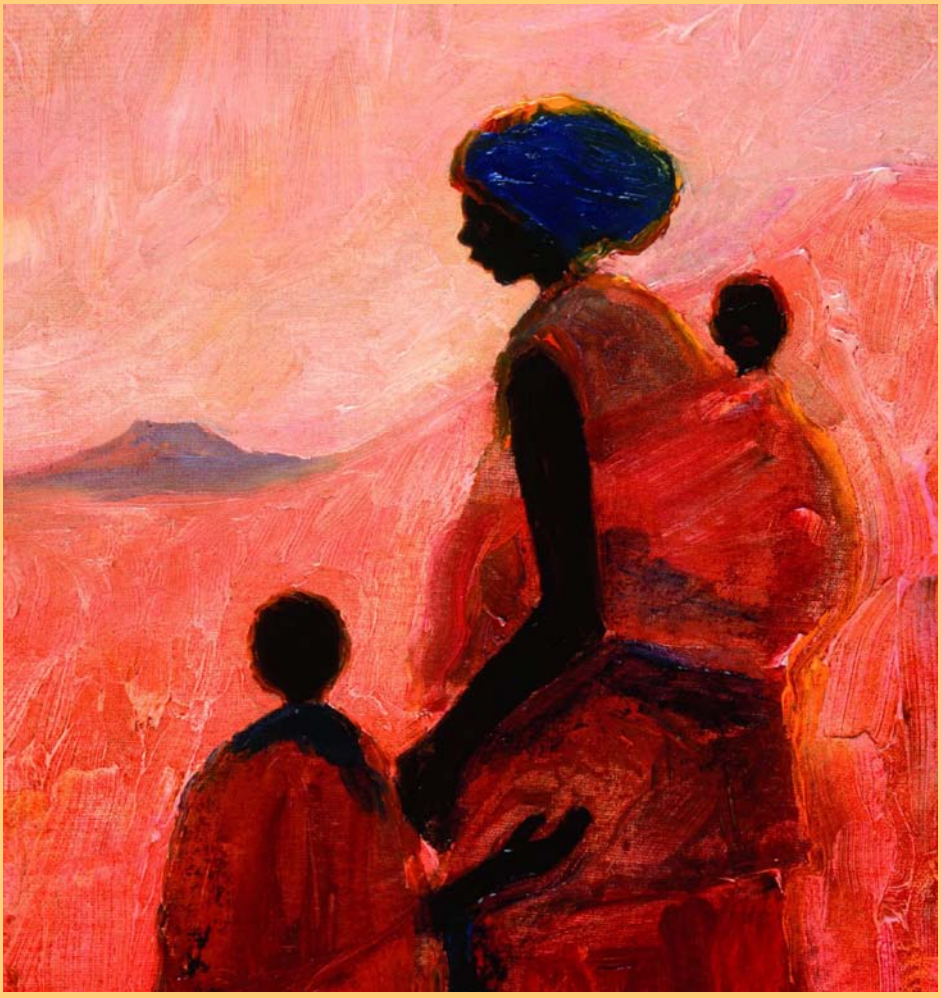
Uwe Groß and Kerstin Wydra (Eds.)

Maternal–Child Health

Interdisciplinary Aspects Within the Perspective of Global Health



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30. Buruli Ulcer: A Disease which Leads to Severe Disabilities and Mostly Affects Children Living in Wet Agro-Ecosystems of West and Central Africa

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1 Introduction- What is Buruli Ulcer?

Buruli Ulcer (BU) is a devastating skin disease with serious necrotizing cutaneous infection caused by *Mycobacterium ulcerans*. BU is the most common mycobacterium infection of humans after leprosy and tuberculosis. The disease affects rural poor people living or working close to rivers and stagnant water. About 70% of those affected are children under the age of 15 years. The start of the illness is painless

while the bacteria invade further into the skin and soft tissue without any warning signs and then even attacks bones. When the ulcer becomes more prominent and if it is not adequately treated through effective antibiotics, surgically removal of the damaged tissue followed by skin transplants and eventually amputations are necessary. The healing process is considered a continuation of the suffering which can be associated with serious handicaps. What remains are most of the time severely disabled children who require long treatment and continuously bear the stigma of disability for the rest of their lives.

BU is a disease less documented and most neglected with high prevalence in wet agro-ecosystems of West and Central Africa. Reported cases range from 900 in Cameroon to 11,000 in Ghana and 28,000 in Côte d'Ivoire.

2 The prevalence of Buruli Ulcer in West and Central Africa

Well identified and described in 30 countries in the world, the prevalence and the incidence of BU varies significantly where it occurs but remains relatively high in West and Central Africa making these two regions the most affected in the world. The National Program for Buruli Ulcer Control in Côte d'Ivoire reports 28,000 cases with an average of 2,000 new cases every year, making Côte d'Ivoire the most endemic country in the world.

In Ghana, results of a national Buruli Ulcer survey, published in 2002, identified 5,619 patients with 6,332 clinical lesions at various stages. The overall crude national prevalence rate of active lesions was 20.7 per 100,000 but the rate was 150.8 per 100,000 in the most disease-endemic district. The case search in endemic areas demonstrated widespread disease and gross underreporting compared to the routine reporting system.

In the endemic locality of Lalo in southwestern Benin, a total of 752 BU patients were detected during a study in 2005. Of these patients, 160 were active cases making an overall extreme prevalence of 86.6 per 10,000 inhabitants for this locality.

In Cameroon, national data for 2005 revealed a total number of notified cases of 932 patients. In total, 914 new cases were reported with 209 cases being recorded in the most endemic locality of Ayos in South Cameroon.

The world report on BU incidence indicates a total of 5,000 new cases per year with a cumulative number of 60,000 cases found for the African continent in 2008. The report also highlighted underreporting of numerous cases in most countries due to low diagnostic facilities in most endemic localities.

3 BU-induced disabilities

According to the World Health Organization, a disability is defined as any long-term limitation in activity resulting from a condition or health problem. A disability could be associated either with a partial or a full limitation of movements.
BU causes extensive destruction of the skin and soft tissues and patients who are not treated early enough are often left with severe scarring and with long-term disabilities. About a quarter of patients are left with permanent disabilities. In Africa, 25% of BU lesions are recorded on upper limbs, 63% on lower limbs and on other parts of the body such as head, neck regions, chest and breast.

A study conducted in Ghana analyzed the appearance of BU ulcers on head and neck regions. This study revealed that most patients (55.3%, $N = 21$) with BU lesions on the head or neck regions present deformities such as stiffness of the neck ($N = 4$), loss of part of the ear ($N = 2$), loss of part the nose ($N = 1$), loss of part of the lower lips ($N= 2$), loss of the eyeball ($N = 5$), loss of the eyelid ($N = 4$), and baldness ($N = 3$) at the frontal part of the head.

BU disabilities are generally accompanied with severe scars due to surgeries. These scars cause psychological effects (e.g., low self-esteem, shyness, and inferiority complex) which can affect the victims in their education (especially in children), marriage, and work. Particularly on the face, plastic surgery for BU is more challenging than applied to other body parts. Establishing surveillance teams in remote endemic localities is necessary for rapid diagnosis and a prompt management of BU for the prevention of disabilities.

4 Agricultural intensification and resulting human diseases such as BU

Wetlands in West Africa have recently been targeted for increased food security as they appear to become new pathways to poverty reduction through increased agricultural productivity and higher food production. However, the intensification of agriculture in wetlands is accompanied by inappropriate practices such as poor water management, inappropriate land use and inadequate use of agricultural inputs which have resulted in a significant disruption of the local agro-ecosystems and a poor supply of ecosystem services. (i) The aggressive soil use (excessive tillage) in farming systems such as maize, roots and tubers has increased water beds in agricultural settings and has disturbed the natural fauna and flora capable of biocontrolling some vectors and reservoirs of human diseases. (ii) Poor irrigation systems and excess watering in vegetable and rice farming have increased the level of standing water bodies and favored the development of vectors and reservoirs of several human diseases (e.g. malaria, schistosomiasis, filariasis). (iii) and finally, misuse and overuse of agricultural inputs such as fertilizers and pesticides have

increased the selection of population of insects capable of withstanding lethal doses of insecticides used for vector control in public health.

Several published papers have revealed associations between the intensification of agriculture in lowlands and the increased incidence of human diseases such as malaria, schistosomiasis, filariasis, and BU. To date we do know that BU transmission is associated with changes in land use, and exacerbated by poor agricultural practices. But what remains unknown is the mechanism through which humans get infected with *M. ulcerans*, the bacteria responsible for BU. To solve this cross cutting problem, studies need to be conducted by multidisciplinary teams of medical, environmental, agricultural and social scientists for clearly analyzing the contributions of poor agricultural practice to the increased incidence of BU as well as developing innovative, cost effective and environmentally friendly technologies for mitigating BU risks exposures during farming activities.

5 BU social rejection and economic cost

BU is associated with disabilities, disfiguration and large lesions which in most cases stigmatize the patient and prevent him from undergoing treatments. As a consequence, most patients seek treatment too late, and both the direct and indirect costs for managing BU are considerable. The long hospital stay, often more than three months per patient, represents a huge loss in productivity for adult patients and family caregivers, and the loss of educational opportunities for children. The long-term care of those disabled, most of whom are children aged 15 years, place an additional costly load on affected families.

BU imposes a serious economic burden on affected households and on health systems that are involved in diagnosing the disease and treating patients. For example, in Ghana in 2001–2003, the mean annual total costs of BU for a household by stage of disease ranged from US$ 76.20 (16% of a work-year) per patient with a nodule to US$ 428 (89% of a work-year) per patient who had undergone amputation. The average cost of treating a BU case was estimated to be US$ 780 per patient in 1994-1996, an amount which far exceeded per capita government spending on health.

In Benin, a survey conducted in rural communities revealed that healing of BU by traditional practitioners range from US$40 to US$120 excluding surgeries.

In Cameroon, studies on the economic cost of BU have revealed that 25% of annual earning of household is spent on each patient suffering from BU. This cost burden clearly surpasses the cost threshold of 10%, which has shown to be catastrophic for a household economy and likely leads to further impoverishment.

In Côte d'Ivoire, the typical cost of treatment can exceed $400 a month and may last for 2 to 3 month. This cost is economically devastating in a region where many people live on less than $2 a day.

Understanding the transmission pattern of BU will facilitate the prevention of the disease and will reduce related expenses and the burden on the household income.

6 Understanding the transmission of BU – a puzzle with several uncovered pieces

BU transmission is poorly understood and reportedly coupled with rapid environmental changes to the landscape and exacerbated by poor agricultural practices. In rural agricultural areas, some hypothesis highlight that (i) inappropriate intensification of agricultural practices such as excess tillage allows *M. ulcerans* to move from the internal soil layers to the surface soil then after; (ii) the bacteria brought at the surface soil is extensively spread in the environment through poor watering systems in irrigated agriculture.

Although the disease can be successfully managed at clinical level if detected early enough, one of the missing pieces of the puzzle is to understand how *M. ulcerans* is transmitted from the environment to humans. This missing element is crucial to identify the main exposure factors, and analyze the potential vectors/hosts implicated in the transmission of the disease. The clear understanding and description of the BU transmission mechanism will be a strong scientific advancement which will help developing programs for preventing the disease. It is also certain that the combination of a BU preventive package to existing BU management strategies will foster the control of this disease also known as "the mysterious disease" in most West African communities.

7 BU – an orphan disease

BU is considered as a neglected or orphan disease because of its confined geographical occurrence which results in low interest to funding bodies and a relatively low attraction to policy makers. Malaria has been long considered the most important target disease in Africa, and is still attracting a lot of attention because of its morbidity. However, most people ignore that BU significantly reduces farmer's productivity in wet agro-ecosystems and affects the schooling rates of children, endangers household's financial stability, and jeopardizes family's livelihoods in several West and Central African rural communities. We advocate that funds have to be raised for a better understanding of the diseases transmission and for the implementation of a sustainable BU preventive program in areas of endemicity. Considering the fact that BU is exacerbated by the intensification of agriculture for food security, it will increasingly become necessary to mobilize funds for joint research activities conducted by a multidisciplinary team of health, environment, agriculture and social scientists to better understand and mitigate risks associated

with poor agricultural practices and increased BU incidence in wet agro-ecosystems.

8 Funding research on BU transmission and prevention

An encouraging initiative focussing on the study of BU transmission has recently been launched in West and Central Africa namely "The AgroEcoHealth systems thinking initiative for fighting BU". The initiative brings together several scientists with different and complementary background knowledge to research on the identification of risk factors associated with BU transmission in wet-agro-ecosystems and analyse agricultural practices likely to favour the spread of *M. ulcerans* and the incidence of BU in wet agro-ecosystems. Target activities are gradually being implemented in selected pilot countries with relatively high prevalence of BU such as Benin, Côte d'Ivoire, Ghana and Cameroon. However, the implementation rate of planned activities remains unacceptably slow due to limitations in financial resources and the poor support of funding bodies.

We conclude that such an initiative which is focused on the control and prevention of the disease for containing new cases of BU calls for adequate resource mobilisation to meet the needs of a 5 years strategic program which has been budgeted with an estimated 1.7 million USD.

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Maternal-Child Health is one of the greatest challenges the world has to cope with today. Every year, thousands of women, newborns and children die unnecessarily, particularly in resource-poor settings. There is a great disparity caused by food insecurity and hunger, environmental health risks, sanitation challenges, cultural barriers and non-accessibility to diagnosis and treatment. "Maternal-Child Health: Interdisciplinary Aspects within the Perspective of Global Health" addresses these issues. The contributions of this book are based on the ONE HEALTH concept by focusing on infectious and non-communicable diseases and to present interdisciplinary views from more than 60 authors who come from 14 countries. The aim is to shape our understanding on Maternal-Child Health Solutions by looking at • agricultural and environmental • economic, social and theological • biomedical and nutritional • clinical human and veterinary as well as • epidemiology and • public health expertise. The Göttingen International Health Network is corresponding to a variety of different geographic regions and programs to improve global health perspective and health of the most vulnerable: mothers and their children.

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