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Continued Progress towards Elimination of Lymphatic Filariasis

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ABSTRACT

Lymphatic filariasis is one of the most debilitating neglected tropical diseases (NTDs). It causes many infectious diseases leading to physical disabled, mental, social and financial losses. Since the year 2000, the World Health Organization (WHO) has launched a campaign to eliminate lymphatic filariasis, and significant achievements have been made in limiting the prevalence of disease in endemic regions. We will highlight certain points on Global Programme to Eliminate Lymphatic Filariasis (GPELF) and review the possibility of vaccine development against lymphatic filariasis in humans.

KEY WORDS: Lymphatic filariasis, elephantiasis, **(**GPELF**)**, Diethylcarbamazine.

1. INTRODUCTION

The Lymphatic filariasis history provides us with evidences that the disease may have been found about 2000 BC. Lymphatic filariasis is caused by infection with parasites of filarial nematodes of the family Filariodidea that are transmitted through the bites of infected mosquitos, such as Aedes, Anopheles, Culex. As known Wuchereria bancrofti, which is endemic throughout the Western Pacific, Asia and Africa (Janet Douglass, 2019; WHO, 2015), cause about 90% of LF infections, while the remaining infections are caused by Brugia malayi and B. timori (Alessandra, 2020; Taylor, 2010).

The Lymphatic filariasis causes either temporary or permanent disability. The chronic cases of LF infection arise from the long life of worms and accumulation of infection with time. Symptoms range from mild symptoms; in some cases, patients do not show any symptoms of infection, to the chronic cases that are associated with lymphoedema, elephantiasis, scrotal swelling and breast swelling (Kanaan Al-Tameemi and Raiaan Kabakli, 2019).

The spread of the disease needs the presence of both male and female parasites in the host for sexual reproduction and producing microfilariae. The low transmission happens because of low loading of adult parasites in the same host. This reduces the prevalence and shift it from control to elimination. Thus, the use of the larviciding and insecticides is very effective in mosquito control (Emma L. Davis, 2019; Goel and Goel, 2016; WHO, 2014).

Global Programme to Eliminate Lymphatic Filariasis (GPELF):

Interrupt Transmission – Mass Drug Administration (MDA): Mapping the geographical distribution of lymphatic filariasis endemic is important to determine the need for MDA .

The use of MDA is advised for at least 5 years, which is considered the reproductive stage of the adult filarial worms (Kazuyo Ichimori, 2014; Michael, 2006; WHO, 2014). The mass drug administration aims to reach low levels of micro filaraemia in the blood of patients that reduce the possibility of infections to new individuals (Kazuyo Ichimori, 2014). The used drugs are: Diethylcarbamazine Citrate (DEC) + Albendazole or Ivermectin + Albendazole, in areas where onchocerciasis is spread; Albendazole twice per year, in areas where a Loa Loa is spread (Kazuyo Ichimori, 2014; Michael, 2006; WHO, 2014).

Alleviate suffering – Morbidity management and disability prevention (MMDP): The MMDP aims to access the recommended care for patients who are living in endemic areas and suffering from dermatolymphangioadenitis, elephantiasis, lymphedema, or scrotal swelling or breast swelling (Mackenzie, 2009; Noroes and Dreyer, 2010). The recommended care includes alleviating painful symptoms of dermatolymphangioadenitis, hydrocele surgery, providing MDA to get rid of any remaining worms or microfilariae (Kazuyo Ichimori, 2014; Mackenzie 2009).

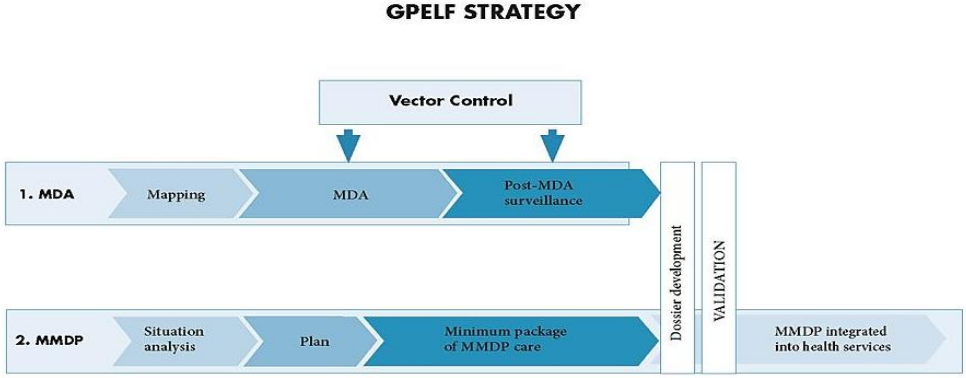

Fig.1. Global Programme to Eliminate Lymphatic Filariasis strategy

Based on a study carried by Local Burden of Disease 2019 Neglected Tropical Diseases Collaborators, about 198 million people were infected globally in 2000, Most of the infections were concentrated in South-East Asia region about 52% of the data were estimated from Bangladesh, India, Indonesia, and Myanmar. The prevalence map from 2000-2018 showed a decrease in lymphatic filariasis infections by 65.56% in South-East Asia region and by 86.44% in Africa, by 88% in Region of the Americas. In 2018, the total number of infections reduced by 74%, 51 million infected individuals reflecting the success of the GPELF in the elimination of this disease.

Development of Vaccine against Lymphatic Filariasis: Many studies suggest the presence of protective immunity to Lymphatic Filariasis. Therefore, trends have emerged towards developing a preventive vaccine. Preclinical studies on candidate vaccines showed the possibility to develop vaccine and using it effectively along with chemotherapy to control Lymphatic Filariasis worldwide.

Many factors influence vaccine development such as complex life cycle of Lymphatic Filariasis, the host immune responses, lack of evidence and information, which support the presence of natural immunity against Lymphatic Filariasis in humans, and the mechanism of the protective immune response against it in animals or humans. Paciorkowski (2010), showed that the early resistance to the Lymphatic Filariasis is mediated by a humoral immune response and they assumed the possibility of developing a vaccine against Lymphatic Filariasis. Perhaps the most convincing argument about protective immunity is the low rates in infections in older individuals compared with children. Ravindran 92003), provided further evidence depending on mathematical modeling studies. They suggested the presence of herd immunity for Lymphatic Filariasis in human communities.

Other studies, which were carried on animal models using Acanthocheilonema viteae, showed that the presence of LF from previous infection may protect the individuals from expected super infection. These individuals have a high rate of IgG antibodies in their blood (Ravindran, 2003; Day, 1991).

It is worth mentioning that the Multivalent Antigens Vaccine gave a better result than monovalent Antigens vaccine (Helmy, 2000; Gregory, 2000). As known, The LF is a parasite which uses many mechanisms to avoid the immune responses of the host. Therefore, the monovalent Antigens vaccine will be less efficient in this case. Hence, the vaccine development concentrated on combining antigens (e.g. ALT-2 (Helmy, 2000), small HSP 12.6 (Veerapathran, 2009), thioredoxin peroxidase 2, and TSP large extracellular loop (Dakshinamoorthy, 2012), and using them in experimental animals (Dakshinamoorthy, 2013).

2. CONCLUSION

Much has been achieved in the control and elimination of lymphatic filariasis as mapping its prevalence, MDA was implemented in endemic counties. At the beginning of 2020, about 23 of 31 countries implemented at least of MDA in all endemic regions. Despite this significant advance, further studies are needed to implement control programs recommended by the WHO.

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