Short Communication

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2021.37.005996

Use of Insecticide-Treated Nets (ITN) Against Diseases Vectors and Sucking Blood Arthropods

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ARTICLE INFO

Received: July 15, 2021

Published: July 23, 2021

Citation: Hassan Vatandoost. Use of Insecticide-Treated Nets (ITN) Against Diseases Vectors and Sucking Blood Arthropods. Biomed J Sci & Tech Res 37(3)-2021. BJSTR. MS.ID.005996.

Keywords: Vector-Borne Diseases, Insecticide Treated Net, Control

ABSTRACT

Sucking arthropods have been considered as important vectors of diseases to human and some of them take blood from human and are nuisance. The main important disease are: Chikungunya, Dengue, Lymphatic filariasis, Rift Valley fever, Yellow Fever, Zika, Lymphatic filariasis, Malaria, Japanese encephalitis, Lymphatic filariasis, West Nile fever, *Schistosomiasis* (*bilharziasis*), *onchocerciasis* (river blindness), Plague, *Tungiasis*, Typhus, Louse-borne relapsing fever, *Leishmaniasis*, Sandfly fever (*phlebotomus* fever), Crimean-Congo haemorrhagic fever, Lyme disease, Relapsing fever (*borreliosis*), Rickettsial diseases (eg: spotted fever and Q fever), Tick-borne *encephalitis*, *Tularaemia*, Chagas disease (American *trypanosomiasis*), Sleeping sickness (African *trypanosomiasis*). WHO recommended several measures and different insecticides for vector control including indoor residual spraying, larviciding, flogging, and using insecticide treated nets? Pyrethroid insecticides are recommended for impregnation of nets. Impregnated bed nets are being used for peoples who are at risk of diseases such as pregnant women and children. There are different types and colors of bed nets in the world. Appropriate usage of impregnate bed nets needs some information in the usage areas.

Introduction

Sucking Arthropods and Related Families in the World are

Mosquitoes (*Culicidae*), Sand flies (*Psychodidae*), Black flies (*Simuliidae*), Biting Midges (Ceratopogonidae), Tabanids (*Tabanidae*), Stable fly (*Muscidae*), Tsetse fly (*Glossinidae*), Kissing bug (*Reduviidae*), Bedbug (*Cimicidae*), Flea (*Pulicidae*), Head and body louse (*Pediculicidae*), Crab (*Phthiridae*), Mite (*Trombiculidae*), Hard Ticks (*Ixodidae*), Soft ticks (*Argasidae*). They transmit deferent diseases to human. World Health Organization listed the main vector borne disease in the world (Table 1). Vector-borne diseases are illnesses caused by pathogens and parasites in human populations. Every year more than one billion people are infected, and more than one million people die from vector-borne diseases including malaria, dengue, *schistosomiasis*, *leishmaniasis*, Chagas disease, yellow fever, *lymphatic filariasis* and *onchocerciasis*. For many vector-borne diseases, there are no vaccines, and drug resistance is an increasing threat. Vector control plays a vital role and is often the only way to prevent disease outbreaks. Many existing interventions, such as insecticide treated bed nets and indoor spraying, are simple and proven. Insecticide-treated bed nets are one of the most. WHO therefore recommends that everyone who is at risk of malaria sleeps under a long-lasting insecticidal net every night?

International donors funded over 700 million bed nets to protect families against malaria in sub-Saharan Africa. Nets should be checked regularly for holes and replaced every 2-3 years (Figure 1). The use of insecticide in impregnation of bed nets against

sucking arthropods is due to these creatures are attracted to contact occupied nets by the odor of the occupants. This equipment is being used as personal protection for high-risk groups. If 80% of the entire population is coverage, it has mass killing effect. At the total coverage, ITN effect on the vector density and survival.

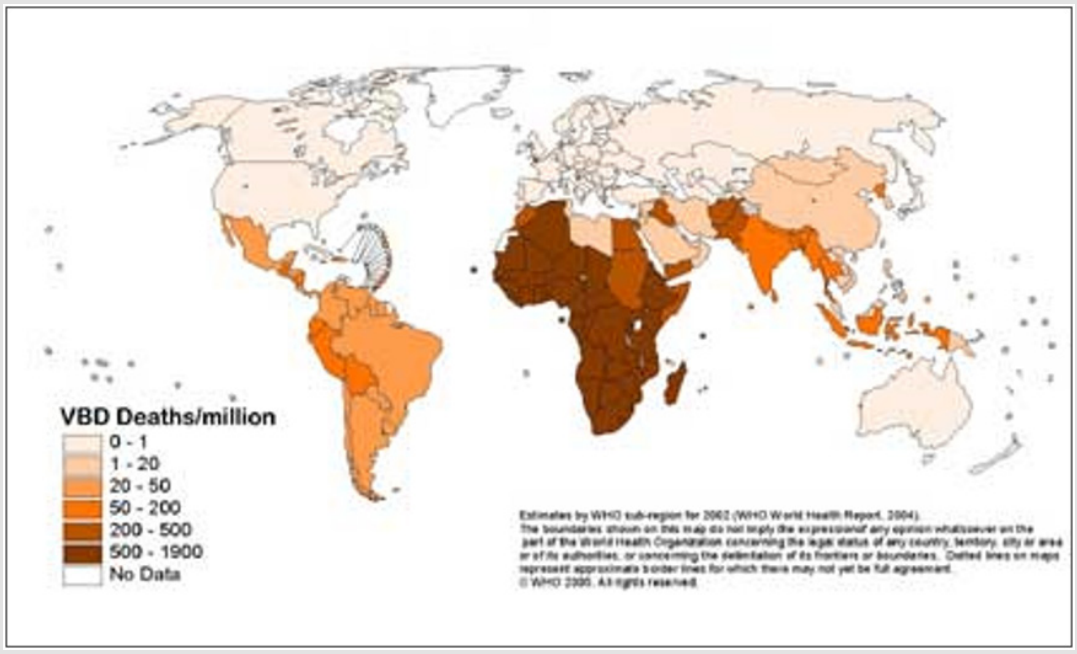

Figure 1: Global death from vector-borne diseases.

Table 1.

Vector	Disease caused	Type of pathogen
Mosquito *Aedes*	Chikungunya	Virus
	Dengue	Virus
	Lymphatic filariasis	Parasite
	Rift Valley fever	Virus
	Yellow Fever	Virus
	Zika	Virus
Anopheles	Lymphatic filariasis	Parasite
	Malaria	Parasite
Culex	Japanese encephalitis	Virus
	Lymphatic filariasis	Parasite
	West Nile fever	Virus
Aquatic snails	Schistosomiasis (bilharziasis)	Parasite
Blackflies	Onchocerciasis (river blindness)	Parasite
Fleas	Plague (transmitted from rats to humans)	Bacteria
	Tungiasis	Ectoparasite
Lice	Typhus	Bacteria
	Louse-borne relapsing fever	Bacteria
Sandflies	Leishmaniasis	Parasite
	Sandfly fever (phlebotomus fever)	Virus

Ticks	Crimean-Congo haemorrhagic fever Lyme disease Relapsing fever (borreliosis) Rickettsial diseases (eg: spotted fever and Q fever) Tick-borne encephalitis Tularaemia	Virus Bacteria Bacteria Bacteria Virus Bacteria
Triatome bugs	Chagas disease (American trypanosomiasis)	Parasite
Tsetse flies	Sleeping sickness (African trypanosomiasis)	Parasite
Vector	**Disease caused**	**Type of pathogen**
Mosquito *Aedes*	Chikungunya Dengue Lymphatic filariasis Rift Valley fever Yellow Fever Zika	Virus Virus Parasite Virus Virus Virus
Anopheles	Lymphatic filariasis Malaria	Parasite Parasite
Culex	Japanese encephalitis Lymphatic filariasis West Nile fever	Virus Parasite Virus
Aquatic snails	Schistosomiasis (bilharziasis)	Parasite
Blackflies	Onchocerciasis (river blindness)	Parasite
Fleas	Plague (transmitted from rats to humans) Tungiasis	Bacteria Ectoparasite
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Sandflies	Leishmaniasis Sandfly fever (phlebotomus fever)	Parasite Virus
Ticks	Crimean-Congo haemorrhagic fever Lyme disease Relapsing fever (borreliosis) Rickettsial diseases (eg: spotted fever and Q fever) Tick-borne encephalitis Tularaemia	Virus Bacteria Bacteria Bacteria Virus Bacteria
Triatome bugs	Chagas disease (American trypanosomiasis)	Parasite
Tsetse flies	Sleeping sickness (African trypanosomiasis)	Parasite

Advantages of Mosquito Nets

Low cost, lack of need for special equipment, fewer organization and logistical problems, less insecticide needed, compatibility with local customs, suppressed on the population nuisance insects, protection against cold, dust and snake.

Disadvantages Mosquito Nets

Several factors are involved including: culture, community acceptance due to the lack of awareness, sustainability, allergic effect, Feasibility, accessibility, misuse, not compatible with vector behavior, less coverage, program of distribution, ventilation

problem, house design, restrictions of the community movement, -side effect on the pregnant women and child, -shape and design of net, re-impregnation, difficult to evaluate the impact of net.

Efficacy of Impregnated Bed Nets Depend on

Bed net types (Type of bednets can be determined through KAP study), Fabrics (cotton, nylon, polyester, polypropylene, polyethylene (Figure 2). World Health Organization recommended several insecticides for impregnation of bednets (Table 2).

Different Formulations for Impregnation of Bed Nets are: (SC = aqueous suspension concentrate, EW= emulsion, oil in water, WT= water dispersible tablet, CS = capsule suspension (microencapsulated), EC = emulsifiable concentrate.

Ways of Impregnation

Soaking, spraying, colour (green, grey, brown, black, white), coding, skirting, insecticides (killing effect, deterrent effect, packaging, safety, registration, cost, social acceptances. Shape could be rectangular, conical, pyramid (Figure 3).

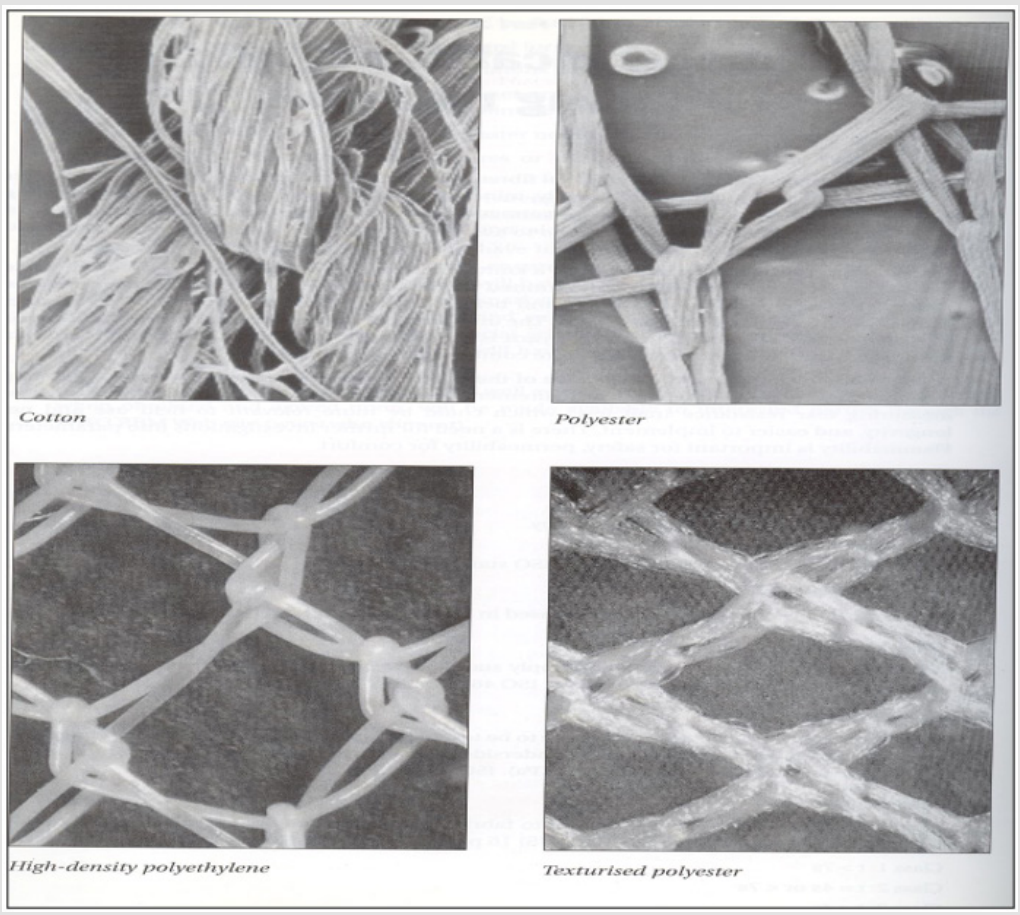

Figure 2: Types of Fabrics of bednets.

Table 2: Pesticide recommended for impregnation of bednet.

Insecticide product	Dosage (active ingredient, a.i) mg/m^2 of netting
Alpha-cypermethrin 10% SC	20-40
Cyfluthrin 5% EW	50
Deltamethrin 1% SC and WT 25%	15-25
Etofenprox 10% EW	200
Lambdacyhalothrin 2.5% CS	10-20
Permethrin 10% EC	200-500
Bifenthrin SC	25

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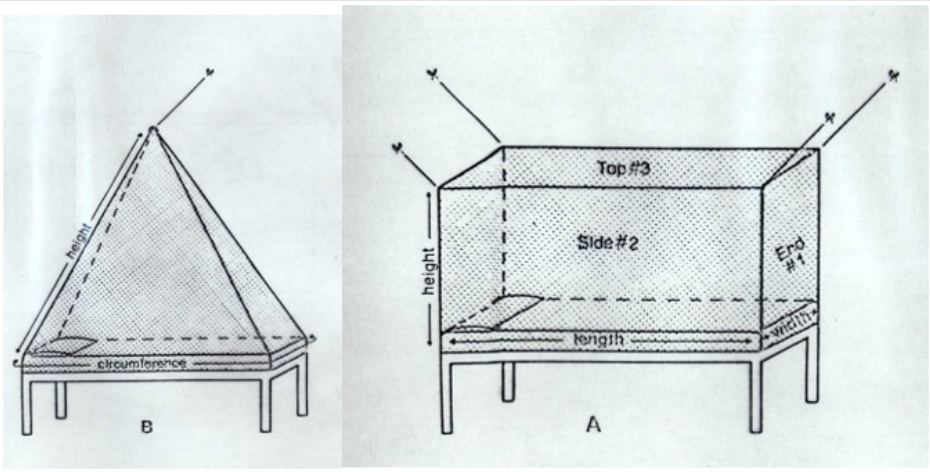

Figure 3: Different type and shapes of impregnated bednet nets commonly used

Current Insecticide Impregnate Bednets Against Insect Resistant to Insecticides are

Olyset® Plus (Permethrin + PBO incorporated into polyethylene, all panels) , PermaNet® 3.0 (Combination of deltamethrin coated on polyester with strengthened border (side panels), and deltamethrin + PBO incorporated into polyethylene roof)), Tsara® Boost (Deltamethrin + PBO incorporated polyethylene, all panels) , Tsara® Plus (Combination of deltamethrin coated on polyester (side panels), and deltamethrin + PBO incorporated into polyethylene (roof)) , Veeralin® (Alpha-cypermethrin + PBO incorporated into polyethylene, all panels) , Interceptor® G2 (Alpha-cypermethrin and chlorfenapyr coated on polyester) , Royal Guard® (Alpha-cypermethrin and pyriproxyfen incorporated into polyethylene, all panels).

Basic Information for Evaluation of Efficacy of Impregnated Bed Nets are

Ventilation, insecticide, vector susceptibility to insecticides, efficacy of insecticides, availability of insecticides, cost of insecticide, demographic data, population estimates, target groups (children, pregnant women), socioeconomic data, sleeping pattern (outside, inside), current use of nets, cultural attitudes, colors, sizes, vector bionomics, exophilicity and endophilicity, vectorial capacity, vector density, feeding pattern, species, zoophiloicity and anthropophilicity.

Ethics Approval and Consent to Participate

There is not applicable.

Consent for publication

Applicable.

Availability of Data and Material

Applicable.

Competing Interests

The author declares that there is no conflict of interest.

Funding

This study was supported by the Ministry of Health and Medical Education of Iran with NIMAD Project Number 971065.

Acknowledgments

This study was funded and supported by Tehran University of Medical Sciences (TUMS) and partially by the Ministry of Health and Medical Education of Iran with NIMAD Project Number 971065.

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