

**THE RELATIONSHIP BETWEEN JIGGERS INFESTATION AND CLIMATE VARIABILITY IN TESO NORTH, BUSIA COUNTY KENYA**

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**ABSTRACT**

Jiggers develop under tropical and subtropical climates of the world and it's usually recorded on the first rain instances. In Teso North, the climate is recorded as hot and wet and there are jiggers infestations at a whole time high. This paper sorted to establish the link between jiggers and climate in Busia county, Teso North. The study found out that jiggers were dominant during low humidity and the rainfall trend has been decreasing from 1987 to 2017 posing a threat to jiggers infestation. The ALUPE metrological station reported a change in temperature with hotter seasons and 95.5% of respondents indicating an increased jigger infestation over time. The respondents indicated that the change in climate over time is linked with the change in climate and there was more jiggers' infestation in the past than now.

**Keywords:** Jiggers, Climate variability, Teso North

**1.0 INTRODUCTION**

Jiggers generally thrive best in humid and tropical climates. A study conducted in Brazil revealed that the disease has a considerable seasonal variation. The prevalence of Tungiasis was observed to be highest at the peak of the dry season in the month of September, which was 54.4% while the lowest prevalence of 16.8% was recorded after the first rain of the rainy season in the month of January (Heukelbach et al., 2005). A similar trend has been suggested in Kenya, as reported by a number of respondents during the Ahadi Kenya team visit to Murang'a District.

This means its prevalence increases with an increase in temperatures and its optimum when there is no humidity in the air and decreases during the rainy season. Rainfall results in high humidity which impairs the development of free-living stages of Tunga Penetrans. Furthermore, heavy rains wash away the eggs, larvae, pupae, nymphs, and adult fleas. Therefore, control measures aimed at reducing morbidity should be scheduled to be in place before the attack rate increases, that is, at the beginning of the dry season.

Studies suggest that infectious disease transmission should be viewed within an ecological framework. Infectious agents obtain the necessary nutrients and energy by parasitization of higher organisms. During the long process of human cultural evolution; population dispersal around the world and subsequent inter-population contact and conflict, several distinct transitions in human ecology and inter-population ecology have greatly changed the patterns of infectious diseases in the human population. It is their view that vector organisms like sand flies are very small and devoid of thermostatic mechanisms. (Patz et al, 2006).

Their temperatures and fluid levels are therefore determined directly by local climate hence there is a limited range of climatic conditions; the climate envelope in which each infective or vector species can survive and reproduce. That, the incubation time for a jigger is typically very sensitive to changes to in temperature, displaying an exponential relationship (Patz et al, 2006).

According to the World Health Organization report on epidermal parasitic skin diseases (EPSD); Tungiasis is geographically restricted to the Caribbean, sub-Saharan Africa and South American countries. The parasite is also climatically restricted compared to other epidermal parasitic skin diseases like; cabbies and head lice. Prevalence of Tungiasis in the tropics is highest in the dry season. (Feldmeier and Heukelbach, 2007).

Climate change has made it possible for parasitic causing diseases to mutate and adapt in their environments making it difficult to fully eradicate the parasites with the available mechanisms. Some of the changes in climate have created breeding grounds for more parasites like jiggers and other disease vectors such as mosquitoes and snails (Desone, 2008). Jigger infestation poses a high risk of secondary infection like tetanus that has reported associations with death (Feed the Children, 2007)

## 2.0 METHODS

The sample frame of the target population was selected based on the ward location. A total of 16.67% of the study area was sampled. This translated to one village per ward of the six wards. Which include Malaba Central ward, Malaba North, Malaba South, Angurai South, Angurai North and Angurai East.

Data for the study were obtained from both primary and secondary sources. The primary sources included first-hand information that was obtained from filling of checklists by target population through observation, photographing, filling questionnaires and conducting interviews. This study was informed by information gathered as a result of interviewing relevant stakeholders at Alupe sub-meteorological station and KMD with regard to data collected on climate parameters over the years. Questionnaires were also be issued to various households within the sub-county as well as other members of the community. This was facilitated the acquisition of first -hand information with regard to jigger infestation. Secondary data were gathered from reviewing relevant textbooks, local newspapers, Peer-reviewed journals as well as internet sources. These sources are readily available at the university library, therefore, saved on time. They helped in identifying how different scholars have approached the issue at hand.

### 3.0 DISCUSSION

#### 3.1 Climate trend and variability

The rainfall trend indicates a trend shows a decreasing rainfall trend from 1987 with peak in 1989 and going to all lowest in 2016 (102mm). The average rainfall in the 31 years indicated a hot and wet climate at 149.86 mm with a maximum precipitation at 196.20 mm which was experienced in the year 1989.

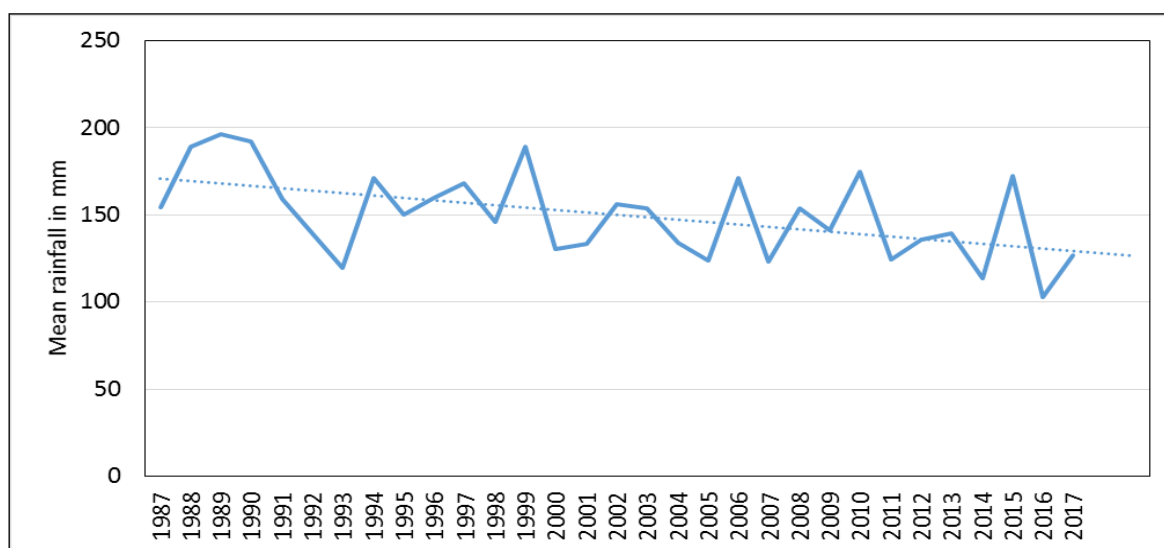


Figure 1: Rainfall trend in mm 1987-2017

The soils in the areas were determined to be silt loam based on its moderate drainage. This saw more areas covered by sandy soils than those covered by pure clay or loam. The soils according to the respondents also have an impact on jiggers infestation. There is a higher jigger infestation in silt loam as compared to other soils in the areas.

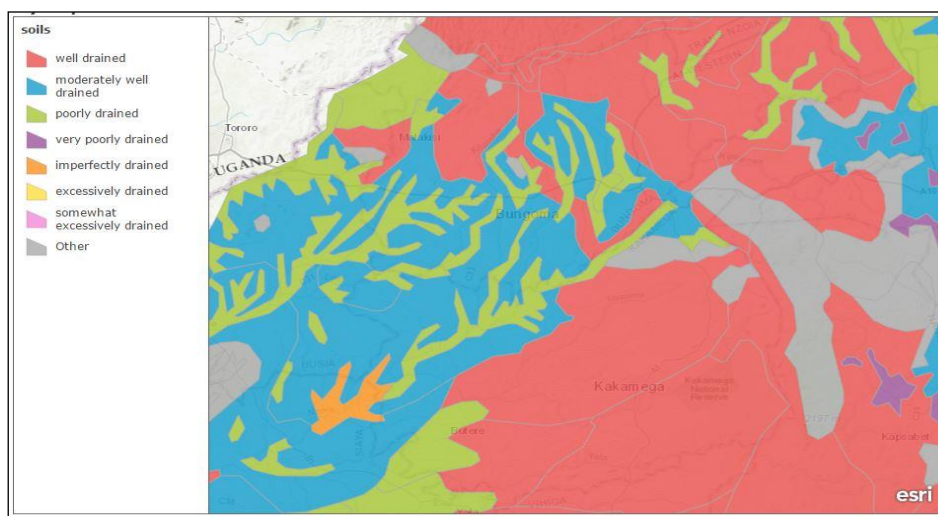


Figure 2: Soils types of Teso North

3.2 Climate effects on respondents

The effect of climate as per elders were seen to be more prevalent in dry seasons with 95.3% while some believed that jiggers are rampant and increase at wet seasons 3.1%. Children indicated that there was more jiggers infestation during the dry season and it wasn't any recorded of jiggers at the wet seasons. This is true because most of them indicated that jiggers and dusty floors are a menace.

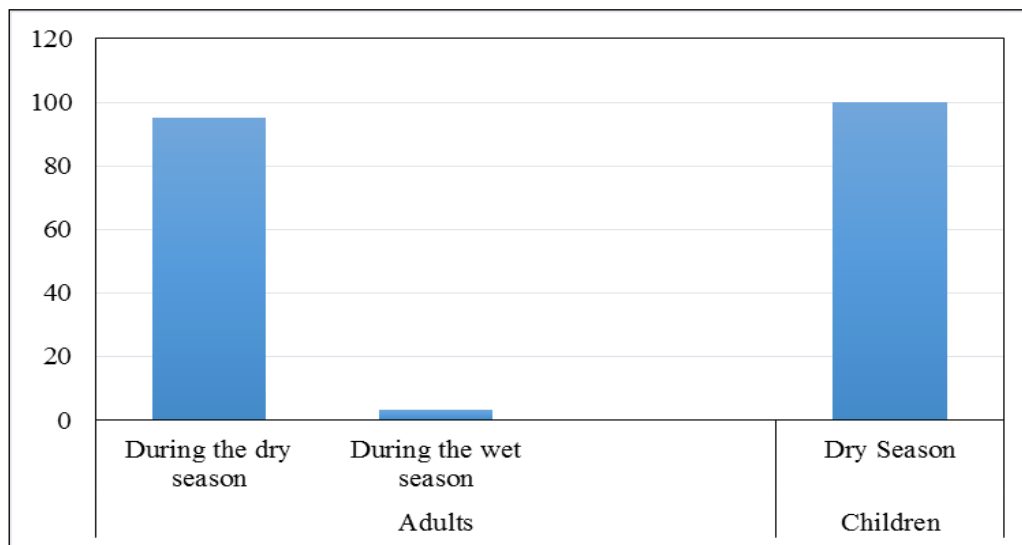


Figure 1: When are jiggers prevalent

The climate area according to children was reported to be Hot and wet while children indicated the same hot and wet climate. The Alupe meteorologist station also indicated the weather to be classified as hot and wet which conforms to the public view.

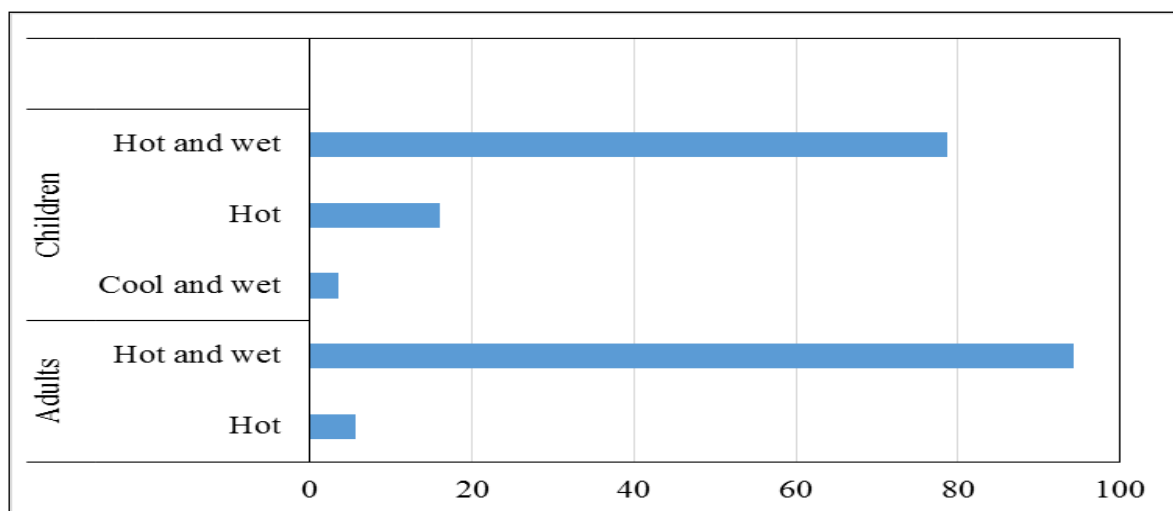


Figure 4: Climate change per children

### 3.3 Change in climate

The change in climate over years was seen to affect across all from the key informants at Alupe meteorological station indicating a complexity in weather prediction, they indicated that the weather patterns have become more varied with 88.8% (82 cases) of adults indicating a change in climate and community leaders indicating the same too. The metrological departments indicate a more reduced rainfall trend and increased hot temperatures from years. The most climate change was indicated to be changed to hot seasons while

**Table 1: Adults climate description**

		Describe the change						Total
		Dry seasons	Dusty seasons	Hot seasons	Short rains	Unpredictability		
<b>Change in climate over years</b>	Yes	0	56	7	82	12	13	170
	No	13	0	0	0	0	0	13
<b>Total</b>		13	56	7	82	12	13	183

The change in the temperatures saw 88% of adults report that they’ve witnessed a change in temperature citing hot temperatures throughout the season while the metrological department also agrees with the temperatures change it now indicates that there are more chances of increased attack of jiggers to the community.

The jigger’s conditions spread was indicated to spread under low humidity with 94.8% of adults indicating and children indicate low humidity. The Ministry of health key informant also indicated that the highest times were there are effects of jiggers are in hot conditions and low humidity. This was also reported by community leaders and corroborates with what recorded by children and adults in their questionnaire.

**Table 2: Under what humid conditions do jiggers spread**

		Frequency	Percent
<b>Adults</b>	High humidity	7	3.6
	Low Humidity	182	94.8
<b>Children</b>	Low Humidity	192	100

There was reported increased jiggers infestation over time by adults and the key stakeholders indicating a sharp increase of jiggers in the community. There were 95.3% while 3.1% did not indicate that there were increased infestations.

**Table 3: Increase in jigger infestation**

	Frequency	Percent
Yes	183	95.3
No	6	3.1
Total	189	98.4

**Table 4: Change in climate over the years and Increase in jigger infestation**

			Increase in jigger infestation	Total
Change in climate over years	Yes	Count	170	170
		% within Change in climate over years	100.0%	100.0%
		% within Increase in jigger infestation	92.9%	92.9%
		% of Total	92.9%	92.9%
	No	Count	13	13
		% within Change in climate over years	100.0%	100.0%
		% within Increase in jigger infestation	7.1%	7.1%
		% of Total	7.1%	7.1%

The jiggers infestation and climate change were computed by a cross-tabulation and it was observed that there was a general agreement that the change in weather indicated by adults was because of change in climate at 92.9% while 7.1% indicated no relationship between climate and increased jiggers infestation. This was supported by the ministry of health official indicating that climate change was a key variable even if other measures were mitigated and climate still becomes a concern.

## 4.0 CONCLUSION

The infestation of jiggers is a menace and it is still seeing an increased infestation with time despite the measures put in place by Ministry of health, schools, churches and other stakeholders in Teso North. This infestation is closely related to climate change and the ministry of health also warned about climate change and jiggers infestation being directly proportional to one another. The impact of jiggers is noted to rise during low humidity children and older people are affected further by jiggers. The Ministry should implement preventive measures of jiggers infestation by promoting fumigation and providing closed shoes to children and older people. Cleanliness should also be encouraged.

## Acknowledgment

- Department of meteorology ALUPE
- Ministry of Health Teso North

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