OPEN ACCESS JOURNALS
Indiana Journal of Agriculture and Life Sciences
*Abbriviate Tittle- Ind J Agri Life Sci*
ISSN *(Online)*- 2583-1623
Journal Homepage Link- https://indianapublications.com/journal/IJALS
DOI- 10.5281/zenodo.7032146

INDIANA PUBLICATIONS
PRODUCTIVE AND QUALITY RESEARCH

## Research Article

Volume-02|Issue-04|2022

# Mapping of Main Mosquitoes in Mogadishu - Somalia

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**Article History**
Received: 02.08.2022
Accepted: 20.08.2022
Published: 25.08.2022

**Citation**
Mio, J. B., Mohamed, M. O. S., Osman, Y. O., Abukar, M. D., Karama, N. Y., Nurani, O. M. (2022). Mapping of Main Mosquitoes in Mogadishu - Somalia. *Indiana Journal of Agriculture and Life Sciences*, *2*(4), 8-19.

**Abstract:** A survey for larvae & adult mosquitoes (Diptera: Culicidae) in Mogadishu City, somali, was undertaken during the period of 4 months) of sep October November 2021 by using dips, and spray sheet for indoor collection.; and the following three different species were collected: Aedes.), Anopheles And culex.
Anopheles arabiensis & Aedes aegypti are main vectors species of malaria diseases and Dengue Fever/Dengue. Aedes aegypti is common in most of the urban areas on account of deficient water management, presence of non degradable tyres and long lasting plastic containers as well as increasing public agglomerations and inability of the public health community to mobilize the population to respond to the need to eliminate mosquito breeding sites.Anophles Arabiensis was caught indoor by spray sheet collection. A Wide entomological survey was conducted in Mogadishu districts. It's purpose was to collect information on the presence or absence of potential vector Aedes aegypti and Anophles Arabiensis habitats .Breeding of Aedes aegypti larvae collected on water holding containers in different houses, were calculated indices of Container and Breteau indices and houses index . The resting of anopheles Arabiensis & Aedes aegypti and the total catch of adult mosquitoes by pyrethrum space spray was also undertaken.
The results showed that, the highest Aedes aegypti container index was recorded in Mogadishu, at 485 larvae collected in which 9.7%(47) was anopheles 18,3 % (89)AEDES , (349)72% was culex., Adult mosquitoes collected were 961 in which 5.7%(55) was anopheles , 18.5%(178) was Aedes, ,75.8%(728) were culex. House index= 63.8, container index = 65% and Breatu index=140
These results proposed that a more urgent, systematic and sustained health education program BCG/IEC to raise public awareness and vector control program that uses both biological and chemical control methods adopted to reduce malaria vector &Aedes aegypti populations to below dengue transmission thresholds..
**Keywords:** Growth shooters, size heterogeneity, length, hatchery.



# INTRODUCTION

Recently, a marked increase in the number of malaria cases has been reported from several parts of the world **(WHO, 1993**). This includes epidemics in some sub-Saharan countries. The entire population of Somalia is at risk of malaria, with 54% at high risk. The intensity of malaria transmission varies in different parts of the country, ranging from unstable and epidemic-prone in **NEZ/Puntland** and **NWZ/Somaliland**, to moderate in Central Zone and moderate to high in the South Zone.

**In southern central zone**, the last malaria cases recorded by emergency health updated issued WHO on October 14 ,2011; revealed.

**Lower and middle juba region**; reported 269 cases of suspected malaria of which eight were confirmed by RDT**(SPR 8/269=3%).** (. 166 of suspected cases were children under five. Most of the population in south and Central Zone of the country are living in temporary or poor shelters lacking basic facilities and protection, thus they are more vulnerable to contract vector born diseases, malaria in particular. Vector control is minimal and ITNs remains the main stay of personal protection but the coverage is still very low to expect mass protection. Health facilities are very poor in Mogadishu districts where the study was conducted, both infrastructure and services. On vector point of view this area is suitable for malaria due to the presence of numerous breeding sites especially during the rainy season.

Anopheles arabiensis is the main and often, the only vector in the country (Maffi, 1958; 1960; Maffi & Colluzi, 1960; Mouchet *et al.*, 2004) and typical of the dominant vector species composition across the Horn and Sahelian belt of Africa. The presence of An. merus in Mogadishu has not been confirmed (Mouchet *et al.*, 2004). An. funestus and An. nili have also been reported in the South (Maffi, 1960). In the North East An. pharoensis and An. d'thali have been described (Choumara, 1961). The characteristic habitation of An. arabiensis is temporary water pools in arid areas and has a preference for bovine blood meals and thus predominantly feeds outside.

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Entomological surveillance was conducted in Mogadishu to determine changes in the geographical distribution and density of vectors both Anopheles and aedes and its purpose was to collect information on the presence or absence of potentials vector of dengue fever and malaria , making it necessary to carry out control operating againstvector.

Mapping of mosquitoes species in Mogadishu will provide a summary of descriptive geographical data. Hence, maps can reveal spatial or geographical patterns of information. On the other hand maps are used in malaria control and other vector borne diseases to support planning, management and decision making. Identifying vectors species will enable us to know the vector behavior which will lead to the process of vectors interventions .Definitive vector control measures in Mogadishu will rely on the findings of an entomological assessment to determine behavior of vectors (usually_Aedes aegypti_ or_Aedes albopictus_) and malaria, hence initiate a tailored response to highlight some aspects of the vector density changes which are an important component of epidemiological study of malaria, and yellow and dengue fever and a baseline to formulate control program.

**Overall GOAL**

To collect information on presence or absent of potential Aedes aegyptis and malaria vectors habitats in Mogadishu

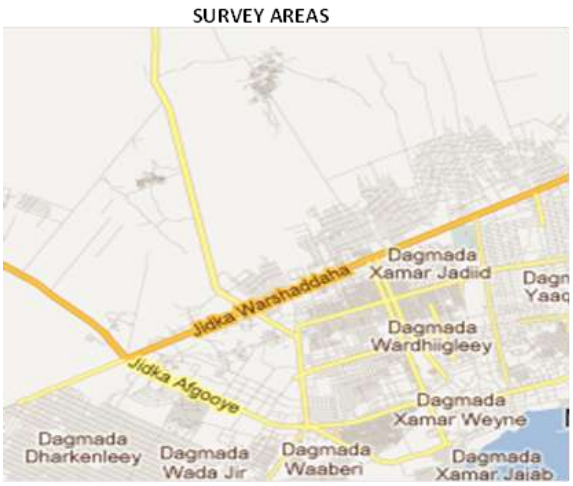
**Specific Objectives**

- To monitor the species composition of Anopheles and aedes mosquitoes in Mogadishu Somalia
- Collection of vector mosquito larvae to identify their preferablebreeding places of Eight districts
- To identify mosquitoes vector present in Mogadishu
- To map the distribution of mosquitoes in Mogadishu and record malaria data in health facilities in target localities
- To understand better of vector bionomic, distribution, in order to facilitate malaria vector and dengue vectors**.**

**Activities**

- Larvae mosquitoes survey
- Adult mosquitoes survey by using spray sheet methods
- Collection of malaria data through health facilities

# MATERIALS AND METHODS



MAP of Mogadishu districts

Mogadishu is located at 2.03711 [latitude in decimal degrees] 24'0.012"N, 45.3438 [longitude in decimal degrees **4522'0.120"E**] at an elevation/altitude of meters. The average elevation of Mogadishu is 39meters, population 2590 1 80 consist of 16 districts. For a city situated so near the equator, Mogadishu has a dry climate. It is classified as hot and semi-arid .Much of the land the city lies upon is desert terrain. The city has a low annual rainfall of 427mm, most which falls in the wet season. The rains are very variable from year to year, and drought is a constant problem for the people living in Somalia.

Mogadishu is thus officially divided into 16 administrative districts: Abdiaziz District,Bondhere District,Dharkenley District,Hamar-Jajab District, Hamar-Weyne District ,Hodan District,Howl-Wadag District ,Kaaraan District, Shangaani District,Shibis District, Waabari District,Wadajir District, Wardhiigley District,Yaaqsh,District,DAYNILE district, HURIWA District

**STUDY DESIGN**

A cross-sectional study were conducted in randomly by selecting Eight districts from 16district of Mogadishu to reveal distribution of Anopheles and aedes mosquitoes and each district was collected larvae , adult and malaria data in health facilities. However, spray sheets collection with sample size of 80 rooms as recorded in (WHO, 1975).

**Sample Size and Sampling Techniques**

A sampling frame were constructed and the district were enumerated according to their geographical locations. Since (8) districts' with total houses of 80 and each district 10 houses randomly selected and collected both larvae and adult mosquitoes. The houses can be schools, hotels , normal houses, IDP campus., all mosquitoes collected in 8 days from these (8) districts were included in the study.(wadajir, dharkeynle, Hodan, Waaberi, Hamar jajab, Hamar weyn,hawlwadaag, and shangani).

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The survey areas are chosen based on accessibility entomological surveillance, Density of population, Livelihood pattern, etc.
Survey Methods;

**Larvae Survey**

Larva will be collected through containers examined for presence of larvae of malaria vectors and aedes. The main containers holding water are, water tanks cements, Barkits with fish and Barkit without fish by using dipping and netting techniques (WHO, 1992) according to the type and size of the breeding containers investigated. Container are examined for the present of mosquitoes larvae and pupa, the search may be terminated as soon as aedes or anopheles are found Identification of larvae was done according to the keys of Gillies and De Meillon (1968) and Gillies and Coetzee (1987).

However, in practice. Larval (L3+L4) **mosquitoes** will be sorted out into species by using morphological identification keys (Verone, 1962) through Len hand and will be recorded in WHO larva survey form.

**LARVEA SURVEY**

**Plate 1.** Mosquitoes larvae collected in wadajir

**Plate 2.** Larvae searching Barkits and main water storage

**Plate 3.** Berkit With Fish in Wadjir DistrictBarkit Without

**Plate 4.** Cement W/Tanks Types Rain Water Covered Main Road at Waber

**Plate 5.** IDP campus larvae

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**Collection of Mosquitoes Indoor Houses Resting By Using Spray Sheets (SPC)**

Spray sheet collection involves using a pyrethrum space spray to knock down mosquitoes resting inside houses and collecting them on white sheets spread on floor.

In case of indoor resting, mosquitoes were collected and each house the following information was recorded such animal presences, bed net, the distance from breeding sites,, numbers of occupants, last spray etc. .The PSC involved removing all large pieces of furniture inside the room, covering the floor with white bed sheets with sizes (2mxm, 2mx2m and 2mx3m).

Pyrethrum solution in pif=paf was first sprayed from outside of the house onto the eaves, windows, and door before entering the dwelling and followed spraying the entire inside of the house. All doors and windows remained closed for 10 min to allow for mosquito knockdown. Collectors then re-entered the dwelling and used forceps to collect mosquitoes from the sheets and place them in small Petri dishes and identified morphologically by using hand Len.

The combined number of mosquitoes collected from the PSC and hand collection was calculated to provide a total catch for each dwelling. Despite that there are many factors influencing our methods PSC such number of mosquitoes resting inside of houses are different, for instance, unfed mosquitoes to be attracted to house in high occupant (haddow, 1942). But, no general arithmetic relationship has been established between catch sizes and number of occupied.

**Plate 6.** Spray Sheet Collection

**Plate 7.** Rubbish collection in Hamar – JAJAB areas(EEL GAAB)

**Mosquitoes Processing and Morphological Identification by Entomology Team**

**Plate 8.** Identification of mosquitoes at Plasma university LAB

**Plate 9.** Morphological identification of adult mosquitoes by using magnified Len in the field

The total number of mosquitoes collected were identified according to morphology key of Gillies and De million (1968), Gillies and coetzee (1987) and separated by examining their gonodotrophic cycle (fed, unfed, gravid, half gravid) based on (WHO protocol 1975)

Mean values; Fed Anopheles had their abdomen filled with blood meal and appeared reddish; †Half-gravid Anopheles had their abdomen half full of bloodmeal/eggs, and appeared reddish/whitish; ‡Gravid Anopheles had whitish abdomen appearance

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**Female Aedes Aegptis**

A smallish, dark mosquito with conspicuous white markings and banded legs; the proboscis is all black although the palps are white tipped; the scutum has adorsal pattern of white scales in the form of a 'lyre' with curved lateral and 2 central stripes contrasting with the general covering of narrow dark scales; wings are dark scaled; hind legs with femur pale scaled for basal three-quarters with dark scales dorsally on apical two-thirds and ventrally on apical third, tibia dark but tarsi with pale basal bands on 1-4 and 5 all pale; abdominal tergites with median and lateral white scale patches or bands (possibly some white scales on apical margins), sternites predominantly pale scaled with subapical bands on distal segments.

**Female Anopheles Arabiensis**

**Legs**: speckled legs,Pale scales on the femera (fe) and tibia (ti) of hind legs.

**Wings**

Anal vein (1A) of the wing usually with 3 dark spots; radius (R) usually with distinct preaccessory Sector Dark (PASD) spot.

**Statistical Analyses Data collection**

The data collected from the eight districts using different methods of mosquito collection include pyrethrum spray sheet method to collect adult mosquitoes from insidehouses. The outdoors collection was not carried out by surveys to collect mosquitoes that resting outdoors (due to lack of aspirators). All potentials resting places were inspected by high skill trainee's personnel. And pyrethrum spray sheet collection methods and mosquitoes nets were adopted where they were practicable and larvaemethods.

**Data Analysis**

Statistical analyses were done using SPSS software (Version 15.0 for windows, SPSS Inc., Chicago, IL). One-way Analysis of Variance (ANOVA) was used to compare the differences in larval abundance between sites. Where significant differences were observed, the means were separated by Tukey test. Pearson correlation was used to determine the association between Anopheles larval density and adult densities, as well as malaria cases with Anopheles density. The relative abundance of Anopheles was calculated as the number of larvae divided by the number of dips taken from each larval habitat, and then expressed as density per 10 dips. The dependent variable (relative abundance of Anopheles larvae) was square roots x+0.5 to stabilize the variance and improve normality of distribution.. Analysis of variance (ANOVA) was usedto test difference between means of different districts followed by Tukey, s Post Hoc to separate between means. In the Aedescollected computed houses index. Container index, Breteau index of larvae and pupa.

## RESULT OF SURVEY

**Larval Abundance**

The density of larvae collected through containers types was **1.25/ dips** for anopheles larvae and **1.9/dip for Aedes**. Overall, **485 larvae** were captured in survey 1st- 2ndand 3-4th instars .The anopheles larvae were captured **47(9.7%)** and **89(18.3%)** larvae for aedes ,**349(72%)** captured for culex. In all the 8 Districts the densities of anopheline larvae vs. habitat types show no significance difference among districts by applying Anova one-way**. F=1.767, p=0.176 d= 3** .this is not greater than 2.

**Table 1.** Relative abundance of Anopheles and aedes larvae in different habitats found in the eight districts data transformed square root of $\sqrt{x} + 0.5$

| Districts | Habitat type | Early stages Anophles | Early stages AEDES | Late stage Anopheles | Late stages AEDES |
|---|---|---|---|---|---|
| **wadajir** | Barkits with fish | 0.707 | 0.707 | 0.707 | 0.707 |
| | Barkit without fish | 1.5 | 1.914 | 2.232 | 1.5 |
| | Cement water tanks | 2.736 | 0.707 | 1.914 | 2.736 |
| | others | 0.707 | 0.707 | 0.707 | 1.5 |
| **Darkrynle** | Barkites with fish | 0.707 | 0.707 | 0.707 | 0.707 |
| | Barkit without fish | 1.5 | 0.707 | 0.707 | 2.232 |
| | Cement water tanks | 2.232 | 1.914 | 0.707 | 1.914 |
| | OTHERS | 0.707 | 0.707 | 0.707 | 1.914 |
| **Hamar weyn** | BARKITS with fish | 0.707 | | 0.707 | 0.707 |
| | BARKITS without fish | 0.707 | 2.736 | 1.914 | 0.707 |
| | Cement water tanks | 0.707 | 3.328 | 2.232 | 3.145 |
| | others | 1.914 | 2.232 | 1.914 | 2.232 |
| **Hodan** | Barkits with fish | 0.707 | 0.707 | 0.707 | 0.707 |
| | Barkit without fish | 0.707 | 0.707 | 1.5 | 1.914 |
| | Cement water tanks | 1.914 | 2.232 | 2.232 | 2.5 |
| | Others | 0.707 | 0.707 | 0.707 | 0.707 |

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| | | | | | |
|---|---|---|---|---|---|
| **Hawl/wadaag** | Barkits with fish | 0.707 | 0.707 | 0.707 | 0.707 |
| | Barkit without fish | 2.232 | 0.707 | 0.707 | 1.5 |
| | Cement water tanks | 0.707 | 0.707 | 1.5 | 0.707 |
| | others | 0.707 | 0.707 | 1.5 | 0.707 |
| **Hamar jajaba** | Barkites with fish | 0.707 | 0.707 | 0.707 | 0.707 |
| | Barkit without fish | 1.5 | 0.707 | 0.707 | 1.914 |
| | Cement water tanks | 0.707 | 0.707 | 0.707 | 1.5 |
| | OTHERS | 1.914 | 1.5 | 2.232 | 1.914 |
| **Waaberi** | | | | | |
| | BARKITS with fish | 0.707 | 0.707 | 0.707 | 0.707 |
| | Barkits without fish | 0.707 | 0.707 | 2.232 | 0.707 |
| | Cement water tanks | 0.707 | 1.914 | 0.707 | 1.914 |
| | others | 0.707 | 2.232 | 0.707 | 2.5 |
| **Shagaani** | Barkits with fish | 0.707 | 0.707 | 0.707 | 0.707 |
| | Barkits Without fish | 2.232 | 0.707 | 1.5 | 0.707 |
| | Cement water tanks | 0.707 | 0.707 | 0.707 | 1.5 |
| | Others | 0.707 | 0.707 | 1.914 | 1.914 |

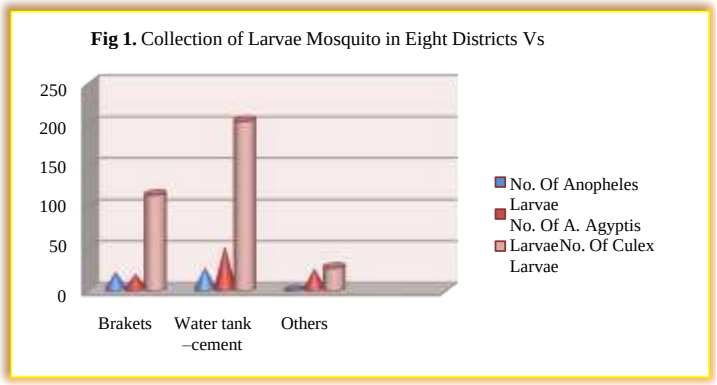


**Fig 1.** Collection of Larvae Mosquito in Eight Districts Vs

**Table 2.** Density of mosquito larval abundance in the different containerstypes in Mogadishu districts

| **Breeding habits** | **# of breeding containers** | **# of *An* larvae** | **Density (No/10 dips)** | **AEDES** | **Density/10dip** |
|---|---|---|---|---|---|
| Bark it's with fish | 25 | 0 | 0 | 0 | 0 |
| BARKITS Withoutfish | 34 | 19 | 1.9 | 17 | 1.7 |
| CEMENTS Tanks | 67 | 21 | 2.1 | 36 | 3.6 |
| Others | 53 | 7 | 0.7 | 23 | 2.3 |
| **Total** | 179 | 47 | 1,2l/10dips | 76 | 1.9L/10DIPS |

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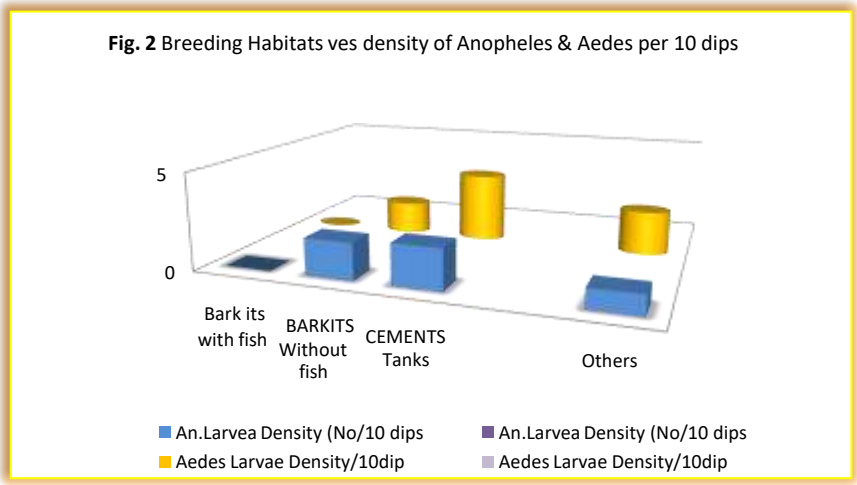


**Table 3.** AEDES aegypti house index, container index and Breatu index indifferent localities of Mogadishu

| Districts | House Inspected | House Positive | Percent | Containers Searched | Positive Containers | Percent | Breatu Index |
|---|---|---|---|---|---|---|---|
| wadajir | 10 | 6 | 60% | 22 | 12 | 54.5% | 120 |
| Dharkinley | 10 | 6 | 60% | 21 | 11 | 52.3% | 110 |
| Hamarweyne | 10 | 2 | 20% | 18 | 7 | 38.9% | 70 |
| Hodon | 10 | 6 | 60% | 27 | 12 | 44.4% | 120 |
| Howlwadaag | 10 | 8 | 80% | 28 | 27 | 96.4% | 270 |
| Hamar jajab | 10 | 9 | 90% | 15 | 15 | 100% | 150 |
| Waaberi | 10 | 8 | 80% | 20 | 12 | 60% | 120 |
| Shangaani | 10 | 6 | 60% | 21 | 16 | 76% | 160 |
| Total | 80 | 51 | 172 | 112 | 56.7% | 65% | 140 |

The total mosquitoes larvae collected were identified to species by morphological criteria. An important observation from these survey is that the main vector species, An. arabiensis , aedes aegyptis were found to breed in at least four habitat types.

The relative importance of water hold, Barkits with fish, Barkits without fish as important breeding sites for malaria vectors as well as dengue, yellow fever vector..Of the total number of breeding sites were 179 breeding sites, over 13.9%(25) in which BarkiTs with fish, 18.9% (34) Barkit without fish. tank cement(67)37.4%, others 53(29.6%).using fish by communities can reduced the larvae in Barkits .we assessed the density of larvae in 25 Barkits with fish (3 without cover and 22 with cover) all them the density of larvae was zero.

The substantial reduction in number of larvae in the Barakit was probably due to thetremendous larva-eating capacity of the local fish. There is no doubt that introduction of this larvivorous fish in these water source dramatically reduce the mosquito population in the cities and hence, malaria infection and can used as vector control. Data on Aedes aegypti such ,house index, container index, Breatu index were calculated during survey in the Mogadishu State, the Aedes aegypti house index= 63.8, container index = 65% and Breatu index=140.

**Species Composition and Distribution among the Containers Ypes**

485 larvae were captured in survey of 8 days .The anopheles larvae were captured 47(9.7%) and 89(18.3%) larvae for aedes ,349(72%) captured for culex. The most distributed larvae was culex larvae in every container of investigation but, Aedes larvae were mostly found Barkit without fish & cement tanks as well as others. But anopheles larvae were confined as general container contain soft waterused for drinking such pots, small size containers.

Data were collected on a range of factors that would affect the production of larvae and therefore explain variability in densities of larvae. These included, water turbidity, ,permanence of breeding site, amount of shade and water temperature, hardness of water, presence of algae, chlorines used.

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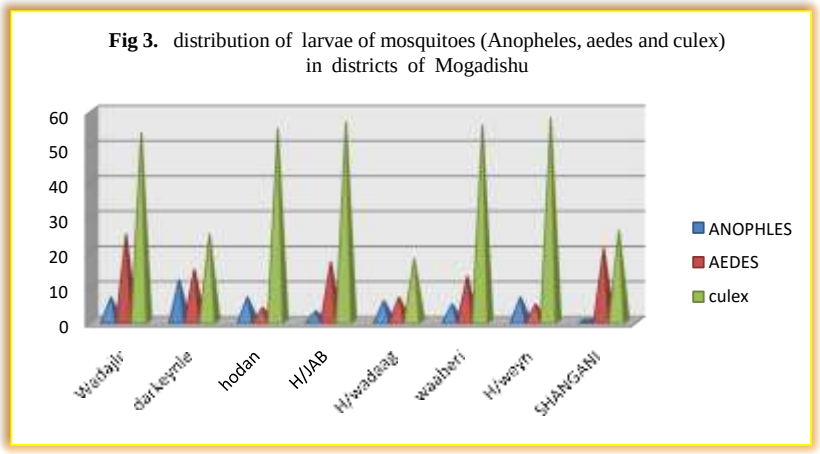


**Fig 3.** distribution of larvae of mosquitoes (Anopheles, aedes and culex) in districts of Mogadishu

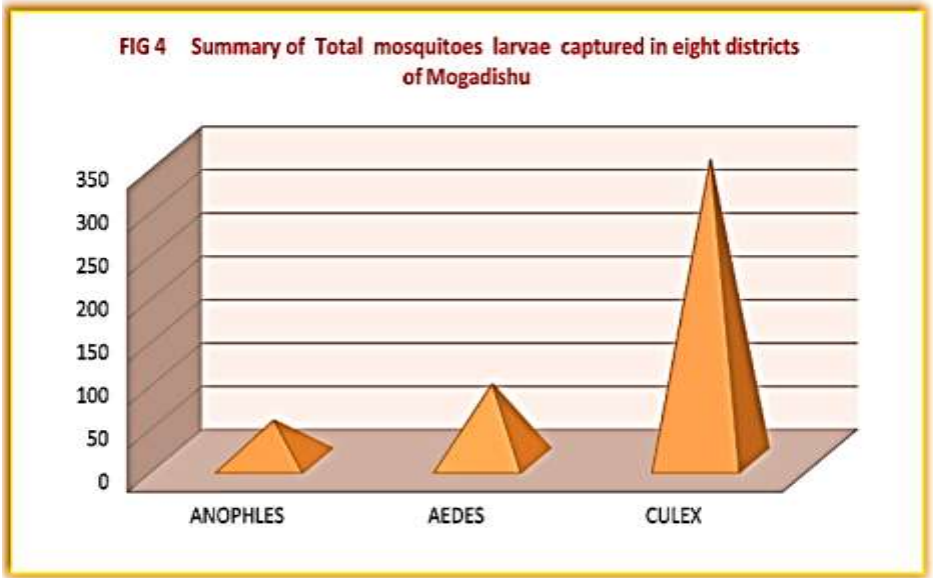


**FIG 4 Summary of Total mosquitoes larvae captured in eight districts of Mogadishu**

**Abundance of Adult Anophelines**

During survey overall, 961 adult mosquitoes were collected by spray sheets , anopheline species were 55 represent**(5.7%),**Aedes aegyptis were 178 **(18.5%)728 (72%).**.This suggests that these species culex dominant in respect of anopheles and Aeded, under appropriate conditions of temperature and humidity.

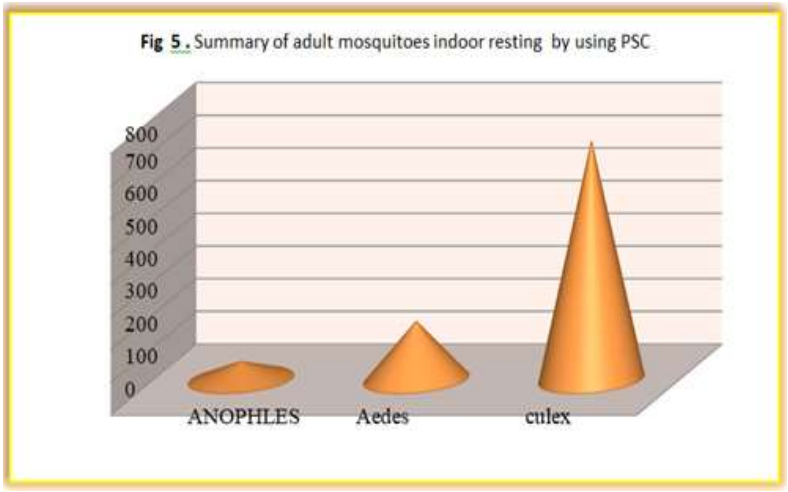


**Fig 5 .** Summary of adult mosquitoes indoor resting by using PSC

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**Table 4.** Density of adult mosquitoes collected in eight different Districts by using spray sheet

| Districts | ANOPHLES | Density/room ANOPHLES | AEDES | DENSITY/ROOM AEDES | Culex |
|---|---|---|---|---|---|
| WADAJIR | 13 | 1.3 | 28 | 2.8 | 68 |
| DHARKEYNLE | 11 | 1.1 | 40 | 4 | 92 |
| HODAN | 2 | 0.2 | 19 | 1.9 | 99 |
| HAMAR JAJAB | 12 | 1.2 | 21 | 2.1 | 132 |
| HAMAR WEYN | 6 | 0.6 | 8 | 0.8 | 19 |
| WAABERI | 8 | 0.8 | 23 | 2.3 | 78 |
| HAWLWADAAG | 3 | 0.3 | 24 | 2.4 | 46 |
| SHANGAANI | 0 | 0 | 15 | 1.5 | 94 |
| TOTAL | 55 | 0.69 | 178 | 2.2 | 728 |

**Indoor mosquito' density per room collection** In the survey of mosquito's collection means density of the study area were calculated by using the following formula; number of female mosquitoes caught in the rooms divided by number of rooms applied by PSC. The result of adult density Anophles arabiensis 0.69/room,aedes Aegptis **2.2/room** mosquitoes compared houses of **eight** districts However , the number of mosquitoes Anophles collected were significantly different in all district . Analysis of the data revealed a significant variation in mosquito densities among district **(f=6.098, p=0.000, DF=7),** But, the distribution of aedes among districts has no statistically different **f=1.307, p=0.259** which is less than two.

**Table 5.** Malaria data collection in the main health facilities of Mogadishu on weeks 44 & 45

| Districts | Week 44 | | Week 45 | | Total cases/ Week 44 | Total cases/Week 45 |
|---|---|---|---|---|---|---|
| | < 5 | > 5 | < 5 | > 5 | | |
| WADAJIR | 106 | 61 | 73 | 42 | 167 | 115 |
| DHARkeynle | 0 | 8 | 0 | 21 | 8 | 21 |
| HOdan | 0 | 13 | 2 | 9 | 13 | 11 |
| HAmar jajab | 4 | 3 | 3 | 1 | 7 | 4 |
| Hawl-wadaag | 0 | 0 | 0 | 0 | 0 | 0 |
| Hamar-weyn | 11 | 21 | 11 | 21 | 32 | 32 |
| Shagaani | 0 | 0 | 0 | 4 | 0 | 4 |
| TOTAL | 121 | 106 | 89 | 98 | 227 cases | 187 cases |

**Table 6.** Districts and Vector Density in Malaria Cases

| DESTRICTS | Date | LARVAE density | Adult density | Malaria cases | Interpretation/Remarks |
|---|---|---|---|---|---|
| WADAJIR | | 0.7 | 1.3 | 282 | High malaria cases |
| dharkeynle | | 1.2 | 1.1 | 29 | low |
| Hodan | | 0.7 | 0.2 | 24 | low |
| Hamar -jajab | | 0.3 | 1.2 | 11 | low |
| Hawl-wadaag | | 0.7 | 0.6 | 0 | Very low |
| Hamar/weyn | | 0.6 | 0.8 | 53 | Moderate high |
| waaberi | | 0.5 | 0.3 | 4 | Low |
| shagaani | | 0 | 0 | 0 | Very low |
| Total | 0.6 | | 0.69 | 403 | |

In general there are great correlation between vector density and malaria cases R=0.6, no correlation found the larvae density and adult density **R=0.39**.

## DISCUSSION

Entomological study in this area which sought to understand the ecologies of mosquito larvae and mosquito species composition in this area. This study found Anopheles and Culex mosquito and aedes species together in the habitats.

The containers which were sampled during the study period included Barkits with fish and Barkit without fish, water tanks cements, and others. In general, larval predation of mosquitoes is less prevalent in temporary habitats than it is in large, permanent habitats. Because small and sunlit habitats have higher water temperatures, mosquito larval-pupal developmental time may be shortened if the warmer habitat produces more food resources. Culicine, anopheles, Aedes larvae were collected in diverse containers types. Urbanization reduces the diversity of anopheline species in an environment, their numbers,

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their survival, their infection rates with P. falciparum and the frequency with which they bite people. The most common explanation is the lower vector densities (**anopheles 0,69/room)** resulting from a paucity of clean freshwater breeding sites (Lindsay *et al.*, 1990). As has been eloquently detailed (Trape & Zoulani, 1987), however, the process of urbanization effects changes in malariometric indices not only by eliminating open spaces for breeding, but also by increasing pollution of the remaining breeding sites, limiting the dispersion opportunities for adult mosquitoes. But triggers the proliferation of culex population with higher densities in eight districts exposed the study.The Culex and aedes,Anophles proliferation of mosquitoesin eight district were different due to their ecological different thus, mosquitoes breedin a wide range of habitats with trees that change microclimate and make favorable proliferation for mosquitoes by enhancing both temperature and relative humidity.

The finding of vectors density variable between houses with trees and houses without trees were tangible. With both anopheline and culicine larvae occurring in similar habitats, there is a need to have larval control programmes targeting all the habitats available in this area. This would ensure maximum reduction of mosquitoes consequently significantly reducing the risk of mosquito borne diseases. A potentially important target of malaria vector control is the immature stages of anopheline mosquitoes. The adult Gambia complex (Anophles arabiensis, Ano.merus& aedes ) were collected from indoor by standardize knock down Pyrethrum Spray sheet Collection method (PSC). Population density per room accounted during the period throughout the eight districts. The results of vector density in Anophles Arabiensi was 0.69/ room which was very low in contrast the finding in sentinel sites due to variation of key factors that play role in proliferation of vectors.

A aegypti was strictly domestic in all the places in which it was observed. The larvae occurred in drinking water, at Mogadishu such, Barkits without fish, water tank cement and other.. It is certain therefore, that this mosquito is highly anthropophilic, but it was still necessary to ascertain to what extent it bites man when the latter is in competition with other hosts, in particular, fowl upon which the mosquito also feeds very readily in captivity.

The adults produced from them very quickly became engorged on man or fowl and laid eggs at once. This very high degree of ability to colonize occurs in most pan tropic urban strains, Where ever it occurs A. aegypti is very abundant. On calculating Breteau' mosquito index (number of positive breeding places per 100 houses visited) from our findings, the following figures are obtained: Breteau index was **140** for Mogadishu, . Areas in which that index is over 50 are considered (Pichon *et al.*, 1969) to be very dangerous potential yellow-fever loci. This study coincide the previous study 1969 byMouchet in Mogadshu, warshick and Merca which Breteau index was **77** for Mogadishu, **286** for Warshick, **50** for Merca. This mean the current Breatu index of Mogadishu increased 2 fold than in period 1969.this show potential distribution of a aegypti in coastal areas.

It was estimated that Aedes aegypti had expanded its range in all areas inside Mogadishu especially where rubbish accumulated (tyres of cares, pits, etc)and oldhouses .(see plate no.

However this attributed to the sharp deficiency in water supply which made people to storage the water in different receptacles. Mixed breeding of Aedes aegypti and Anopheles arabiensis the vector of malaria, was also detected in holding water. The resting of Aedes aegyptiundertaken by pyrethrum space spray method led to the collection of Aedes aegypti, Culex , Anopheles arabiensis that breeding may continue throughout the dry season.

Complain of nuisance for mosquitoes biting in all period of year is common in Mogadishu districts. The mosquitoes problem in Mogadishu is based on nuisance and health related. Bed net distributions were shown to be protective but the coverage is low, none of the bed nets were treated with insecticides and many areas no bed net seen. A close association has been observed between people´s perception of the cause of malaria and the type of protective measure used. The level of mosquito nets use has been found to be low in communities. The level of household income has been found to directly influence the purchase and prolonged use of bed nets.

But, whatever system is used, the diagnosis of malaria in Mogadishu districts presents difficult methodological problems. The symptoms of acute malaria are similar to those of many other acute infectious diseases of childhood (Trape *et al.*, 1987, & Greenwood, 1999). Many health Facilities for investigation of malaria cases used both microscopy and RDT method, the total malaria cases collected in week 44and 45 result was 403, more cases were captured in wadajir areas(282) which correspond the findings vector density in target are.

## CONCLUSION AND RECOMMENDATION

- The vector density and malaria data indices suggest that human populations in Mogadishu are more predisposed to malaria vector bites, as well as Aedes Aegyptis transmitted diseases, hence there is a greater risk of malaria and aedes transmitted diseases in Mogadishu. This finding accentuates the need for greater focus in terms ofvector control.

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- Regular monitoring of species densities and composition is needed to continually assess any surges in the size of adult populations of the main vectorial system.
- Strengthening of vector surveillance mechanisms through Mogadishu districts would address the prediction of epidemic and establishment of critical threshold both vector density and malaria cases in long term future.
- Community awareness is required IEC/BCC to use bed nets throughout night because high proportion of An. arabiensis can bit outdoor as well as indoor.
- It is vitally important to increase community participation in environmental management and encourage the use of local larvious fish especially breeding of Barkits and big water tanks in many areas of urban.
- The present survey demonstrates the diversity of breeding habitats and their relative significance for Anopheles and aedes larval production. The breeding sites could be ranked according to larval presence and abundance, use of local fish, water size containers, hardness of water, chlorine use. This provides a basis for consistent monitoring and targeting of specific breeding sites by use of appropriate larval control strategies on a temporal basis.
- The mosquito larval densities indicate that the inhabitants of these districts are at risk of mosquito-borne diseases including malaria and dengue fever, mosquito control measures targeting both the mosquito immature and adults should be enhanced especially during the rainy season to ensure maximum protection of the inhabitants.
- Prompt and accurate parasitological confirmation of malaria is essential for effective cases management and malaria surveillance with diagnostic tools - microscopy and rapid diagnostic tests
- Capacity building is need in order to create well skilled cadre for diagnose and differentiation of plasmodium species (human resource infrastructure).
- Strengthening the IEC/BCC strategy to deliver malaria education at grassroots level through a network of Public Health Coordinators based within partner NGOs and, each of whom train and oversee community educators
- Intrasectorail collaboration among different NGOS , international agency , ministries is crucial to lift the burden of vector borne diseases.
- operational research of malaria(prevention and control)

**Challenges**

- Migration of non-immunes from hypo to hyper-endemic areas
- Poor nutritional status and concurrent infections
- Climatically and geographical factors like rainfall pattern, and Temperaturevariations
- Widespread use of artificial water sources in the Mogadishu
- Self- medication behavior where communities either under-dose themselves with anti-malarial drugs or use Injection chloroquin indiscriminately. This is due tolack of legislation and regulation for drugs control both in public and private sectors
- Shortage of treatment facilities for malaria cases due to collapsed infrastructure
- Lack of clear guidelines on the use of prophylaxis in epidemics
- Unstable and constantly ever changing security situation in the south and central
- Limited access to and low coverage of health care facilities especially among thenomadic populations
- Lack of accurate population data for planning purposes.
- Lack of knowledge on drug efficacy hence sensitivity
- Lack of baseline prevalence of malaria and other diseases in the country.

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