Eco. Env. & Cons. 28 (May Suppl. Issue) : 2022; pp. (S22-S30)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2022.v28i03s.003

Knowledge and Practices Regarding Chikungunya among Community Members in Urban Area

[1]Khalid Haroon Fadul, [2]Maha Hamad Ali, [3]Hatim Rahamtalla Mohamed, [4]Mazahir E Abdallah, [5]Mohammed Osman Elamin, [6]Hatim Abdullah Natto and [7]Ahmed A. Osman

[1,3]University of Bahri, [2,4] King Khalid University, [5,6,7] Faculty of Public Health & Informatics, Umm Al-Qura University, Saudi Arabia

(Received 11 September, 2021; Accepted 26 October, 2021)

ABSTRACT

Chickungunya is a serious and increasing public health problem in tropical and subtropical regions of the world. It is caused by a group A virus and transmitted by *Aedes aegypti* and *Aedes albopictus*. Among the signs and symptoms were sudden onset of fever headache, joint pain and swelling, inability to walk, fatigue, muscle pain, rash, nausea, chills, anorexia, lumbago, and conjunctivitis. Prevention is entirely upon taking steps to avoid mosquito bites and eliminating of mosquito breeding sites. This is a cross-sectional descriptive study with the aim to study knowledge, attitude and practice of households was conducted in Kassal State, Sudan. 388 households were recruited for the study. A modified structured questionnaire targeting households was used to collect data and the collected data were analyzed by using computer software program (SPSS). The results were presented in text, tables and figures. Although, 49.2% and 93% of the participants had knowledge concerning modes of transmissions and causative factors, respectively, 61.45 and 50.8% had poor or lack knowledge concerning symptoms and signs and method of prevention of chickungunya, respectively. 69.6% and 68.1% of the participants had favorable attitudes towards perceiving the severity of chickungunya and dealing with the infected person, respectively. The majority (84.7%) of the participants use mosquitoes net as method of prevention and more than half (53.2%) of the participants were participating in chickungunya prevention program. Household had lack of in-depth knowledge about Chickungunya causal factors and methods of prevention. Therefore health education and community awareness can play a role for the control of Chickungunya epidemic.

Key words : *Knowledge, Practices, Chickungunya.*

Introduction

Chickungunya is a serious and increasing public health problem in tropical and subtropical regions of the world. It is a dengue-like disease caused by a group A virus, where the incubation period is from is 4 to 7 days. It is transmitted by *Aedes aegypti* and *Aedes albopictus*, two species which can be found biting throughout daylight hours though there may be parks of activity in the early morning and late afternoon, (WHO, 2019).

Chickungunya is an alpha virus that causes a non-specific illness. While most people recover from the acute illness in 1-2 weeks, there are a proportion of individuals that continue to suffer from chronic joint pain which can persist for weeks to years following infection, (Staples *et al.*, 2009).

Among the signs and symptoms were sudden onset of fever, headache, joint pain and swelling, inability to walk, fatigue, muscle pain, rash, nausea, chills, anorexia, lumbago, and conjunctivitis (WHO, 2018).

Among the determinants of the increasing incidence are the simultaneous circulation of four serotypes, the lack of continuous water supply, poor or inadequate solid waste management, unplanned urban growth, internal displacement, and poverty, (Daina Sarmiento, 2019).

Prevention is entirely upon taking steps to avoid mosquito bites and elimination of mosquito breeding sites by wearing long-sleeved shirts and long trousers, using mosquito coils, electric vapor mats during the daytime to prevent mosquito bites, using mosquito nets to protect babies, old people and others and having secure screens/nets on windows and doors to keep mosquitoes out. There is no specific treatment of chickungunya infection and is usually self limiting. Analgesics, antipyretics like paracetamol, diclofenac sodium, and chloroquine along with fluid supplementation are recommended to manage infection and relieve fever, joint pains and swelling. Drugs like aspirin and steroids should be avoided. The recent outbreak has occurred in the Red Sea State on May 2018 and then spread to Kassala State on August 2018 (WHO, 2018).

Although, the disease has history worldwide, it appeared newly on May 2018 in some states of Kassal, Red Sea and Gadarif. Despite the high prevalence rate, there was no documented evidence of knowledge, attitude and practices (KAP) concerning the disease among the citizens. The citizens of the study area lack information, and having poor practices concerning the disease; its mode of transmission, methods of prevention and treatment, even they didn't hear the name of the disease before the outbreak. Studying, knowledge, attitudes and practices can provide data base for prevention, health services and more researches, (WH), 2018).

The chickungunya is one of the most serious diseases in tropical areas. The outbreak in Sudan reported a total of 48,763 cases of chickungunya during the period between 31 May 2018 and 30 March 2019. Almost all cases (99.7%) of chickungunya in the country occurred in Kassala and Red Sea States of eastern Sudan alone. The large number of cases is due to the lack of knowledge and poor practices concerning the causes, the mode of transmission and prevention methods of the disease, (WHO, 2018).

We aimed to study knowledge, attitudes and practices of households toward chickungunya in Kassala State.

Chickungunya virus (CHIKV) has circulated in Africa, Asia, and the Indian and Pacific Ocean Islands (Thiberville, 2013). In 2013, the virus spread to the Americas and caused outbreaks in countries that harbor the vectors, *Aedes aegypti* and *Aedes albopictus*. On 21 October 2014, the disease reported in Montpellier, and in the pacific islands. WHO reported small outbreaks of chickungunya in late 2015 in the city Dakar, Senegal, and the state of Punjab, Indian. Countries reporting most cases were Brazil (265000 suspected cases), Bolivia and Colombia (19000 suspected cases, respectively). As of April 2015, over 1,379,788 suspected cases and 191 deaths have been recorded in Caribbean island, Latin American countries, and the United States of America. Cases have been documented as well as several small outbreaks in Europe due to importation of the virus into an area with suitable vectors (CDC, 2016). 2016 Chickungunya was reported in Argentina following an outbreak of more than 1000 suspected cases. In the African region, Kenya reported an outbreak of chickungunya resulting in more than 1700 suspected cases. In 2017, Pakistan continues to respond to an outbreak which started in 2016. The first suspected of chickungunya in the neighboring Kassala State was reported on 8 August 2017. Since then cases have been reported in three localities of the state; Kassala, West Kassala and Rural Kassala. From 31 may through 2 October 2018, seven states (Kassala, Red sea, Al-Gadaref, River Nile, Northern State, South Darfur and Khartoum) have been affected with a total of 13,978 cases of Chickungunya, 95% of which are from Kassala State. No hospital admission or death has been officially reported cases were children less than 5 years of age and 60% were female, (WHO, 2018).

The persistence of breeding sites, risk behaviors, and practices of social and institutional factors, as well as the proliferation of other potential problems (such as solid waste collection), increase the likelihood of chickungunya, making clinical diagnosis difficult. Limited accessibility to a diagnostic laboratory, which has caused delays in diagnosis, and a lack of trained health personnel in some endemic areas, has resulted in a reduced opportunity to detect cases and report them correctly (Gloria *et al.*, 2017).

Several studies were found, one of them is a study that conducted by Gloria, 2017 in Colombia showed that 70% of the respondents were aware that, chickungunya is viral diseases. Fever was considered the most important symptom. 79.45% knew that a mosquito transmits these diseases (Gloria *et al.*, 2017).

A study that conducted by M. L. Moro, 2010 showed that (61%) of the respondents knew that Chickungunya virus is transmitted through mosquito bites. 49.8% of respondents perceived Chickungunya infection as a high-risk disease (Moro *et al.,* 2010).

A study that conducted by Daina Sarmiento, 2019, in Colombia, showed that 58% of the respondents were male. 73.8 % of the respondents knew the symptoms, 90.8 % knew the transmission route. Average scores on attitudes towards disease severity were high. Seeking treatment in medical centers and the use of mosquito net and space-spraying of insecticides were the most frequently identified practices. 92% participants perceive the severity of the disease. 82.0% were seeking care at a medical center and 52.4% were using of mosquito nets. Space-spraying of insecticides was the second most common choice for prevention, (Daina Sarmiento, 2019).[4]

A study that conducted by Prashaant Kumar Bhatnagar, 2019, in India showed that 71% of the participants knew chickungunya are caused by mosquito bite. 43% children knew female mosquito bites can cause and spread. Only 21% knew that they are caused by Aedes mosquito. Only 50-60% children took personal protective measures against mosquito bites and check for breeding of mosquitoes.

A study that conducted by Haroon Or Rashid, (2008) in Bangladesh, showed that about 92.5% of the respondents had heard of Chickungunya infection but only (50%) responded correctly that Chickungunya is transmitted by *Aedes* mosquito. Study respondents were conscious about clinical features of Chickungunya infection particularly high fever (18.0%) and joint pain (14.6%). Most (88%) of respondents believe Chickungunya is preventable. Study participants use various methods including, mosquito nets (28.4%), insecticide spray (19.3%), and window net (12.4%) for mosquito bite prevention (Md Haroon Or Rashid *et al.,* 2008).

A reviewed study conducted by Tricia Corrin, (2017) showed that there was awareness Chickungunya in eight studies conducted in Asia among the general public, which varied from 7 – 96%. The awareness of Chickungunya was highest in the four studies where an outbreak was on-going and among urban link workers who are responsible for implementing anti- larval measures through door-to door visit s in their community. In Nicaragua, 93.5% of individuals were informed about Chickungunya. General knowledge on mosquito borne diseases in India among a group of health-care workers was 83%. Gender was shown to be a significant predictor of knowledge of chickungunya as a mosquito borne disease in two studies from India. In both studies, females were shown to have more knowledge about chickungunya, (Tricia Corrin *et al.,* 2017).

A study that conducted by Fritzell (2016), showed that most of the confirmed patients were housewives, at p=<.04, people aged 60-69 or 70 are more likely to be infected, among active people, farm workers < 10% of the population, are more likely to be infected. People living in socio-economically deprived areas were more likely to be infected. Knowledge of a disease is believed to derive attitudes, believed and practices towards better protection, (Fritzell *et al.,* 2016).

A study that conducted in Colombia, by taylor and francis showed that 92.7% of the participants had some type of education but primary education is the most frequent 29.3% and of those 93.9% had knowledge concerning chickungunya disease *(*Juan, *et al.,* (2015).

Materials and Methods

This cross-sectional descriptive community based study aimed to study knowledge, attitude and practice of community members toward Chickungunya.

We conducted his study in Kassala State, Sudan. Kassala State is the one of the 18 states of Sudan. It consists of 11 localities, (Kassala, West Kassala, Reify Kassala, Reify Halfa, Nahr Atbara, Reify Wed Hilalo, Reify Aroma, North-Dalta, Talkok and Hamshkoraep). The total area is about 42,242 km^2. It lies between longitudes 35 to 37E and latitudes 15 to 17N. It bordered Eritrea country from the east, River Nile State and Khartoum State from the west, Red Sea State from the north, Al- Gdarif State and Ethiopia country from the southwest. Kassala Locality is the largest locality in Kassala State; it is divided into six sectors, (SMOH, 2018).

The total household in Kassala locality is about population of the state is about 2434285 according to the last census in 2011. The target populations are households. The total number was 12,677, household, (MICS, 2014).

Sample size was determined by using the following formula:- n=N\1+N (e)^2

n= sample size, N=number of total population, e =marginal error equal 0.05 and 1= constant

n= 12677/1+12677 $(0.05)^2$ n=12677/31.7 n=388

A multi-stage sampling techniques was used to distribute the sample.

Stage One: Kassala State constitute of 11 localities, (Kassala, West Kassala, Reify Kassala, Reify Halfa, Nahr Atbara, Reify Wed Hilalo, Reify Aroma, North-Dalta, Talkok and Hamshkoraep), Kassala locality was chosen by simple random sampling techniques as study area

Stage two: Kassala Locality constitute geographically of seven units, the first unit was chosen by simple random sampling techniques to represent study area.

Stage three: This first unit constitute of six areas (Al-Mirghanie, Al-Suryba, Al-Shheed Tag Alsir, Al-Ameriya, Al-Khtmeia and Ashabeia), with the total household population 12,677. The sample size from each area was selected proportionally by the following formula;

The total sample size divided by total household of the sector and multiplies by the total household in the area as: (388/12.677) × total population of each area as follow:

Study area	Population number	Sample size
Al-Mirghanie	1585	48
Al-Suryba	1170	36
Al-Shheed Tag Alsir	1210	37
Al-Ameriya	2150	66
Al-Khtmeia	4670	143
Al-Shabeia	1892	58
Total	12,677	388

Stage four: the interval was determined in each area by dividing the total household over the determined sample size of this area to select the households. The first house was selected by lottery from within the interval and then the interval was added to select the second house and so forth till the entire sample was selected.

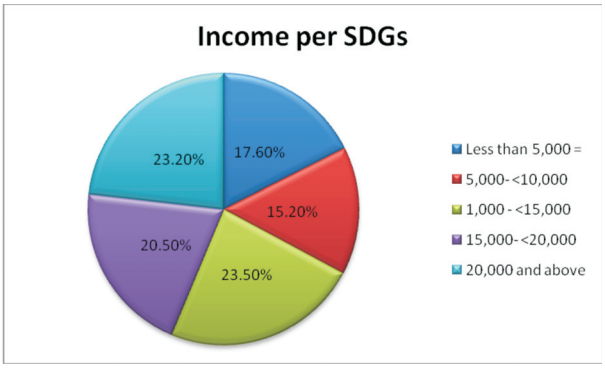
Data was collected by modified structured questionnaires targeting households and structured interviews; the questionnaire includes demographic data, knowledge, attitude and practice about chickungunya fever and the interview targeting Health State Ministry of Health staff. The knowledge is assessed as excellent when the respondents respond correctly to the five options, v. good to four options, good to three options, moderate to two options, poor to one option and lack knowledge to those who failed to choose any correct option.

Data Analysis: Data was analyzed by using computer software program; Statistical Packaging for Social Science (SPSS) and c^2 test was used to show the association between demographic data and KAP. The result was presented as tables and figures. Ethical consideration: written agreements from the State Ministry of Health, Bahri University and consent agreement from the participants were obtained.

Results

The study revealed the following findings: More than two thirds (70%) of the participants were females, 40.3% of the participants were university graduated, 29% were secondary educated, 10% were basic education, were attending Khalwa, where 6.1% were illiterate. More than Three quarters (75.5%) of the participants were married, 18.9% were widow, and 5.6% were divorced.

31.1% of the participants had excellent knowledge 18.1% had good knowledge and 14.4% had moderate knowledge



n=388

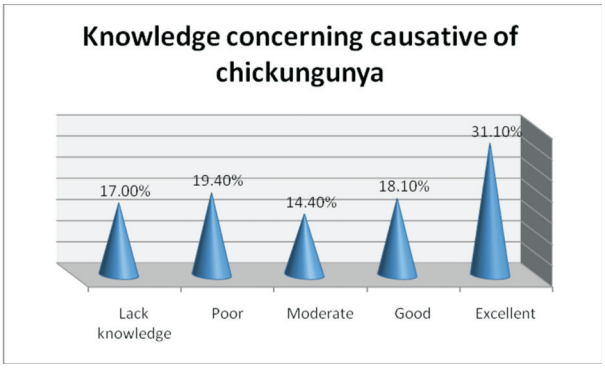
Fig. 1. Distribution of the participants according to income in SDGs

Most (56.3%) of the participants income was less than 5,000 and 15,000 SDGs

93% of the participant had excellent knowledge concerning modes of transmissions of Chickungunya

More than half (55%) of the participants knew about the availability of treatment

38.1% and 30% of the respondents strongly agreed and agreed to deal with the infected person respectively.



n=388

Fig. 2. Knowledge concerning causative factors of Chickungunya

More than half of the participants have favorable attitudes towards contacting the infected person with chickungunya.

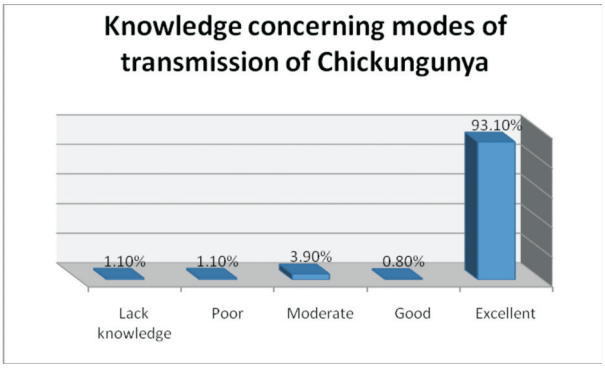
The majority (84.7%) of the participants use mosquitoes net as method of prevention

More than half (53.2%) of the participants Participating in chickungunya prevention methods.

Table 1. Knowledge concerning symptoms and signs of Chickungunya n=388

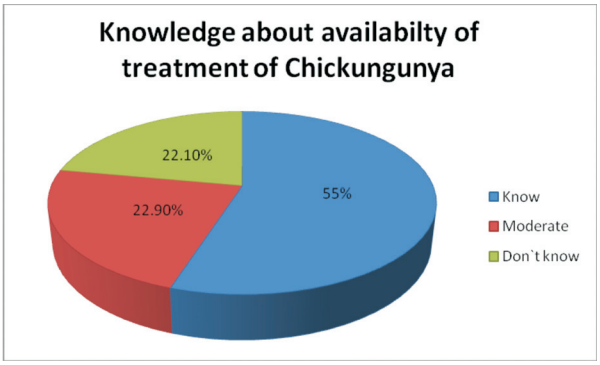
Knowledge	Frequency	Percentage
Excellent	6	1.5%
Good	52	13.4%
Moderate	92	23.7%
Poor	150	38.7%
Lack Knowledge	88	22.7%
Total	388	100%

Most 38.7% and 22.7% of the participant had poor and lack of knowledge concerning symptoms and signs of Chickungunya respectively.



n=388

Fig. 3. Knowledge concerning modes of transmissions of Chickungunya fever



n=388

Fig. 4. Knowledge about availability of treatment of (Chickungunya) fever

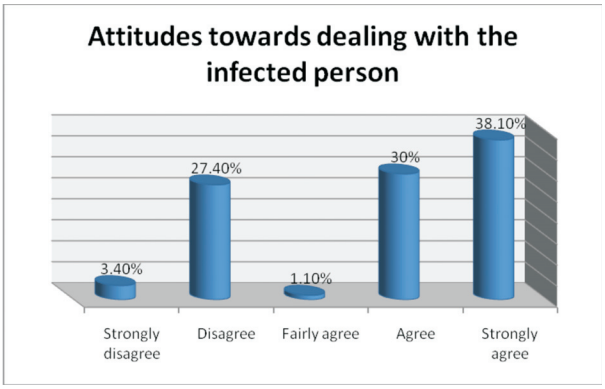
Table 2. Knowledge concerning the method of prevention of Chickungunya n=388

Knowledge	Frequency	Percentage
Excellent	5	1.3%
Good	88	22.7%
Moderate	64	16.5%
Poor	197	50.8%
Lack Knowledge	34	8.7%
Total	388	100%

More than half (50.8%) of the participants had poor knowledge concerning the method of prevention of Chickungunya

Discussion

The results of the study show that most 70% of participants were female this is because males usually leave the house early in the morning for work or other purposes and leave women at home. This finding agreed with a study conducted by Daina Sarmiento, 2019, in Colombia, which showed that



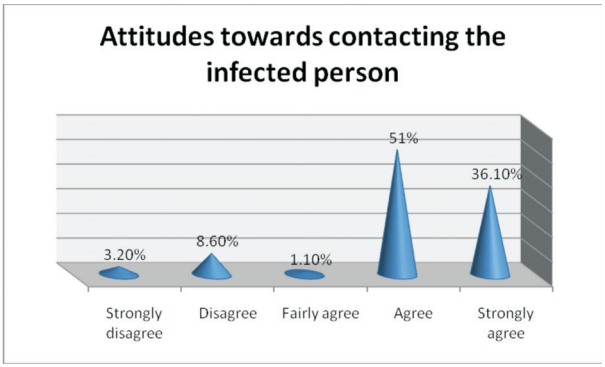
n=388

Fig. 5. Attitudes towards dealing with the infected person

Table 3. Perception concerning the severity of (Chickungunya) n=388

Knowledge	Frequency	Percentage
Excellent	15	3.9%
Good	270	69.6%
Moderate	38	9.8%
Poor	45	11.6%
Lack Knowledge	20	5.1%
Total	388	100%

Most (69.6%) of the participants had good knowledge concerning the perception concerning the severity of Chickungunya



n=388
Fig. 6. Attitudes towards contacting the infected person

58% of the participants were male, (Daina Sarmiento, 2019). The result showed that 31.1% of the participants had excellent knowledge 18.1% had good knowledge and 14.4% had moderate knowledge concerning the causative factors of Chickungunya. The high awareness was due in part to the high educational level, where 40.3% of the participants were university graduated, 29% were secondary educated and in other part to the intensive health education campaign. This finding agreed with the study that conducted by Gloria, 2017 in Colombia, which showed that 70% of the respondents were aware that, chickungunya is viral diseases (Gloria *et al.*, 2017). It is also agreed with the study that conducted by Prashaant Kumar Bhatnagar, 2019, in India, which showed that 71% the participants knew that chickungunya are caused by mosquito bite, (Prashaant Kumar Bhatnagar *et al.*, 2019). The study also revealed that 93% of the participant had excellent knowledge concerning modes

Table 4. Association between gender and knowledge concerning symptoms and signs of Chickungunya

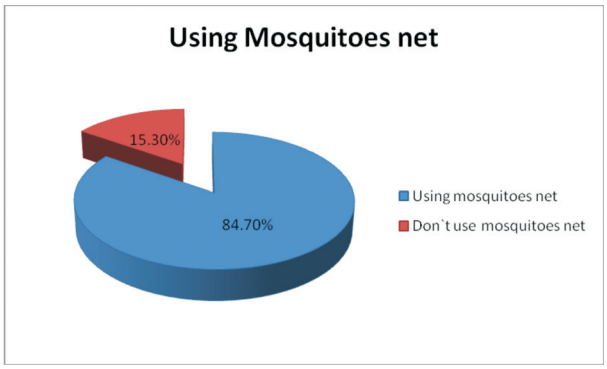
		Gender		Total
		Male	Female	
Knowledge	Excellent	1(0.9%)	44(16.2%)	6(1.5%)
	Good	7(6%)	45(16.6%)	52(13.4%)
	Moderate	18(15.4%)	74(27.4%)	92(23.7%)
	Poor	61(52.1%)	70(25.8%)	150(38.7%)
	Lack	30(25.6%)	38(14%)	88(22.7%)
	Total	117(30%)	271(70%)	388(100%)

n=388
There significant association between gender and knowledge concerning symptoms and signs of Chickungunya at $p<0.005$

Table 5. Association between Level of education and knowledge concerning symptoms and signs of Chickungunya

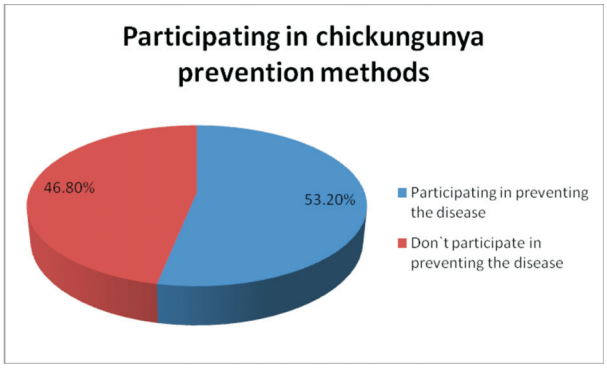
		Level of education					Total
		University	Secondary	Basic	Khalwa	Illiterate	
Knowledge	Excellent	51(28.2%)	28(25.7%)	6(15.4%)	2(5.7%)	00(0%)	87(22.4%)
	Good	50(27.6%)	26(23.9%)	7(17.9%)	4(11.4%)	1(4.2%)	88(22.7)
	Moderate	45(24.9%)	24(22%)	9(23.1%)	8(22.8%)	5(20.8%)	91(23.5%)
	Poor	23(12.7%)	18(16.5%	8(20.5%)	10(28.7%)	7(29.2%)	66(17%)
	Lack	12(6.6%)	13(11.9%)	9(23.1%)	11(31.4%)	11(45.8%)	56(14.4%)
	Total	181(46.3%)	109(28.7%)	39(10%)	35(8.9 %)	24(6.1%)	388(100%)

n=388
There significant association between level of education and knowledge concerning symptoms and signs of Chickungunya at $p<0.005$



n=388

Fig. 7. Using mosquitoes net



n=388

Fig. 8. Participating in chickungunya prevention methods

of transmissions of Chickungunya, this attributed as we mentioned before to the high level of education and intensive health education campaign. This finding agreed with a study that conducted in Colombia by Daina Sarmiento, 2019, which showed that 90.8 % of participants knew the transmission route (mosquito bites) (Daina Sarmiento *et al.*, 2019).

The study revealed that most 38.7% and 22.7 % of the participant had poor and lack of knowledge concerning symptoms and signs of chickungunya respectively. This finding agreed with the study that conducted by Md Haroon Or Rashid, 2008 in Bangladesh, which showed that the respondents were conscious about clinical features of Chickungunya infection particularly high fever (18.0%) and joint pain (14.6%), (Md Haroon Or Rashid *et al.*, 2008).

The study revealed that More than half (50.8%) of the participants had poor knowledge concerning the method of prevention of Chickungunya. This the first time for the citizen to hear about the disease, they didn't experience an outbreak of the mentioned disease before. This result agreed with the study that conducted by Daina Sarmiento, 2019, in Colombia, which showed that 52.4% were using of mosquito nets. Space-spraying of insecticides was the second most common choice for prevention, (Daina Sarmiento, 2019).

The study revealed that most (69.6%) of the participants had good knowledge concerning the perception concerning the severity of chickungunya. The participants observed and heard about the infected persons, suffer, and the mortality rate. This finding agreed with the result of the study that con-

Table 6. Association between gender and participation in prevention of Chickungunya

		Gender		Total
		Male	Female	
Participation in prevention of Chickungunya	Participate	35(29.9%)	171(63.1%)	206(53.2%)
	Not Participate	82(70.1%)	100(36.9%)	182(46.8%)
	Total	117(30%)	271(70%)	388(100%)

n=388

There significant association between gender and participation in prevention of Chickungunya at p<0.005

Table 7. Association between level of education and participation in prevention of Chickungunya

		Level of education					Total
		University	Secondary	Basic	Khalwa	Illiterate	
Participation in prevention of Chickungunya	Participate	96(80%)	68(70.1%)	20(38.5%)	13(23.6%)	9(13.6%)	206(53.2%)
	Don't Participate	24(20%)	29(29.9%)	32(61.5%)	42(76.4%)	55(86.4%)	182(46.8%)
	Total	120(30.9%)	97(24.9%)	52(13.4%)	55(14.2%)	64(16.6%)	388(100%)

n=388

There significant association between level of education and participation in prevention of Chickungunya at p<0.005

ducted by Moro, 2010, which showed that (49.8%) of respondents perceived chickungunya infection as a high-risk disease (Moro *et al.,* 2010).

38.1% and 30% of the respondents strongly agreed and agreed to deal with the infected person respectively. The extended families and strong relationships between household community members lead the person to sacrifice for the sake of the others.

The study revealed that the majority (84.7%) of the participants use mosquitoes net as method of prevention. they accustomed to use mosquitoes net for prevention of malaria. This finding the study that conducted by Md Haroon Or Rashid *et al.,* 2008 in Bangladesh, which showed that (28.4%) of the participants use, mosquito nets for mosquito bite prevention, (Md Haroon Or Rashid, 2008).

The study revealed that more than half (53.2%) of the participants participated in chickungunya prevention methods. the participation is one of the valuable values of the Sudanese especially in rural areas. This finding disagreed with the study that conducted by Gloria, 2017 in Colombia, which showed that the problems in the health system make people tend to involve God in their response, for example, "God allows mosquitoes to bite us" or "God allows us to get sick." This "divine" attribution to events related to health-disease processes is common in the Colombian population, giving responsibility for the causes and consequences of the disease to God. In some cases, religion can affect health processes in a negative way, leading to passive styles, in which people give the control of problems to a higher power, (Gloria *et al.,* 2017). The result revealed that there were significant association between gender and level of education on one side and knowledge concerning symptoms and signs of and participation in the prevention of chickungunya on the other at p=<0.005. This indicates that the level of education increases the awareness and information towards the health problems and lead lo translate these into action in participation in chickungunya prevention programme. Also gender reflects interest of female in the disease and in the participation in the chickungunya prevention programme. These findings agreed with the study that conducted by Fritzell 2016, which showed that knowledge of a disease is believed to derive attitudes, believed and practices towards better protection, (Fritzell *et al.,* 2016). It also agreed with the result of the study that conducted in Colombia by Juan *et al.,* 2015, which showed that 92.7% of the participants had some type of education but primary education is the most frequent 29.3% and of those 93.9% had knowledge concerning chickungunya disease (Juan *et al.,* 2015).

Conclusion

Household had lack of in-depth knowledge about Chickungunya breeding place and methods of prevention of the disease. Health education and community awareness can play a role for control of chickungunya epidemic.

Recommendation

1. The State Ministry of Health should conduct health training program to the health promoters raise their capabilities to implement program of monitoring and investigation of disease in early detection.
2. The local health authorities should encourage households to apply protective measurements
3. The Health Education and Health Promotion Departments should conduct health education programmes to raise the awareness of the households regarding chickungunya.
4. The promotional health authorities should encourage households to change the water daily and cleaning the water container well to prevent the spread of mosquitoes.

References

Centers for Disease Control and Prevention, 2016. Chikungunya virus, 20i5.https://www.cdc.gov/chikungunya/geo/united-states-20i5.html. Accessed 22 July.

Diana Sarmiento-Senior, María Inés Matiz and Juan Felipe Jaramillo-Gómez, 2019. Knowledge, Attitudes and Practices about Dengue among Pupils from Rural Schools in Colombia. *Biomédica.* 39 (3) : Bogotá July/ Sept. 2019 Epub.

Fritzell, C. 2016. Knowledge, attitudes and practices of vector brone disease.

Gloria Jaramillo Ramírez, Luz S. Buitrago Álvarez, 2017. Knowledge, Attitudes and Practices Regarding Dengue, Chikungunya, and Zika and their Vector Aedes Aegypti in Villavicencio, Colombia. The open Public Health Journal

Juan C. Rueda, Ana M. Santos and John Londono. 2015. Emerging Microbes and Infections.

Kassala State Ministry of Health, 2018. Chikungunya Outbeak. Health Promotion Department,

Md Haroon Or Rashid, Hafiza Sultana and Md Tariq Zzaman, 2008. Knowledge and Awareness regarding Chikungunya among Urban Community People of Selected Area of Dhaka City Bangladesh. *Journal of Infectious Diseases & Therapy.*

Moro, M. L., Carlo Gagliotti, Giuliano Silvi, P. Macin, 2010. Knowledge, attitudes and practices survey after an outbreak of chickungunya infections. *International Health.*

Staples, E.J., Breiman, R.F. and Powers, A.M. 2009. Chikungunya fever: an epidemiological Review of a re-emerging infectious disease. *Clin Infect Dis.* doi:10.1086/605496.

Thiberville, S.D., Moyen, N. and Dupuis-Maguiraga, L. 2013. Chikungunya fever: epidemiology, clinical syndrome, pathogenesis and therapy. *Antivir Res.* doi:10.1016/j.antiviral.2013.06.009

Tricia Corrin, Lisa Waddell, Judy Greig, Ian Young, Catherine Hierlihy and Mariol Mascarenhas, 2017. Risk Perceptions, Attitudes, and Knowledge of Chikungunya among the Public and Health Professionals: A Systematic Review. *Tropical Medicine and Health Journal.*

WHO, 2018. Guidelines for prevention and control of Chickungunya fever. MoH,

WHO, 2019. Guidelines for prevention and control of Chickungunya fever World Health Organization