

Survey Relation of Malaria Disease to Environmental Factors: A Case Study

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Abstract: In recent years because of some problems such as pharmaceutical resistance, irregular use of insecticides in agriculture, deficit of appropriate budget and etc malaria disease had prevalence more in all over the world. Malaria disease had different distribution in over the Ardabil province in northwest of Iran. This research was done for the reason that survey of effective probable factors on condition and incidence of malaria. This search was an analytic study that during it studied region has surveyed from different aspects of ecological geographical and disease prevalence. For defining correlation between measured variables from Pierson correlation coefficient and variance analysis test(ANOVA) has used for survey in group difference in mean of measured variables. Results show that between studied areas, two of cities there was a positive and significant relation between prevalence of malaria disease and climatic conditions (temperature, rainfall rate, humidity) but in other townships in spite of being relation and correlation between climatic conditions and prevalence of malaria disease, this correlation is not significant statistically. So, this study was shown relation between malaria disease distribution and environmental factors.

Key words: Anopheles mosquito • Environmental parameters • Correlation • Distribution of malaria • Ardabil province • Iran

INTRODUCTION

Malaria is one of the world's most serious and complex public health problems and it has now been identified as the disease most likely to be affected by climate change [1]. Iran with settling in northern moderate region and east of middle-east with having various climates is settled in endemic region of world map of malaria spreading [2]. Human malaria is an infectious hematic disease that threatens about 40 percent of world population [3 and 4]. This disease, furthermore in its attracts digests patient's force severely and causes sever decreasing of patient actions along disease period, causes weakening of public hygiene and welfare in families, risks for children life and causes extra tear of society and human sources of countries that nowadays yet this disease is the most important world hygienic problem and about 107 country in the world are counted as malarial countries. According to surveys, mortality arising from malaria has reported between 1.1 to 7.2 million of people in a year [2]. Regression results using Ordinary Least Squares indicate no relationship between malaria prevalence and environmental and socio-economic

variables. There is need for further study using disaggregated data, panel data and adding more control variables to the health production model to identify the factors that are associated with malaria prevalence in Uganda [5].

Parsabad city in north of Ardabil province is taken into account one of the endemic transfer centers of disease in Iran. The results of studies in this area show that prevalence of malaria had received to the lowest amount during recent 7 years. For fighting with anopheles mosquito, is expended considerable sum every year [6].

In spite of allocating abundant budgets and continued performing of fighting operations with malaria in these regions such as active and passive case finding, use all kinds of antiphlastic medicines, using of all kind of insecticides for fighting, yet transfer of this disease continues in special regions of this province such as Parsabad, Bilehsavar and Khalkhal cities and etc. [6]. In as much as surveying for survey of probable factors in situation and indent of malaria in statistical period since the years 2003 to 2007 of Ardabil province and use of its information in malaria control program.

MATERIALS AND METHODS

In this research, required information had prepared along statistical period since the years 2003 to 2007 including temperature of cities of Ardabil province, prevalence of disease in different regions of province, humidity and rainfall rate.

This research is a descriptive-analytic study that during it studied region has surveyed from different aspects of ecological, geographical and disease prevalence. For defining correlation between measured variables from Pierson correlation coefficient and variance analysis test (ANOVA) was used for survey in group difference in mean of measured variables. Statistical software SPSS17 had used for doing the statistical analysis.

RESULTS AND DISCUSSION

Just as pointed before, malaria disease is one of the diseases that climatic conditions effect on its genesis and spreading, some of these climatic conditions that we can mention are temperature, rainfall and humidity. In this search, we attempted that with studying of available dates, would survey relation between climatic conditions (temperature, humidity, rainfall) and malaria disease in studied area.

The results of surveying correlation coefficients between measured parameters in all over the province (Table 1) showed that in between studied features there is a negative and significant relation between rainfall and humidity rate in 5 percent probability level. The relations of the other features with each other weren't significant.

The results of surveying correlation coefficients between measured parameters in Ardabil cities (Table 2) showed that in between studied features there isn't any significant relation.

The result was shown that correlation coefficients between measured parameters in Parsabad city (Table 3) showed that in between studied features there is a positive and significant relation between rainfall and humidity rate. The relation of the other features with each other weren't significant.

The results of surveying correlation coefficients between measured parameters in Khalkhal city (Table 4) showed that in between studied factors there is a positive and significant relation between disease and temperature rate. In other words as much as temperature rate increases, also disease rate increases so that changes percentage of disease rate in controlled via temperature. Also there is a positive and significant relation between rainfall and humidity rate. The relations of the other features with each other weren't significant.

Table 1: correlation of measured parameter in Ardabil province

Environmental factors	Disease	Rainfall	Temperature	Humidity
Disease	1			
Rainfall	0.10	1		
Temperature	0.18	-0.30	1	
Humidity	0.25	-0.42*	0.22	1

* significant ($p \leq 0.05$)

Table 2: Correlation of measured parameter in Ardabil city

Environmental factors	Disease	Rainfall	Temperature	Humidity
Disease	1			
Rainfall	-0.50	1		
Temperature	-0.47	-0.19	1	
Humidity	-0.22	-0.24	0.10	1

Table 3: Correlation of measured features in Parsabad city

Environmental factors	Disease	Rainfall	Temperature	Humidity
Disease	1			
Rainfall	0.87	1		
Temperature	-0.55	-0.77	1	
Humidity	0.83	0.92*	-0.48	1

* significant ($p \leq 0.05$)

Table 4: Correlation measured features in Khalkhal city

Environmental factors	Disease	Rainfall	Temperature	Humidity
Disease	1			
Rainfall	-0.68	1		
Temperature	0.95 *	-0.46	1	
Humidity	-0.45	0.89 *	-0.24	1

* significant ($p \leq 0.05$)

Table 5: Correlation measured features in Mshghinshahr city

Environmental factors	Disease	Rainfall	Temperature	Humidity
Disease	1			
Rainfall	0.85	1		
Temperature	-0.30	-0.04	1	
Humidity	-0.40	-0.03	0.94*	1

* significant ($p \leq 0.05$)

Table 6: Correlation measured features in Bilehsavar city

Environmental factors	Disease	Rainfall	Temperature	Humidity
Disease	1			
Rainfall	0.93*	1		
Temperature	-0.70	-0.73	1	
Humidity	0.56	0.76	-0.30	1

* significant ($p \leq 0.05$)

Table 7: Correlation measured features in Ghermi city

Environmental factors	Disease	Rainfall	Temperature	Humidity
Disease	1			
Rainfall	-0.14	1		
Temperature	0.37	-0.97	1	
Humidity	0.26	-0.99**	0.98**	1

** significant ($P < 0.01$)

Table 8: The results of Analysis of variance for disease, rainfall, temperature and humidity factors

Source of variance	Disease	Rainfall	Temperature	Humidity
Treatment	125.87 ^{ns}	110.12 ^{ns}	38.39*	229.47*
Degree of freedom	5	5	5	5

^{ns} nonsignificant, * significant ($p \leq 0.05$)

The results of surveying correlation coefficients between measured parameters in Meshghinshahr city (Table 5) showed that in between studied features there is a positive and significant relation between temperature and humidity rate. The relations of the other features with each other weren't significant.

The results of surveying correlation coefficients between measured parameters in Bilehsavar city (Table 6) showed that in between studied factors there is a positive and significant relation between disease and rainfall rate. In other words as much as rainfall rate increases, disease rate increases so that changes percentage of disease rate is controlled via rainfall rate. The relations of the other factors with each other weren't significant.

The results of surveying correlation coefficients between measured parameters in Ghermi city (Table 7) showed that in between studied features there is a negative and significant relation between rainfall and temperature rate. There is a negative and significant relation between rainfall and humidity rate and also there is a positive and significant relation between temperature and humidity rate. The relations of the other features weren't significant.

The results of one-way variance analysis test (Table 8) showed that in between surveyed cities there is a significant difference in ($P < 0.01$) in temperature and humidity parameters exception of disease and rainfall rate. So that comparing the means in LSD way showed that there is a significant difference in $P < 0.01$ in disease between

Ardabil and Parsabad cities there is a significant difference in disease parameter between Ardabil and the other cities and also there is a significant difference in $p \leq 0.05$ in disease parameter between Parsabad and Meshghinshahr cities in addition to Ardabil.

About rainfall parameter, comparing the means in LSD way showed that there is a significant difference in rainfall rate between Ardabil and Khalkhal and between Ardabil and Meshghinshahr and also there is a significant difference between Parsabad and Khalkhal and between Parsabad and Meshghinshahr. The relations of the other features in different cities in rainfall parameter are significant.

Regarding took necessary actions to control and prevent for prevalence of this disease across the region show that malaria disease in study area has been controlled. As according to the reports of the hygienic center of Ardabil province from the 2007 up to now has not observed any item of malaria disease in Ardabil Province.

CONCLUSION

The results were shown that there was a significant statistical relation between climatic conditions and malaria disease just in Khalkhal and Bilehsavar cities. We can attribute this matter that there is a direction relation between air heat and prevalence of disease. So generally it seems that air heat causes increasing of anophel mosquitoes and it help to spread this disease, because of this, scientists can foresee incidence of malaria via climatic patterns [3].

As observed in results, also in Bilehsavar township there is a positive and significant relation between rainfall rate and disease prevalence. In other words with increasing of rainfall rate in this township, prevalence of disease increase and with decreasing of rainfall rate, prevalence of disease decrease too. Cause of this matter can justify that generation of malaria mosquito is accomplished in swamps and places that there is stagnant water, so it seems that with increasing of rainfall rate, malaria will be prevalent more. In addition to, it seems that neighborhoods of the republics of Azerbaijan and Armenia countries in disease prevalence in this region. In any case for exact conclusion needs more studies.

Odongo-Aginya *et al.* [7] show that rainfall pattern and age influence parasite density and are important determinants of malaria infection and transmission in Entebbe Municipality. In view of the changing ecological scenario and consequent risk of malaria transmission on

the prevalence of malaria vectors and its relationship in transmission of malaria in bhabar and terai it is possible that vector species which were wide spread in terai zone might have shifted to forest area of bhabar zone[8] due to deforestation and extensive agricultural practices[9]. The results of study in Nigeria indicated that there is no relationship between malaria and Salmonella infection, but there was a significant ($p < 0.01$) association between *S. typhi*, *S. paratyphi B* and *S. paratyphi C* infections[10]. Patricia *et al.* [11] assessed malaria infection in relation to age, altitude, rainfall, socio-economic factors and coverage of control measures in Oromia and SNNP regions of Ethiopia. The results shown that malaria prevalence was positively associated with peak monthly rainfall in the year before the survey. People living above 2000 m and people of all ages are still at significant risk of malaria infection.

The results of this study shown that having climatic conditions and suitable humidity on the one hand and also presence of Aras boundary river on the other hand and more important than other neighboring with the republic of Azerbaijan country that is counted epidemic region in transfer of malaria, transfer of malaria in Parsabad city is accomplished locally. Based on the results of this research seems that there is significant relation between environmental factors and malaria disease.

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