

A Case-Control Study of Determinative Factors on Malaria Morbidity in Minab, Jask and Roodan Counties, in Hormozgan Province, Southern Iran, 2001

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Abstract

A case control study was performed in three districts in Hormozgan province in 2001 to assess how different determinants affect on malaria morbidity. It assume that results will help the decision makers in all levels of national development program. A total of 384 febrile patients with positive peripheral blood smear were selected as case group, and 753 people with negative peripheral blood smear as control group in three districts (Minab , Jask , Roodan) in Hormozgan province during second half of the year 2001. Appropriate questionnaire was designed and data entered twice. Data were analyzed as matched and unmatched case – control using EPI6 and STATA softwares. Some determinants showed strong and significant relationship with malaria morbidity, including ; illiteracy (OR = 0.59), lack of health house and surrounding as a satellite village (OR = 2.83), far away from health facilities (OR = 1.43), not accessibility to school (OR = 1.75), road (OR = 2.3), screening and curtain (OR = 3.65), electricity accessibility (OR = 1.96), television (OR = 1.50), radio (OR = 1.73), telephone (OR = 2.71), and bed net (OR = 1.69). There was no significant relationship between malaria morbidity and the following determinant: residual spraying in the past 6 months (OR = 1.08). This study indicates that several factors affect on malaria control program. Malaria exists in low socio-economic and undeveloped conditions. Coordination of all sectors and close collaboration among them is a necessary component for malaria control program.

Keywords: *Malaria, Morbidity, Determinants, Iran*

Introduction

Despite several years campaign against malaria, about 300–500 million clinical cases occur every year with over 1.2 to 1.7 million deaths that contain over 1 million deaths among under 5 year-old African children, over 90% of the cases (generally *falciparum* infections) occur in Sub Sahara district of Africa (1). Malaria is considered as a public health problem in Iran, causing socio-economical problem. Except cases from southeastern district and a few endemic foci of the other parts of the country, the other clinical cases of the disease are imported. Annual Parasitic Index (API) of the disease in Iran is below 28/100000 in year 2000 (2). For malaria control strategy all aspects of malaria chain including human host, parasites and

vectors must be considered. Recognition of all effective factors and assessment of their effect is necessary for this purpose. There are several some more similar questions in this area. Studies in other countries have shown that some of factors reduce and the others increase malaria mortality and morbidity (3- 8). Some of the developmental programs of communities, e.g. enhancement of employments and income, literacy, electrification, road construction and also augmentation of communications, significantly reduce the malaria infections. On the other hand some of projects, e.g. agricultural projects, dam construction and water supplies raise the malaria cases (5, 6, 9, 10, 11). This survey will notice designers of developmental programs (socio-economical

and cultural) to environmental side effects of these projects especially on malaria. Some of these programs have bilateral effects on the disease. For example projects of agriculture, water supply and dams, although provoke augmentation of employment and income but with increasing of relative humidity and larvae breeding sites, cause increasing abundance of vectors and infection of disease respectively.

Materials and Methods

Statistical community of this case-control study was malaria cases of Minab, Jask and Roodan counties in second half of 2001. A comprehensive questionnaire was prepared through the KAP study and distributed for assessment.

1-What kinds of environmental factors affect on biology and abundance of malaria vectors?
2-Which factors affect human-mosquito contact?

3-Does cultural customs and behaviors of human affect malaria infection?

4-Is malaria infecting affected by socio-economical status of the community?

5-Which socio-economical developmental programs affect malaria?

6-Does residual spraying as a method of vector control provoke reduction on clinical cases?

7-Is there any relationship between individual protecting, e.g. using mosquito bed net and malaria morbidity?

Case definition: Clients to health centers of Minab, Jask and Roodan counties that diagnosed as malaria cases by blood examination.

Control definition Clientes to the same centers that simultaneously were diagnosed as non-malaria cases using blood examination.

Sample size Number of specimens for this case-control study with odds ratio equal 2 and $\alpha = 95\%$ was calculated using this formula:

$$n = \frac{2 (Z_a + Z_B)^2 \times p (1 - p)}{(P_0 - P_1)^2}$$

Generally, in similar case-control studies the power is raised with matching of case and control and then number of specimens is calculated with the other theorems to reduction of this number, but we conservatively calculate the number of needed specimens as a usual case-control study. In addition to reducing in probable complications of questionnaire, the number of specimens augmented about 10% and reached to 384 persons. Luckily all questionnaires of 384 cases and 753 controls were complete.

Case and control selecting method

Without considering age, sexuality, locality and nationality, all malaria patients were placed in case group and two clienteles were selected spontaneously as control group. Then questionnaire was completed for them individually. The results analyzed with EPI6 and STATA software. Truly analysis with EPI6 is an unmatched analysis. STATA software used for matched analysis. Unmatched analysis repeated again with STATA and then matched analysis performed.

Results

The results are shown in table 1. Generally in all variables "Odds Ratio" in unmatched analysis associate with matched one. Matched analysis was used to eliminate effects of manipulating variables and estimate combined values of relative risk. Mantel Haenszel method –as a common method was employed in this study, whereas, in case-control studies relative risk proximally equal to odds ratio "RR=OR", estimation of RR has mentioned in column of OR in table. P_{value} has noticed for further comparisons of two groups.

Table 1: Matched & Unmatched Analysis of Determinants

No.	Determinant	Unmatched			Matched		
		Confidence interval	OR	P V	Confidence interval	OR	P V
1	Sattelite & mobile villages to main villages Health network	1.01 – 1.94	1.40		1.75 – 4.60	2.83	
2	Primary or without literacy to middle & High school literacy	1.27 – 2.41	1.75		0.36 – 0.97	0.59	
		0.63 – 1.07	0.82	N S			
		0.41 – 0.99	0.64				
		0.36 – 1.56	0.75	N S			
3	Absence of school	1.18 – 2.58	1.75		1.86 – 6.50	3.48	
4	Long distance to health center	1.01 – 1.85	1.43		1.83 – 4.82	2.96	
5	Absence of roads	1.30 – 4.04	2.30		1.79 – 8.93	4.00	
6	Disuse of net for doors and windows	2.14 – 6.22	3.65		2.71 – 9.57	5.09	
7	Disuse of bed net	1.22 – 2.34	1.69		1.44 – 3.16	2.32	
8	Disuse of electrification	1.49 – 2.58	1.96		2.87 – 7.86	4.75	
9	Disuse of television	1.16 – 1.92	1.50		1.38 – 2.77	1.95	
10	Disuse of radio	1.06 – 1.75	1.37		1.24 – 2.46	1.75	
11	Disuse of telephone	1.85 – 3.98	2.71		3.30 – 10.88	6.00	
12	Background of residual spraying in houses at the preceding 6 months	0.82 – 1.42	1.08	N	0.67 – 1.75	1.08	N
				S			S

Discussion

Existence of school and literacy level.

Education of nation is one of the most important ways for malaria control. In this way educational centers and schools have the greatest role. According to the other studies, these roles have been proved (6, 12). Chance of malaria infecting in areas without school is 1.75 times more than the others (OR=1.75, 95%, CI: 1.18-2.58). Importance of educational centers in malaria control is proved by this significant difference. This proportion was equal to 3.48 with matched analysis that revealed severity of the relation. With matched analysis a significant difference observed between who had over middle school literacy and who had primary literacy or without literacy (OR=0.59, 95%, 0.36-0.97). Therefore increasing trend of literacy is a protective factor and illiteracy and low literacy are important risk factors for malaria morbidity (6).

Communication facilities, and availability (status of network, access to health and treatment centers, roads and telephone)

Accessing to health and treatment centers and communication facilities have an undeniable role in prevention and control of malaria (9). In the present study this relation was confirmed vigorously. According to table 1, there is a significant difference between residents of villages in view of distance to health centers. Large distance from this center enhanced the risk of malaria infection to 1.43 times and proportion of chances is 1.43 (OR=1.43, 95%, CI: 1.10-1.85). With matched analysis this variable was 2.96. In view of approaching to roads significant difference is higher and chance of acquiring malaria enhanced 2.3 times (OR=2.30, 95%, CI: 1.30-4.00). This proportion vigorously confirm with matched analysis and this odds ratio was equal as 4 (OR=4). Absence of communicational facilities, for example telephone in village, boost malaria morbidity. Proportion of chances for this factor is 2.71. This significant difference revealed that chance of acquiring malaria for inhabitants of telephone less villages is 2.71 times more than the others (OR=2.71, 95%, CI: 1.86-3.98). The aim of this question was to

determine the existence or absence of telephone office in villages (not personal telephone line). This proportion reviewed by secondary analysis and the odds ratio equal 6. Row 1 (in table) shows differences between three kinds of villages: main satellite and those that covered by mobile team (covering of health and treatment network) in view of malaria infection. Accordingly, chance of acquiring malaria in residents of satellite villages is 1.4 times more than habitants in main villages. This proportion in villages covered by mobile team is 1.75 times further than main villages. In matched analysis main villages compared with combined two other groups (satellite villages and villages covered by mobile team) that had vigorous significant difference (OR=2.83, 95%, CI: 1.75-4.6).

Trend of infecting risk is incremental from main to satellite villages and from satellite to those villages covered by mobile team, that estimate about three times.

Utilization of individual protecting instruments (nets for windows and doors and mosquito bed net). Various studies have been done in Africa for surveying the effects of individual protection against malaria. All these studies proved the benefits of mosquito bed net (specially impregnated ones) (4, 7, 13, 14, 15). Thus W.H.O. posed the motto "one mosquito bed net for one Africans". Disuse of nets for doors and windows enhances the risk of infecting with malaria. This odds ratio equal 3.65 and vigorously significant (OR=3.65, 95%, CI: 2.14-6.22). This proportion estimated with matched analysis equal as 5.09. Disusing of nets for doors and windows raise the risk of acquiring malaria to 5 times. If disusing of bed net consider as a risk factor, infecting chance for malaria enhanced 1.9 times. If these bed nets impregnated with a suitable insecticide not only reduce human-mosquito contact but also provoke decline in their abundance (OR=1.64, 95%, CI: 1.22-2.34). In this condition (unused bed net) risk of acquiring malaria with matched analysis have been estimated equal 2.32.

Electricity Disadvantaged areas are described with 4 factors: electricity, water supply, suitable roads and educational centers. In this study all of foregoing factors in cases and control groups significantly differ. Results of this study prove again that malaria is an under developing sickness and with corrected supervised developmental programs, malaria will control and eradicate. In this way electricity is one of the most important factors. Anywhere electrified in southeastern district, manifestation with malaria vigorously reduced. Truly, electricity fulfils this in various ways. According to results, chance of malaria infecting in areas without electricity increases 1.96 times more than the control group (significant difference, OR=1.96, 95%, CI: 1.49-2.58). Matched analysis not only confirms this result but also estimates this proportion to 4.75. Protecting of electrified areas is 5 times more than the others. Thus electrification is one of most important factors of developmental superiority in infected areas with malaria (6).

Using mass media, educational and communicational instruments (television and radio) Communicational instruments have a special and main effect for improvement of community knowledge. Change in attitude consequently causes behavioral change. Lack of accessibility to television and exclusion of educational programs, raise risk of malaria 1.5 times in comparison to the other villages. Radio has the same effects and people who don't utilize these instruments become more infected (1.37 times more than the others (OR=1.37, 95%, CI: 1.06-1.75). According the matched analysis estimated proportion risk of acquiring malaria in condition of television lacking is 1.95 (row 9 in table) and this for radio lacking is 1.75 (row 10 in table). Thus employing of these instruments with aim of national education is a protective factor against malaria (5, 6).

Background of residual spraying in houses at the preceding 6 months Residual spraying is one of the best control methods for adult mosquitoes. These expensive and

technical operations reduce abundance and biting of mosquitoes and reduce the disease (9, 16, 17). In this study we didn't observe significant difference between cases and control groups of the areas in which there was no any background of residual spraying in preceding 6 months. This result may be consequence of: fatigue of nations from residual spraying during past decades, less cooperation with exterminators, low level coverage of spraying, reducing quality of spraying and finally disclose and increasing resistance in mosquitoes. These results confirmed with matched analysis and difference between two groups wasn't significant.

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