



Malaria Status in Economic Cooperation Countries; Achievement and Gaps toward United Nations Millennium Development Goals

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Abstract

Background: Evaluating the malaria status of the Economic Cooperation Organization (ECO) member countries relation to goal 6 of 3rd Millennium Development Goals (MDGs) which includes have halted by 2015 and begun to reverse the incidence of malaria.

Methods: By 2009, we reviewed the MDGs reports, extracted the data from surveillance system, published, and unpublished data. The main stakeholders, from both governmental and international organizations in the country have been visited and interviewed by the research team as part of the data validation process.

Results: The malaria incidence is very heterogeneous among ECO countries, which differ less than 200 cases in total country in Kazakhstan, Kyrgyzstan, Turkey, Turkmenistan, Uzbekistan, and Azerbaijan to 82,564 cases (2,428/100,000) in Afghanistan and 59,284 cases (881/100,000) in Pakistan and about 18/100,000 in Iran in 2008. Malaria has been a major public health problem in Pakistan and Afghanistan and will continue to pose serious threat to millions of people due to poor environmental and socioeconomic conditions conducive to the spread of disease. The main malaria endemic areas of Iran are in southeastern part of the country; consist of less developed provinces that are bordered in the east by Afghanistan and Pakistan. There are little valid information about proportion of population in malaria-risk areas using effective malaria prevention and treatment measures indicators.

Conclusion: All ECO countries could achieve MDGs malaria indicators by 2015 except Pakistan and Afghanistan, unless preparing urgent intervention programs to fulfill the goals.

Keywords: Malaria, United Nations, Asia, Evaluation

Introduction

In the United Nations (UN) Millennium Development Goals (MDGs) as the key strategic tools for renewing the political commitment towards the promotion of Sustainable Human Development at the country level based on a global consensus, eight major goals are described and all UN members have agreed to try to achieve them by the year 2015(1).

To combat fighting disease epidemics, an important declared target of MDGs is to reverse the spread of malaria. In terms of its mortality and morbidity, malaria is among the most serious health problems and yearly impacts the lives of 3.3 billion people worldwide (2-3). "Actually, half the world's population is at risk of malaria, and an estimated 243 million cases led to nearly 863,000 deaths in 2008" (4-5).

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Malaria should have halted by 2015 and begun to reverse the incidence of it, as well as the death rates associated. Some related important measures are to increase the proportion of children under 5 sleeping under insecticide treated nets (ITNs), and improve proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs (6). Although global goals will not be met fully of several aspects in many regions, such as sub-Saharan Africa and some regions in Asia, remarkable progress has been witnessed in malaria control over the recent past years (4).

Economic Cooperation Organization (ECO) is a regional organization established in 1985 with cooperation of Islamic Republic of Iran, Islamic Republic of Pakistan, and Republic of Turkey (7-8). In 1992, the number of member countries has increased to 10 including Islamic Republic of Afghanistan, Republic of Azerbaijan, Republic of Kazakhstan, Republic of Kyrgyzstan, Republic of Tajikistan, Republic of Turkmenistan, and Republic of Uzbekistan. Now total population of 10 member countries is more than 400 million people and the total area is 8,620,697 Square kilometers (9). According to the United Nations Development Programme (UNDP), Human Development Report 2003, Human Development Index (HDI), which measures achievements in terms of life expectancy, educational attainment, and adjusted real income, classified most of the ECO member states within medium human development countries (7). In fact, there are many economic, social, and cultural similarities between the ECO countries, which can make a good context for sharing all experiences to overcome health problems such as malaria with more performance and help to make the related disease control programs better. The aim of present article is to review the progression of achievement to malaria control MDGs in countries that are members of ECO to evaluate achievements and gaps toward them by 2009.

Materials and Methods

In the review, we considered the goal and target related to malaria from MDGs statement (Goal 6:

To combat HIV/AIDS, malaria, and other diseases; Target: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases) and some treatment and prevention measures of it. New cases and death rates associated with it both were defined per 100,000 people in one year. Malaria prevention was measured as the percentage of children ages 0–59 months sleeping under insecticide-treated bed nets; and its treatment was measured as the proportion of children ages 0–59 months who were ill with fever in the two weeks before the survey and who received appropriate ant-malarial drugs per year.

As the first step of data gathering, basically according to the regional report on Millennium Development Health related Goals in Economic Cooperation Organizations (ECO) countries (Goals 4, 5 and 6) (10) and to update it, a comprehensive literature review has been done to find the most recent documents related to MDGs for each country of interest as the member of the ECO. The focal MDG secretariats in the Ministry of Health and the international Organizations have been contacted in advance to provide the available documents and reports (mostly gray literature) for the research team. We also reviewed the latest MDGs' report critically to extract the most valid and reliable data by year of data collection and place of residence (if available).

In the next phase, the main stakeholders, from both governmental and international organizations, in the country have been visited and interviewed (individually and in-group) by the research team. A specific data extraction toolkit was applied to extract the findings into tables and list all the important pros and cons regarding the country health care services and public health programs.

Using information derived literature review and country visits, the most valid available sources were identified and cited including Countries' cooperation based on the approved international methodologies such as Demographic Health Surveys (DHS) and Multiple Indicators Cluster Surveys (MICS) assessments under the supervision of the international organizations; reports published by UNICEF, WHO, UNFPA, UNDP and other

international organizations; and reports prepared by member countries based on the registered information and local consensus.

Results

Table 1 represents the population and Gross domestic product (GDP) per capita in 2008 reported by UN for each ECO country (7, 9, 11). Table 2 presents the total number of malaria cases notified in 2008 in each member of ECO according to World Malaria Report of 2009(5) and regional office for the Eastern Mediterranean Region (EMRO)(12). As we see in this table, the frequency of malaria has overall decreased in the countries of ECO. The malaria incidence is very heterogeneous among ECO countries, which differ less than 200 cases in total country in Kazakhstan, Kyrgyzstan, Turkey, Turkmenistan, Uzbekistan, and Azerbaijan to 82,564 cases (2,428/100,000) in Afghanistan and 59,284 cases

(881/100,000) in Pakistan and about 18/100,000 in Iran in 2008.

Table1: Population and per capital Gross Domestic Product (GDP) of each member of Economic Cooperation Organization (ECO) countries reported by UN

Country	Population (2008)*	GDP per capita** (Year)
Afghanistan	27.4	400 (2008)
Azerbaijan	8.3	2550 (2007)
Iran	74	3540 (2007)
Kazakhstan	15.8	2536 (2008)
Kyrgyzstan	5.2	956.4 (2005)
Pakistan	149.5	580 (2003)
Tajikistan	7.2	701.9 (2007)
Turkey	71.5	4400 (2007)
Turkmenistan	5.0	1236 (2003)
Uzbekistan	27.3	2600 (2006)

*million
**US \$

Table2: Malaria cases from 1990 to 2008 for each member of Economic Cooperation Organization (ECO) countries*

Country	Year				
	1990	1995	2000	2005	2008
Afghanistan	317479	No data	203911	116444**	82564
Azerbaijan	24	2840	1526	242	73
Iran (Islamic Republic of)	77470	67532	19716	18966	11460**
Kazakhstan	No data	No data	7	0	0
Kyrgyzstan	1	3	12	226	18
Pakistan	79689	111836	82526	97049	104454**
Tajikistan	175	6103	19064	2309	318
Turkey	8680	82098	9465	1627	136
Turkmenistan	1	10	24	1	1
Uzbekistan	28	27	126	102	27

*Source: WHO

**Source: EMRO

Although there are no valid and comprehensive information about proportion of population in malaria-risk areas using effective malaria prevention and treatment measures indicators, all available data is demonstrated in table 3. In this table,

proportion of children under 5 who sleep under ITNs and proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs has been presented according to some existing reports from UN and WHO.

Table3: Proportion of children under 5 who sleep under insecticide-treated bed-nets and children under 5 with fever who are treated with appropriate anti-malarial drugs according to UN and WHO reports

Country	% of Children < 5 who sleep under insecticide-treated bed-nets (Year)		% of Children < 5 with fever who are treated with appropriate anti-malarial drugs (Year)	
	UN	WHO	UN	WHO
Afghanistan	N	6.2(2008)	N	7.9(2008)
Azerbaijan	1.4 (2000)	1.4(2000)	0.8(2000)	N
Iran (Islamic Republic of)	N	N	N	N
Kazakhstan	N	N	N	N
Kyrgyzstan	N	N	N	N
Pakistan	N	N	3.3 (2007)	N
Tajikistan	1.3(2005)	N	1.9 (2005)	N
Turkey	N	N	N	N
Turkmenistan	N	N	N	N
Uzbekistan	N	N	N	N

N = No data

Afghanistan is considered to have the fourth largest malaria burden worldwide of any country outside Africa and the second highest in the WHO Eastern-Mediterranean Region. Malaria is endemic in large areas of Afghanistan below 2000 meters above sea level and is highly prevalent in river valleys used for growing rice. Initial control effects brought a marked decline in the number of reported cases from 626,839 cases in 2002 to 271,763 in 2004, however from 2004, the number of reported cases increased to reach 433,412 cases in 2007 which means 19 cases per 1000 population. Population coverage of ITNs is very low. Only about 5% of the population used ITNs (less than 10% living below 1500m) (7-9). Fortunately, according world malaria report 2009, reducing in the number of malaria cases has been realized in Afghanistan between 2000 and 2008 (decrease in cases > 50%)(13).

WHO estimates that 80% of Azerbaijan population lives in areas prone to malaria risk. Therefore, the risk for malaria is existent. Azerbaijan faced a resurgence of malaria in the 90s due to displacement of people because of war and challenges the country faced at the time (5, 14-17). "Only 20 cases of *Plasmodium vivax* malaria were reported in 1990 but this rose to over 13,000 in 1996. By the end of the 1990s, the rate had re-

turned towards its earlier level, although transmission continues in some areas "(16).

Malaria is one of the major public health problems in Iran. The main malaria endemic areas of Iran are located in the southeastern part of the country, consisting of three provinces: the Sistan and Baluchistan province, the Hormozgan Province and the tropical part of Kerman province with a combined population of approximately 3 million and this region is considered "refractory malaria region". The south-eastern provinces of Iran are less developed compared with the other parts of Iran; they are bordered in the east by Afghanistan and Pakistan; besides these two factors the ecologic and whether condition all together intensify the problem of malaria. Illegal traverse over southeastern borders especially by afghan and Pakistani people, behavior changes of parasite transmitters, reactivation of non-active centers, shortage of skilled personnel are some of the problems confronting malaria control in disease-localized regions. As Pakistan's malaria epidemic especially at Baluchistan state has a negative impact over Sistan and Baluchistan province, this disease cannot be completely eliminated unless malaria control program gets improved in Pakistan.

Malaria is not a public health problem in Kazakhstan now while its incidence rate in Kyrgyzs-

tan is low and it has some variations; the peak of morbidity happened in 2002.

Malaria has been a major public health problem in Pakistan and will continue to pose serious threat to millions of people due to poor environmental and socioeconomic conditions conducive to the spread of disease. Transmission is seasonal and large-scale epidemics have been reported in the past, the recent was during 1973–77 when Annual Parasite Incidence (API) reached up 13 per thousand population. According to 1988 malaria review mission report; the disease incidence is at least five times higher than what is being currently reported. The main malaria endemic areas are located in the Baluchistan state. Following the resurgence of malaria after the eradication program of the 1970s, malaria has been a persistent problem in Pakistan. There were an estimated 1.5 million malaria episodes in 2006, accounting for one quarter of all cases in the WHO Eastern Mediterranean Region. Almost all are confirmed as malaria, and about 30% are due to *P. falciparum*.

The status of malaria control in Tajikistan is acceptable, especially after 1997 epidemic peak, and it is possible to reach MDG about this disease. It seems the strategies taken to control this disease in Tajikistan were effective. It is recommended to continue these strategies and control the program. According to reports of 2000 and 2005 the indicator of prevention /treatment (proportion of population in malaria-risk areas using effective malaria prevention and treatment measures) are low and there should be planning for their increase. However, this indicator is not meaningful for the whole country and it should be defined for high-risk areas.

In Turkey, in addition to economical factors, it seems that the strategies taken to control the environmental factors of malaria (Indoor Residual and Spraying) and case management policies were effective. It is recommended that more attention be paid to their sustainability. "Estimating malaria deaths and episodes has always been challenging because of inadequate health reporting systems, the co-incidence of malaria and other diseases, and the similarities of symptoms with those of

other diseases (17)". Therefore, more attention should be paid to estimating malaria death and episode.

During the period 1965-1980 only 23 malaria cases were reported in Turkmenistan, but this number increased in late 1990s(18). Still there is a very limited risk of malaria transmission in Turkmenistan (16, 18). As a result, not much data on prevention activities (such as ITNs) is available.

Malaria was eradicated in Uzbekistan in 1961. Since that time, the majority of cases are imported cases mostly from Tajikistan and Afghanistan. From the mid 1990's to date, the number of imported malaria cases has continued to increase (21 cases in 1994 and 80 cases in 2000). In 1999, due to a steady increase in imported malaria cases and the presence of conditions favorable for malaria transmission, the first local cases of malaria, seven in all, were registered. By 2000, the locally transmitted cases have been increased to 46 (15). Malaria is not a public health problem in the country now.

Discussion

In some countries malaria is endemic while the others has eradicated the disease and only the annual reports indicate that patients are only the imported cases especially from the neighborhood countries. In this circumstance, only joint international activities could control the malaria.

In the medical literature, there are strong evidences regarding the effectiveness of primary health care (PHC) to reduce the child and maternal mortality and control/prevent of several diseases such as tuberculosis, HIV infections, and malaria. Thus, an effective collaboration between the ECO countries in order to develop and conduct joint strategies for better control and management of the most important disease such as malaria is recommended. It is highly recommended that the ECO secretariat help and support the member countries to re-establish and improved the PHC, to integrate the prenatal and neonate health programs as well as the surveillance of the tuberculosis, HIV/AIDS and malaria in the

health system. The ECO countries, from the Soviet Unions, have a brilliant experience on the PHC development and by refining the system; even they could provide best-practice examples for the other countries in the world. According to the findings of the present review, some suggestions for ECO countries are as follows:

In Afghanistan and Pakistan, all socioeconomic sectors should be involved and high-level advocacy should be promoted in order to create awareness and of the impact and magnitude of malaria problem. Mechanisms best supporting intersectoral and intrasectoral collaboration, public private partnership and cross border coordination should be developed. Further studies should be made for targeting of interventions, and for monitoring and evaluation in implementation areas. Turkmenistan is planned to achieve malaria elimination by 2010 while Azerbaijan is certain to meet MDG targets for malaria control, unless unexpected situations occur. Malaria control in Iran is possible when it would be controlled in neighbor countries so it is recommended to perform malaria control programs together with these countries. Based on status of the malaria in Kyrgyzstan, MDG goals are achievable. Now, malaria is not an important problem in the country and desired goals had been achieved. In Tajikistan, it is recommended to calculate the rates of prevention and treatment indicators in shorter time intervals in high-risk areas. An alternative way for this case is to put the process of controlling this indicator in malaria surveillance program, and to be some definitions as well. Finally, Turkey has reached the MDG goal about this disease. Therefore, a regional collaboration will also benefit national malaria control programs to combat the disease. It is recommended to perform more studies on misuse of anti-malarial drugs leading to multidrug resistance.

As conclusion, all ECO countries could achieve MDGs malaria indicators by 2015 except Pakistan and Afghanistan, unless preparing urgent intervention programs to fulfill the goals. It is recommended ECO secretariat, like other countries, defines proper tools and methodologies for pre-

vention and treatment indicators, and introduces an easier way for data gathering and evaluation.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

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References

1. United Nations Millennium Development Goals. Available from: http://www.who.int/topics/millennium_development_goals/about/en/index.html/.
2. Roll Back Malaria Partnership. Global Malaria Action Plan for a malaria-free world 2009; Available from: <http://www.rbm.who.int/gmap/>.
3. Lopez A et al. *Global burden of disease and risk factors*. 2006, New York: Oxford University Press.
4. Campbell C (2009). Malaria control--addressing challenges to ambitious goals. *N Engl J Med*, 361(5):522-3.
5. World Malaria Report 2009. 2009; Available from:

- http://whqlibdoc.who.int/publications/2009/9789241563901_eng.PDF.
6. The Millennium Development Goals Report 2010. 2010; Available from: <http://www.un.org/millenniumgoals/pdf/>.
 7. Macro-Economic Performance of the ECO Region in 2001. 2001; Available from: <http://www.ecosecretariat.org/>.
 8. Moradi G, Holakouie Naieni K, Rashidian A et al. (2012). Evaluation of Tuberculosis Situation in Economic Cooperation Countries in 2009; Achievement and Gaps toward Millennium Development Goals. *Int J Prev Med*, 3(2):77-83.
 9. Map of ECO Member States. Available from: <http://www.ecosecretariat.org/>.
 10. A regional report on Millennium Development Health related Goals in Economic Cooperation Organizations (ECO) countries (Goals 4, 5 and 6). 2009, Institute of Public Health Research, Tehran University of Medical Sciences.
 11. Affordable Medicines Facility – malaria. Available from: <http://www.theglobalfund.org/en/amfm/>.
 12. Country profiles. World Health Organization, Regional Office for the Eastern Mediterranean; Available: <http://www.emro.who.int/emrinfo/>.
 13. Azerbaijan Health Sector Review Note(2005). Human Development Sector Unit, Europe and Central Asia Region, World Bank.
 14. Vatandoost H, Ashraf H, Lak SH, Mahdi RE, Abai MR, Nazari M (2003). Factors involved in the re-emergence of malaria in borderline of Iran, Armenia, Azerbaijan, and Turkey. *Southeast Asian J Trop Med Public Health*, 34 Suppl 2: 6-14.
 15. Ministry of Health. National malaria elimination strategy in Azerbaijan for the years 2008-2013, M.o. Health, Editor. 2008: Baku.
 16. Holley J, Akhundov O, Nolte E (2004). Health care systems in transition: Azerbaijan. WHO Regional Office for Europe for The European Observatory on Health Systems and Policies: Copenhagen.
 17. Malaria Research & Development: An Assessment of Global Investment. The Malaria R&D Alliance 2005; Available from: <http://www.malariaalliance.org/index.cfm/>.
 18. Amangel'diev KA, Morozova KV, Medalieva DO (2002). The epidemic situation with malaria in Turkmenistan. *Med Parazitol (Mosk)*, 2: 29-32.