Inequality in the global prevalence of HIV based on the human development index

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ABSTRACT

Background and aims: Burden of HIV and AIDS is considerably different among regions and countries around the world. The aim of this study was to assess the inequality in the prevalence of HIV, according to human development index worldwide.

Methods: The desired outcome was prevalence of HIV, which was estimated in 100 countries in 2012. The annual report of Joint United Nations Programme on HIV and AIDS (UNAIDS) was used for determining the prevalence of HIV in countries. In addition, we used the data of the human development index of the countries from United Nations Development Programme (UNDP). We defined inequality of human development index in the prevalence of HIV by using the concentration index.

Results: Concentration index for prevalence of HIV among 25-49 years adults was -0.217 (95% CI: -0.074, -0.361). This index indicated the inequality in the prevalence of HIV based on the human development index and concentrating on more HIV subjects in poor countries. In addition, concentration indexes in the prevalence of HIV among young males and females were 0.229 and -0.200, respectively.

Conclusion: This study emphasized on the inequality in the prevalence of HIV and concentration of HIV in countries with lower human development index. Therefore, it is recommended that the international organizations should perform fundamental actions to help these countries, such as prevention, care and treatment programs.

Keywords: Inequality, HIV, Prevalence, Human development index, Concentration index.

INTRODUCTION

Since the outbreak of HIV/AIDS pandemic, 70 million peoples infected by HIV and about 35 million people died due to AIDS.[1] Estimations indicated that 35.3 [32.2-38.8] million people were living worldwide while affected to HIV at the end of 2012 and the prevalence of HIV among adults aged between 15-49 years old was 0.8% [0.7-0.9%] in 2012, also 1.6 [1.4-1.9] million people were died due to AIDS-related diseases in 2012.[1] However, the burden of the HIV epidemic is considerably different among regions and countries of the world; for example, Sub-Saharan Africa remains most severely affected region, with approximately 1 in each 20 adults living with HIV and 71% of the people with HIV living in this region.[1] According to millennium development goals until 2015, the trend of HIV/AIDS spreading must be inverse. In addition, the universal

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access to care and treatment services of HIV/AIDS was supposed to be provided for all peoples who needed these services at the end of 2010.[2] The association of the prevalence of HIV with poverty demonstrated in countries with high prevalence of HIV. So, poverty is a factor which helps to spread HIV affecting on the preventive activities of HIV prevention. Moreover, about 95% of HIV infected people are living in developing countries. Therefore, evidences could show that there may be a strong association between prevalence of HIV and poor economic conditions.[3]

The human development index (HDI) as a mixture of indexes of income, education and life expectancy, is one of the most important development indexes in each country. Annually, HDI computed and reported by United Nations Development Program (UNDP) for each country. Countries are ranked based on HDI values. The difference between rank in gross national income and HDI shows if a country is satisfied using its income for improvement in the two non-incomes HDI dimensions, including education and life expectancy.[4]

The few researches studied on the association between economic status and HIV in African countries; however, there is no study about the inequality in the prevalence of HIV, according to the HDI globally. So the aim of study was to assess inequality in the prevalence of HIV, according to HDI throughout the world.

METHODS

This ecological study was conducted in December 2013. We used the annual report of UNAIDS for obtaining prevalence data of HIV in countries around the world.[5] Data for the HDI attained for countries from UNDP which were computed and reported annually for all countries.[6] From 196 countries in 2012,

HIV prevalence data were available for only 113 countries, HDI data were available for 148 countries, and data for both prevalence of HIV and HDI were available just for 100 countries. Unfortunately, nor HIV and neither HDI data were available for 35 countries. Finally, we collected the information of hundred countries in our analysis.

In this study, our desired outcome was prevalence of HIV in each country. Prevalence of HIV estimated annually in each country by Spectrum software and reported to UNAIDS.[5] HDI is a combined indicator that formed of three components such as life expectancy, level of education and the per capita income.[7] Since 1990 UNDP reported a set of annual reports of HDI and computed HDI for each country annually.[4]

The total HDI before 2010 computed as an arithmetic made of three indices, including the per capita income, level of education and life expectancy.[8] After 2010 the methods of HDI computation was changed. For computation of this index in the first step, we must determine the dimension indexes (education, life expectancy and income). In the second step, it is necessary to calculate the geometric mean of three indexes. The scale of HDI varies between zero and one. The value of HDI indicates the achievement in the best progresses at the level of each country. Also, it provides possible comparison among countries.[9]

We defined inequality in the prevalence of HIV, according to the HDI by using concentration index among different countries around the world. The value of concentration index is between -1 to +1 and its usage in socioeconomic inequality studies is frequent.[10] The negative value of this index is indicating that the related variable to health is more concentrated on the poor population and the positive value indicates that the related variable to health concentrated among the

rich population. When there is no inequality the value of concentration index would be zero.[11] We used Stata 11 (Stata Corp, College Station, TX, USA) for data analysis and results were reported at 5% (P<0.05) significant level.

RESULTS

In this study, we used HIV prevalence data among 25-49 years old young men adult and women between 14-25 years old. The lowest prevalence of HIV was related to countries such as Egypt, Pakistan and Kobo about 1% and the highest prevalence was related to Swaziland in southern Africa about 26.5%. The lowest and highest HDI was related to the Democratic Republic of the Congo and Niger (HDI= 0.304) and Australia (HDI= 0.938), respectively.

The concentration index for prevalence of HIV, according to the HDI among 25-49 years old adults was -0.217 (95% CI: -0.074, -0.361), that indicated inequality in the prevalence of HIV, which means that HIV is more concentrated on poor countries. Also, concentration 0.es for prevalence of HIV among young women and men was -0.229 and -0.200, respectively. It indicates the HIV prevalence inequality in age and gender subgroups according to HDI (Table 1).

Table 1: Concentration indexes for inequality of prevalence of HIV, according to HDI

Variable	Concentration index	95% confidence interval	
		LB	UB
Prevalence in adults	-0.217	-0.361	-0.074
Prevalence in young women	-0.229	-0.372	-0.087
Prevalence in young men	-0.200	-0.314	-0.085

The Lorenz curve indicates a negative concentration index. it means the prevalence of HIV in adults is concentrated on countries with low human development index rather than on high human development index in 2012 (Figure 1).
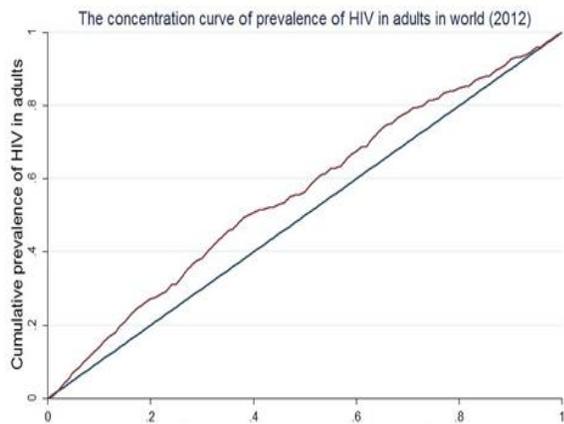
The prevalence of HIV in young women and men is concentrated on countries with low human development index rather than on high human development index in 2012 (Figure 2 and 3).
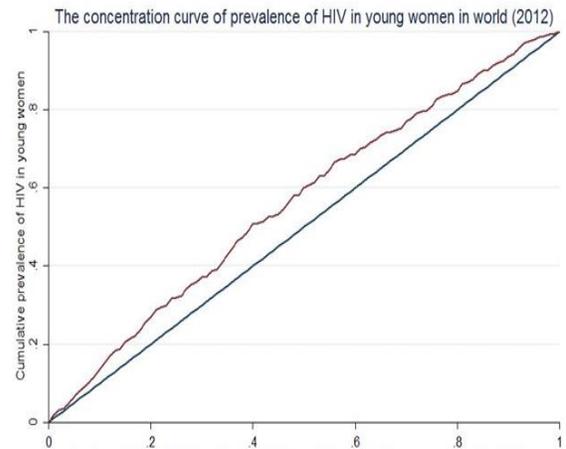

Figure 1: Cumulative prevalence of HIV in adults ranked by human development index

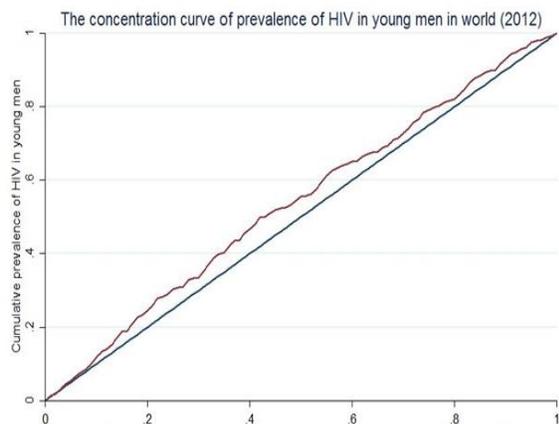**Figure 2:** cumulative prevalence of HIV inadults ranked by human development index

Figure 3: cumulative prevalence of HIV in adults ranked by human development index

DISCUSSION

Generally, the results of this ecological study indicated that HIV infection concentrated on the countries with low HDI. HDI is compounded of education, life expectancy and income and indicated status of countries in the achievement of development goals.[7] The results of this study showed that countries with higher prevalence of HIV have lower levels of education, income and life expectancy status compared to countries with lower prevalence of HIV.

According to the reports of UNAIDS, developing countries with low HDI like countries in sub-Saharan Africa have the highest prevalence and annual incidence rate of HIV compared to developed countries with higher HDI.[5,6] On the other hand, the African countries have been most affected by the global inequality in mortality. A reason for this inequality may be due to AIDS pandemic.[12] Furthermore, the mortality related to AIDS decreases the life expectancy as a component of the HDI index in African and other developing countries with low level of income. Therefore, economic assistance to such countries can be helpful for developing the socioeconomic status of people. As a result the better socioeconomic status, higher level of education and income is prepared for

people. In addition, it results in decreasing the size of high risk population, such as female workers and injecting drug users, and it results decreasing the incidence of HIV in these countries.

Moreover, results of this study showed that the inequality in the prevalence of HIV, according to the HDI in young women (concentration index= -0.229) was more than that in young men (concentration index= -0.200); it means that having more cases of HIV in the countries with low HDI is equal to living of more young women with HIV in these countries. Other studies[13,14] indicated gender inequality for prevalence of HIV in countries with low HDI; that is concordant with the results of our study. A reason for gender inequality in prevalence of HIV is due to exposure to sexual partner violence in countries with low HDI. Results of a study in South African showed that the population attributable fractions for intimate partner violence was 11.9% (95% CI: 1.4, 19.3) and 13.9% (2.0, 22.2) for relationship power equity.[13]

Other studies showed the effect of inequality in socioeconomic status on health and different diseases.[15-17] The results of our study emphasized on the effect of socioeconomic inequality in the prevalence of HIV as well. These results indicate that international organizations such as World Health organization and United Nations organization must have more focus on HIV/AIDS as one important disease especially in countries with lower HDI. International organizations must plan for helping these countries in the field of prevention; control and treatment of HIV and financial assistance for patients whom need supporting services; in fact, helping countries with low HDI can be effective in control and prevention of HIV worldwide.

The results of this ecological study also showed that HDI is relatively a suitable index

for assessing the inequality of infectious diseases especially HIV and AIDS. However, we recommend conducting more studies about using HDI as a proxy of socioeconomic status for inequality different infectious diseases among countries.

This study had 2 limitations. First, we used ecological data of countries with no access to individual data in order to assess the effect of other potential factors on inequality which is the main limitation of ecologic studies; i.e., ecological fallacy. It means that the observed associations between the aggregated data between different countries, might not be true at the individual level in countries.[18] Second, data for prevalence of HIV or HDI for 96 countries was not accessible and we could not include these countries in this study. So, selection bias is probable in this study.

CONCLUSION

According to the results of this study, HIV infection concentrated in countries with low human development index. So, level of HDI and inequality based on this index could be a good proxy for identifying the countries with high prevalence of HIV and can be helpful to prevention and control of HIV in these countries.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

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