

*Full Length Research Paper*

# Rate of saving health in program of screening for congenital hypothyroidism (CH) in Iran

Ali Mohammadzadeh K. H.<sup>1\*</sup>, Yarahmadi S. H.<sup>2</sup>, Tabibi S. J.<sup>1</sup>, Nasiripour A. A.<sup>1</sup>

<sup>1</sup>Department of Health Services Management, Science and Research Branch, Islamic Azad University, Iran.  
<sup>2</sup>CDC, Ministry of Health and Medical Education of Iran.

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**Congenital hypothyroidism (CH) is one of prevalent and preventable diseases. There is a delay to diagnose this disease because its symptoms at the beginning of birth are non-specialized. This study is aimed at anticipating the rate of prevented years living with disability and its resulted costs in the population under supervision of the Program of Screening for CH in Iran. In this study, the rate of CH incidence is determined by forms and questionnaires related to the Program of Screening for CH in 2008, performed by 41 University of Medical Sciences and Health services the executors of the plan, under supervision of control diseases center (CDC) of Ministry of Health services and Medical Education of Iran and index of Disability adjusted life years (DALY) has been calculated by determining other parameters of the formula. Costs of education, cares and or prevention of years living with disability, has been calculated in dollar considering the results of previous studies. Considering the program coverage in 2008 (92.6%), saving health (saved DALY) in lieu of each patient, is estimated as 53.9 years and the total program is annually 147956 years. Present value of spent cost to prevent one year living with disability with annual discount rate of 3% in this program has been estimated as 28 \$, while the present value of just education and caring patients in governmental-daily sector, for one year living with disability (in case of non-screening) has been calculated about 624 \$. Program of Screening for Congenital Hypothyroidism (CH) in Iran, considering the saved DALY has been performed with high quality and it can remove the pain of life with mental retardation together with disability and facilitates providing backup and resources by decision makers in addition to prevent loss of human and fiscal resources by on time diagnosis and appropriate treatment of the disease.**

**Key words:** Program of screening of newborns in Iran, congenital hypothyroidism, saving health (saved DALY), mental retardation.

## INTRODUCTION

Congenital hypothyroidism (CH) is one of the most prevalent preventable factors of mental retardation (Ordookhani, 2003). There is a delay in diagnosis of this disease because its symptoms at the beginning of birth is little and non-specialized (Brown, 2001; Hung, 2001). In addition, there is no special technique to determine transient and permanent CH at the beginning of the disease and this diagnosis is occurred gradually (Sava et al., 1984; Saglam et al., 2007).

The transient CH is prevalent in the regions with

insufficient iodine and if thyroxin deficiency in the newborn continues for 2 weeks and is not treated, it will have negative effect on the newborn's IQ. Then CH (whether transient or permanent) should be treated (Saglam et al., 2007).

Screening for this disease in any society, as preventive service, by immediate identifying the newborns lead to early treatment of the patients and prevention of mental retardation in these patients (Elbualy et al., 1998).

The screening program executed in most of developed countries, affects diagnosis and treatment of this disease (Lafranchi, 2008). The Screening Program for Congenital Hypothyroidism (CH) has been combined with Health System in Iran since 2005 and at the present it is

\*Corresponding author. E-mail: Dr\_khalil\_AMZ@yahoo.com.

**Table 1.** Incidence of the disease, coverage of the program and variables related to saved DALY\* in the program of screening for CH in Iran, 2008.

Variables	Value
Coverage of the program	92.6%
Incidence of the disease	2.20 per 1000
YLL*	0
YLD*(=DALY*) in lieu of each patient	53.9 years
Total saved DALY of births of one year	147956 years

DALY\*: Disability adjusted life years, YLL\*: Years of life lost, YLD\*: Years lived with disability.

successfully executed (Delavari et al., 2006).

Based on the plan authorities, at the present half of the costs of this plan has been supplied by Ministry of Health, Treatment, Medical Education and the remaining cost should be paid by the executors and through attracting financial partnership and cooperation of organizations and the patients families which ask annual and continuous follow up to continue this plan (Yarahmadi, 2008).

Nowadays, analysis of plans, health and treatment systems, especially in the area of resources management has been changed into a main and necessary goal of health and treatment departments. The need to present appropriate services, which depend on the future development, is increasing and also lack of resource considering its annual increase, shall impose directors on doubt of accepting or refusing some of the health and treatment operations (Jefferson, 2007).

DALY index shows the lost years because of disability or premature death. This index causes disease effects and economical, social and mental burden of diseases as a basis for devoting and applying facilities, using comparative methods and cost-effectiveness analysis (CEA), cost-benefit analysis (CBA) and cost-utility analysis (CUA) techniques and statistical and mathematics methods (Karimi, 2004).

This study shows that by executing the program of screening for CH, how many years of each diagnosed and treated newborn living with disability, shall be prevented and also shows present cost of preventing one year living with disability and shows cost of education and cares for one year of life with disability in case of doing screening.

Response to these questions shall affect the view of health policy makers and planners about back up and improved devotion of resources to these kinds of plans, by clearing status of returning investment on the program of screening for CH. It is clear that health resources shall be used in the other ways if effectiveness of the plan is less or ratio of cost to benefit is uncertain.

## MATERIALS AND METHODS

In this research, at first by determining variable of "live births" of 2008 (extracted from annual report of Iranian National Center of Statistics of 2009) and variables of "populations under coverage of

the plan" and "identified patient in the plan" at the same year (obtained from forms and questionnaires of the screening program for CH, reported by 41 Universities of Medical Sciences and Health Services throughout the country to CDC, Ministry of Health and Medical Education) the disease incidence rate has been calculated according to the formula.

Disability weight (DW) for CH (without goiter) has been extracted from Dutch table amounted to 35% and then by determining amount of other items affecting on DALY index, the saved DALY in lieu for every identified and treated patient during life and also DALY annually saved in the plan have been calculated using the following formula:

Disability adjusted life years (DALY) = YLL+YLD (Van Lier et al., 2007).

Years of life lost (YLL) = (Number of deaths) × (Standard life expectancy at age of death in years), Years lived with disability (YLD) = (Number of incident cases) × (Disability weight) × (Average duration of the case until remission or death).

The present costs of total screening, identifying patient newborns and medical cares of patients and also the costs of education and cares of the patients in governmental-daily sectors during the life (which shall be occurred in case of non-screening) have been determined according to the other studies (Ali, 2010).

## RESULTS

In 2008, coverage of the screening program for CH in Iran was 92.6% and rate of incidence of the disease has been calculated as 2.20 per 1000. Considering zero for the lost years because of premature death (YLL), rate of saved health (saved DALY) in lieu of each identified and treated patient through the screening program, has been estimated as 53.9 years (Table 1).

In this study, standard life expectancy at age of death has been considered as one and average duration of the case until remission has been considered as the same.

Number of the prevented years living with disability in lieu of one year of executing screening program, has been estimated as 147956 years.

The present value of total cost of screening, identifying patient and medical cares of the patients up to the end of life in lieu of preventing one year living with disability, in this plan has been calculated as 28 \$ and totally as 4,000,000 \$ for under coverage births of the same year, (Table 2). In case of non-screening for CH, irrespective of other heavy costs of the disease complications, only

**Table 2.** Costs of prevention/ education and cares for one year living with disability in case of screening or non-screening, 2008.

Variable	Present value (\$)
Cost of preventing one year living with disability in the screening program	28
Cost of education and care for one year living with disability	624
Total cost of preventing of years living with disability in the screening program for births of one year	> 4,000,000
Total cost of education and cares for disability years in case on non-screening for births of one year	> 92,000,000

\* One dollar equals to 10000 Rls.

present costs of education and caring each patient suffering from mental retardation in governmental-daily sectors for one year living with disability has been estimated at least 624 \$ and totally more than 92,000,000 \$ for the patients of the same year, (Table 2).

## DISCUSSION

The coverage of the screening program for CH in Iran has been improved to 92.6% in 2008. Studies of (Delavari et al., 2006) have estimated coverage of the program about 74%. According to effective actions taking by disease management center of Ministry of Health, Treatment and Medical Education of Iran, in order to cover tribal population and foreign immigrants, it is anticipated that during the future years coverage of the program will reached up to 100% (Ali et al., 2010).

At the present, incidence rate of CH is 2.20/1000, considering that at risk population is 7.4% more than under coverage population.

If the coverage is through and in case of equalization of the population under coverage of the plan with at risk population (total live births of the same year) probably the number of patients shall be increased from 2745 persons to 2965 persons and as a result the incidence rate will be calculated about 2.38/1000 of live births.

Previous studies in Iran have reported that the incidence rate of this disease had increased from 1/1000 to 1433/1000 which had been reported before applying screening program (Ordoorkhani, 2003; Karamizadeh and Amirhakimi, 1992). On other hand, study of Beaulieu, (1994) has mentioned that by applying screening during the next years, the incidence rate of the disease will decreased gradually.

In this study, the lost years because of premature death (YLL) have been ignored because CH is not resulted to mortality ( $(N(0) \times L(70))$ ) and rate of index of DALY is equaled to the lost years of disability (YLD).

As the patient has been identified and treated through screening during the first month, so the average standard of life expectancy in Iran (70 years) will be saved for the patients.

The results of this research show that screening for CH during 2008 in lieu for every diagnosed and treated patient will prevent 53.9 years of living with disability,

then considering diagnosis and treatment of 2745 patients, actually the saved DALY for patient births of the same year, is 147956 years.

If the program covers all of at risk population, rate of adjusted years of life saved at the same year by screening, is 58.07 years in lieu for every diagnosed patient and totally is amounted to 172178 years for births diagnosed at the same year.

Study of Sassi, (2006) introduces the prevalence of the disease as an important factor to determine the difference between the number of quality adjusted life years (QALY) and the saved DALY and express that in case of long real life expectancy, the difference between these two indices will be less and vice versa.

As screening program identifies CH at the first month, and by preventing mental retardation, saves real life expectancy for the patient, probably the estimated disability level in DALY calculations could be equaled with the lost quality of through QALY calculations, however calculation of these two indices is based on different theories and methods.

However index of DALY is a longitudinal index (not sectional) and determination of its value in dollar was dependant on making given cohorts based on birth date and determining annual costs and then summing cost of the same years and obtaining a sectional cost which the same cost should be divided into the calculated DALY, that this operation needs to analyze susceptibility and Monte Carlo analysis of the rebuilt society and in other word, it needs a research with technique of cost-effectiveness, in this study by calculating the saved DALY through the above mentioned formula, and obtaining total costs of screening, identifying patients and medical cares up to the end of life from the other studies, the present value of cost of preventing one year living with disability, has been estimated about 28 \$ and totally amounted to 4,000,000 \$ for all of the years. Also the present value of cost of education and cares for one year living with disability in governmental-daily sector (in case of non-screening and as a result, non-identifying on time and lack of appropriate treatment of CH patient) has been estimated as 624 \$ and more than 92,000,000 \$ for all of the years.

It is clear that value of the saved DALY in dollar is not the same for all of lifelong and in addition, estimated costs are corrected considering discount rate up to the

end of year.

Owens (1998) suggests that intervention with the costs less than 50 to 60 thousands dollars are efficient for each QALY and (Devlin and Parkin, 2003) studies shows that interventions with costs less than 20 to 30 thousands pounds are acceptable for each QALY (Yarahmadi, 2008).

On this basis, the costs considered for screening program for CH in lieu of each saved QALY has high quality.

## Conclusions

Irrespective of great sums saved by treatment of CH complications, the present necessary investment in lieu of each saved DALY is effective cost and emphasizes on necessity of the program continuity and its execution. Full coverage of the screening program in Iran, in addition to help to improve status of the saved DALY index, shall provide condition of combining other metabolic diseases with the health system by consuming minimum possible costs (apposite to heavy costs imposed by new structures on the management systems).

Considering limited health resources in most of countries including Iran, and as a result, directing fiscal credits toward preferred programs in order to continue the program, it is proposed to economical group of disease management to research precisely about cost-effectiveness analysis of plans, directly related to health or lack of health of humane and also effects of diseases and economical, social and mental burdens of the diseases and by establishing connection with policy and decision makers and sending justifying reports to them, especially by presenting true interprets of DALY and QALY calculations attracting their attention assure that not only devotion of resources to these kinds of plans can prevent heavy costs of these kinds of diseases and their complications, but also by preventing spiritual, mental, and social irreparable costs of mental retardation, can improve quality of services provided by the plan and shall result to logical development of these kinds of plans. Also mentioning these indices can attract participation of local societies and families.

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