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COST EFFECTIVENESS ANALYSIS OF TYPE 2 DIABETES SCREENING IN MAHABAD PUBLIC HEALTH CENTERS, IRAN

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ABSTRACT

Aim: The chronic nature of diabetes, which accounts for about 85% to 95% of diabetes and its consequences have made the disease costly. This study aimed to analyze the cost-effectiveness of Type 2 Diabetes screening and determine the most appropriate group for this purpose given cost-effectiveness and economic considerations.
Material and Method: This is a descriptive-analytical study which covered people aged over 30 years who were covered by 4 health centers and 25 health houses. To calculate the cost-effectiveness, the diabetes care and screening costs and the number of avoided DALYs were used. Excel and Treeage software's were used for data analysis.
Results: without the screening, the number of lost years of life caused by type 2 diabetes was 111.6395 including 0.0395, 22.5, 23.84 and 4.56 years were associated with diabetic foot, neuropathy, nephropathy, and retinopathy respectively. The Incremental Cost-Effectiveness Ratio was estimated as 192,112,395 Rials that compared to threshold defined by the WHO, diabetes screening is cost-effective among the people over the 40 years ages.
Conclusion: The program of type 2 diabetes screening is a cost-effective intervention and could save 111.6395 years of life in the target population. Therefore, the diabetes screening program, as well as beneficial results for patients in the long run, will save money for the society and improve the quality and quantity of life in the affected population. Also, the results of this study can be helpful in allocating resources for diabetes prevention and treatment.
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Introduction

Type 2 diabetes is one of the most serious chronic diseases with an increase in prevalence in the developed countries.(1-3) World Health Organization (WHO) has warned that the population with types of diabetes will be increased by 122% between 1995 and 2025.(4) In 2003, the global prevalence of diabetes among people aged 20-79 years was 5.1% and it is estimated to reach 6.3% by 2025.(5)

The mortality rate in those with diabetes is higher than non-diabetic people and this has led to 5-10 years reduction in life expectancy in middle-aged people with diabetes.(6, 7) One of the main reasons for this higher mortality is that diabetes increases the risk of micro and macro-vascular complications. The risk of stroke in people with diabetes is 1.5 to 3 times greater than people without diabetes.(8)

Among the complications of diabetes, the highest costs are associated with cardiovascular and coronary artery diseases(9, 10). In Iran, cardiovascular diseases account for nearly 46% of the cost of diabetes-related illnesses.(11) According to the World Diabetes Foundation's fourth report, about 11% of Iran's health expenditure is allocated to diabetes.(12)

The chronic nature of diabetes and its complications have made the disease a costly one such that the disease in Iran would cost $10 billion in direct costs (13) and in the United States, it costs nearly $44 billion in direct costs and $54 billion in indirect costs annually.(14)

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In Iran, there is no systematic and large-scale study on the amount of imposed costs of diabetes disease on the health system of the country. However, studies and reports on the part of responsible sources and centers show a cost of 2.5 to 15 percent of the total health budget of the country.(4, 15)

In the study conducted by Amini et al., the cost of diabetes is estimated to be 176.4 billion Rials in Isfahan including 167 billion Rials indirect costs and direct medical costs of 9 billion Rials. In this study, the per capita cost of the diabetic patient is estimated as 7,893,868 Rials.(11) In another study in Tehran, the cost of diabetics is estimated to be 2.8 times greater than that of non-diabetics, and the total per capita cost of health care for each diabetic person is estimated as $192 per year out of which $123 is associated with diabetes. The total direct costs of diabetes in Tehran and Iran are estimated as 112.424 and 590.679 million dollars respectively.(16)

Esteghamati et al., have estimated the economic costs of diabetes using Tehran's data for the whole country by a prevalence-based approach in the two phases. In the first phase, 23,707 people were randomly selected and interviews were conducted with the participants to collect information. In the second phase, 710 diabetic patients and 904 control group were monitored over a 1 year to estimate the direct and indirect costs. The results showed that the cost of diabetic patients was 2.92 times greater than the control group. The direct annual costs in Tehran and Iran are estimated as 112.424 and 590.676 million dollars, respectively. Complications caused by diabetes account for 53% of the total direct diabetes costs.(17)

Hoerger et al. (2004) studied screening people with high blood pressure and universal screening to estimate the incremental cost effectiveness ratio of type 2 diabetes screening strategies. Estimates of costs were conducted based on the UK health system. In this research, Markov model was used to evaluate the effects of screening, as well as cost simulation and quality of life of diabetics throughout their lives. The final outcome measure index was obtained based on cost per QALY discounted at a rate of 3%. The results of this study showed that in all age groups, incremental cost-effectiveness ratio of screening for people with blood pressure is higher than the universal screening and the most cost-effective strategy was the screening of the population within the age group of 55-75.(18)

The question is whether there is a solution for reducing the cost of the disease. Diabetes is a chronic disease that is associated with significant mortality and morbidity. The disease has an asymptomatic stage that may exist up to 7 years before diagnosis.(19) The chronic and intangible course, as well as complicated and debilitating complications of this disease, have led to the highest attention to prevent or delay the onset of the disease or its complications so that in addition to increase the disability adjusted life years prevented, treatment costs would be reduced (13) especially with respect to the fact that there are effective solutions to prevent type 2 diabetes.(4)

The increasing prevalence of diabetes, the multifactorial nature of its causes and the need for continued control of the disease have caused the health care provider units of the country to assume its related responsibilities which have gradually converted screening and control of the cases as a cross-sectional action into a continuous and integrated program in the health care system.(20) Early treatment of diabetes diagnosed due to symptoms will be followed by improved micro-vascular outcomes.

Regardless of the reasons for non-interventional action, the question now being discussed is: Is screening program cost effective among the existing programs for controlling type 2 diabetes? In the other words, given the prevalence, duration of early diagnosis, the chance of treatment and control of complications could the cost reduction and the increase in avoided DALY compensate the screening costs? The cost effectiveness ratio depends on several variables, including the prevalence and incidence of the disease, treatment costs, screening range, and so on. Since these variables vary between the countries, screening could be cost-effective in a country but this is not necessarily true in another country.

If screening is more cost effectiveness, how much is the difference between cost effectiveness with screening and the absence of this program (do nothing)? In other words, how much is ICER? What is the best age to begin screening? This study seeks to answer the above questions by analyzing the cost effectiveness of the screening program for type 2 diabetes in people over 30 years old covered by health centers of Mahabad city.

Material and Method

This cross-sectional study was a type of economic evaluation, cost-effectiveness analysis in which diabetes screening and non-screening strategies were economically compared. The study population consisted of 13,872 rural people over 30 years' old who referred to health centers for diabetes management in Mahabad city.

According to the country's plan for preventing and controlling diabetes, people with fasting blood sugar levels of 110-125 mg/dl defined as diabetics and the ones whose blood sugar levels are 140-199 mg/dl two hours after taking 75 gr of glucose, have impaired glucose tolerance. A group of people with impaired glucose tolerance and fasting blood sugar disorder are called pre-diabetic. These people are at risk and should refer to the physician for blood tests annually.

First, using the available resources and evidence, an appropriate decision tree model to comparing the study scenarios including screening and no-screening of type 2 diabetes was developed in Treeage software. Accordingly, first the existing conditions' data (Do nothing or non-intervention) was entered into the model and the amount of Disability Adjusted Life years due to diabetes was obtained. In the absence of screening (A), since there is no cost of screening, costs were considered zero. The screening scenario (B) is located on the other side. This time, the data obtained by screening intervention was entered into the model and the number of avoided DALYs was calculated. In this case, there is a screening cost as well as care costs (treatment and control) of the disease. So these costs were also included. After calculating screening cost and the cost of care, the amount of cost and effectiveness (avoided DALYs) were used for both modes. The obtained results were put into the following formula and analyzed.

$$ICER = \frac{CostB - CostA}{OutcomeB - OutcomeA}$$

As the diagnosed cases are at an earlier stage, the number of prevented years with the disability (avoided DALYs) will increase and intervention (screening) will be more effective. On the other hand, because treatment is easier and less costly in the early stages of the disease, treatment cost will be lower.

Increasing the amount of avoided DALYs and reducing treatment and other costs will cause the value of cost effectiveness is low (lower ICER), which means that the obtained effectiveness is achievable at lower cost.(21)

After performing the above analysis, the amount of main parameters of the research, such as screening cost, care cost, and DALYs were separately changed to achieve the level of change in the cost effectiveness ratio due to changes in each parameter. In other words, it should be determined to what threshold level of these variables the screening will be cost effectiveness.
Also, the most appropriate age to start screening will be determined by a sensitivity analysis. Based on this criterion, if the cost effectiveness ratio of intervention is less than three times Gross Domestic Production per capita, intervention at that age is considered as a cost effective intervention. Paying attention to GDP per capita is due to the fact that if a patient improves and could work for one year, one unit per capita will be added.
Data collection was done in two forms: information about human resources costs was collected based on the system of salary and benefits of employees and the data related to equipment and consumables based on accounting records of the screening centers. Data related to outcome or effectiveness (that is the DALYs averted by diabetes morbidity) such as incidence rate, the average duration of disability, the average age of onset of the disease and age and gender specific mortality rates were determined by dismod software and the weight assigned to each diabetes complication was obtained by reviewing the literature.(22)
In order to calculate the cost of controlling and treating the disease, domestic studies in the field of costing of type 2 diabetes were used. These costs are calculated for one year and then estimated for the period. In this study to calculate the current present of the screening results, future treatment costs of individuals and avoided DALYs in the future were discounted by 3%.(23)

Results

Table 1 presents the demographic characteristics of the screened population in terms of age and gender and the population at risk of diabetes. Among 13,872 people participating in the program, 6,745 people were male and 7,127 were female. 58.8% of the 13,872 screened people were at risk. The rate of the population at risk was 51.6% for all male age groups, while it was 65.7% for female age groups. Therefore, in this study, women made up more percentage of the population at risk.

Table 1: Demographic characteristics of the screened population in terms of age and gender and the population at risk of diabetes in Mahabad city in 2016

As can be seen in Table 2, according to the latest diagnostic criteria for diabetes, among the 13872 screened individuals, 235 subjects (1.69%) were diagnosed as new diabetic patients with 112 males (47.66%) and 123 Females (52.34%).

Table 2: Percentage of diabetic population in screened population in terms of age and gender in Mahabad city in 2016

In figure 1, the decision tree for screening the studied population is formed for the diabetic patients.

Figure 1: Decision tree model for both screening and non-screening modes of diabetes

In this study, the total cost of screening was 15,415,750,200 Rials. By dividing this amount by the total number of participants in the screening program (13,872 people) and the number of diabetics diagnosed by the program (235 people), the per capita cost per screening and per capita cost for the diagnosis of each diabetic patient are obtained as 1,111,285 and 65,598,937 Rials respectively.
According to Baroni study, the per capita care costs for a new diabetic patient were estimated as 1133080 Rials that by applying the discount rate of 3% and for different age groups, the cost of health care for 235 people was estimated as 6,031,682,335 Rials. Therefore, the total cost of screening and care was 21,447,432,535 Rials.
In this study, the disability weights reported by the World Health Organization were used to calculate disability adjusted life years (DALYs) for diabetics.
Based on the results of Table 3, the DALYs in the absence of screening and diagnosis of diabetes were obtained as 60.7 years that the male and female population had a share of 34 and 26.7 years respectively. Additionally, the disability adjusted life years due to retinopathy were estimated as 4.56 years that the male and female population had a share of 2.4 and 2.16 years respectively. These rates were 4.56, 23.84, 22.5 and 0.0395 for nephropathy, neuropathy and diabetic foot respectively. Total prevented life years of diabetes were 111.6395 years in Mahabad city.

Table 3: DALYs for diabetes and each of its complications in terms of age and gender in Mahabad city in 2016

The incremental cost effectiveness ratio in this study was estimated based on the total prevented life years due to diabetes (111.6395 years) and calculated costs (21,447,432,535 Rials) as 192112395 Rials. This criterion is estimated in Table 4 in terms of gender and age group (according to the World Bank's report in 2016 the per capita GDP was $4,680, equivalent to 151,725,600 Rials).

Table 4: Incremental cost effectiveness criterion in terms of age and gender groups in Mahabad city in 2016

In the next step, a sensitivity analysis was conducted to determine if variables such as DALY and screening costs are changed, what threshold of these variables, screening for diabetes is effective. As shown in Figures 2 and 3, the estimated threshold for DALY and screening costs are 40.6 years and 2,607,284 Rials, respectively.

Figure 2: Sensitivity analysis for DALY

Figure 3: Sensitivity analysis for screening costs

Discussion

Based on the results of the research, the total lost years due to diabetes in the rural population of Mahabad was 111.6395 years and accordingly the cost of prevention of each lost years is about 91,265,670 Rials. Thus, the incremental cost effectiveness ratio of screening per life-year saved in the rural population of Mahabad was 192,112,395 Rials. Therefore, in this study screening is cost effective based on the threshold defined by the World Health Organization (which considers the cost-effectiveness threshold to be 3 times of the per capita GDP).(24) The incremental cost effectiveness calculated in the age group of 30-39 is higher than the threshold defined by the WHO in both genders; therefore, diabetes screening is not cost effective in this age group. But diabetes screening has been cost effective in other age groups, in other words, screening becomes more cost effective with age. Therefore, the best age for screening is 40 years in this study.
Also, according to the results of the sensitivity analysis, performing diabetes screening is cost-effective to the minimum DALY level of 40.6 and if it is less than this value, diabetes screening will not be cost-effective. If the per capita cost of screening is more than 2,607,284 Rials, diabetes screening will not be cost effective. Therefore, in addition to economic justification, there should be a high sensitivity to the overall screening method.

Type 2 diabetes is a costly illness in Iran's healthcare system and in addition to direct and indirect costs, it imposes many intangible costs on the society in terms of reducing the quality of life. According to this study, the average quality-adjusted life years (QALY) of the studied patients was 34 years, that is, patients with diabetes over the age of 30 are expected to live 34 years of full quality, and to lose 10 years.

There are very few studies in developing countries on the cost effectiveness of type 2 diabetes screening programs, while over 80% of diabetics live in low and middle-income countries. Barouni et al. calculated the costs and effectiveness of screening for type 2 diabetes in comparison with its lack of implementation in Shiraz. In their study, the ratio of the incremental cost effectiveness ratio was 49,111,444 Rials per avoided DALY that according to the WHO threshold, screening was effective in this study. The results of this study are consistent with the present study for type 2 diabetes screening.(25)

In a study by Schaufler et al (2010) in Germany titled "Cost Effectiveness of Type 2 diabetes Screening and Prevention Programs" conducted on 35-75 year old people using the Monte Carlo simulation model, ICER was $892.5 per QALY for lifestyle interventions and $316.33 per QALY for metformin prevention. In this study, the occurrence of side effects associated with diabetes decreased significantly and life expectancy increased compared to the non-screening mode. They concluded that, in general, the screening and prevention programs were generally cost effective which confirmed the results of the present study. In this study, that the effectiveness criterion was QALY, prevention by metformin was estimated to be more cost effective than lifestyle.(26)

Amini et al. reported the average direct and indirect costs of Type 2 diabetes for people over 40 years old in Isfahan as 9 billion and 167 billion Rials, respectively.(11) By generalizing these results to all diabetic patients in the country, the cost of type 2 diabetes will be very high.

Using the Markov-based cost effectiveness model to simulate the long-term costs and benefits of type 2 diabetes screening in the study of people over 40 versus the lack of a screening program Toscano et al. concluded that if screening was not performed, the cost per QALY would be 31147 and if targeted screening for people with high blood pressure was performed, this ratio would be 22,695. Cost effectiveness ratios were not effective when considering the threshold proposed by the WHO.(27) Therefore, policymakers should consider the benefits and costs of the program using a population-based approach to diabetes screening carefully.

Also, in the study by Javanbakht et al., the total cost of diagnosed type 2 diabetes in Iran was estimated at 3.78 billion dollars in 2009 including 2.04 billion and 1.73 billion dollars were direct (medical and non-medical) and indirect costs respectively. The average per capita of direct and indirect costs was 842.6 and 864.8 respectively. Complications (48.9%) and drugs (23.8%) were the main components of direct costs. The largest components of medical expenses were associated with complications of diabetes, cardiovascular disease (42.3% of total complication costs), nephropathy (23%) and ocular complications (14%). Indirect costs include temporary disability (335.7 million $), permanent disability (452.4 million $), and reduced productivity due to premature mortality (950.3 million $).(28)

Identifying new effective strategies to control diabetes and its complications can increase the quality and quantity of patients' lives and reduce the above costs. Therefore, the implementation of screening and prevention programs should be considered as a public health priority for the country.

Among the limitations of this study is the ignorance of indirect costs; therefore, it is suggested to evaluate the impact of these costs on life quality and quantity of patients so that it would be more possible to decide on the cost effectiveness of type 2 diabetes.

Conclusion

In general, due to the increasing incidence of type 2 diabetes and lower costs of screening tests, as well as the prevalence of complications of the disease, which itself imposes high costs on the health system, screening seems to have an economic justification. The calculations also confirm the cost-effectiveness of type 2 diabetes screening. Therefore, the continuation of the current type 2 diabetes screening program is necessary.

Ethical Approval

Ethical issues have been completely observed by the authors.

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Conflict of interests

All authors declare no competing interests.

References

1. Durand CP. A systematic review and meta-analysis of diabetes disease management programs: The University of Texas School of Public Health; 2008.
2. Roglic G, Unwin N. Mortality attributable to diabetes: estimates for the year 2010. Diabetes research and clinical practice. 2010;87(1):15-9.
3. AHMAD KA, Najafi B. OBESITY IN TYPE 2 DIABETES: A REVIEW OF HEALTH ECONOMICS EVIDENCES. 2012.
4. Delavari A, Alikhani S, Nili S, Birjandi RH, Birjandi F. Quality of care of diabetes mellitus type II patients in Iran. Arch Iran Med. 2009;12(5):492-5.
5. Aguiree F, Brown A, Cho N, Dahlquist G, Dodd S, Dunning T, et al. International diabetes federation diabetes atlas. Brussels: International Diabetes Federation; 2013.
6. Gu K, Cowie CC, Harris MI. Mortality in adults with and without diabetes in a national cohort of the US population, 1971–1993. Diabetes care. 1998;21(7):1138-45.

7. Morgan CL, Currie CJ, Peters JR. Relationship between diabetes and mortality: a population study using record linkage. Diabetes care. 2000;23(8):1103-7.
8. Sander D, Sander K, Poppert H. Stroke in type 2 diabetes. The British Journal of Diabetes & Vascular Disease. 2008;8(5):222-9.
9. Brown JB, Pedula KL, Bakst AW. The progressive cost of complications in type 2 diabetes mellitus. Archives of Internal Medicine. 1999;159(16):1873-80.
10. O'brien JA, Shomphe LA, Kavanagh PL, Raggio G, Caro JJ. Direct medical costs of complications resulting from type 2 diabetes in Hie US. Diabetes care. 1998;21(7):1122-8.
11. Amini M, Khadivi R, Haghighi S. Study of economic cost of type2 diabetes in Isfahan. Iranian Journal of Endocrinology and Metabolism. 2002;4 (2):97-104.
12. International Diabetes Federation. Diabetes Atlas, fifth edition. Hallado en http//www idforg/diabetesatlas/5e/es/prologo. 2013.
13. Hossein-Nezhad A, Larijani B. Cost analysis of screening and diagnostic methods in gestational diabetes mellitus. Iranian Journal of Diabetes and Metabolism. 2001;1(1):31-40.
14. Songer TJ, Ettaro L. Studies on the Cost of Diabetes. National Center for Chronic Disease Prevention and Health Promotion, Division of Diabetes Translation; 1998.
15. Solanky P, Desai B, Kavishwar A, Kantharia S. Study of psychological stress among undergraduate medical students of government medical college, Surat. 2012.
16. Patel P, Macerollo A. Diabetes mellitus: diagnosis and screening. diabetes. 2010;100:13.
17. Esteghamati A, Khalilzadeh O, Anvari M, Meysamie A, Abbasi M, Forouzanfar M, et al. The economic costs of diabetes: a population-based study in Tehran, Iran. Diabetologia. 2009;52(8):1520-7.
18. Hoerger TJ, Harris R, Hicks KA, Donahue K, Sorensen S, Engelgau M. Screening for type 2 diabetes mellitus: a cost-effectiveness analysis. Annals of Internal Medicine. 2004;140(9):689-99.
19. Elliott R, Payne K. Essentials of economic evaluation in healthcare: Pharmaceutical Press; 2005.
20. Najafi B, Farzadfar F, Ghaderi H, Hadian M. Cost effectiveness of type 2 diabetes screening: A systematic review. Medical journal of the Islamic Republic of Iran. 2016;30:326.
21. Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Methods for the economic evaluation of health care programmes: Oxford university press; 2015.
22. Mohammadi M, Dadkhah B, Mozaffari N, Nemati A. To understand the effective studying between Ardabil city university students in 2006 year. Koomesh. 2008;9(2):93-8.
23. Mahboub-Ahari A, Pourreza A, Akbari Sari A, Rahimi Foroushani A, Heydari H. Stated time preferences for health: a systematic review and meta analysis of private and social discount rates. Journal of research in health sciences. 2014;14(3):181-6.
24. Muennig P, Bounthavong M. Cost-effectiveness analysis in health: A practical approach: John Wiley & Sons; 2016.
25. Keshtkaran A, Karimi R, Barouni M, Kavoosi Z, Jafari A. Cost-effectiveness Analysis of Type 2 Diabetes Screening: A case study in Shiraz, Iran. 2013.
26. Schaufler TM, Wolff M. Cost effectiveness of preventive screening programmes for type 2 diabetes mellitus in Germany. Applied health economics and health policy. 2010;8(3):191-202.
27. Toscano CM, Zhuo X, Imai K, Duncan BB, Polanczyk CA, Zhang P, et al. Cost-effectiveness of a national population-based screening program for type 2 diabetes: the Brazil experience. Diabetology & metabolic syndrome. 2015;7(1):95.
28. Javanbakht M, Baradaran HR, Mashayekhi A, Haghdoost AA, Khamseh ME, Kharazmi E, et al. Cost-of-illness analysis of type 2 diabetes mellitus in Iran. PloS one. 2011;6(10):e26864.

Table 1: Demographic characteristics of the screened population in terms of age and gender and the population at risk of diabetes in Mahabad city in 2016

Age Groups	Men			Women			Total		
	Screened Population	Population at Risk	Population at Risk (%)	Screened Population	Population at Risk	Population at Risk (%)	Screened Population	Population at Risk	Population at Risk (%)
30-39	1894	1038	54.8	2188	1484	67.82	4082	2522	61.78
40-49	1558	946	60.72	1964	1215	61.86	3522	2161	61.36
50-59	1565	733	46.84	1477	1004	67.95	3042	1737	57.1
60-69	999	465	46.54	996	629	63.15	1995	1094	54.84

70≤	729	297	40.63	502	348	69.32	1231	645	52.4
total	6745	3479	51.58	7127	4680	65.66	13872	8159	58.81

Table 2: Percentage of diabetic population in screened population in terms of age and gender in Mahabad city in 2016

Age Groups	Men			Women			Total		
	Screened Population	Diabetic Population	Diabetic Population (%)	Screened Population	Diabetic Population	Diabetic Population (%)	Screened Population	Diabetic Population	Diabetic Population (%)
30-39	1894	15	0.79	2188	24	1.09	4082	39	0.95
40-49	1558	38	2.43	1964	28	1.42	3522	66	1.87
50-59	1565	32	2.04	1477	42	2.84	3042	74	2.43
60-69	999	14	1.4	996	20	2.008	1995	34	1.7
70≤	729	13	1.664	502	9	1.79	1231	22	1.78
total	6745	112	1.66	7127	123	1.725	13872	235	1.69

Table 3: DALYs for diabetes and each of its complications in terms of age and gender in Mahabad city in 2016

Gender	Age Groups	Number of estimated DALYs for diabetes and each of its complications				
		DALY of Retinopathy	DALY of Nephropathy	DALY of Neuropathy	DALY of Diabetic Foot	DALY of Diabetes
Men	30-39	0.014	0.51	0.65	0.0007	1.4
	40-49	0.17	1.43	2.1	0.004	6.9
	50-59	0.66	4.64	3.5	0.008	13.7
	60-69	0.62	3.62	2.85	0.0059	6.1
	70≤	0.93	2.97	2.7	0.0069	5.9
total of Men		2.4	13.17	11.8	0.0255	34
Women	30-39	0.025	1.12	1.07	0.001	1.8
	40-49	0.69	1.3	1.4	0.0017	3.7
	50-59	0.59	3.77	3.54	0.006	12.9
	60-69	0.56	3.1	3.1	0.0039	5.5
	70≤	0.3	1.38	1.6	0.0014	2.8
total of women		2.16	10.67	10.7	0.014	26.7
total of men and women		4.56	23.84	22.5	0.0395	60.7

Table 4: Incremental cost effectiveness criterion in terms of age and gender groups in Mahabad city in 2016

Age Groups	Incremental cost effectiveness ratio in men	Incremental cost effectiveness ratio in women
30-39	1166195009	960011789
40-49	287377868	443856473

50-59	100166381	111382574
60-69	89209393	97813957
70≤	68149925	91026218

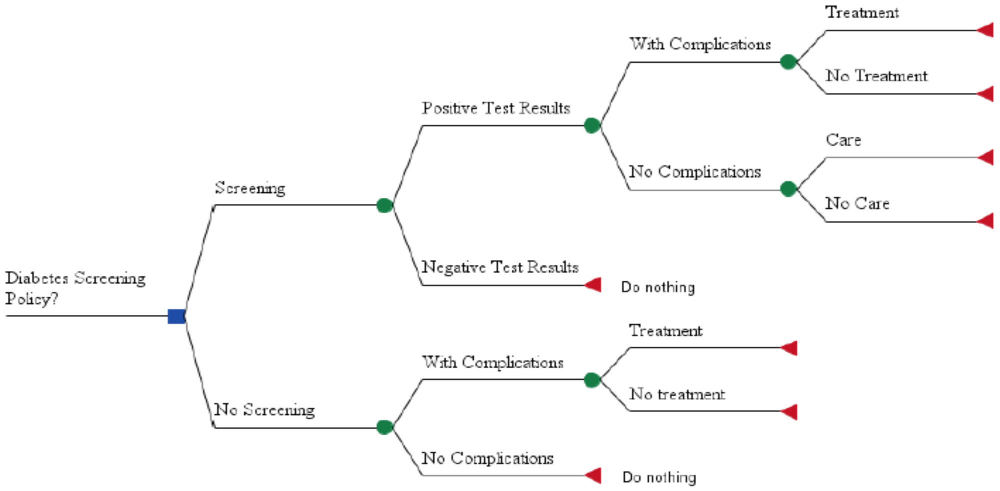

Figure 1: Decision tree model for both screening and non-screening modes of diabetes

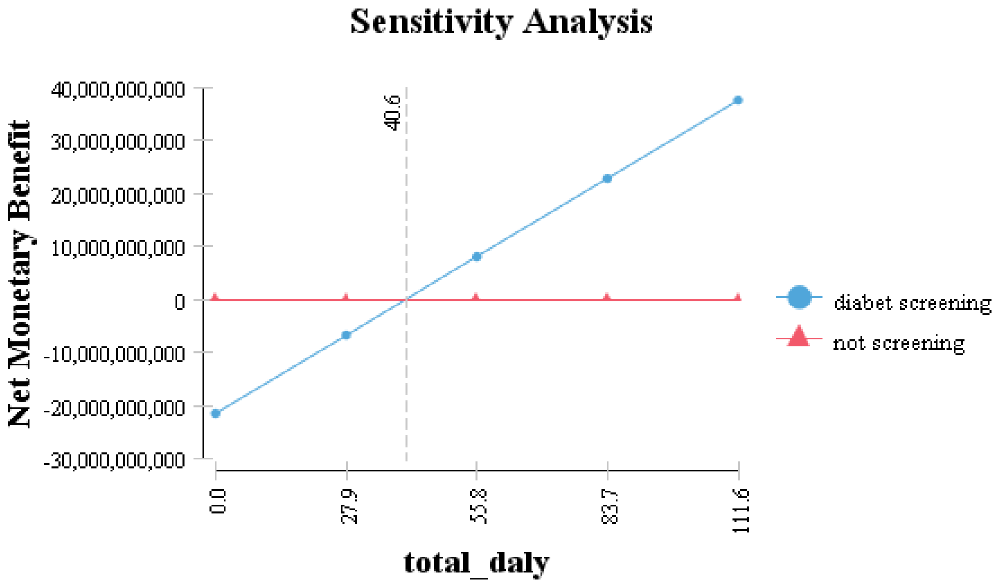

Figure 2: Sensitivity analysis for DALY

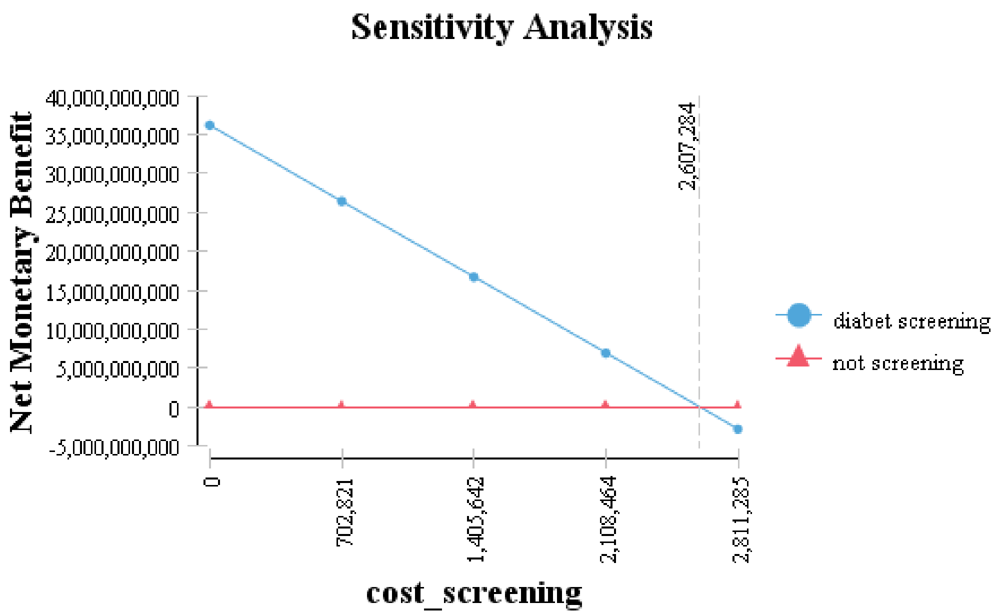

Figure 3: Sensitivity analysis for screening costs