

Trends in the Prevalence of Diabetes Mellitus in Patients with Myocardial Infarction in the South of Iran: 2008 to 2014

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Abstract

Background: Diabetes mellitus is a strong risk factor for cardiovascular disease, including acute myocardial infarction (AMI). Management of risk factors and the other prevention services in recent years lead to a significant decrease in AMI incidence. However, to examine the success of those strategies to control diabetes, this study aimed to identify the trends in prevalence of diabetes mellitus in patients with myocardial infarction from 2008 to 2014.

Methods: A descriptive study was conducted in 2015 in the Shahid Mohammadi hospital of Bandar Abbas, Iran and records of 150 myocardial infarction patients hospitalized between March 2008 and March 2014 were randomly selected. A two part checklist was used to collect information from records: part one for demographic characteristics including smoking, marital status and their employment and part two for specialized data including fasting blood glucose and history of heart disease.

Results: No significant oriented difference was observed in the prevalences of diabetes in the examined years. However, the prevalence of diabetes among MI patients increased for the years 2008-2010. Thereafter, a downward slope was detected in the years 2010 to 2013. Prevalence of diabetes indicated a statistically significant relationship with smoking and history of heart disorders in myocardial infarction patients (P value= 0.002, P value= 0.013 respectively).

Conclusions: According to the results, we can conclude that the managements and prevention methods used to control diabetes as a risk factor for cardiovascular disease, were relatively successful in recent years (2010 to 2013) and this trend was in relationship with smoking and also history of heart disease in population study.

Keywords: Myocardial infarction, Diabetes mellitus, Prevalence

Introduction

Diabetes mellitus is a common risk factor for cardiovascular disease, including acute myocardial infarction (AMI) and is a determinant in relation to survival or mortality of these patients (1). In fact, this issue can affect on incidence and also the outcome of acute myocardial infarction (2). Recently, lots of studies in different populations were conducted to evaluate the prevalence of diabetes mellitus among patients with AMI. Based on their findings, the value of DM has been mostly diagnosed in the range of 10 to 42% of patients with AMI (1, 3). According to the previous researches, the incidence and mortality of cardiovascular disorders were diminished in the majority of populations during past decades (4). This is mainly due to the better management of risk factors and the other prevention strategies implemented by physicians and health systems (5). Therefore, disputes among prior surveys and

populations can be due to the failure of mentioned strategies in managing diabetes in those populations that lead to a lower levels of public knowledge about the harmful influences of elevated glucose (6). For instance, though the importance of diabetes in most of the countries is well-known, some communities not included the diabetes in their AMI risk indexes so far (7, 8). In addition, given the increasing prevalence of poor nutrition, overweight and obesity, some investigations in those populations demonstrated increasing process of diabetes mellitus. This can consequently lead to a higher incidence and mortality of AMI (9). The prevalence of diabetes in patients with AMI is an appropriate way to detect the contribution of this factor in the risk of myocardial infarction. In addition, this matter indicates the success in the management of diabetes as a MI risk factors (10). Thus, evaluating the trends in the prevalence can

reveal the measure of success in used controlling services. However, only few data are available to identify the trends in relation to the prevalence of diabetes mellitus in patients with myocardial infarction. In addition, though the main burden of AMI is in developing countries, only limited reports are available in relation to the effect of diabetes in these populations (11, 12). These gaps in knowledge make us unable to observe the exact route and direction in management of diabetes as a risk factor for AMI. Therefore, the overall aim of this prospective study was to assess the trends in prevalence of diabetes mellitus in patients with myocardial infarction from 2008 to 2014 in Bandar Abbas, Iran.

Methods

A descriptive study was performed in 2015 in the Shahid Mohammadi hospital of Bandar Abbas, Iran. We included patients hospitalized between March 2008 and March 2014 (six complete Iranian calendar year) with a principal diagnosis of acute myocardial infarction. Data were obtained from Shahid Mohammadi hospital dataset center, a teaching and referral hospital affiliated to Hormozgan University of Medical Sciences. A two part checklist was used to gather data from records, part one for demographic characteristics including smoking, marital status, and their current job or employment status. However, part two was designed for specialized information including fasting blood glucose and history of heart disease. Since processing the entire dataset is expensive and also not necessary, simple random sampling method was used in this research. This was conducted by assigning a number to each record and

a table of random numbers to determine which units were to be selected. Therefore, records of 150 patients were investigated in present study to extract the required data. All case records were extracted by a relevant expert, leading to the reduction in errors. Thereafter, records with invalid or incomplete data were ruled out from the survey. This study was approved by Ethics Committee of Hormozgan University of Medical Sciences and all personal information were kept confidential and those records which we were not allowed to review or participate in the study, were excluded. All statistical analyses were conducted using SPSS version 19 for Windows. The obtained data were statistically analyzed using T-test for quantitative data and K-square for qualitative data. For all comparisons, a two sided $\alpha = 0.05$ was considered statistically significant.

Results

Thirty five case records were excluded from the study during the research period due to the incomplete information and thus 115 records were analyzed. As indicated in table 1, among all of the samples, 70(60.87%) were diabetic patients which distributed without a discipline and specific trend in the years of 2008 to 2014. In fact, no significant oriented differences were observed in the prevalences of diabetes in this project. Figure 1 also shows a graph in relation to the trends in prevalence of diabetes mellitus in patients with myocardial infarction from 2008 to 2014. As shown, the prevalence of diabetes mellitus in examined patients increased for the years 2008 to 2010 and then reduced in the next years.

Table 1. Prevalence of diabetes mellitus in patients with myocardial infarction in the years of 2008 to 2014.

Variable	Year							Total
	2008	2009	2010	2011	2012	2013	2014	
Diabetic patients	8(53.33%)	7(53.85%)	15(71.43%)	14(70%)	10(58.82%)	11(55%)	5(55.56%)	70(60.87%)
Nondiabetic patients	7(46.67%)	6(46.15%)	6(28.57%)	6(30%)	7(41.18%)	9(45%)	4(44.44%)	45(39.13%)
Total	15(100%)	13(100%)	21(100%)	20(100%)	17(100%)	20(100%)	9(100%)	115(100%)

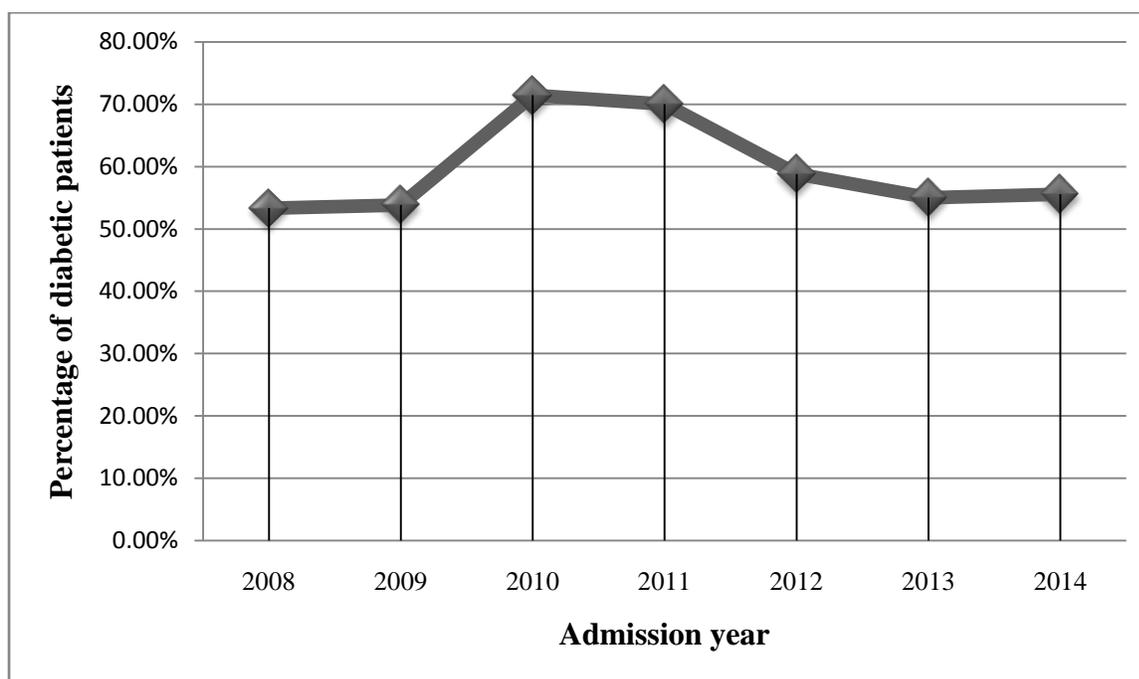


Figure 1. The prevalence of diabetes among MI patients increased slightly from 53.33% to 53.85% for the years 2008-2009. However, the sharp rise (from 53.85% to 71.43%) can be observed in this value in the years 2009 to 2010, followed by a mild reduction from 2010 to 2013 and a relatively increase in 2014.

Further analysis demonstrated that, there was a statistically significant relationship between smoking and diabetes in myocardial infarction patients (P value= 0.002). In addition, majority of diabetic subjects in this experiment, experienced the previous heart disorders (P value= 0.013). However, no considerable differences were diagnosed in the prevalence of diabetes between single and married patients. On the other hand, although the prevalence of diabetes was higher in workers and unemployed cases, no significant correlation was observed in relation to the employment of patients. Table 2 demonstrates complete characteristics of patients and also the results of statistical analysis performed in this study.

Discussion

Over the past decade, lots of studies showed that lower glycated hemoglobin levels are related with a

lower risk of AMI and also hyperglycemia can lead to a noticeably elevation in the risk of cardiovascular disease (13). In this regards, large number of surveys indicated the benefits of managing and treating diabetes mellitus in order to reduce the incidence and mortality of myocardial infarction (14). As our knowledge, this is the first project which has carried out to assess the trends in prevalence of diabetes mellitus in patients with myocardial infarction in the south of Iran. Findings of current research demonstrates a positive trend of elevating the prevalence of diabetes mellitus for the years 2008 to 2010. This result is similar with a study conducted by Lawrence et al in southern California that illustrated a significant increase in the prevalence of preexisting diabetes from 10% in 1999, rising to 21% in 2005 (15).

Table 2. Characteristics of population study and the results of statistical analysis.

Variables	Diabetic patients	Nondiabetic patients	Total	P value
Smoking				
Yes	54(46.96%)	22(19.13%)	76(66.09%)	P = 0.002
No	16(13.91%)	23(20%)	39(33.91%)	
Marital status				
Single	0(0%)	1(0.87%)	1(0.87%)	P = 0.391
Married	70(60.87%)	44(38.26%)	114(99.13%)	
Employment				
Unemployed	31(26.96%)	25(21.74%)	56(48.70%)	P > 0.05
Worker	28(24.35%)	13(11.30%)	41(35.65%)	
Soldier	1(0.87%)	2(1.74%)	3(2.61%)	
Employee	1(0.87%)	1(0.87%)	2(1.74%)	
Other	9(7.82%)	4(3.48%)	13(11.30%)	
History of heart disease				
Yes	45(39.13%)	18(15.65%)	63(54.78%)	P = 0.013
No	25(21.74%)	27(23.48%)	52(45.22%)	

On the other hand, a positive trend of improving the control of diabetes mellitus was observed for the next years, which indicates the promotion in managing diabetes in recent years. These findings agree with those of a study performed by Steinberg et al. They examined 102,318 patients over nine years and found that Hemoglobin A1C levels decreased in the last years of their study in Europe and the United States, demonstrating improving glycemic management in these cohorts (5). In contrast, another research in India documents that the prevalence of diabetes continues to rise from 8.3% in 1989 to 14.3% in 2006. This issue may be a reason for a positive trend in the incidence of cardiovascular disease in India (16). These differences are due to the dependence of mentioned trend to the population study and their characteristics particularly their knowledge in relation to that disorder. Indeed, this value shows the the success of prevention and managing strategies implemented by governments and health systems. Thus, in countries with better management and higher level of knowledge, the negative trend can be detected in the prevalence of diabetes (17). In addition some studies in recent years indicated that insulin infusion during the initial hours of

hospitalization for myocardial infarction may also lead to a decline in glycated hemoglobin level and the risk of cardiovascular mortality (18). The results of present study revealed a significant association between smoking and diabetes. In this regard, a recent systematic review and meta-analysis approved that smoking is associated with an increased risk of type 2 diabetes (19). Therefore, smoking can lead to cardiovascular disease in both direct and indirect ways, however further analysis are required to clarify its mechanisms (20). Based on these findings, the trends in the prevalence of smoking may affect the changes in the prevalence of diabetes and AMI as shown in a study conducted by Gabrielle Foy et al in 2005. In the other words, populations with positive trends in smoking are more likely to have positive trends in prevalence of diabetes and AMI (21). Data analysis also were illustrated that there is no relationship between marital status and the prevalence of diabetes. However, analysis of the data for this variable is not reliable due to low population of singles in present research. Thus, future investigation should be carried out with a larger population of single patients with myocardial infarction. Incidentally a recent research in Iran reported that marital status is

not significantly related to diabetes mellitus (22). Moreover, the employment of patients had no correlation with the prevalence of diabetes in this study whereas the prevalence of diabetes was higher in workers and unemployed cases which received less social support. The results are consistent with a study conducted by Westaway et al in 2005 (23). However, based on several studies, there is a two-way association between employment status and diabetes. Since many researches showed that diabetes affects employers by reducing employment and contributing to work loss (24) and on the other hand, some specific works especially those with low mobility increase the risk of diabetes (25). Also, this survey revealed that diabetic patients with myocardial infarction had a history of heart disorders more than nondiabetic patients. This correlation was agree with the results of two recent researches (26, 27). Consequently, we can conclude that the managements and prevention methods used to control diabetes as a risk factor for cardiovascular disease, were relatively successful in recent years and this trend was in association with smoking and also history of heart disease in population study. However, reports of this study should be represented with caution, since present research was limited in several ways. First, most of the participants were married and thus, it was not possible to enter single patients with myocardial infarction into our analysis. Second, age and gender were not entered in this investigation. Therefore, these limitations are suggested to be considered in future studies.

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Conflict of Interest

The authors declare that they have no conflict of interests.

References

1. Gustafsson I, Hildebrandt P, TENERZ A, LÖNNBERG I, BERNE C, NILSSON G, et al. Myocardial infarction and prevalence of diabetes mellitus: is increased casual blood glucose at admission a reliable criterion for the diagnosis of diabetes. Editorial. *European heart journal*. 2001;22(13):1102-10.
2. Ishihara M, Inoue I, Kawagoe T, Shimatani Y, Kurisu S, Nishioka K, et al. Impact of acute hyperglycemia on left ventricular function after reperfusion therapy in patients with a first anterior wall acute myocardial infarction. *American heart journal*. 2003;146(4):674-8.
3. Iwakura K, Ito H, Ikushima M, Kawano S, Okamura A, Asano K, et al. Association between hyperglycemia and the no-reflow phenomenon inpatients with acute myocardial infarction. *Journal of the American College of Cardiology*. 2003;41(1):1-7.
4. Abildstrom S, Rasmussen S, Rosen M, Madsen M. Trends in incidence and case fatality rates of acute myocardial infarction in Denmark and Sweden. *Heart*. 2003;89(5):507-11.
5. Steinberg BA, Bhatt DL, Mehta S, Poole-Wilson PA, O'Hagan P, Montalescot G, et al. Nine-year trends in achievement of risk factor goals in the US and European outpatients with cardiovascular disease. *American heart journal*. 2008;156(4):719-27.
6. Braunwald E, Antman EM, Beasley JW, Califf RM, Cheitlin MD, Hochman JS, et al. ACC/AHA 2002 guideline update for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction—summary article: a report of the American College of Cardiology/American Heart Association task force on practice guidelines (Committee on the Management of Patients With Unstable Angina). *Journal of the American College of Cardiology*. 2002;40(7):1366-74.
7. Granger CB, Goldberg RJ, Dabbous O, Pieper KS, Eagle KA, Cannon CP, et al. Predictors of hospital mortality in the global registry of acute coronary events. *Archives of internal medicine*. 2003;163(19):2345-53.
8. Kosiborod M, Rathore SS, Inzucchi SE, Masoudi FA, Wang Y, Havranek EP, et al. Admission glucose and mortality in elderly patients hospitalized with acute myocardial infarction implications for patients with and without recognized diabetes. *Circulation*. 2005;111(23):3078-86.
9. Yusuf S, Hawken S, Ounpuu S, Bautista L, Franzosi MG, Commerford P, et al. Obesity and the risk of myocardial infarction in 27 000 participants from 52 countries: a case-control study. *The Lancet*. 2005;366(9497):1640-9.
10. Cubbon RM, Wheatcroft SB, Grant PJ, Gale CP, Barth JH, Sapsford RJ, et al. Temporal trends in mortality of patients with diabetes mellitus suffering acute myocardial infarction: a comparison of over 3000 patients between 1995 and 2003. *European heart journal*. 2007;28(5):540-5.
11. Bahonar A, Sarrafzadegan N, Kelishadi R, Shirani S, Ramezani MA, Taghdisi MH, et al. Association of socioeconomic profiles with cardiovascular risk factors in Iran: the Isfahan Healthy Heart Program. *International journal of public health*. 2011;56(1):37-44.

12. Donyavi T, Naieni KH, Nedjat S, Vahdaninia M, Najafi M, Montazeri A. Socioeconomic status and mortality after acute myocardial infarction: a study from Iran. *International journal for equity in health*. 2011;10(1):9.
13. Selvin E, Marinopoulos S, Berkenblit G, Rami T, Brancati FL, Powe NR, et al. Meta-analysis: glycosylated hemoglobin and cardiovascular disease in diabetes mellitus. *Annals of internal medicine*. 2004;141(6):421-31.
14. Henderson DC, Cagliero E, Gray C, Nasrallah RA, Hayden DL, Schoenfeld DA, et al. Clozapine, diabetes mellitus, weight gain, and lipid abnormalities: a five-year naturalistic study. *American Journal of Psychiatry*. 2000; 157(6):975-81..
15. Lawrence JM, Contreras R, Chen W, Sacks DA. Trends in the prevalence of preexisting diabetes and gestational diabetes mellitus among a racially/ethnically diverse population of pregnant women, 1999–2005. *Diabetes care*. 2008;31(5):899-904.
16. Mohan V, Deepa M, Deepa R, Shanthirani C, Farooq S, Ganesan A, et al. Secular trends in the prevalence of diabetes and impaired glucose tolerance in urban South India—the Chennai Urban Rural Epidemiology Study (CURES-17). *Diabetologia*. 2006;49(6):1175-8.
17. Hardoon SL, Whincup PH, Lennon LT, Wannamethee SG, Capewell S, Morris RW. How much of the recent decline in the incidence of myocardial infarction in British men can be explained by changes in cardiovascular risk factors? Evidence from a prospective population-based study. *Circulation*. 2008;117(5):598-604.
18. Malmberg K, Rydén L, Wedel H, Birkeland K, Bootsma A, Dickstein K, et al. Intense metabolic control by means of insulin in patients with diabetes mellitus and acute myocardial infarction (DIGAMI 2): effects on mortality and morbidity. *European heart journal*. 2005;26(7):650-61.
19. Willi C, Bodenmann P, Ghali WA, Faris PD, Cornuz J. Active smoking and the risk of type 2 diabetes: a systematic review and meta-analysis. *Jama*. 2007;298(22):2654-64.
20. Baillargeon J-P, McClish DK, Essah PA, Nestler JE. Association between the current use of low-dose oral contraceptives and cardiovascular arterial disease: a meta-analysis. *The Journal of Clinical Endocrinology & Metabolism*. 2005;90(7):3863-70.
21. Foy CG, Bell RA, Farmer DF, Goff DC, Wagenknecht LE. Smoking and Incidence of Diabetes Among US Adults Findings from the Insulin Resistance Atherosclerosis Study. *Diabetes Care*. 2005;28(10):2501-7.
22. Azimi-Nezhad M, Ghayour-Mobarhan M, Parizadeh M, Safarian M, Esmaeili H, Parizadeh S, et al. Prevalence of type 2 diabetes mellitus in Iran and its relationship with gender, urbanisation, education, marital status and occupation. *Singapore medical journal*. 2008;49(7):571.
23. Westaway MS, Seager JR, Rheeder P, Van Zyl DG. The effects of social support on health, well-being and management of diabetes mellitus: a black South African perspective. *Ethnicity & Health*. 2005;10(1):73-89.
24. Tunceli K, Bradley CJ, Nerenz D, Williams LK, Pladevall M, Lafata JE. The impact of diabetes on employment and work productivity. *Diabetes care*. 2005;28(11):2662-7.
25. Toobert DJ, Glasgow RE, Strycker LA, Barrera M, Ritzwoller DP, Weidner G. Long-term effects of the Mediterranean lifestyle program: a randomized clinical trial for postmenopausal women with type 2 diabetes. *International Journal of Behavioral Nutrition and Physical Activity*. 2007;4(1):1.
26. Lorenzo C, Williams K, Hunt KJ, Haffner SM. The National Cholesterol Education Program—Adult Treatment Panel III, International Diabetes Federation, and World Health Organization definitions of the metabolic syndrome as predictors of incident cardiovascular disease and diabetes. *Diabetes care*. 2007;30(1):8-13.
27. Orchard M, Fowler S, Temprosa M. Impact of intensive lifestyle and metformin therapy on cardiovascular disease risk factors in the diabetes prevention program. *Diabetes care*. 2005;28:888-94.