

# Changes in age and sex trend of patients undergoing coronary artery bypass graft surgery: A 17-year retrospective study

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## Abstract

**Context:** Coronary artery bypass graft (CABG) decreases the signs and symptoms of ischemic heart disease, but it cannot treat the disease completely.

**Aim:** The purpose of this study was to determine the changes in age and sex trend of patients undergoing CABG surgery from 1996 to 2013 in the north of Iran.

**Setting and Design:** This retrospective study was done in an educational therapeutic center in the north of Iran.

**Material and Methods:** The medical records of 8544 patients who underwent CABG surgery during 1996–2013 were assessed and age and sex of all patients who underwent CABG were recorded.

**Statistical Analysis Used:** All data were analyzed by descriptive statistics and *t*-test, analysis of variance, and linear regression analysis in SPSS version 16.

**Results:** The mean values of age were increased in both men and women in this period and this increase was statistically significant by *t*-test ( $P = 0.0001$ ). Nearly 65.2% of patients were male and 34.8% were female. The results of linear regression analysis showed that by increasing 1 year, 0.35 year has added to patient's age ( $P = 0.0001$ ).

**Conclusion:** Considering the age and gender pattern of patients undergoing surgery due to coronary artery disease can affect the therapeutic planning of these patients. The results of this 17-year study confirmed the increased age of patients undergoing CABG surgery. Providing education services to enhance lifestyle may prevent the practice of CABG surgery at an advanced age.

**Keywords:** Age, Coronary artery bypass, Heart disease, Retrospective study, Sex

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## INTRODUCTION

Ischemic heart disease (IHD) is one of the most important causes of death in developed countries.<sup>[1]</sup> Based on the World Health Organization (WHO) reports, this disease

causes 16.5 million deaths worldwide in 2020 and it was estimated to cause 25 million deaths in 2012.<sup>[2]</sup> Nearly 23% of all deaths in world are related to IHD and it is mainly responsible for inefficiency worldwide in 2020.<sup>[3,4]</sup>

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In Iran, 15 million people are afflicted with coronary artery disease and this is the main cause of the occupancy of hospital beds in Iran.<sup>[5]</sup> According to the WHO, this disease was responsible for 43.5% of deaths in Iran in 2005. By 2020, it is expected to account for about 44.8% of deaths.<sup>[6,7]</sup> The cost of direct and indirect care and cure of this disease is estimated at \$850,000 annually.<sup>[8,9]</sup>

The lifestyle in developing countries has been changing rapidly in recent years. Lifestyle changes in these countries have led to a change in the pattern of illness and the age of the disease has decreased in these countries and younger people are at an increased risk of developing the disease.<sup>[10]</sup> Increasing the risk of cardiovascular disease leads to more use of invasive treatment methods, such as coronary artery bypass graft surgery (CABG).<sup>[11]</sup> A 10-year study in the United States, of course, suggests a reduction in this surgery in both women and men.<sup>[12]</sup> By changing the age pattern of ischemic disease, it seems that the age of patients undergoing CABG also would be changed.<sup>[13,14]</sup> The frequency of coronary artery disease in different ages does not follow the same pattern in men and women, so the number of women and men who undergo this surgery is very different at different ages.<sup>[15]</sup> Sex of patients is the other predictor of ischemic diseases and prevalence of this disease in lower age is higher in men.<sup>[16]</sup> It is noticeable that CABG can decrease the signs and symptoms of ischemic diseases but cannot cure this disease completely.<sup>[17]</sup> Decreasing the age of patients who undergoing CABG can incur cost for health system.<sup>[18]</sup>

Results of a study showed that male premature coronary artery diseases constituted the cases suffering from the heart attack, or died as a result of cardiac attacks below the age of 49, and the mature disease that affects people who is older than 54 years old.<sup>[19]</sup> This point shows that the effect of age has an important effect on coronary artery disease onset. The results of another study that assessed 8277 long-term clinical outcomes of CABG showed that 18.9% of all patients underwent surgery before the age of 60 years.<sup>[20]</sup> In northern part of Iran, as in other parts of the country, the incidence of coronary artery disease is high,<sup>[21]</sup> thus the determination of the age and sex pattern of patients undergoing CABG surgery can contribute to care and education, as well as rehabilitation programs in these patients. Based on this important view, this study was done to determine the pattern of age and sex of patients who underwent CABG in north of Iran during 1996–2013.

## MATERIAL AND METHODS

This retrospective study was done in an educational and medical center in Rasht, a city in the north of Iran. This

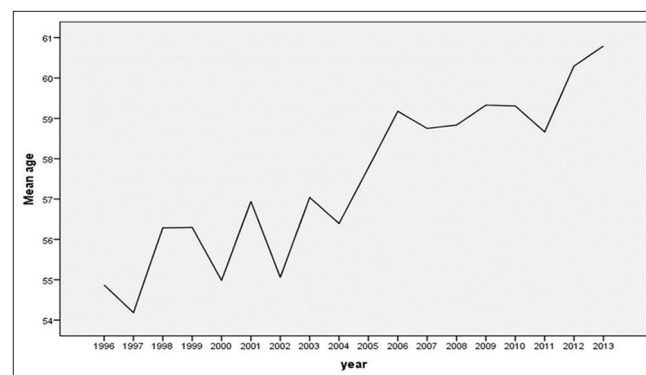
center is the only educational center in this city that CABG is done in it. After giving agreement of ethical committee of Guilan University of Medical Sciences (GUMS), gathering of data was done. The ethical code of this study is IR. GUMS. rec. 1394.805. Based on the design of this study, researchers were allowed to record the sex and age of patients who underwent CABG surgery in 17 years from 1996 to 2013. Unfortunately, at the time of study, the hospital did not have an electronic registration system, considering that many medical records have also been removed from the archives. The researchers were forced to record data from the registry offices of the surgery in the hospital archives.

All medical records were assessed from 1996 – the year that CABG was done in this city for the first time – to 2013. Age and sex of all patients who underwent CABG were recorded. Due to the confidentiality of patients' information, data collection was performed only by one person, and the only variable recorded from the records was the age and sex of the patient.

All data were analyzed by descriptive statistics and *t*-test, analysis of variance (ANOVA), and linear regression analysis in SPSS version 16 (SPSS version 16 acquired by IBM, Chicago, US).

## RESULTS

Results of this study showed that 8544 CABG surgeries were done in this center from 1996 to 2013. Totally 5571 (65.2%) of them were male and 2973 (34.8%) were female and, based on Figure 1, the number of men aged 18 years was more than the number of women. The mean age of all patients was  $58.57 \pm 9.63$  years. Distribution of age of males and females undergoing CABG surgery in 1996–2013 is shown in Table 1.



**Figure 1:** Number of men and women undergoing coronary artery bypass graft surgery during 1996–2013

Based on results, it was found that the mean age increased from 1996 to 2013 and this increase was statistically significant based on ANOVA analysis ( $P = 0.0001$ ,  $df = 17$ ,  $F = 14.2$ ).

Results showed that mean age was  $54.88 \pm 1.12$  years in 1996, with confidence interval (CI) 95%: 52.58–57.16 and mean age was  $60.79 \pm 0.33$  years in 2013, with CI 95%: 60.13–61.45 [Figure 2].

The mean values of age increased in both men and women and this increase was statistically significant by  $t$ -test ( $P = 0.0001$ ). Based on this test, it was found that the mean age in women was  $54.46 \pm 1.84$  years in 1996, with CI 95%: 50.45–58.47 and the mean age in women changed to  $61.11 \pm 0.53$  years, with CI 95%: 60.06–62.16 in 2013. The mean age in men changed from  $55.17 \pm 1.44$  years, with CI 95%: 52.12–58.21 in 1996 to  $60.62 \pm 0.43$  years, with CI 95%: 59.77–61.47 in 2013 [Figure 3].

As shown in Figure 3, despite the increased age of patients from 18 years during 1996–2013, the minimum age of patients who had CABG decreased. In this way, the range

of age was 44–67 years in 1996, but this range changed in 2006 to 22–81 years and in 2013 to 28–92 years.

The results of linear regression analysis showed that by increasing 1 year, 0.35 year added to patient's age ( $P = 0.0001$ ) [Table 2].

### DISCUSSION

Coronary artery disease in young patients is a rapidly progressive form of disease,<sup>[22]</sup> thus changing the age pattern of this disease can be a concern. A study that reviewed 1212 patients undergoing CABG surgery 10 years after surgery showed that only 12% of them were female.<sup>[23]</sup> CABG surgery is the last method to reduce the progression of signs and symptoms of the disease. This treatment cannot treat coronary artery disease, but it can reduce the progression of signs and symptoms of the disease. For this reason, the reduction in the age of patients undergoing surgery can be very risky. A risk that threatens younger patients after CABG is that new vessels may be blocked in the future and require re-surgery. The mean age of patients in our study was lower than the mean age of patients undergoing CABG in other countries. The findings of Oliveira's study in Brazil showed that only about 14% in 655 patients with CABG history were aged under 50 years.<sup>[11]</sup> The mean age of patients who underwent CABG in Chan *et al's.* study in Canada in 44,740 patients

**Table 1: Distribution of age of men and women undergoing coronary artery bypass graft surgery in 1996–2013**

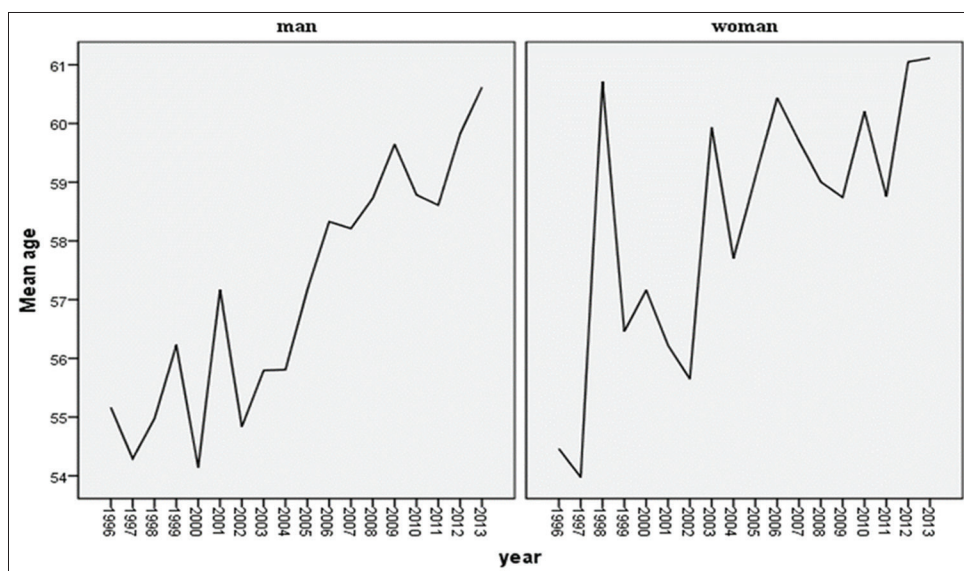
Variables	Mean age±SD	Minimum	Maximum	n
Men	58.14±9.883	22	88	5571
Women	59.37±9.103	24	92	2973

SD: Standard deviation

**Table 2: Linear regression analysis about relationship between age and coronary artery bypass graft surgery**

Model	Unstandardized coefficients		Standardized coefficients	t	Significant	95.0% CI for B	
	B	SE	Beta			Lower bound	Upper bound
Year	0.35	0.02	0.15	14.13	0.000	0.30	0.39

CI: Confidence interval, SE: Standard error



**Figure 2: Mean of age in patients undergoing coronary artery bypass graft surgery during 1996–2013**





**Figure 3:** Mean of age in men and women undergoing coronary artery bypass graft surgery during 1996–2013

was  $73.7 \pm 7.9$  years.<sup>[24]</sup> In a study conducted in the US assessing the age of 898 patients revealed the mean age to be  $62.9 \pm 9.1$  years.<sup>[25]</sup> In the US, a study by Epstein *et al.* showed that the mean age of patients undergoing CABG was  $69 \pm 10$  years.<sup>[26]</sup> The result of another study showed that the age range of patients who underwent CABG was between 61 and 76 years.<sup>[27]</sup> In Iran, Sabzi *et al.* assessed the age of 1489 patients who underwent CABG in the west of Iran. Based on their results on about two-third of the samples, age was under 70 years.<sup>[28]</sup>

Comparing the mean age of patients with CABG history in Iranian study and other countries showed the mean age of patients who had to do CABG were lower than age of this surgery in other countries. It may be related to unsuitable lifestyle practices and manner of Iranian people though this situation cause to do surgery in middle age.

The result of this study showed that about one-third of CABG surgeries were done in women. This result is similar to the findings of many of the studies.<sup>[11,24-26,29]</sup> Along with the results of this study, the results of a study that looked at the demographic characteristics of patients undergoing surgery in a 5-year period in China also showed that more than 75% of patients were men.<sup>[30]</sup>

In spite of the low age of Iranian patients by CABG history, our results showed that the mean age of these patients increased by years. This finding is similar to Natarajan and Dinh *et al.*'s study in the UK.<sup>[31,32]</sup>

It may be related to primary-level prevention encouraging by health-care delivered system in Iran that probably cause to increase the knowledge of people about their health.

Quality of care improving year by year can help to modify the high-risk factors in people's lifestyle and it can increase the mean age of patients undergoing CABG. In addition, progress of other treatment styles such as percutaneous coronary intervention can help to increase the mean age of patients who had to undergo CABG surgery. In fact, CABG surgery cannot control coronary artery disease, but can slow down the progress of its signs and symptoms. An increase in the age range of men and women undergoing this surgery could be due to lack of preventive care and appropriate lifestyle.

The limitation of this study was assessing the handmade records and many of the records would have mistaken. Our findings emphasize on the responsibility of nurses and other health-care team about their educational and consultation role about modifying risk factors in at-risk population that can cause decrease in the rate of coronary artery disease.

## CONCLUSION

It is noticeable that despite the decrease in the mean age of these patients, the minimum age also decreased. Increasing the range of age may be related to lower age of coronary artery disease can tend to CABG and may related to progress of CABG style that help to old-age patients. An increase in the mean age of women and men undergoing surgery may be due to the general aging of the population under study. This finding suggests that provision of preventive care services for middle-aged people could help to reduce the incidence of this surgery. Providing education services to enhance lifestyle may prevent the practice of CABG surgery at an advanced age.

### Conflicts of interest

There are no conflicts of interest.

### Authors' contributions

All authors contributed to this research.

### Financial support and sponsorship

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### REFERENCES

1. Sadeghi MM, Arasteh M, Gharipour M, Nilfroush P, Shamsolketabi H, Etesampour A, *et al.* Evaluation of accuracy of Euroscore risk model in prediction of perioperative mortality after coronary bypass graft surgery in Isfahan. *J Res Med Sci* 2011;16:787-92.
2. Bonow R, Mann DL, Zipes DP, Libby P. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. 9<sup>th</sup> ed. Philadelphia: Saunders, Elsevier; 2012.
3. Hosseinzadeh T, Paryad E, Kazemnejad E, Asiri S. A study of self-efficacy in patients with coronary artery disease and its predictors. *Qom Univ Med Sci J* 2013;7:97-104.
4. Shanmugasegaram S, Perez-Terzic C, Jiang X, Grace SL. Cardiac rehabilitation services in low- and middle-income countries: A scoping review. *J Cardiovasc Nurs* 2014;29:454-63.
5. Fakhrzadeh H, Bandarian F, Adibi H, Samavat T, Malekafzali H, Hodjatzadeh E, *et al.* Coronary heart disease and associated risk factors in Qazvin: A population-based study. *East Mediterr Health J* 2008;14:33-41.
6. Rouhi Balasi L, Paryad E, Kazemnejad Leili E, Booraki S, SadeghiMeibodi A, Nassiri Sheikhan N. Study status of care adherence and its related factors in patients undergoing. *Holist Nurs Midwifery* 2015;25:34-45.
7. Seyam S, Hidarnia AR, Tavafian SS. Self-care education through coping style for patients after heart surgery. *J Isfahan Med Sch* 2011;29(135):13-19
8. Neyshabouri M, Ashktorab T. Effects of change positioning on vascular complications and comfort in patients undergoing heart catheterization. *koomesh* 2007; 9(1):53-8
9. Commodore-Mensah Y, Himmelfarb CR. Patient education strategies for hospitalized cardiovascular patients: A systematic review. *J Cardiovasc Nurs* 2012;27:154-74.
10. Ghazanfari Z, Alizadeh S, Azizadeh Furozi M, Bahodini N. Prevalence of coronary artery diseases risk factors in Kerman. *Iran J Crit Care Nurs* 2010;3:29-32.
11. Oliveira EL, Westphal GA, Mastroeni MF. Demographic and clinical characteristics of patients undergoing coronary artery bypass graft surgery and their relation to mortality. *Rev Bras Cir Cardiovasc* 2012;27:52-60.
12. Swaminathan RV, Feldman DN, Pashun RA, Patil RK, Shah T, Geleris JD, *et al.* Gender differences in in-hospital outcomes after coronary artery bypass grafting. *Am J Cardiol* 2016;118:362-8.
13. Andreoli T, Carpenter C, Griggs R, Benjamin I. Andreoli and Carpenter's Cecil Essentials of Medicine. 8<sup>th</sup> ed. Edinburgh: Elsevier,

- Saunders; 2010.
14. Neamatipoor E, Sabri A, Dahi F, Soltanipoor F. Changing risk and demographic factors of myocardial infarction in a decade (1371-1381) in three university hospital. *Tehran Univ Med J* 2006;64:88-94.
15. Edwards ML, Albert NM, Wang C, Apperson-Hansen C. 1993 2003 gender differences in coronary artery revascularization: Has anything changed? *J Cardiovasc Nurs* 2005;20:461-7.
16. Kreatsoulas C, Natarajan MK, Khatun R, Velianou JL, Anand SS. Identifying women with severe angiographic coronary disease. *J Intern Med* 2010;268:66-74.
17. Safaie N, Montazerghaem H, Jodati A, Maghamipour N. In-hospital complications of coronary artery bypass graft surgery in patients older than 70 years. *J Cardiovasc Thorac Res* 2015;7:60-2.
18. Masoumi M, Jalili Z, Sabzi F, Moradi B, Abdoli G, Siah F, *et al.* Relation of early parents coronary artery disease and child dyslipidemia. *J Kermanshah Univ Med Sci* 2003;7:26-35.
19. Abderrahman HA, Al-Abdallat IM, Idhair AK. Age threshold for proper definition of premature coronary artery disease in males. *J Forensic Leg Med* 2018;58:45-9.
20. Nicolini F, Fortuna D, Contini GA, Pacini D, Gabbieri D, Zussa C, *et al.* The impact of age on clinical outcomes of coronary artery bypass grafting: Long-term results of a real-world registry. *Biomed Res Int* 2017;2017:9829487.
21. Paryad E, Rouhi Balasi L, Kazemnejad E, Booraki S. Predictors of illness perception in patients undergoing coronary artery bypass surgery. *J Cardiovasc Dis Res* 2016;7:1-4.
22. Klein LW, Nathan S. Coronary artery disease in young adults. *J Am Coll Cardiol* 2003;41:529-31.
23. Petrie MC, Jhund PS, She L, Adlbrecht C, Doenst T, Panza JA, *et al.* Ten-year outcomes after coronary artery bypass grafting according to age in patients with heart failure and left ventricular systolic dysfunction: An analysis of the extended follow-up of the STICH trial (Surgical treatment for ischemic heart failure). *Circulation* 2016;134:1314-24.
24. Chan W, Ivanov J, Ko D, Fremes S, Rao V, Jolly S, *et al.* Clinical outcomes of treatment by percutaneous coronary intervention versus coronary artery bypass graft surgery in patients with chronic kidney disease undergoing index revascularization in Ontario. *Circ Cardiovasc Interv* 2015;8. pii: e001973.
25. Domanski MJ, Farkouh ME, Zak V, Feske S, Easton D, Weinberger J, *et al.* Predictors of stroke associated with coronary artery bypass grafting in patients with diabetes mellitus and multivessel coronary artery disease. *Am J Cardiol* 2015;115:1382-8.
26. Epstein AJ, Polsky D, Yang F, Yang L, Groeneveld PW. Coronary revascularization trends in the United States, 2001-2008. *JAMA* 2011;305:1769-76.
27. Halm MA. Age and gender influences on the needs, concerns and strategies of CABG caregivers. *Heart Lung* 2017;46:159-65.
28. Sabzi F, Kazerani H, Jalali A, Samadi M, Ghasemi F. Coronary arteries bypass grafting surgery in elderly patients. *J Tehran Heart Cent* 2013;8:76-88.
29. Saxena A, Dinh D, Smith JA, Shardey G, Reid CM, Newcomb AE, *et al.* Sex differences in outcomes following isolated coronary artery bypass graft surgery in Australian patients: Analysis of the Australasian Society of Cardiac and Thoracic Surgeons cardiac surgery database. *Eur J Cardiothorac Surg* 2012;41:755-62.
30. Wang J, Yu W, Zhao D, Liu N, Yu Y. In-hospital and long-term mortality in 35,173 Chinese patients undergoing coronary artery bypass grafting in Beijing: Impact of sex, age, myocardial infarction, and cardiopulmonary bypass. *J Cardiothorac Vasc Anesth* 2017;31:26-31.
31. Natarajan A, Samadian S, Clark S. Coronary artery bypass surgery in elderly people. *Postgrad Med J* 2007;83:154-8.
32. Dinh DT, Lee GA, Billah B, Smith JA, Shardey GC, Reid CM, *et al.* Trends in coronary artery bypass graft surgery in Victoria, 2001-2006: Findings from the Australasian Society of Cardiac and Thoracic Surgeons Database project. *Med J Aust* 2008;188:214-7.