

The Estimation of Medical Cost for Ischemic Heart Disease

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Abstract

The number one killer in Malaysia reported to be the Ischemic Heart Disease. To make matters worse, the medical cost for treating this disease has also increases. Therefore, it is important for us to be informed of what are odds of getting ischemic heart disease and the expected cost needed for treating heart disease so that we can plan for future savings. This paper calculates the probability of getting heart disease based on age, gender and ethnic. We then estimate the expected medical cost of different procedure for treating ischemic heart disease varying age group. A comparison between different age group, the probability of suffering form from heart disease rises as age increases and the rate is the highest for those in age 50 to 59. While probability of male getting heart disease is higher as compared to female. Further, Malay was the most diagnosed with heart disease as compared to Chinese and Indian. The expected cost for Ischemic heart disease also varies by age and procedure where those in the age of 50 to 59 need to save the most for medical treatment.

Keywords: Ischemic Heart Disease, Myocardial Disease, Angina, Medical Cost

INTRODUCTION

Heart disease has been the leading cause of death since decades ago and the number of death keep increasing over the years. It is a major concern that the age of onset of getting heart disease in Malaysia is younger compared to other countries. Heart disease is known as cardiovascular disease which generally refers to conditions that involve narrowed or blocked blood vessels. There are several types of diseases that link to heart disease such as myocardial infarction, stroke, heart failure, hypertensive heart disease, cardiomyopathy, valvular heart disease, aortic aneurysms, peripheral artery disease, and venous thrombosis. Heart disease treatments vary by condition and type of illness that affected the patient. For example, the treatment for a person suffer from heart failure is differ to a person suffer from myocardial infarction.

According to American Heart Association, the health data compiled from 190 countries showed that heart disease is the number one killer worldwide with 17.3 million deaths each year and the number is expected to rise more than 23.6 million by 2030. In addition, a report by World Health Organization (WHO) states that cardiovascular disease is said to be the number one killer disease in Malaysia with the total number of death of 22,701 that constitutes to about 22.8 percent in 2010 which then increase to 36% in 2014. (Lauren, 2015). Further, Department of Statistics Malaysia stated that main cause of death occurred in year 2016 was ischaemic heart disease with the highest percentage among all diseases at 13.8%. (Office of Chief Statistician Malaysia, 2016).

To make matters worse, the medical cost has increased from 10 to 15 percent per year. The increment of medical expenses per annum is mainly because of the improvised, upgraded and high-technology that used for the

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operation of the patients. A study has found that the cost for open-heart surgery in the year 2000 only cost RM 30,000.00 but it has increased to RM 62,000.00 in the year 2015 (Lee, 2017). Therefore, the medical cost for heart disease also varies based on cost of procedure.

According to a study by National Cardiovascular Database Annual Report the mean age of Malaysia patients of getting heart disease is younger at age 58 compared to Global Registry of Acute Coronary Event which is at age 66. As mentioned by Surendran (2016), according to Credit Counselling and Debt Management Agency (AKPK), 11.5% of those who enrolled into their Debt Management Programme fell into debt due to high medical expenses. Therefore, it is important to mane financial effectively as some of the cost might come from cost of treating medical conditions.

There is a need to look at the probability of getting heart disease by age and the expected medical cost at different age so that funding or allocation can be made to ensure we are able to pay for treatment if we are diagnose with ischemic heart disease. Therefore, this paper attempts to find the probability of getting heart disease by age, gender and ethnicity and find the expected medical cost for ischemic heart disease varying by age.

2 METHODOLOGY

2.1 Data Collection

This paper uses 2106 secondary data from university hospitals which provide the treatment for heart disease. The data was collected from the year of 2016 to June 2017 for patients age 20 and above. The collected data are grouped according to age, gender, ethnic and number of patients.

2.2 Calculating the Distribution of People Getting Heart Disease

To analyse the distribution of people suffering from heart disease, data will be group according to age, gender and ethnicity. Each data will be group according to age group starting from age 20 to 29, 30 to 39, 40 to 49 until age 80 and above. Data will then be group based on gender and ethnic. The percentage of each group then will be analysed and equation (1) denotes the percentage formulas follows:

$$\text{Percentage} = \frac{\text{Number of patients based on group}}{\text{Total patients}} \times 100 \quad (1)$$

2.3 Calculating the Probability Ischemic Heart Disease by Age

The method that is used to determine which illness has the highest number of patients according to age group as follows:

$$\text{Percentage} = \frac{\text{No of patient affected by ischemic heart disease}}{\text{Total No of patient affected by heart disease}} \quad (2)$$

2.4 Expected Cost for Ischemic Heart Disease

Expected cost is determined by multiplying the probability of a person suffers from heart disease and cost of treatment by different procedure as treatment. Procedure for treating heart disease includes

- PCI : Percutaneous Coronary Intervention - is a non-surgical procedure that uses a catheter (a thin flexible tube) to place a small structure called a stent to open up blood vessels in the heart that have been narrowed by plaque buildup, a condition known as atherosclerosis
- CABG : Coronary artery bypass grafting - Coronary artery bypass grafting (CABG) is a type of surgery that improves blood flow to the heart
- COROS - A coronary angiogram is a procedure that uses X-ray imaging to see your heart's blood vessels. The test is generally done to see if there's a restriction in blood flow going to the heart.

The expected cost is calculated as follows:

$$\text{Expected Cost} = \text{Probability} \times \text{Cost of Procedures} \quad (3)$$

3 RESULTS AND DISCUSSIONS

3.1 Probability Of People Getting Heart Disease Based On Age, Gender And Ethnicity.

Table 1. Probability of Getting Heart Disease by Age

Age Group	Probability
20 - 29	0.0308
30 - 39	0.0646
40 - 49	0.1591
50 - 59	0.2968
60 - 69	0.3105
70 - 79	0.1229
≥80	0.0152

Overall, as age increases, probability of getting heart disease increases. The group of age between 60 to 69 years has the highest probability of people suffered from heart disease with a probability of 0.31. It is then followed closely by the group of age between 50 to 59 years with 0.29. This is because the people at both of these age group have higher risk to be affected by heart disease. The group age with lowest probability is those who are age 80 and above with probability of 0.015. Older people suffer higher probability of heart disease as compared to younger age group might be due to aging factor. Thus, preparation is crucial for people at this age which may include savings enough money to pay for medical treatment. It is also important for those aged 40 and above to schedule regular medical check-up as to detect any early symptom of heart disease.

Table 2. Probability of Getting Heart Disease by Gender

Gender Group	Probability
Male	0.7222
Female	0.2778

Table 2 shows the probability of getting heart disease by gender. It can be seen clearly that male has the highest probability with 0.7222 while female with a probability of 0.2778. This is alarming as the difference between male and female is huge. Working condition, health awareness, lifestyle and smoking might have caused these differences.

Table 3. Probability of Getting Heart Disease by Ethnicity

Ethnic Group	Probability
Malay	0.7355
Chinese	0.1382
Indian	0.1135
Others	0.0128

Table 3 shows the probability of getting heart disease by ethnicity. The majority of the ethnic that suffered from heart diseases is Malay with a probability of 0.7355 which then followed by Chinese with 0.1382 and Indian with 0.1135. The remaining probability of 0.0128 is from other ethnicity than Malay, Chinese and Indian. This high probability might due to difference in number of population as represented by Malay as compared to other ethnicity. Another factor that can be considered might be food consumption taken by different ethnicity and health awareness on good diet and health management.

3.2 Probability of Ischemic Heart Disease

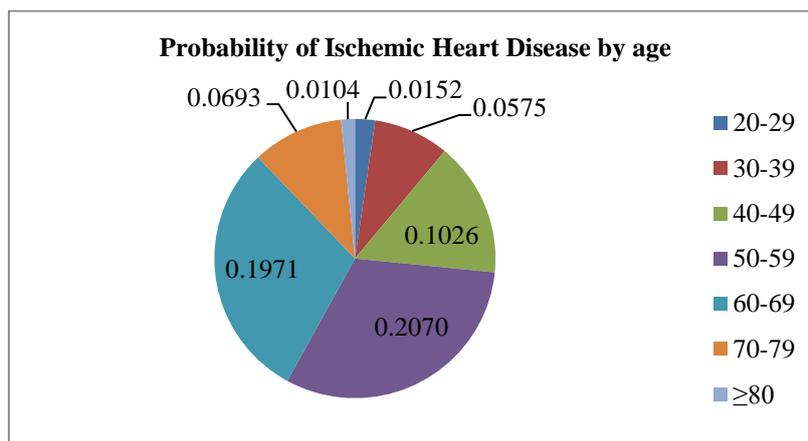


Fig 1: Probability of Ischemic Heart Disease by Age

The figure above shows the probability of getting diagnosed with Ischemic heart disease categorised by age group. The highest probability of 0.2070 for patients diagnosed with Ischemic come from the age group 50 to 59 years, while probability of 0.1971 comes from group age between 60 to 69 years. For age group between 40 to 49 years, the probability is 0.0693. The lowest probability comes from those ages 80 and above with only 0.0104.

3.3 Estimation of Expected Cost of Procedure for Ischemic Heart Disease

Expected Medical Cost (Ischemic Heart Disease)							
Age	Probability	Procedure					TOTAL
		Percutaneous Coronary Intervention			CABG	COROS	
		PCI Balloon 1	PCI Balloon 2	PCI Balloon 3			
20-29	0.0152	227.92	334.28	455.84	303.89	45.58	1367.51
30-39	0.0575	861.82	1264.01	1723.65	1149.10	172.36	5170.94
40-49	0.1026	1538.46	2256.41	3076.92	2051.28	307.69	9230.77
50-59	0.2070	3105.41	4554.61	6210.83	4140.55	621.08	18632.48
60-69	0.1971	2955.84	4335.23	5911.68	3941.12	591.17	17735.04
70-79	0.0693	1039.89	1525.17	2079.77	1386.51	207.98	6239.31
≥80	0.0104	156.70	229.82	313.39	208.93	31.34	940.17

Fig 2: Expected Medical Cost for Ischemic Heart Disease by age group

The figure above shows the age group, probability and cost procedures used for the treating of ischemic heart disease. There are 3 procedures for PCI Balloon differentiated by number of balloon required for blocked vessels. PCI Balloon 1 has the highest expected cost of RM3, 105.41 for group of age 50 to 59 years. For, PCI Balloon 2 and PCI Balloon 3 both have the highest expected costs of RM4, 554.61 and RM6, 210.83 each for the group of age 50 to 59 years. The second procedure which is CABG with the highest expected cost of RM4, 140.55 for group of people age 50 to 59 years and has the lowest expected cost of RM208.93 for group of people age 80 years and above. The last procedure which is the COROS has the highest expected cost of RM621.08 for people age 50 to 59 years.

The expected cost tends to be higher for those aged between 40 and 69 as these are largest age group that suffer Ischemic heart disease. As age increases, the expected cost also increases. This indicates that the need to save money earlier during lifetime is important as to cover the cost of procedure in future. As people age group 50 to 59 is near to retirement age, it is crucial for them to have a sufficient savings to finance their medical needs at retirement. Therefore, allocation for savings for future medical cost might be required to ensure that retirement fund will not exhausted just for paying medical expenses. It is also recommended to buy health insurance at young age as the premium is cheaper. Further, once someone is diagnosed with terminal disease such as heart disease, it is likely that any health insurance application will be rejected.

CONCLUSIONS

In conclusion, heart disease is a common cause of death and requires huge amount of money for its treatment. The probability of getting heart disease increase significantly as age increase especially for those aged 40 and above. It is also found that Malay has the most number of patients suffering from heart disease as compared to Chinese and Indian. Further, if we compare the probability of getting heart disease by gender, male suffer the most.

We also found that the probability of ischemic heart disease increases age as increases. The probability was the highest for those ages between 50 to 59 indicating that most heart cases come from this age group. Nonetheless, the probability reduce significantly after age 69 as some might have died before. The expected cost also varies by age and procedure. We found that expected amount that need to be fork out to cover for heart disease treatment also rises as age increases.

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