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Prevalence of Deep Venous Thrombosis Among Outpatients in University Malaya Medical Center (UMMC) Malaysia

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Abstract

Deep Vein Thrombosis (DVT) can lead to pulmonary embolism and it is the third most common causes of death in cardiovascular disease after stroke and heart attack. This study aims to determine the frequency of deep venous thrombosis (DVT) in relation to age, gender, and ethnic in Malaysia. A retrospective cohort study was conducted with patients who went for suspected DVT screening in University Malaya Medical Center (UMMC), Kuala Lumpur from 1 January 2016 to 31 December 2019. Colour Doppler ultrasound machine (Philips IU22) was used for the DVT screening. All patients' data were retrieved from the Radiology Information System (RIS) database of UMMC. Only outpatients' data with confirmed DVT were collected. The data were analysed according to age, gender and ethnicity. A total of 474 outpatients with suspected with DVT were enrolled in this study. But, only 167 outpatients were diagnosed with DVT. However, based on inclusion and exclusion criteria, only 151 of outpatients' data were eligible for analysis according to age. Meanwhile, there were 159 and 155 of outpatients' data which were eligible for analysing the prevalence of DVT based on gender and ethnicity, respectively. The highest prevalence of DVT was shown by the age group of 65-100 (52.3%). The difference between the eldest and oldest age group was 50.7%. As for gender, the female has a higher frequency than the male by 66.7% with the differences of 33.4%. Among the three main ethnicities in Malaysia, Chinese shows higher frequency (44.5%). The differences between Chinese and Malay ethnic was 4.5 % while 29% between Chinese and Indian ethnic. Older age group have a greater frequency of having DVT among all age groups. Females have a high risk of having DVT compared to male for all studied ethnicity and Chinese ethnic has higher prevalence followed by Malay and India.

Keywords: DVT, gender, ethnicities

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Introduction

Deep vein thrombosis (DVT) occurs when a blood clot which is also known as thrombus forms in one or more of the deep veins in the body. This disease is commonly diagnosed in the deep vein of the leg, but its incidence is also increasing for upper extremities ^[1]. There are four classes of lower extremity DVT. Those four classes are isolated calf thrombosis (class I), femoral-popliteal vein thrombosis (class II), common femoral or iliac vein thrombosis (class III), and inferior vena cava thrombosis (class IV). This classification is used as a guideline so that the location of the blood clot and its extensions can be determined accurately. Contrarily, there are no specific classes for the upper part. The incidences of the upper part are about 5 to 10 per cent of all cases of DVT and keep increasing due to the high usage of the intravenous catheter ^[2].

The risk factors and the sign and symptoms such as leg pain, tenderness, redness, and edema or swelling are used to determine whether patients are having DVT. A scoring system known as Wells' score is then used to diagnose that suspected patients with DVT. The score is rated based on nine clinical features: paralysis or unable to move, having active cancer, confined to bed for more than 3 days, localized tenderness, entire leg swollen, and unilateral calf swelling of greater than 3 cm, unilateral pitting edema, collateral superficial veins, and alternative diagnosis. Wells' score classifies the suspected patients into two different categories which are "DVT unlikely" if the clinical score is ≤ 1 and "DVT likely" if the clinical score > 1 . If the Wells' score is 'unlikely', the clinician will proceed with the D-dimer test to confirm it. But, if the Wells' score is 'likely' then ultrasound is one of the commonly used imaging modalities to confirm the diagnosis of DVT ^[3].

Multiple imaging techniques and modality are used for diagnosis and visualization of DVT and ultrasound are one of the modalities used for that purposes. Ultrasound uses the sound wave transmission to visualize the venous system of the patient. There are three types of venous ultrasonography which are compression ultrasound, duplex ultrasound, and colour Doppler ultrasound. The examination begins with a compression ultrasound to reach the venous system. The failure to compress a vein indicates the presence of deep vein thrombosis. Duplex ultrasound is then used to assess the blood vessel clot followed by colour Doppler ultrasound to determine the outflow of the venous system. The presence of DVT is shown by direct visualization of the blood clot, the absence of spontaneous flow, absence of phasicity of flow with respiration, and the incompressibility of deep veins with probe pressure ^[4]. D- dimer test is also used as a further diagnosis if the ultrasound result is still suspicious. It is a blood test that monitors the level of D- dimer, a type of protein when there is a need to break down the blood

clot in the body. If the level of D- dimer is higher than the normal threshold which is $500\mu\text{g/L}$, the clinician will conclude that the patient has a significant blood clot ^[3].

It has been reported that Asians have the lowest incidence of DVT compared to Western countries. Therefore, most of the studies were conducted in Western countries. However, the trends are rising in Asian countries ^[5]. The incidence is about 3 per 10,000 hospital admissions in Hong Kong and Malaysia in 1998 and 1990; rising to 8 to 15.8 per 10,000 hospital admissions in Singapore in 2000, respectively ^[6]. Malaysia has been known as one of the countries with many ethnicities. There are three main ethnic groups in Malaysia which are Malay, Chinese and India. No studies have also been the prevalence of DVT especially for outpatients in Malaysia. Therefore, this study aims to determine the frequency of DVT in relation to age group, gender, and ethnic in Malaysia who are at high risk of getting this disease, especially for outpatients.

Patients and Methods

Ethics Statement

This study was approved by the Research and Human Ethics Committee of UniSZA (UHREC: UniSZA / UHREC / 2019/152) as well as the Medical Research Ethics Committee, University of Malaya Medical Center (MREC ID NO: 20201116-8185). This study was conducted based on the Nuremberg Code. The patient consent form is not required.

Study design and Patients

This study was a retrospective study. The patients' data from 1 January 2016 to 31 December 2019 were retrieved from the Radiology Information System (RIS) database of University Malaya Medical Centre (UMMC), Kuala Lumpur. Colour Doppler ultrasound machine (Philips IU22) were used to screen the patient with suspected DVT. First, all patient's data with suspected DVT who went for colour Doppler ultrasound screening were identified. The search was then further narrowed only to outpatients. Lastly, only outpatients' data with confirmed DVT were selected for further analysis.

Methods

Data was collected based on inclusion and exclusion criteria. Patients who are less than 20 years old or with incomplete information and undergoing repeated examination were disregards from this study. The outpatients were group into six age group (20-24 years old, 25-34 years old, 35-44 years old, 45-54 years old, 55-64 years old, and 65 years old and above), gender (male and female) and ethnicity (Malay, Chinese and India). Statistical analyses were performed using IBM SPSS

version 22. Descriptive statistics were used to present the results.

Results

474 outpatients with suspected with DVT were selected in this study. 167 out of 474 outpatients were diagnosed with DVT. There were only 151 of 167 of outpatients' data that eligible for analysis according to age based on the inclusion criteria. Meanwhile, only 159 and 155 of outpatients' data which were eligible for analysing the prevalence of DVT based on gender and ethnicity, respectively.

A total of 159 outpatients, 53 men (33.3%) and 106 women (66.7%) were included in this retrospective study. The number of outpatients with the age of 20-24 years old is 3 (2.0%), 25-34 years old is 9 (6.0%), 35-44 years old is 16 (10.6%), 45-54 years old is 14 (9.3%), 55-64 years old is 30 (19.9%) and 65 years old and above is 79 (52.7%) respectively (Figure 1). Based on Figure 2, the number of female's outpatients were higher than the male for each age group except for the age group of 25-34 years old.

According to ethnicity, 62 (40 %) of the outpatients were Malay, 69 (44.5%) and 24 (15.5%) were Chinese and Indian respectively (Figure 3). Figure 4 shows that female has a higher prevalence of DVT compared to male for all studied ethnicity.

Discussion

In this study, the outpatients with the age of 65 years old and above have a higher prevalence of having DVT compared to another age group. Ageing is usually associated with increased levels of coagulation factors and a decrease in a natural anticoagulant factor. The risk for thromboprophylaxis is increasing with age. Most of the treatment used a medication that could reduce the formation of blood clots [7]. Besides, changes in peripheral vein vascular biologically become a factor for increasing of DVT based on age. The biological changes of peripheral vein cause a local blood clot, thrombus growth, and blockage [8]. Ageing could affect the thickness and elasticity of venous wall and valves respectively. Muscle fibres in vessel wall atrophy increase with age [9]. The valves are also thickened in parallel to the age make it become less flexible, reduce its function and leads to reflux which could result in stasis and possibility of DVT formation [10]. Silverstein et al. showed that the incidence of DVT rises significantly with age which makes it higher in elderly [11].

The prevalence is less at an early age because at older ages a particular thrombus composition will be less stable, less attached to the vessel wall, and more prone to blockage which could lead to death [12]. An autopsy study showed that patients aged less than 60 years old were died because

of pulmonary embolism and only 19% of them had DVT symptoms before died [13]. However, there is also a potential risk to neonates which is mostly related to central lines and after puberty with the prevalence of about 0.007 of every 10 000 children due to clinical and environmental conditions [14]. Additionally, a higher level of amino acid in the blood or also known as hyperhomocysteinemia may increase the DVT risk among the children [14]. The risk is increased because hyperhomocysteinemia as can damage the artery and leads to blood clots.

Based on gender, some studies found out that women were more frequently diagnosed with DVT while some studies proved that men have a higher prevalence than women [15]. In a Norwegian study, the incidence of deep vein thrombosis was slightly higher in women compared to men [16]. Meanwhile, in the Swedish study, both sexes have an equal incidence of DVT [17]. However, in a community-based study, the incidence of this disease was higher for men than women [18].

This study showed that the prevalence of DVT was higher in females compared to male's outpatients for each age group and ethnicity. However, according to Romero et al. gender is not a risk factor of DVT, but the risk is related to certain conditions such as pregnancy and hormone replacement therapy (HRT) especially for women [19]. Women under hormone therapy or pregnant have a higher probability of DVT compared to men. Pregnancy and hormone therapy can act as a provoked risk factor for the occurrence of DVT [20]. Non-pregnant women have a lower risk than pregnant women of similar age and the risk of having DVT is also lower for vaginal delivery compared to caesarean [21].

Ethnic is portrayed as a social group that shares history, identity, geography, and cultural roots. Many studies have been done worldwide to find out the prevalence of DVT of different ethnic groups [22-24]. Few studies have reported that the incidence of DVT is the highest in African ancestry, followed by Caucasians, Hispanics, and the lowest was showed by Asians [25]. Among the three main ethnicities in Malaysia, both male and female from Chinese ethnic shows higher prevalence than Malay and Indian ethnicities. This is similar to the study of Hansson et al. which reported that the incidence of DVT among Chinese patients is increasing by about 2.6% to 17% in Hong Kong [26]. Contrarily, a study that conducted at Johor Bahru Hospital, Malaysia in 2004 shows that Malays have a higher prevalence than other ethnicities [27]. However, only inpatients were taken into account in their studies. The genetic differences, socioeconomic status and diet on the other hand are said to be the factors that could also promote the risk or occurrence of DVT. Each ethnic has a different lifestyle and diet which could result in a different risk of acquiring DVT. Large intake of meat can increase the incidence of venous thrombosis embolism (VTE) compared to the food which is enriched in vitamins B

complex, an omega-3 fatty acid [28]. Besides, in East Asian, seafood was used traditionally to prevent VTE [29]. Pomp et al. in his study recorded that the differences in alcohol consumption among a different cohort of patients result in dissimilarities among studies because drinking 2-4 glasses per day could reduce the risk of venous thrombosis [30]. This is contrasting with the result of this study. This study found out that females from Chinese ethnic have a higher prevalence of DVT. In Malaysia, the consumption of alcohol is more significant in males rather than females [31]. Alcohol consumption also is more significant in Chinese ethnic who have high household income and higher education compared to other ethnics. [31].

However, the findings of our study are still at an early stage for estimating the prevalence of DVT of outpatients in Malaysia. The findings in this study were only based on the data from one medical centre which was located in the urban area. Future study should include more medical centre in Malaysia. The location and the geographical area of the medical centre should also be taken into account to accurately determine the prevalence of DVT among the various ethnic groups in Malaysia.

Conclusion

It can be concluded that the prevalence of DVT among outpatients are higher in a female with the age of 65 years old and above from Chinese ethnic. However, further study with a longer duration is required. The study should also involve the outpatients from all states in Malaysia including Bumiputera Sabah and Sarawak for a better outcome on the prevalence of DVT in Malaysia.

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References

1. Baarslag H-J, van Beek EJ, Koopman MMW, Reekers JA. Prospective study of color duplex ultrasonography compared with contrast venography in patients suspected of having deep venous thrombosis of the upper extremities. *Ann Intern Med*. 2002;136(12):865-872.
2. Muñoz FJ, Mismetti P, Poggio R, et al. Clinical outcome of patients with upper-extremity deep vein thrombosis: results from the RIETE Registry. *Chest*. 2008;133(1):143-148.
3. Arnoldussen CWKP, Wittens CHA. An imaging approach to deep vein thrombosis and the lower extremity thrombosis classification. *Phlebology*. 2012;27(1_suppl):143-148.
4. Ciccone WJ, II J, Pellegrini Jr VD. The role of ultrasonography in thromboembolic disease management in the orthopaedic patient. *Iowa Orthop J*. 1999;19:18.
5. Roberts LN, Patel RK, Arya R. Venous thromboembolism and ethnicity. *Br J Haematol*. 2009;146(4):369-383.
6. Lee LH, Gu KQ, Heng D. Deep vein thrombosis is not rare in Asia-the Singapore General Hospital experience. *Ann Med SINGAPORE*. 2002;31(6):761-764.
7. Keenan CR, White RH. Age as a risk factor for venous thromboembolism after major surgery. *Curr Opin Pulm Med*. 2005;11(5):398-402.
8. Kristinsson SY, Fears TR, Gridley G, et al. Deep vein thrombosis after monoclonal gammopathy of undetermined significance and multiple myeloma. *Blood, J Am Soc Hematol*. 2008;112(9):3582-3586.
9. Chopard RP, MH MN, Biazotto W, Molinari SL. Age-related changes in the human renal veins and their valves. *Ital J Anat Embryol Arch Ital di Anat ed Embriol*. 1994;99(2):91-101.
10. Raju S. Venous insufficiency of the lower limb and stasis ulceration. Changing concepts and management. *Ann Surg*. 1983;197(6):688.
11. Silverstein MD, Heit JA, Mohr DN, Petterson TM, O'Fallon WM, Melton LJ. Trends in the incidence of deep vein thrombosis and pulmonary embolism: a 25-year population-based study. *Arch Intern Med*. 1998;158(6):585-593.
12. Bounameaux H, Rosendaal FR. Venous thromboembolism: why does ethnicity matter? Published online 2011.
13. Cheng TO. Autopsy Proven Pulmonary Embolism in Hospital Patients. *J R Soc Med*. 1989;82(8):508.
14. Nowak-Gottl U, Kosch A. Factor VIII, D-dimer, and thromboembolism in children. *N Engl J Med*. 2004;351(11):1051-1053.
15. Tormene D, Ferri V, Carraro S, Simioni P. Gender and the risk of venous thromboembolism. In: *Seminars in Thrombosis and Hemostasis*. Vol 37. © Thieme Medical Publishers; 2011:193-198.
16. Næss IA, Christiansen SC, Romundstad P, Cannegieter SC, Rosendaal FR, Hammerstrøm J. Incidence and mortality of venous thrombosis: a population-based study. *J Thromb Haemost*. 2007;5(4):692-699.
17. Nordström M, Lindblad B, Bergqvist D, Kjellström T. A prospective study of the incidence of deep-vein thrombosis within a

- defined urban population. *J Intern Med.* 1992;232(2):155-160.
18. Heit JA, Beckman M, Grant A, et al. Venous Thromboembolism (VTE) Characteristics among White-and Black-Americans: a Cross Sectional Study. Published online 2008.
19. Romero A, Alonso C, Rincón M, et al. Risk of venous thromboembolic disease in women: A qualitative systematic review. *Eur J Obstet Gynecol Reprod Biol.* 2005;121(1):8-17.
20. Kesieme E, Kesieme C, Jebbin N, Irekpita E, Dongo A. Deep vein thrombosis: a clinical review. *J Blood Med.* 2011;2:59.
21. Bates SM, Ginsberg JS. Pregnancy and deep vein thrombosis. In: *Seminars in Vascular Medicine.* Vol 1. Copyright© 2001 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New ...; 2001:97-104.
22. Zakai NA, McClure LA. Racial differences in venous thromboembolism. *J Thromb Haemost.* 2011;9(10):1877-1882.
23. Lippi G, Franchini M, Montagnana M, Guidi GC. Genomics and proteomics in venous thromboembolism: building a bridge toward a rational personalized medicine framework. In: *Seminars in Thrombosis and Hemostasis.* Vol 33. © Thieme Medical Publishers; 2007:759-770.
24. Roberts LN, Patel RK, Chitongo P, Bonner L, Arya R. African–Caribbean ethnicity is associated with a hypercoagulable state as measured by thrombin generation. *Blood Coagul Fibrinolysis.* 2013;24(1):40-49.
25. White RH, Zhou H, Murin S, Harvey D. Effect of ethnicity and gender on the incidence of venous thromboembolism in a diverse population in California in 1996. *Thromb Haemost.* 2005;93(02):298-305.
26. Hansson P-O, Welin L, Tibblin G, Eriksson H. Deep vein thrombosis and pulmonary embolism in the general population: 'the study of men born in 1913'. *Arch Intern Med.* 1997;157(15):1665-1670.
27. Yap DFS, Clin Mp, Ng ZY, et al. Appropriateness of deep vein thrombosis (DVT) prophylaxis use among medical inpatients: a DVT risk alert tool (DRAT) study. *Med J Malaysia.* 2019;74(1):45.
28. Steffen LM, Folsom AR, Cushman M, Roasamond WD. Greater fish, fruit, vegetables intakes are related to lower incidence of venous thromboembolism. *Circulation.* 2007;115(2):188-195.
29. Bergqvist D. Geographical aspects of postoperative venous thromboembolism. *J Thromb Haemost.* 2005;3(1):26-27.
30. Pomp ER, Rosendaal FR, Doggen CJM. Alcohol consumption is associated with a decreased risk of venous thrombosis. *Thromb Haemost.* 2008;99(01):59-63.
31. Mutalip MHBA, Kamarudin RB, Manickam M, Abd Hamid HAB, Saari RB. Alcohol consumption and risky drinking patterns in Malaysia: findings from NHMS 2011. *Alcohol Alcohol.* 2014;49(5):593-599.

Figure

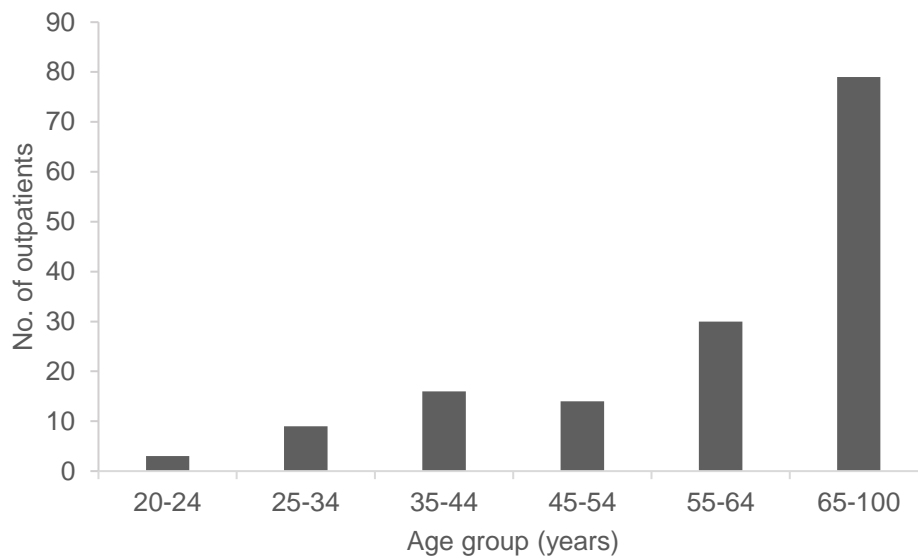


Figure 1: The frequency of outpatients with confirmed DVT according to age group.

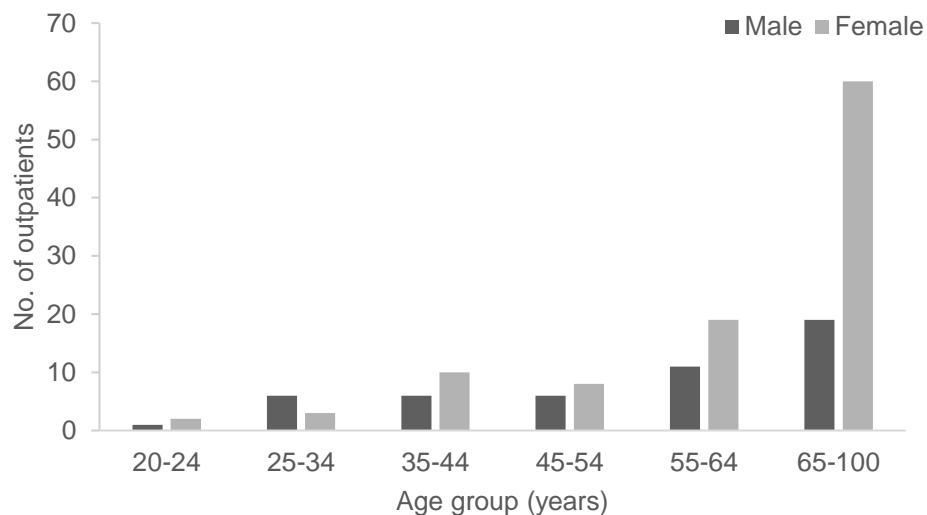


Figure 2: The distribution of female and male outpatients based on the age group.

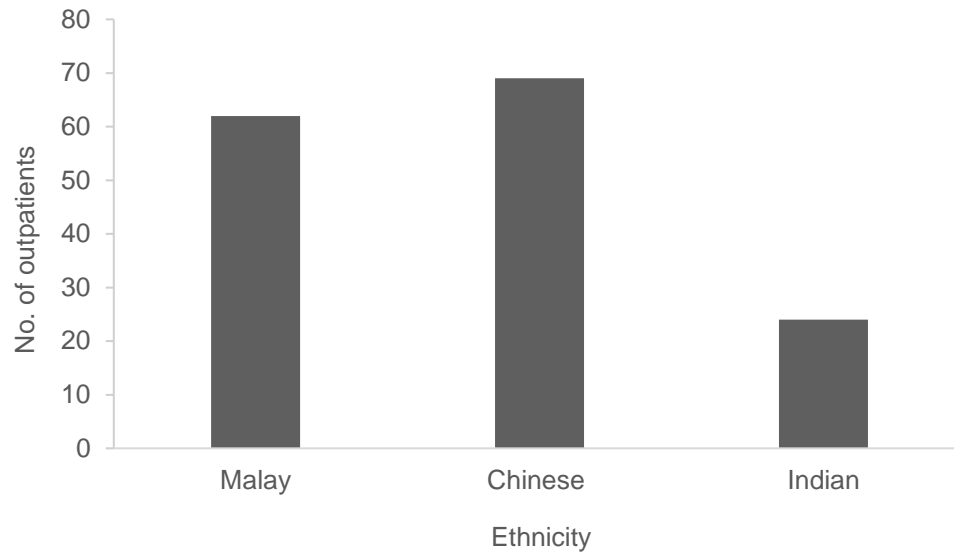


Figure 3: The number of outpatients based on ethnicity.

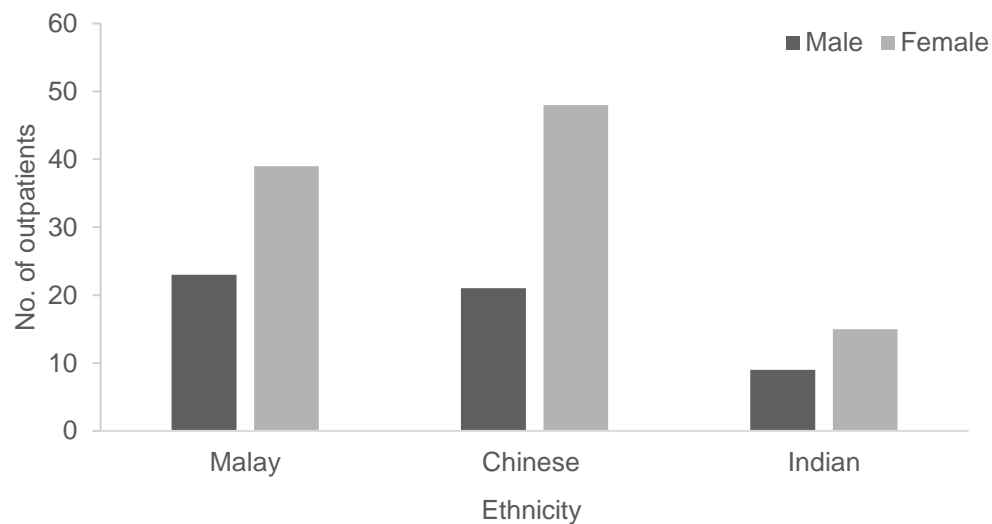


Figure 4: The difference between male and female outpatients based on ethnicity.