

Original Research Article

The incidence of symptomatic deep vein thrombosis and pulmonary embolism, following THA in patients, with postoperative chemoprophylaxis in Indian population

Sandeep Krishna Avulapati^{1*}, Senthil Kumar Mahalingam¹, T. Munirathnam¹,
Jagadeesh Gudaru², Karthik Gudaru¹

¹Assistant Professor, Director, ²Professor and HOD, Department of Orthopedics, BIRRD (T) Hospital, Sri Padmavathi Medical College for Women, Tirupati, Andhra Pradesh, India

Received: 16 October 2018

Revised: 01 November 2018

Accepted: 03 November 2018

*Correspondence:

Dr. Sandeep Krishna Avulapati,
E-mail: sundeepavulapati@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Deep vein thrombosis (DVT) and pulmonary embolism (PE) can occur in patients after elective total hip arthroplasties (THA). Indian population appears to have low incidence of DVT and PE in comparison with Western population due to difference in ethnicity, genetic make-up, social life styles. The study intends to find the incidence of symptomatic DVT and PE in postoperative THA patients. The aim of the study was to study the incidence of symptomatic DVT and PE, in post-THA patients in Indian Population.

Methods: Retrospective study conducted from 1st January, 2017 to 31st July, 2018 in BIRRD (T) Hospital. All patients who underwent THA are included, after fulfilling inclusion and exclusion criteria. Patients were evaluated for symptoms during the hospital stay and after discharge for 3 Months.

Results: Total number of patients who had THA were 447 (n=447). The symptomatic DVT was found in 1 (n=1) patient. He developed DVT (n=1) during the study period, in first 48 hours postoperatively and recovered with ICU management. The same patient showed symptoms of PE but recovered fully. All patients were on a prophylactic regimen.

Conclusions: Our results suggest incidence of DVT and PE are low in the Indian population with a prophylactic regimen.

Keywords: Deep vein thrombosis, Pulmonary embolism, Prophylaxis, Total hip arthroplasties, Venous thromboembolism

INTRODUCTION

Deep vein thrombosis and pulmonary embolism are life-threatening complications from elective joint replacements in the Western world. At about 300000-600000 admissions occur into hospitals every year in the United states due to DVT and pulmonary embolism and resultant mortality at 50000 patients yearly.¹ incidence of postoperative DVT for hip arthroplasties is 0.15%, lower than knee arthroplasties (0.22%) and fracture hip surgeries (0.16%).²

In India the incidence of DVT in THA is 2.97% (3/101).³ Orthopedic surgeries contributes at about 22% of DVT cases in all surgical procedures.⁴ The incidence of DVT and PE appears to be low in our study, may be because of genetic makeup and lifestyle differences. Indian population is mostly rural (2/3 of the population live in villages, with the farming as main occupation, belong to poor socioeconomic status. They do have a physically demanding lifestyle and present at a late age with primary osteoarthritis of knee than primary osteoarthritis of hip.⁵ Patients who present to our institute are from rural

background. Presence of risk factors of DVT and PE is less in rural population than urban population like sedentary lifestyle 3.3% to 13.7%, smoking 13.4% to 19.2%, obesity 5.4% to 12.7%, diabetes 10% to 14.4%.⁶

Most of the cases presented to us are due to secondary osteoarthritis of hip, where primary osteoarthritis is very rare here. This is because of anatomical and mechanical perfection of joint in Indian population and absence of continuous stress on hip joint in full extension as seen in Western population.⁷ Secondary osteoarthritis of hip in Indian population is due to idiopathic avascular necrosis of hip, local trauma, hip dysplasia, aseptic necrosis, inflammation mainly tuberculosis, congenital subluxation, slipped capital femoral epiphysis, Perthe's and metabolic disorders.⁸

The incidence of osteoarthritis of hip in US population ranges from 65-74 years (with median age 70 years), while in the India it is 45-88 years (with median age 47 years).⁹⁻¹¹ Based on the differences between the two populations, we do expect the incidence of DVT and Pulmonary embolism are low because of the low mean age, in Indian scenario. Moreover, medicines used as a prophylactic measure are costly and their use is limited in Indian population due to lack of adequate health facilities in a rural set-up, poor socioeconomic conditions, illiteracy here. Results of various studies conducted in India shows variable incidence because of small sample sizes. Hence we have performed a study with a large sample size to ascertain the more accurate incidence of DVT and PE in the Indian population.

Clinical diagnosis

Patients were diagnosed clinically based on symptoms like pain not controlled with analgesics and pain on dorsiflexion of the foot (Homans' sign), swelling of lower limb, discomfort and discoloration of extremity, erythema of lower limb, pulselessness of the lower limb. Patients with PE are diagnosed clinically by tachypnea, tachycardia, dyspnoea, chest discomfort, and acute onset of pleuritic chest pain, cough and fever.⁴ DVT cases present the second day to 6th postoperative weeks, where PE presents in first postoperative week.⁴

Treatment

In India use of anticoagulant medication is the mainstay in the treatment of VTE where 5 days of subcutaneous anti coagulation therapy followed by long-term (3 months) of vitamin K antagonist orally.⁴

NICE recommendation:

1. Low molecular weight heparin for 10days and aspirin (75/150 mg) for 28 days.
2. Low molecular weight heparin for 28 days and anti embolism stockings for discharge.
3. Rivaraxobarin – 28 days.

METHODS

This was a retrospective study. All THA patients who underwent in BIRRD (T) hospital from 1st January, 2017 to 31st July, 2018 were included in the study. 447 patients were evaluated for the DVT symptoms postoperative during the course of the hospital stay up to 7 days and later post-discharge for 3 months.

Inclusion criteria

- All patients underwent THA in the BIRRD (T) Hospital.
- Complex primary and Revision THA surgeries.

Exclusion criteria

- History of venous thromboembolism.
- Varicose veins.

Patients on admission were evaluated for hypertension, diabetes, smoking, malignancy. Those patients with a history of thromboembolism were excluded from the study. Patients were evaluated in cardiology, anaesthesiology departments prior to surgery, regarding advice for fitness for procedure.

We follow the following Protocol for Chemoprophylaxis for DVT, in BIRRD (T) Hospital for the THA patients.

Intra-operatively we are not using mechanical devices such as calf pumps, compression stockings during the procedure, due to cost implication, and low incidence. Up to 24 hours of surgery no anticoagulation therapy started, due to presence of epidural catheter for pain relief and postoperative mobilization. After 24 hours of surgery, we start low molecular weight heparin for 5 days or to the day of discharge (whichever is the last) after removal of epidural catheter (6 hours after removal of epidural catheter). Due to practical reasons, we don't recommend continuation of LMV heparin at home. Ankle and calf exercises started soon after surgery. Quadriceps, and hamstrings exercises, ROM of ankle, and knee movements, hip abduction exercises, and partial weight bearing walking exercises on the first postoperative day. Mobilization of patients with walker support with full weight bearing walk started from the 2nd postoperative day. From the day of discharge, we switch over to oral anticoagulant tab Rivaroxaban 15 mg twice daily for 14days from the 8th postoperative day."

Patients were evaluated for DVT symptoms such as Homans' sign, ankle and leg swelling, prominence of veins, discoloration of the skin, and erythema of skin, pulselessness of the lower limb, fever and respiratory symptoms (dyspnoea, chest discomfort, and pain) for pulmonary embolism. Patients were followed up at 6 weeks, 3 months thereafter. They were evaluated for symptoms during these visits.

Statistical analysis

The incidence of symptomatic deep vein thrombosis, and pulmonary embolism were calculated through simple statistical analysis accordingly.

RESULTS

In our study, we have included at about 447 patients in our study. There were 298 male and 149 female patients. The average age of patients in our study is 48 years (male=47 years and female=49 years). Patients undergoing right THA are 219 and left THA are 218. There is no significant difference between right and left THA in male and female population.

In our institute, we don't take up bilateral THA, in order to prevent postoperative complications which may increase than single THA surgeries. We do see that the gap between two THA is at about 6 months or more. Of these 447 surgeries, 22 patients had complex and revision THA with M series, use of cage for protrusio acetabuli, hybrid fixations. Average operating time for THA is 105 minutes (90-120 minutes) with higher time towards

Revision and complex THA. Post surgery we do checkup lower limb pulses, SpO₂ as a part of Institute protocol. We use intrarticular drains during the procedure were estimated blood loss is at about 200ml during surgery and less than 200 ml post surgery. Drains are removed after 24 hours of the procedure.

In our study, the incidence of symptomatic DVT is 0.22% (1 out of 447 patients) and PE 0% (0 out of 447 patients). Mortality incidence is about 0% (0 deaths over 447 patients). Morbidity is negligible 0% (0/447). The reported number of DVT cases in our study is 1 with 0 PE patients. Number deaths reported in our study are 0. Patient presented with complaints of abnormal pain and swelling of left lower limb. On examination, there was pulselessness, discoloration, erythema of lower extremity. Patient had tachycardia, tachypnea, breathlessness and was immediately shifted to cardio-thoracic unit, where he was diagnosed to have popliteal vein thrombosis with decreased flow in saphenous vein in color Doppler. Later he was managed in the same department. Patient had recovered from the episode in a week, mobilized thereafter as per protocol. At present he is able to carry out his activities of daily living.

Table 1: Showing no of patients (male and female), average age, no. of right and left THA done.

Sex	No of patients	No of primary THR	Revision and complicated surgeries	Average age (years)	RT THA N (%)	LT THA N (%)	Bilateral who underwent at later date the other hip
Male	298	281	17	47 years	150 (7)*	148 (10)*	2
Female	149	144	5	49 years	69 (3)*	80 (2)*	2
Total	447	425	22	48 years	219 (10)*	228 (12)*	4

(*) value in brackets shows complicated THA.

Table 2: Showing incidence of DVT, PE and morbidity and mortality in male, female and total number of patients in our study.

Sex	Deep vein thrombosis N (%)	Pulmonary embolism N (%)	Morbidity N (%)	Mortality N (%)
Male	1 (0.22)	0 (0)	0 (0)	0 (0)
Female	0 (0)	0 (0)	0 (0)	0 (0)
Total	1 (0.22)	0 (0)	0 (0)	0 (0)

(Values in brackets shows incidence in that group).



Figure 1: Showing color Doppler report with diminished blood flow in left popliteal vein of the THR patient.

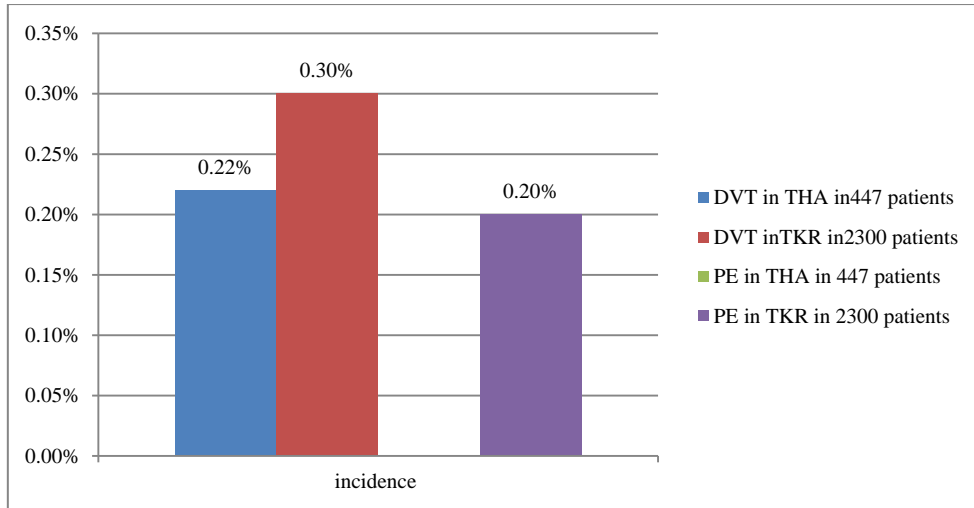


Figure 2: Frequency columns showing incidence of symptomatic DVT and PE in comparison with THA and TKA in our Institute with sample sizes.

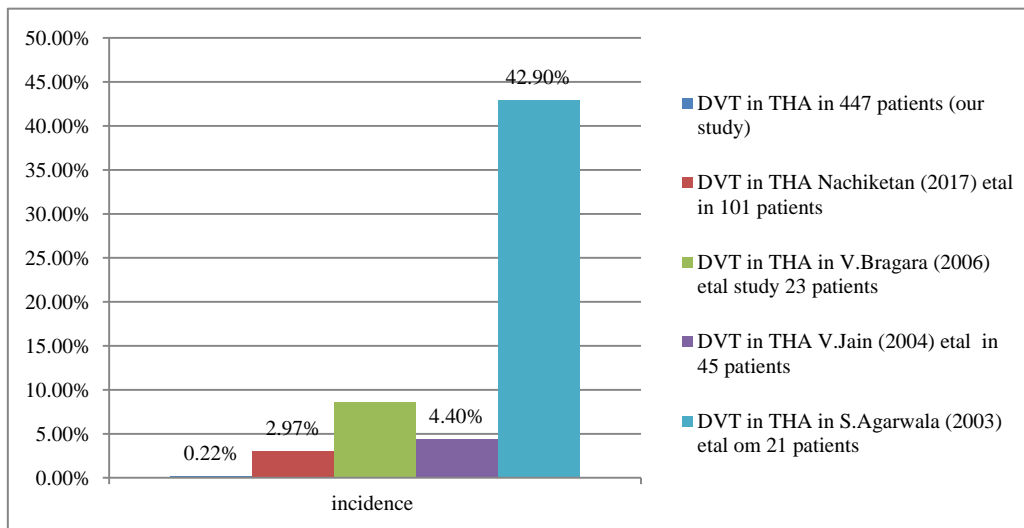


Figure 3: Frequency columns showing, incidence of symptomatic DVT of our study in comparison to other Indian studies with their sample sizes.

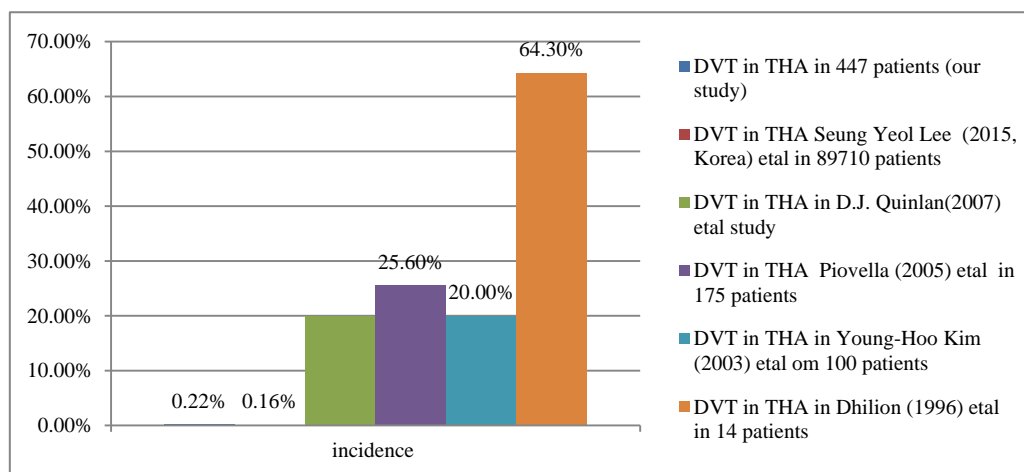


Figure 4: Frequency columns showing incidence of symptomatic DVT in our study in comparison to other Asian studies with their sample sizes.

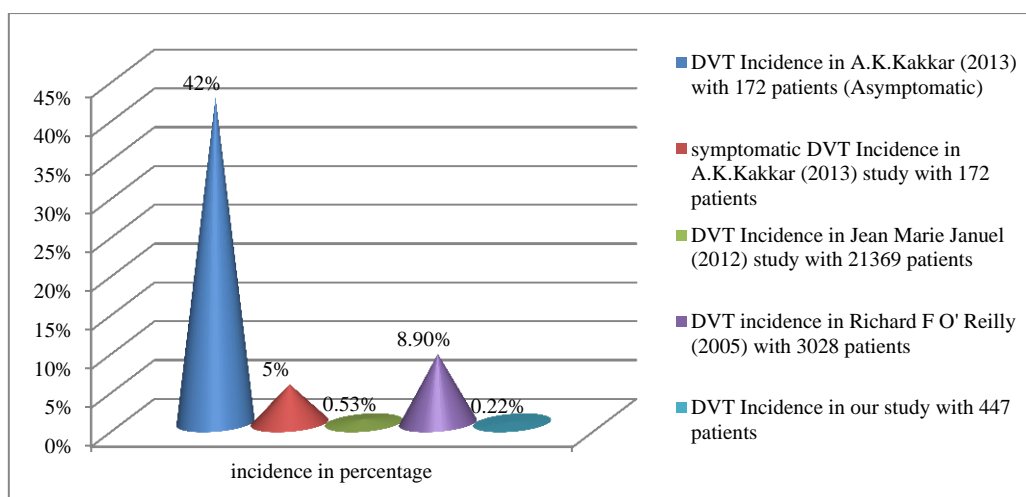


Figure 5: Frequency cylinders showing incidence of symptomatic DVT in our study in comparison to studies conducted in other parts of world with sample sizes.

Table 3: Showing incidence in various parts of India, Asia, World with their sample size, year of study.

Study	Incidence	Sample size	Year	Region
Indian studies				
Nachiketan et al ³	2.97%	101	2017	India
Bagaria et al ¹²	8.6%	23	2006	India
Jain et al ¹⁰	4.4%	45	2004	India
Agarwala et al ¹⁴	23.1% (with prophylaxis) and 42.9% (without prophylaxis)	13 (with prophylaxis) and 21 (without prophylaxis)	2003	India
Other Asian studies				
Lee et al ²	0.16%	89710	2015	Korea (Asia)
Quinlan et al ¹⁶	20% (1 symptomatic)	5 (asymptomatic)	2007	Asia
Piovella et al ²⁰	25.6%	175	2005	Multi ethnic study (Asia)
Kim et al ¹²	26% (bilateral THA) 20% (unilateral THA)	100 (bilateral) 100 (unilateral)	2003	Korea
Dhilion et al ¹⁹	64.3%	9 out 14 THA	1996	Malayasia
Other parts of world				
Kakkar et al ¹⁷	42-57% (asymptomatic) 2-5% (symptomatic) 0.33% (fatal PE)	172 (without prophylaxis)	2013	England
Januel et al ¹⁸	0.53% (0.35-0.70%)	21369 (38 studies)	2012	Europe
O'reilly et al ²¹	8.9% (263)	3028	2005	Australia

DISCUSSION

Here in our Institute, we do perform 2-3 THA per day, 6 days a week, more than 300 cases year. We do have our own customized thromboprophylaxis protocol. Our Institute is Charity Institute with THA performed free of cost in most of the cases. This is because we have patients who are from rural background, farming community, low socio-economic status, with minimal primary health care at the village, most of the population uneducated. Patients are given LMV Heparin injections 6 hours after epidural catheter removal, up to 5 days or to the day of discharge (whichever is the last). They will be

discharged with oral Rivaroxaban 15 mg twice daily for 14 days. Patients were started oral, as per reasons mentioned above, and it is very easy for them to take medications orally than having subcutaneous heparin injections. Patients were examined for DVT and PE symptoms throughout stay in the hospital. We don't take up simultaneous Bilateral THA as there is increase in incidence of DVT and PE in Bilateral THA (26%) than that of Unilateral THA (20%) was shown in the study by Kim et al.¹² The other reasons being longer operating time, large amount of blood loss during surgery and post operatively through intra-articular drains, chances of

infections, difficulty and delay in postoperative recovery and rehabilitation.

Our incidence of DVT is 0.22% is low when compared with other studies 2.97% by Nachiketan et al, 8.6% by Bagaria et al, and 4.4% by Jain et al.^{3,10,13} Previously it was thought that incidence of DVT was high in Western population due to their Genetic makeup, lifestyle, and food habits when compared to Indian population. This is due to paucity of data and absence of clinical material in India. Present studies by Agarwala et al, show variable incidence in the Indian population (i.e. incidence in patients with and without prophylaxis being 23.1% (n=13) and 42.9% (n=21) respectively).¹⁴ Shortcoming our study is that we may have missed large asymptomatic, diagnosed only USG, venography, Doppler and other investigations.

The incidence of symptomatic DVT to asymptomatic DVT is low as shown in the following studies. In the study conducted by Sun et al, incidence of symptomatic DVT is 3.7% (20 out 537) to asymptomatic DVT 11.2% (60/537).¹⁵ In study by Quinlan et al, study ratio of symptomatic to asymptomatic is 1:5 (i.e., is one out 5 asymptomatic DVT patients become symptomatic DVT) in THA patients.¹⁶

In a study, by Kakkar et al, shows that incidence (n=172) of asymptomatic DVT, symptomatic DVT, and fatal PE are 42-57%, 2-5%, and 0.33% respectively in absence of prophylaxis. Here the ratio of symptomatic to asymptomatic DVT is very low.¹⁷

Data of 21369 THA patients (citation from 38 studies were included) conducted across from January 1st, 1996 to September 30th, 2011 (collected across Medline, Embase and Cochrane library), shows symptomatic VTE occurred in 155 postoperative patients (pooled incidence 0.53%) and pulmonary embolism in 93 patients (pooled incidence 0.14%). All the patients in the study were on chemoprophylaxis.¹⁸ Study also reveals that one out of 200 patients undergoing THA might present with VTE before discharge from the hospital.

Incidence in our study 0.22% (1/447) is comparable with some studies and grossly different from other studies done in Asian population like 0.16% by Lee et al, 64.3% by Dhillon et al, 26% (bilateral THA) and 20% (unilateral) by Kim et al, 25.6% by Piovella et al.^{2,12,19,20}

In the Table 3 data shows different incidences between Western, Asian and Indian population. Incidence varies with geographical region, ethnicity, and possible genetic make-up of the population. The incidence of DVT and PE after THA in India is variable in published literature. We do infer that chemoprophylaxis protocol followed in the Western countries may not applicable for Indian population, because of low incidence of DVT and PE. A customized chemoprophylaxis is followed in our Institute for patients after THA which is effective and patient friendly. The efficacy of Mechanical prophylaxis in

prevention of DVT and PE is questionable in our population.

Postoperative rehabilitation protocol for THA patients in our Institute also contributes to low incidence. Our dedicated physiotherapy team starts ankle and calf exercises immediately postoperatively. Patients were started quadriceps and hamstrings exercises, knee and ankle ROM exercises, within 24 hours, followed by weight bearing exercises with walker support within 48 hours. The chemoprophylaxis protocol, are similar in dose and duration to postoperative TKA patients post operatively. Physiotherapy protocol also includes mobilization as early as possible.

CONCLUSION

We in our Institute do follow customized chemoprophylaxis protocol to meet the needs and requirement of our patients. The chemoprophylaxis protocol was developed by our institution which caters the patient needs; keeping in the mind of their limitation (large rural background, poor socioeconomic status, minimal primary health care at the village) is easy to follow. The low incidence of DVT and PE in our study may be due to patient from active rural background, with farming as main occupation (physically demanding life style), ethnicity and geographical consideration. In view of variable results of incidence of DVT and PE from different regions of the world, separate studies with large sample size need to be conducted to understand the influence of mechanical and chemical prophylaxis and titrate the treatment regimen to suit the needs of local population without comprising the incidence of DVT and PE. This will help in optimal and judicious use of available resources for prevention of DVT and PE in THA patients.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. No authors enlisted. Prevention of venous thrombosis and pulmonary embolism. NIH Consensus Development. *JAMA.* 1986;6(2):1-8.
2. Lee SY, Ro DH, Chung CY, Lee KM, Kwon SS, Sung KH, et al. Incidence of DVT after major lower limb orthopedic surgery: Analysis of nationwide chain Registry. *Yonsei Med J.* 2015;56(1):139-45.
3. Nachiketan Dore K, Gopi M, Sathish Devadoss, Devadoss A. Incidence of post-operative deep vein thrombosis in patients undergoing joint replacement surgeries of lower limb. *Int J Orthop Sci.* 2017;3(3):140-4.
4. Kamekar DR, Joseph J, Desai SC, Dsilva LC, Joglekar SJ. Arrive: A retrospective registry of

- Indian patients with venous thromboembolism. *Indian J Crit Care Med*. 2016;20(3):150–8.
5. Pal CP, Singh P, Chaturvedi S, Pruthi KK, Vij A. Epidemiology of knee osteoarthritis in India and related factors. *Indian J Orthop*. 2016;50(5):518–22.
 6. Junapudi SS, Rao BB. A comparative study of cardiovascular disease risk factors among urban and rural population South Indian city. *Int J Community Med Public Health*. 2017;4(12):4623-5.
 7. Mukhopadhaya B, Barooah B. Osteoarthritis of hip in Indians. An anatomical and clinical study. *Ind J Orthop*. 1967;1:55-62.
 8. Chauhan R, Paul S, Dhaon BK. Primary osteoarthritis of hip joint in Indians A cadaveric study. *Indian J Orthop*. 2002;36:7.
 9. Losina E, Weinstein AM, Reichmann WM, Burbine SA, Solomon DH, Daigle ME, et al. Lifetime risk and age of diagnosis of symptomatic knee osteoarthritis in the US. *Arthritis Care Res (Hoboken)*. 2013;65(5):10.
 10. Jain V, Dhaon BK, Jaiswal A, Nigam V, Singla J. Deep vein thrombosis after total hip and knee arthroplasty in Indian patients. *Postgrad Med J*. 2004;80:729–31.
 11. Pachore JA, Vaidya SV, Thakkar CV, Bhalodia HKP, Wakankar HM. ISHKS joint registry:A preliminary report. *Indian J Orthop*. 2013;47(5):505–9.
 12. Kim YH, Oh SH, Kim JS. Incidence And Natural History Of Deep-Vein Thrombosis After Total Hip Arthroplasty. *J Bone Joint Surg [Br]*. 2003;85:661-5.
 13. Bagaria V, Modi N, Panghate A, Vaidya S. Incidence and risk factors for development of venous thromboembolism in Indian patients undergoing major orthopedic surgery: Results of a prospective study. *Postgrad Med J*. 2006;82:136–9.
 14. Agarwala S, Bhagwat AS, Modhe J. Deep vein thrombosis in Indian patients undergoing major lower limb surgery. *Indian J Surg*. 2003;65:159–62.
 15. Sun Y, Chen D, Xu Z, Shi D, Dai J, Qin J, et al. Incidence of Symptomatic and Asymptomatic Venous Thromboembolism After Elective Knee Arthroscopic Surgery: A Retrospective Study With Routinely Applied Venography. *Arthroscopy*. 2014;30(7):818-22.
 16. Quinlan QJ, Eikelboom JW, Dahl OE, Eriksson BI, Sidhu PS, Hirsh J. Association between asymptomatic deep vein thrombosis detected by venography and symptomatic venous thromboembolism in patients undergoing elective hip or knee surgery. *J Thrombosis Haemostasis*. 2007;5:1438–43.
 17. Ajay Kakkar K, Sophie K, Smith R. Incidence of venous thromboembolism in orthopedic surgeries. London: Springer-Verlag; 2013.
 18. Januel JM, Chen G, Ruffieux C, Quan H, Douketis JD, Mark A, et al. Symptomatic In-Hospital Deep Vein Thrombosis and Pulmonary Embolism Following Hip and Knee Arthroplasty Among Patients Receiving Recommended Prophylaxis. *JAMA*. 2012;307(3):294-303.
 19. Dhillon KS, Askander A, Doraisamy S. Postoperative deep vein thrombosis in Asian patients is not a rarity. *J Bone Joint Surg. (Br)*. 1996;78:427–30.
 20. Piovella F, Wang CJ, Lu H, Lee K, Lee LH, Lee WC, et al. Deep-vein thrombosis rates after major orthopedic surgery in Asia. An epidemiological study based on postoperative screening with centrally adjudicated bilateral venography. *J Thromb Haemost*. 2005;3(12):2664-70.
 21. O'Reilly RF, Burgess IA, Zicat B. The prevalence of venous thromboembolism after hip and knee replacement surgery. *MJA*. 2005;182:154–9.

Cite this article as: Avulapati SK, Kumar MS., Munirathnam T. The incidence of symptomatic deep vein thrombosis and pulmonary embolism, following THA in patients, with postoperative chemoprophylaxis in Indian population. *Int J Res Orthop* 2019;5:92-8.