

Variation of Pattern of Superficial Veins in Cubital Fossa of the Nepalese Blood Donors in Blood Bank of a Tertiary Care Hospital

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Abstract

The superficial veins present on the roof of cubital fossa, are usually used for collecting blood for various laboratory tests, venesection or blood transfusion and intravenous therapy in various diseased conditions of human body. Various connections and anastomosis form different patterns of veins over the fossa. This study was conducted to see different patterns of superficial veins in the cubital fossa of blood donors.

One hundred and five apparently healthy blood donors were enrolled in the study under the collaboration with the Blood bank, NMCTH. Using the references of published articles and standard books of Anatomy, the venous patterns of the participants were categorized as H pattern, I pattern, M pattern and N pattern.

The present study investigated the different patterns of superficial veins of cubital fossa in Nepalese blood donors. Four different patterns were observed H, I, M, and N. Some uncommon patterns were also observed. M pattern was the commonest venous pattern followed by N pattern. Significant differences were observed on patterns of veins on gender wise comparison (P value 0.03). In the age group between 18 to 30 and 31 to 45 the most common pattern was M. No significant differences were observed in comparison of ethnicity and different pattern of veins (P value: 0.08).

M pattern was found to be the most common pattern in both genders followed by N pattern. The patterns of superficial veins of the cubital fossa did not show any significant variations in ethnicity wise distribution of the participants.

Keywords: Blood donors, Cubital fossa, Superficial veins, Venesection

Introduction

Veins are grouped into superficial and deep but these are widely interconnected, both groups have valves, which are numerous in deep veins. The superficial veins are close to the surface of the body that is they are subcutaneous in the superficial fascia; it is used to differentiate from the deep veins.¹ The cubital fossa is seen superficially as a depression on the anterior aspect of the elbow. Deeply, it is a space filled with a variable amount of fat anterior to the most distal part of the humerus and elbow joint.²

There are numerous superficial veins that can be visualized prominently on the surface of the skin overlying cubital fossa when tourniquet is applied firmly on the flexor surface of arm. The superficial veins are identified as cephalic vein (CV), Basilic Vein (BV), Median Cephalic Vein (MCV), Median Basilic Vein (MBV), Median Antebrachial Veins (MABV) and their smaller tributaries by their normal anatomical location. Various connections and anastomosis are found between these veins forming various types of patterns (eg: M pattern, N pattern, H pattern etc) over the fossa.³

The cephalic and basilica veins run lateral and medial side of the forearm respectively. The cephalic vein gives off the median cubital vein which receives a communicating branch from the deep vein of the forearm and passes medially to join the basilica vein.⁴

The superficial veins present on the roof of cubital fossa, are usually used for collecting blood for various laboratory tests, venesection or blood transfusion and intravenous therapy in various diseased conditions of human body. It is also an alternate for making arterio-venous fistula in patients undergoing end stage renal disease.⁵ The superficial veins of the forearm undergo variations like the veins of the other parts of the body.⁶ This research was conducted to see those different types of patterns in arrangements of these superficial veins. The anatomical knowledge regarding these variations and their exact location is very important to health personals trying their hands on above mentioned clinical procedures in the laboratory, health camps, blood donation camps, inpatient departments and in the emergency department.

Materials and methods

This was a descriptive and observational study in a tertiary care hospital of National Medical College and Teaching Hospital (NMCTH), Birgunj, Nepal. One hundred and five apparently healthy blood donors were enrolled in the study under the collaboration with the Blood bank, NMCTH. The blood donors visiting blood bank and fulfilling the inclusion criteria were enrolled for the study using purposive sampling technique. Detailed history of patients along with age, gender and ethnicity were recorded in the proforma after getting their verbal and written consent. Study duration was six months (August 2019 to March 2020). Ethical clearance was obtained from Institutional Review Committee (IRC), National Medical College and Teaching Hospital (NMCTH).

After taking consent of the blood donors, a tourniquet was used to make the vein prominent. The photograph of the cubital fossa was then taken to see the superficial venous patterns of the cubital fossa. Using the references of published articles and standard books of Anatomy, the venous patterns were categorized as H pattern, I pattern, M pattern and N pattern. Those venous patterns which are not under these categories were recorded as “others”.

Statistical analyses

All the data were entered in the Microsoft Excel 2010, converted to SPSS version 22 accordingly. Data were expressed in frequency and percentage. All the data from proforma was entered in Microsoft Excel version 2010 and converted into SPSS version 22 for statistical analyses. Frequency and percentage were calculated for descriptive statistics. Chi square test was applied to compare the categorical variables. P value <0.05 was considered as statistical significant.

Inclusion Criteria:

1. All the blood donors with prominent superficial veins of cubital fossa
2. Adult donors (18 to 60 years old)
3. All blood donors who were screened to donate blood
4. All the donors who were willing to participate in the study

Exclusion Criteria

1. Cubital fossa with less prominent veins (Obese donor)
2. Age group below 18 and above 60
3. Cubital fossa with any deformities
4. The donors who gave consent to the study

Results

In the present study, four major types of superficial venous patterns of the cubital fossa were observed namely M type, N type, H type and I type and those superficial venous patterns not falling in above category were recorded as other patterns as shown in table.

Table 1: different types of venous patterns in the cubital fossa (n=105)

S.No.	Type of Patterns of Veins	Observations
1	M Pattern	MABV divides into MCV and MBV which joins CV and BV respectively
2	N Pattern	MCV arises from CV and passes obliquely upwards to medial side to join the BV
3	H Pattern	Presence of the horizontal venous connection between CV and BV
4	I Pattern	MABV and its branches establishing connections with BV only
5	Other Patterns	Superficial Veins Patterns other than above

[MABV: Median Antebrachial Vein, MBV: Median Basilic Vein, BV: Basilic Veins, MCV: Median cephalic Vein and CV: Cephalic Vein]

Then, distributions of blood donors were done according to their gender. The male blood donors were 59, contributes 56.2% of the participants and female blood donors were 46 contributing 43.8% of the participants as depicted in the Pie chart M pattern was the most common pattern of the vein among 105 blood donors contributing 36(34.28%) on the basis of patterns of veins (shown in figure 2) followed by N pattern 28, I pattern and others were contributed equally having 15 frequencies on each type.

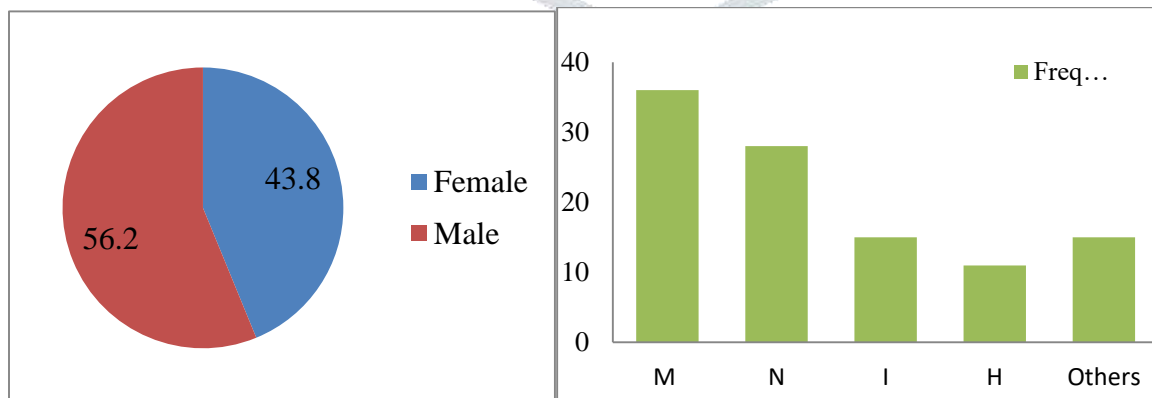


Figure 2: gender wise distribution of blood donors (n=105)

Figure 1: different patterns of veins observed on the blood donors (n=105)

H type was found to be least common in our study. Then, comparison of M, N, I, H and others pattern were done in both male and females by calculating the row percentage, as depicted in table 2. Significant differences were observed on patterns of veins and gender wise comparison (P value 0.03). M pattern was predominant in both genders followed by N patterns. I pattern was common in male and less common in female. H pattern was common in female in comparison to male participants.

Table 2: comparison of patterns of veins on the basis of gender (n=105)

Gender	Patterns of Veins					P Value
	H Pattern	I Pattern	M Pattern	N Pattern	Others	
Female	8(17.4%)	2(4.3%)	17(37.0%)	14(30.4%)	5(10.9%)	0.03
Male	3(5.1%)	13(22%)	19(32.2%)	14(23.7%)	10(16.9%)	

Then, age wise comparisons of different patterns of veins were done as depicted in table 3. No significant differences observed on patterns of veins and different age groups. As the blood donors between 18 to 60 years old age group were enrolled for the study. The age groups were categorized as 18 to 30, 31 to 45 and 46 to 60. In the age group between 18 to 30 and 31 to 45 the most common pattern being the M followed by N pattern, whereas in the age group between 46 to 60 the most common pattern being the N pattern followed by M pattern whereas no any veins having H, I and others were observed. All the patterns were H, I, M and N in the age group 31 to 45 in our study. The majority of the blood donors were from the Parsa district, Birgunj, Province number two hence the address was categorized into Parsa and other districts including Siraha, Saptari, Dhanusa, and Mahottari districts as others, as shown in the figure 3. M pattern was the common pattern for participants belonging to Parsa district and other districts.

Table 3: age wise comparisons of different patterns of veins (n=105)

Age Group (Years)	Pattern of Veins					P value
	H Pattern	I Pattern	M Pattern	N Pattern	Others	
18-30	8(9.6%)	12(14.5%)	28(33.7%)	20(24.1%)	15(18.1%)	0.48
31-45	3(15.8%)	3(15.8%)	7(36.8%)	6(31.6%)	0	
46-60	0	0	1(33.3%)	2(66.7%)	0	

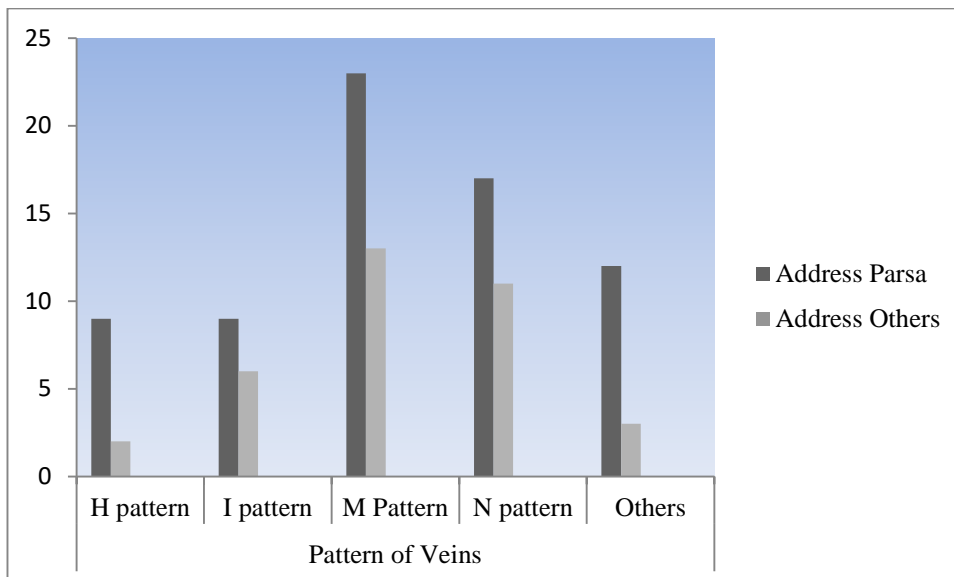


Figure 3: comparison of venous pattern between parsa and other districts (n=105)

Majority of the population were of Bhojpuri and Maithili ethnicities in this region. So we had categorized the study subjects into Bhojpuri, Maithili and other ethnic groups including Brahmin, Chhetri, and Newar etc.

In the Bhojpuri ethnic group, M and N pattern contributed equally 25% on each followed by I pattern, then “others” and H pattern. In the Maithili ethnic group, M pattern was common followed by N pattern, I pattern and H pattern. M pattern was also predominant in other ethnic groups as well followed by N pattern. Patterns other than H, I, M and N were also abundant in other ethnic groups contributing 21.4% by row percentage. However, no statistically significant differences were observed in comparison of ethnicities with different patterns of superficial patterns of veins among 105 participants of our study.

Table 4: ethnicity wise comparison of venous patterns (n=105)

Ethnicity	Pattern of Veins					P value
	H Pattern	I Pattern	M Pattern	N Pattern	Others	
Bhojpuri	5(13.9%)	7(19.4%)	9(25%)	9(25%)	6(16.7%)	0.08
Maithili	1(3.7%)	6(22.2%)	11(40.7%)	9(33.3%)	0	
Others ethnic groups	5(11.9%)	2(4.8%)	16(38.1%)	10(23.8%)	9(21.4%)	

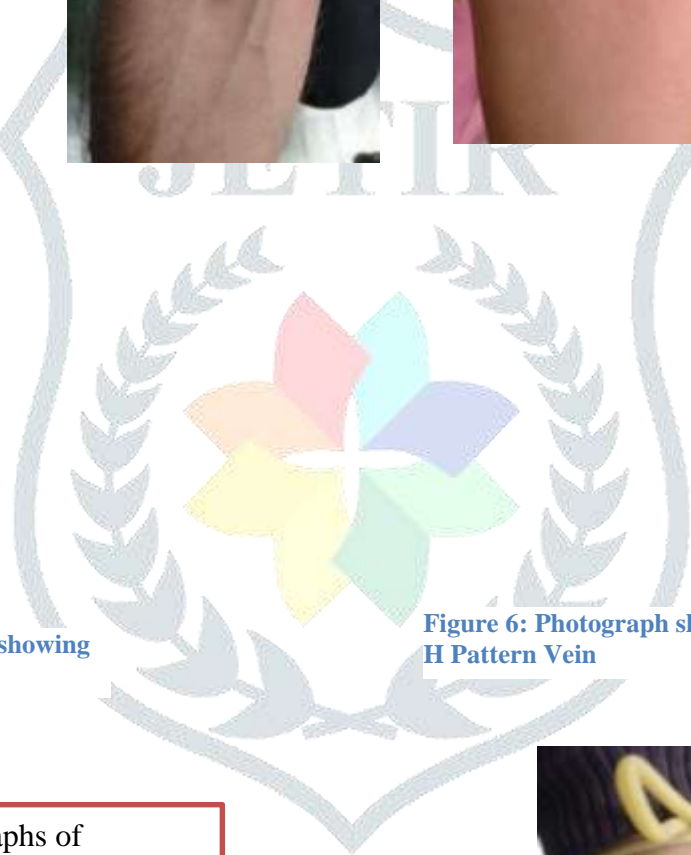


Figure 4: Photograph showing
Pattern Vein

Figure 6: Photograph showing
H Pattern Vein



Representative Photographs of
Different Patterns of Superficial Veins
in Cubital Fossa of Participants



Figure 7: Photograph showing I
Pattern Vein

Figure 8: Photograph showing
Others Pattern Vein

Discussion

The present study, investigated the superficial venous patterns of the cubital fossa of one hundred and five blood donors in a tertiary care hospital of National Medical College and Teaching Hospital (NMCTH), Parsa, Province number two of Nepal. The photographs of the cubital fossa showed five different patterns of superficial veins that are H pattern, I pattern, M pattern, N pattern and “others” for other than aforementioned patterns.

Our study revealed, the most common pattern of veins was “M pattern” followed by “N pattern” in comparison to other patterns. H pattern was the less common pattern and I and others contributed equally in Nepalese blood donors in our study population. A study in adult Nigerians by Ukoha AA et al reported M patterns as the most common pattern among one hundred and thirty five subjects.⁵ Some authors reported the patterns A to F in their study subjects.⁷ A study by Vasuda TK, in Karnataka, India reported Type I to Type V patterns of veins on the basis of venous anastomoses in the cubital fossa.⁽⁸⁾ Similar to our study, Wasfi FA et al, reported M pattern as the common venous pattern out of six different patterns in Iraqis.³ Das M et al in Bihar reported that the most common pattern of vein was type A (resembling M alphabet) pattern which was different from the other studies conducted in India. They also reported ten types of different patterns. They arranged the patterns into six different types from type A to type F. Among three hundred and ninety six forearms examined most common pattern was type A (33.58%) followed by type E (27.02%).¹⁰

In the present study 56.2% participants were male and remaining 43.8% were female. In comparison of venous patterns in male and female revealed M pattern was found to be predominant in both the genders. In the male participants 32.2% have M patterns and 23.7% contributes for N pattern. In female participants M pattern (37%) was predominant followed by N pattern (30.4%). Our study also revealed the significant difference in patterns of veins and gender (P value: 0.03) unlike the study of Hamzah AA et al.⁹ Some authors reported A, B, C and E were more common in males while type F and D were higher in females.⁵ Some authors reported that the gender has an influence on the pattern of superficial veins on cubital fossa. Most of the patterns M, N, I and H have higher incidence in males than females. This could be due to the fact that superficial cubital veins are prominent in males than in females.³ We had enrolled the participants between the age group 18 to 60 years old. M pattern was the common pattern 28(33.7%) followed by N pattern 20(24.1%) in the age group between 18 to 30 years old. In the age group 31 to 45, the common pattern was M pattern 7(36.8%). There was no statistical significant difference of age group with patterns of the veins (P value: 0.48).

The enrolled participants were then categorized into Bhojpuri, Maithili and other ethnic groups according to their response on the proforma. No significant difference was observed in comparison of venous patterns and different ethnic groups in our population (P value: 0.08). However, M and N pattern contributed equally in Bhojpuri ethnicity twenty five percent on each pattern. In Maithili ethnic group and “other ethnic” groups M pattern was predominant. To the best of our knowledge, we did not find any literature studied on superficial venous patterns in Nepalese subjects. In a study of venous patterns in Malay, Chinese and Indian population author revealed that M pattern was the predominant venous pattern on the superficial cubital fossa.⁹

Conclusions

The understandings of the superficial veins of the cubital fossa are important, as these veins are used for the blood collection for the diagnostic purpose, blood donations and blood transfusion as well. Our study revealed four distinct patterns (H, I, M, N) and other uncommon patterns. There was significant difference between gender and pattern of superficial veins in cubital fossa. M pattern was found to be the most common pattern in both genders followed by N pattern. The patterns of superficial veins of the cubital fossa did not show any significant variations in ethnicity wise distribution of the participants.

Limitations

The illuminator devices were not used to visualize the veins. The study duration was short. Only one forearm, either right or left was used to visualize the superficial venous patterns of the cubital fossa depending on the prominence of the veins.

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Disclosure

The authors of this publication declare that there is no conflict of interests.

REFERENCES

1. Willams PL, Bannister LH, Berry MM et al. Gray's Anatomy. 38th Ed. Edinburgh UK: Churchill Livingstone; 1995
2. Moore KL, Dalley AF. Clinically Oriented Anatomy. 5th ed. Baltimore MD: Lippincott Williams; 2006
3. Wasfi FA, Dabbagh AW, Althari F, Salman S. Biostatistical Study on the Arrangements of Superficial Veins on the Cubital Fossa in Iraqis. *Acta Anat.* 1986; 126: 183–6.
4. Grant JCB. *A Method of Anatomy Descriptive and Deductive.* Baillier Tindall & Cox. London; 1948. 114 p
5. Ukoha U, Oranusi C, Okafor J, et al. Patterns of superficial venous arrangement in the cubital fossa of adult Nigerians. *Niger J Clin Pract.* 2013;16(1):104.
6. Stern JJ. Jr.(ed). *Essentials of Gross Anatomy.* Davis Philadelphia. First Indian Edition. 1990:589-590
7. Del Sol M, Vasquez B, Superficial Veins of Cubital Fossa, Anatomical, Clinical and Anthropological Aspects. *Int J. Morphol,* 2009;27(2):527-538
8. Vasudha TK. Study on Superficial Veins of Upper Limb. *National Journal of Clinical Anatomy.* 2013;2(4)204-208

9. Hamzah AA, Ramasamay S, Adnan AS, Khan AH. Pattern of Superficial Venous Arrangement of the Cubital Fossa Among volunteers in a Tertiary Hospital. Prop Med Surg. 2014;2(2):164
10. Das M, Pankaj P, kr Sah G. An Observational Study of Pattern of Superficial Cubital Veins Among Students of Rama University. Int J Anat Res. 2019 Aug 5;7(3.2):6835–40

