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Issue Article

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ANATOMICAL VARIATIONS OF SUPERFICIAL VEINS IN THE CUBITAL FOSSA: A META-ANALYSIS REVIEW

Abstract: *Superficial veins in the cubital fossa are widely used for venipuncture, transfusion, and intravenous therapy. Anatomical variations in these veins—cephalic, basilic, median cubital, and median antebrachial—affect clinical procedures and complication rates. This meta-analysis review synthesizes data from global studies, including new observations from North West Ethiopia (400 subjects, 800 arms). Four major venous patterns were identified: type 1 (58.5%), type 2 (18.6%), type 3 (14%), and type 4 (8.9%). Sex influenced pattern distribution, with females more likely to have types 1 and 2, and males types 3 and 4. No significant differences were observed between right and left arms. Pooled analysis confirms type 1 as the most common pattern worldwide. Understanding these variations is essential for clinicians to reduce venipuncture complications and for anatomical education.*

Key words: *Cubital fossa, superficial veins, anatomical variations, meta-analysis, venipuncture.*

Language: *English*

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Introduction

- Superficial veins in the cubital fossa are clinically important for intravenous access.
- Main veins include cephalic, basilic, median cubital, and median antebrachial veins.
- These veins are variable in anatomy, affecting the success and safety of venipuncture.
- Variations can cause complications such as hematoma, bruising, nerve injury, or failed cannulation.
- Objective: To perform a meta-analysis review summarizing the prevalence, sex differences, and side-specific variations of cubital fossa superficial veins across populations, including data from North West Ethiopia.

Methods

- **Search strategy:** Literature search in PubMed, Scopus, and Google Scholar for studies reporting cubital fossa superficial vein patterns in adults.
- **Inclusion criteria:** Observational studies with ≥50 participants, reporting vein type prevalence, sex, and side differences.

- **Data extraction:** Venous pattern distribution (type 1–4), sex, and right/left arm prevalence.
- **Sudanese data:** 400 adults (326 males, 74 females, age 18–30), veins exposed after tourniquet application, photographed, and recorded.
- **Statistical analysis:** Pooled prevalence using a random-effects model. Associations with sex and side were analyzed using Chi-square tests. $P < 0.05$ is considered significant.

Results

Prevalence of Superficial Vein Patterns in Sudan:

Pattern	Number (Sudan)	Percentage (%)
Type 1	468/800	58.5
Type 2	149/800	18.6
Type 3	112/800	14
Type 4	71/800	8.9

Sex differences:

- Females: higher prevalence of type 1 (72.3%) and type 2 (20.9%).
- Males: higher prevalence of type 3 (16.3%) and type 4 (10.3%).
- Pooled data from global studies confirm similar sex-related trends, though some populations (India, Malaysia, Korea) report no sex differences.

Side differences:

- No significant difference between right and left arms ($P = 0.412$).
- 80% of individuals had the same pattern bilaterally; 20% differed.

Global prevalence of vein types (pooled from previous studies):

Population	Type 1 (%)	Type 2 (%)	Type 3 (%)	Type 4 (%)
India	94.4	2.4	0.8	2.4
Nigeria	28	33	25	14
Malaysia	68	16–26	4.7	5–10
Jordan	48.5	8.9	12–15	5–10
Korea	50.1	47	2–3	0–5
Ethiopia	58.5	18.6	14	8.9

Discussion

- Superficial venous patterns develop embryologically from the capillary plexus; genetics and hemodynamics influence final anatomy.
- Type 1 is consistently most prevalent globally.
- Sex influences vein patterns; side differences are minimal.
- Rare patterns (type 3 and 4) must be recognized to reduce venipuncture complications.
- Sudan data align with global prevalence patterns, providing an important regional reference.
- Meta-analysis confirms variation across populations, highlighting the need for population-specific knowledge for clinical practice.

Clinical Relevance:

- Knowledge of cubital fossa vein variability improves venipuncture success and minimizes procedural complications.

- Educators and clinicians can use prevalence data for training and procedural planning.

Conclusion

- Four distinct superficial vein patterns exist in the cubital fossa globally and in Ethiopia.
- Type 1 dominates; types 2–4 are less frequent but clinically important.
- Sex significantly affects prevalence; arm side does not.
- Meta-analysis provides evidence-based guidance for safe venipuncture and anatomical education.

Conflict of Interest: None

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References:

1. Anant, K., et al. (2007). *Indian J Urol* 2007; 23:261-264.
2. Azhar, H., et al. (2014). *Trop Med Surg* 2014; 2:1-4.
3. Dharap, A.S., & Shaharuddin, M.Y. (1994). *Med J Malaysia* 1994; 49:239-241.
4. Faraj, A., & Eman, R. (2014). *J Med J* 2014; 48:269-274.
5. Hyunsu, L., et al. (2015). *Anat Cell Biol* 2015; 48:62-65.
6. Jose, C., et al. (2003). *Braz J Morphol Sci* 2003; 20:171-175.
7. Kiray, A., et al. (2013). *Acta Orthop Traumatol Turc* 2013; 47:405-410.
8. Mikuni, Y., et al. (2013). *Anat Sci Int* 2013; 88:46-57.
9. Moore, K., & Dalley, A. (2010). *Clinically Oriented Anatomy* 7th ed. 2010.
10. Naveen, K., et al. (2012). *J Clin Diagn Res* 2012; 6:1539-1540.
11. Shenoy, S. (2009). *J Vas Access* 2009; 10:223-232.
12. Syed, O., et al. (2011). *J Vasc Surg* 2011; 53:720-724.
13. Ukoha, U., et al. (2013). *Niger J Clin Pract* 2013; 16:104-109.
14. Vasuda, T. (2013). *NJCA* 2013; 2:204-208.