

# A Study to Assess the Incidence and Contributing Risk Factors of Peripheral Intravenous Therapy Related Complications among Patients Receiving Peripheral Intravenous Therapy in a Tertiary Care Hospital

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**Abstract:** **Background:** Peripheral intravenous catheter (PIVC) insertion is one of the most common invasive procedures performed in a hospital. It is an integral part of professional nursing practice in all the healthcare institutions. PIVC related complications are the most frequent complications of peripheral intravenous therapy which can be local and systemic. It is estimated that 150 million Peripheral intravenous catheters are inserted annually in the United States. Phlebitis is the most frequent complication of peripheral intravenous therapy. Its rate is 50% or even as high as 75% in patients with infectious diseases. In India incidence of phlebitis in medical and surgical wards was found to be 56.5% and 29.8% respectively. However CDC and INS guideline recommendations revealed the accepted phlebitis rate to 5% or less. **Methods:** A non experimental prospective observational design was adopted for this study. A simple random sampling was applied for selection of samples. The data was collected by means of non-structured tool consists of Demographic variables, observational checklist, patient related factors, Therapy related factors and Practice related factors. The freshly inserted cannulas were observed for 24hrs, 48hrs and 72 hrs and the incidence of the observed complications were recorded. **Aim:** To assess the incidence of IV therapy related complications and it's contributing risk factors. **Results:** Out of total 90 samples, 12 samples (13%) were not having any complications remaining 87% were having complications. 96% found to have local complications and 4% were systemic complications. Out of all the complications, overall pain was reported maximum followed by edema and infiltrations. The Association was found significant for presence of co-morbidities like diabetes, Hypertension and presence of a previous cannulation history. **Conclusion:** IV therapy complication is an important ongoing problem in present day clinical practice. Avoiding risk factors, proper intracath insertion technique may be sought to lower the incidence of PIVC complication.

**Keywords:** Assess, Incidence, Risk, Intravenous therapy, Complication

## 1. Introduction

“As to diseases make a habit of two things- to help, or at least, to do no harm” (Hippocrates)

Intravenous is a term that means ‘within a vein’. Intravenous (IV) therapy is the infusion of drugs or food into vein for treating physical problem or illness (Oxford Dictionary). Peripheral Intravenous cannulation is the commonest of all invasive procedures. In 1795, first successful human to human transfusion was done by Doctor Philip Syng Physick, later acknowledged as Father of Modern Surgery. The golden age for the medical devices including intravenous catheter is the mid twentieth century by the introduction of disposable medical devices, initially made up of polyvinyl chloride, then Teflon and then finally of polyurethane. IV treatment as we know it today would not have been possible without serial experiment, failure and success and most important without development of needles and syringes. In Makafi SA and Marfega MACM, Saudi Arabia (2017) conducted a quantitative descriptive study to determine the incidence of peripheral intravenous cannula related local complications in the hospital, a total of 406 patients with 458 peripheral cannula were assessed. The findings showed that the rate of phlebitis, infiltration, extravasation and hematoma are 21, 7, 3.5, 12 percent respectively. The conclusion of the study was that there was high incidence of intravenous cannula related complications which needs to be

reduced in order to decrease hospital stay, economic burden and to improve overall patient's health outcome.

### Aim of the study

The aim of the study was to assess the incidence of IV therapy related complications and it's contributing risk factors.

### Objectives

- 1) To assess the incidence of intravenous therapy related complications among patients who are receiving intravenous therapy in a tertiary care hospital.
- 2) To assess the risk factors contributing to intravenous therapy complications among patients who are receiving intravenous therapy in a tertiary care hospital.

## 2. Material and Methods

The prospective observational study was conducted on the patients admitted in the acute medical surgical ward of tertiary hospital. A non experimental research design was adopted. Simple random sampling was used and 90 samples were selected.

**Part A:** A non-structured questionnaire to assess the demographic characteristics of the samples.

**Part B:** An observational checklist to assess the incidence of complications

**Part C:** Factors leading to complication

- (A) Patient related
- (B) Therapy related
- (C) Practice related

To ensure the content validity, prepared tool was given to 13 experts from different specialties in nursing and two Medical officer including one anaesthesiologist and one vascular surgeon. Reliability was tested by conducting a pilot study on ten patients. Data collection was done for two weeks. The Data was analyzed in terms of frequencies, percentage, standard deviation and chi square.

### 3. Results

The present study was conducted to assess the incidence of PIVC the risk factors leading to the same. The study was conducted in acute Medical and Surgical wards.

#### Demographic data

Majority (55.5%) of the sample were from the age group of 40-60 years and 60% were male and 40% were females. Maximum samples were from surgical ward that is 55.6% and remaining 44.4% were from medical ward .out of 90 41 samples were associated with complications like DM, HTN, CKD, CAD Pediatric age group and patients receiving Chemotherapy were excluded

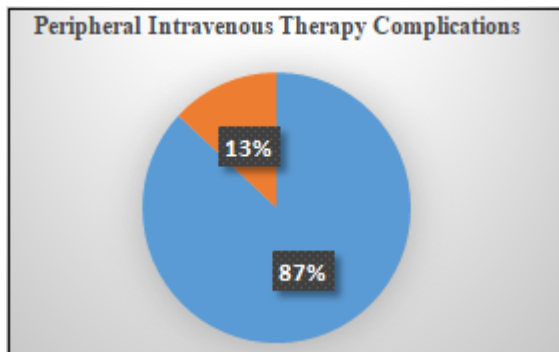


Figure 1

Fig 1 explains that Total 87% had complications and 13% did not have any complications. The maximum incidence of complication was seen in age group of 60-80years (25%) & minimum were seen in 20-40 years (16%).

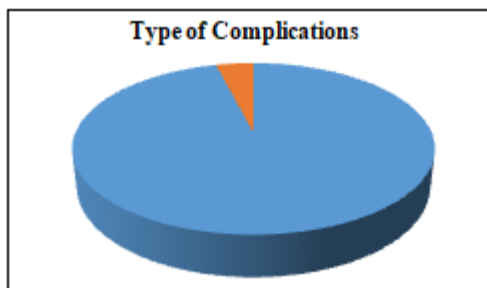


Figure 2: Type of complications

Fig 2 explains that Out of all the peripheral IV therapy complications developed 96% were identified as local complications and only 4% were systemic complications

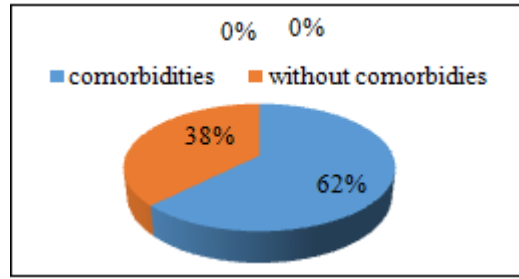


Figure 3: 38% with complications and 62 % without complications

Out of total 90 samples 49 were having no co morbidities Remaining 41 were having co morbidities and 25.8% developed complications related to IV therapy

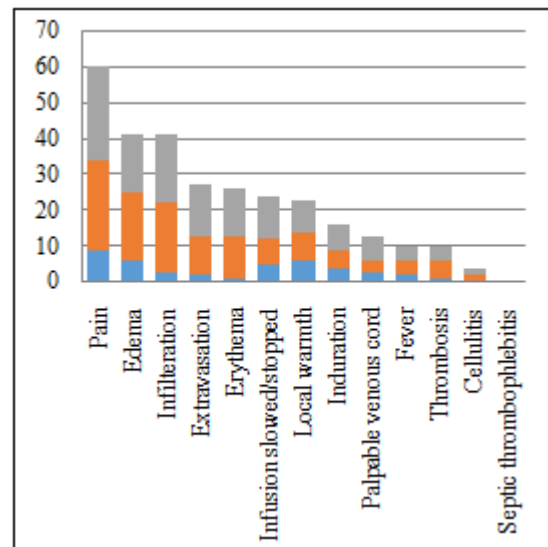


Figure 4

Fig 4 explains that the Y Axis depicts the frequency of incidence of complication and X Axis depicts the various complications

Maximum complication found was pain (60%) followed by edema and infiltration and the least was cellulitis and no cases of septic thrombophlebitis was found.

- Maximum incidence of complication was found in basilica vein followed by dorsum of hand.
- The intracath size of 22 G developed the maximum complications (24%) followed by 20G 20.6%. Minimum complications were observed in the intracath of size 16 G.
- Majority of the complications were observed (38%) in those samples receiving Blood & blood products followed by drug (24%). Only 19.80% samples receiving developed complications with intravenous fluid administration

### 4. Discussion

Regarding the incidence of incidence of IV therapy complication, the complications were divided into Mild, Moderate and Severe. Out of total samples, 87% developed IV therapy related complications which included 96% of local and 4% of systemic peripheral intravenous therapy related complications.

The above findings are in consistent with the findings of the study conducted by Mostafa A Abolfotouh, Mahmoud Salam et al (2014) at KAIMRC, Saudi Arabia on incidence and predictors of PIVC induced complications showed that frequency of complications were from 1% -79% .Majority of the surgical cases developed complications (82%) and complications developed in medical cases were 75%. These finding are not in concordance with the previous studies. Findings related to assessment of risk factors contributing to IV therapy related complications.

Out of 20G, 22G and 16G intracaths majority of the complication were recorded in the intracath of 22G and minimum in 16G. Findings are concordance with the study conducted by Osei-Tutu et al 2013 on PIVCP hlebitis risk at Cape Coast teaching Hospital Ghana showed that incidence of complication increases with increase of intracath size. Patients with Intracaths in right hand developed 17% complications and those in left hand developed 20%. The findings are compatible with the study conducted by Sookhee Lee , Kyunghhee Kim et al 2019 .

Findings related drug therapy related factors leading to peripheral intravenous therapy related complications. On studying the relative risk ratio of IV therapy complications in two significant sub factors i.e. **IV fluids** and **IV medications**, it was found that relative risk of IV therapy related complications in **IV fluids** administration was decreased by 6.7% relative to patients with **IV medications** .These findings are consistent with the findings of the study conducted by Mostafa A Abolfotouh, Mahmoud Salam et al (2014) at KAIMRC, Saudi Arabia on Incidence and predictors of PIVC induced complications showed patients on IV Medications were 1.41 times are more likely to contract complications than those on IV fluids.

Findings related to the association between risk factors and peripheral intravenous therapy related complications.

In nourishment status of the patient ,after calculating relative risk ratio of the two significant sub factors i.e. **well nourished** and **underweight**, it was found that risk of complication was reduced in well nourished relative to underweight.

While calculating relative risk ratio in patients having **co morbidities** and **without co morbidities**, patients with **co morbidities** were at higher risk of developing comorbidities by 37% relative to patients **without comorbidities** or we can say that complication was 1.3710 times more likely to occur in patients with comorbidities. In the factor, site of insertion, the two significant studied factors i.e. **basilic vein** and **veins on dorsum of hands**, when studied by relative risk ratio gave the conclusion that complications on the site of insertion of **basilic vein** were at higher risk by 9.33% compared to that of **veins on dorsum of hands**. These findings are consistent with study findings of the study conducted by Mostafa A Abolfotouh, Mahmoud Salam et al(2014) KAIMRC, Saudi Arabia on Incidence and predictors of PIVC induced complications.

On studying the relative risk ratio between IV therapy related complications on **Left upper limb** and **Right upper**

**limb**, the **Right upper limb** was at higher risk of developing IV therapy related complications b 5.55% relative to **Left upper limb**.

While studying the relative risk ratio of complications in two significant intracath size i.e. **20G** and **22G** ,it was inferred that relative risk of IV therapy related complication in **22 G** intracath was increased by 25.92% relative to **20G** intracath. These findings are consistent with study findings of the study conducted by Mostafa A Abolfotouh, Mahmoud Salam et al (2014) at KAIMRC,Saudi Arabia on Incidence and predictors of PIVC induced complications showed that patients on IV medications were 1.41 times more likely to contract complications than those on hydration (RR=1.41, p=0.0006).

There is no studies in the literature review discussed the complication rate regarding the history of IV line on the same site and use of the IV fixator but these are the significant predictor of complication. Patients having **history of IV line** within 30 days of presents IV therapy was at increased risk of IV therapy related complications by 40.39% relative to patients with **no history of IV line** and the relative risk of developing IV therapy related complication was 6.6% more in intracath fixed with IV fixator which was **soiled with blood** relative to **intact** one.

Regarding the findings related to demographic characteristics of samples:

I, majority samples were from age group 40-60 years (55%), and minimum were from age group more than 80(4%). 54(60%) of them were males and 36(40%) were females. Surgical cases were 55.6% and medical cases were 44.4%.Out of 90 samples 45.5% were having single or multiple complications. These findings are consistent with the findings of study conducted by Osei-Tutu E et al 2013 on PIVC and Phlebitis risk at Cape Coast teaching Hospital Ghana showed that total of 224 patients with cannula were assessed of which male (54%), females(46%). Maximum age group was 40-49(20.1%) and minimum was 60-69 (8%). equal medical and surgical cases were taken (50%) each. Out of total samples 42.4% were having single or multiple complications.

## 5. Conclusion

Incidence of IV therapy related complications in this study was significantly higher (87%) than many rates found in literature. These complications were significantly predicted by Age, Sex, Size of intracath, Site of insertion, infusion of IV medications , and presence of comorbidities. Better insertion techniques may be sought to lower the incidences of IV therapy related complications thus extending their onset beyond day 03.changing intracath is recommended when clinically indicated rather than routinely post 72 hours.

## 6. Recommendations & Suggestion

### Nursing Practice

- 1) Standard gudelines-Adherence to guidelines for the personnel involved in the insertion and maintenance of

- intravascular catheters .Date of insertion should be written .soiled dressing should be changed immediately
- 2) **Standard assessment:** Using the VIP score to evaluate and follow up of catheter insertion periodically during each change of shift
  - 3) **Periodic training:** Healthcare personnel should be educated regarding indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent peripheral intravenous catheter related infections.
  - 4) **Appropriate selection:** Selection of catheters size, site etc on the basis of intended purpose and duration of use.
  - 5) **Evaluation**
    - **Removal:** Prompt in removal of peripheral intravenous catheter if the patient develops signs of any related complications.
    - **Aseptic practices:** Strictly Performing hand hygiene procedures, conventional soap and water or with alcohol based hand , before and after palpating catheter insertion sites as well as before and after inserting, replacing, accessing, repairing or dressing an intravascular catheter. Wear clean gloves, rather than sterile gloves for insertion of peripheral intravascular catheters if the access site is not touched after the application of skin antiseptics
    - **Preparation of skin:** Use of an antiseptic before peripheral venous catheter insertion (70 per alcohol, tincture of iodine or chlorohexidine preparation. Replace catheter site dressing if the dressing becomes damp, loosened or visibly soiled. No recommendations are made regarding replacement of peripheral catheters in adults; only when clinically indicated.
    - **Nursing Administration:** has a key role in preparing standard guide lines, supervision, conducting mandatory training and in implementing check list which will definitely help in reducing the incidence of IV Therapy Complications
- peripheral intravenous catheter administration. Pakistan Journal OF Medical Sciences.2014 Jul-Aug ;30(4):725-730
- [7] Sengupta Manasi.Use of VIP score to care and control IV infusion related phlebitis.International Journal Of Integrative Medical Sciences. 2019;6(5):836-838
  - [8] Patidar AB. Comparative efficacy of heparin saline and normal saline flush for maintaining patency of PIVC lines. International Journal Health science Res [Internet]. 2014; 159-66
  - [9] Thamlikitul Visanu. Switching from heparinized saline flush to normal saline for maintain PIVC patency. International Journal Qual Health Care. 2006; 18(3): 183-184.
  - [10] Lee Sookhee, Kyunghee , Kim Su-Ji.Amodel of Phlebitis Associated with PIVC in Orthopedic Inpatients. International Res Public Health. 2019 ; 16(18):3412

## References

- [1] SA Makafi and Marfega. Peripheral intravenous catheter (PIVC) Related local complications among patients in KFCH –Jizan. Journal of Advanced Practices in Nursing. 2017.
- [2] Mandal Abhijit, Raghu K. Study on of phlebitis following the use of peripheral intravenous catheter. Journal of family medicine and primary care 2019; 8(9): 2827
- [3] Daud A. Incidence of phlebitis among adult patient. International Journal of Care Scholars .2018;1 (2):5-8
- [4] Souza de Jenete, Peixoto Grassman Cibella , Amanda Tassia May .Incidence of phlebitis associated with the use of PIVC and following catheter removal. Rev Lat Am Enfermagem.2016; 24:e2746.Available on <https://www.ncbi.nlm.nih.gov>.
- [5] E Tutu Oesi, A D Tuoyire, S Debrah etal. Peripheral Intravenous Cannulation And Phlebitis Risk.2015;4(1): Available on <https://www.researchgate.net/publication/275949575>.
- [6] Pasalioglu Burcu Kadriye , Kaya Hatice. Catheter indwell time and phlebitis development during

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