

Hemodynamic Instability of the Closed Fractures Femur in Children

Ahmed Alkhuzai (✉ ahmedalkhozaey@gmail.com)

Surgical Department, Faculty of Medicine, Sulaimani University

Original research

Keywords: hematocrit (%), hemodynamic, hemodilution, Fracture femur

Posted Date: March 18th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-300694/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: This is a prospective Study to assess the occurrence of hypovolemic shock in children with traumatic isolated closed fractures femur. This is common in children and adolescent as result of trivial to high energy trauma.

Methods: A prospective descriptive study was performed on children with traumatic femoral fractures from the 20th of September 2015 to the 15th August 2018. Selection of 100 patients presented with isolated closed fracture femur in children, were admitted to the Sul. Emergency Hospital. Reason was to correct the old criteria of blood transfusion immediately, without suitable indication of replacement with real blood requirements. Depend on the children clinical parameters rather than on hemoglobin or hematocrit concentration; pulse rate. Systolic blood pressure, respiratory rate, Skin capillary refill time, and the mental status. Excluded open fractures and bilateral fracture femur in children, also excluded any fracture associated with trauma to the body organ as associated injury.

Results: There was no evidence of hemodynamic instability in the 100 patients of these type fractures, selection inclusion criteria of the study when compared with internationally accepted normal vital sign parameters. No any patients in the study had hemoglobin less than 8.5 g/dl, the vital sign between these groups were similar, 2-6% incidence with hemodynamic instability has found among multiple injured children with femoral fractures, has excluded from the study.

Conclusions: No evidence of hemodynamic instability was found in children with traumatic isolated femoral fractures bone. The Hemoglobin and hematocrit ratios early were non dependable, later on not significantly decreased or change to abnormal rate. Depending on vital signs parameters in the femur bone fractures patients after exclusion of bilateral fractures femur, and associated injury or patients with compound fractures, we confirmed that isolated closed femoral fractures are hemodynamically stable.

Introduction:

The occurrences of hypovolemic shock in children with traumatic closed femoral fractures are from multidisciplinary Orthopaedic centers. Trauma Which is common in children and adolescent as a result of trivial to high energy, was treated by different variety of management includes; Home traction, traction followed by Spica casting, immediate Spica casting, Intra-medullary nailing, plating & screws, External fixation. Fracture shaft femur of child age groups most common sites is the middle third (diaphyseal), with peak incidence from two to five-year age, males have three time more common than female, fall is the most common cause in children under five years of age. After acute trauma hemorrhage will be start, the hematocrit may not reflect the true red blood cell mass loss reason beyond that identified the hemodilution occurrence for up to 72 hours post trauma. [1 – 3]

Blood loss is 20% of total blood volume in isolated fracture femur of children. Blood aspirated from all patient presented with isolated closed fracture femur in children send for hemoglobin- hematocrit ratio, detected these ratios are undependable, reason beyond that hemodilution will reflect non-real results.

However, we must depend on the assessment of vital signs; the pulse rate beat per minute, blood pressure, respiratory rate, capillary refilling times, and mental status, for these fractures children were clear, dependable data, plus direct relationship to children with isolated fracture femur. [4]

Patients child age group from all population with femoral shaft fractures represents 2% of all fractures, with an incidence of approximately 20/100,000 per year. Management options depend on a number of factors which includes patient age, fracture pattern, and the use of Pavlik harness in child below 6 months age group, spica casting, intramedullary nailing, Submuscular plating, and external fixation. Advances in treatment with different types of fixation have further contributed to increased popularity of operative treatment, with benefits of less hospitalization stays and earlier movement. [5–7]

The severity trauma in the study of Kopp et al,[8] from moderate to severe, five from nine patients presented in the casualty hospital with shock while other were stable general condition, all these shock child are either bilateral femur fracture or associated injuries to other body organ, multisystem injuries. In the above study, most of patients were resuscitated earlier and after that send for required procedures weather earlier or later. These were confirmed post exclusion the shock state of other associated injuries or bilateral fractures femur in children, defined the hemodynamic stability of isolated closed fracture femur in children. Keith et al. Supported the bilateral femur fracture or patients associated with other multi system organ injuries, represented the life danger emergency treated early as urgent conditions, fixation with stabilization of the fracture as soon as patient life condition permit. [9] Early stabilization mandatory however, the definitive treatment still required but further evidence still needs to be looked upon before a definitive opinion can be established. [10]

Bilateral femoral shaft fractures the percentage of mortality reach to 16% in a study by, [11] we treated these patients as early as possible without any death rate in these group patients, also with less morbidity rate. The suitable fixation with early stabilization of the isolated fractures femur improved the hemodynamic stability later on. [12] The early fixation with intramedullary nailing for proper stabilization of these fracture type after initial resuscitation. [13]

Bilateral femur fracture patients is associated with proper evaluation of child admitted hospital for treatment of pediatric closed femoral shaft fractures in Department of Orthopaedic,, were detected closed femoral shaft fractures in children treated with open reduction internal fixation, or closed reduction plus internal fixation, or using external fixation. Closed femoral shaft fractures in children age group less than 5 years, mostly treated by conservative method. However, child older than 11 years were treatment with open reduction plus internal fixation obvious observation seen in table1, Fig. 1. Children with closed femoral fractures represent the significant blood loss when leading to hypovolemic shock is less obvious. [14]

Falls and motor cycle accident are commonest mechanisms of trauma; represent two thirds of the traumatic injuries in older children. Fall in the ground appear as the more common traumatic injury, in younger children, up to 80% of fractures femur in children less than 5 years as result of non-injury types fractures. Transverse fractures femur good indicator of Non traumatic in younger child when compared to

accidental traumatic injuries leading to spiral. [15] Fractures are identification plus classification according to shape, site, stability, and type of fractures closed or open. Fracture femur another classification; transverse, oblique short or long, spiral, and comminuted. The locational site of fractures femur is mandatory to defined, as direction the displacement of fragments will lead from muscles insertion to the bone with the force that effects on the pieces of fragments within the fractures, reveal the angles and displacements in different direction plus shortening factors with age of child with these type fractures shown in table 2.

The Transverse fractures are regards as stable and part of short or long oblique. However, the comminuted or segmental fractures are classified as unstable". Compound or open fractures are excluded from those fractures femur of closed types .The Treatment of closed fractures femur depend on different factors which includes; age, shape of fracture, mechanism of injury, body weight of the child. [16].

Fracture femur Options of management: [16]

- **Pavlik harness.**
- **Satisfactory result after traction.**
- **Traction followed by spica casting.**
- **Home traction.**
- **Immediate spica casting.**
- **Spica casting incorporating traction pin.**
- **External fixation.**
- **Flexible intra-medullary nailing.**
- **Rigid nailing.**
- **Plating. Submuscular plating.**

Assessment plus testing of hematological state for the all patients with closed fractures femur in children, also for cross match are not required for those healthy child patients, the hypotension plus reduction in hemoglobin-hematocrit ratio have not seen in those fractures patients. The dynamic instability and severely drop in hematocrit-hemoglobin ratio are rarely seen in a child with an isolated closed femur fracture, and if available that required to inform the specialist searching for Organ trauma or associated injured. [17]

Patients And Methods:

A prospective descriptive study approved by IBR of the author affiliated institution of Sul. Univ. was performed on children with traumatic femoral fractures from the 20th of September 2015 to the 15th August 2018, 100 patients presented with isolated fracture femur in children, were admitted to the Sul. Emergency Hospital. Reason was to correct the old criteria of blood transfusion immediately, without

suitable indication of replacement with real blood requirements. Depend on the children clinical parameters rather than on hemoglobin or hematocrit concentration; these parameters are pulse rate, Systolic blood pressure, respiratory rate, Skin capillary refill time, and the mental status.

Fluid and blood transfusion were evaluated according patients requirements; the hemoglobin and hematocrit results were obtained initially and finally after three days from the fractures. However, these are independent initially reason beyond that the hemodilution, plus body reaction lead to hemodilution happen earlier in the post trauma time, were non major difference in the final rate from normal range so regard as exclusion criteria.

Depend on **Inclusion Criteria**; All children admitted to Emergency ward in the Casualty Hospital Sulaimaniyah City, We collected these children depend on isolated closed fractures femur in children, all age groups, excluded the compound fractures, depend on clinical parameters. With final diagnosis of isolated closed fracture femur, during that time complete checking of vital signs was ready within 4 hours post trauma.

Exclusion Criteria are;

Which includes; Birth injury (child abuse), any fractures femur not emergency required treatment by elective method, child delayed in presentation beyond 24 hours, Predisposition factors that lead to decrease bone mineralization as a result of spasticity or muscle contracture, Osteogenesis imperfect, slipped capital femoral epiphysis, child with bilateral fracture femur, or compound fractures femur, plus any child presented with associated injury (other organ, or other part of body). We depend on the Criteria of fractures femur in children, age factors, Degree of angle displacement, Shortening distance of the fracture compare to normal one which seen Obvious on table1, Fig. 1.

The principle of management whether conservative or surgical method seen in tables 1, were dependable on clinical pictures during methodological processing assessment of child with fractures femur, the clinical pictures of expected blood loss from different traumatized patients in table 3.

We depend on volume of blood lost in mille litter in correspondence with clinical sign of blood loss on specific site of body. The hemodynamic instability in adult patients more liability to seen than in children with closed isolated fractures femur, that reason which was explain in table 3, and table 4.

According to international criteria of these type fractures which is so clear that amount of blood loss in child less than 500ml. However, for adult which was reach to 1000-1500ml, so the clinical sign in children non or occasionally presented with vasovagal syncope, in spite of the adults presented at rest may be no clinical evidence of volume loss, plus slight postural drop in blood pressure can be seen, also tachycardia with exercise. The female to male ratio is 44% -56%, blood taken from every patient presented with isolated closed fracture femur in children send for hemoglobin- hematocrit ratio. We assessed the vital signs of pulse rate beat per minute, blood pressure; respiratory rate, capillary refilling times, and mental status for these fractures were clear demonstration in Table 4.

Procedure; Clinical parameters were collated to documents when presence or absence of hypovolemic shock; these parameters must be within range of internationally standards base.

Parameters:

1. Pulse Rate.
2. Systolic Blood Pressure.
3. Respiratory Rate.
4. Skin Capillary Refilling time.
5. Mental State (We excluded mentally unstable in all age groups patients for exclusion criteria).

Results:

There was no evidence of hemodynamic instability in the 100 patients had been included in the selection inclusion criteria of the study when compared with internationally accepted normal vital sign parameters. The highest group age affected fracture femur between 5–12 years age group demonstration in the Fig. 1.

There is no significant difference between the patients who received fluid bolus or blood transfusion with those patients without any access of blood or fluid resuscitation shown in table 4, and 5 also demonstrated in Fig. 2, and 3.

Hemoglobin and hematocrit values were not significantly changes or decrease. In this study, 40% of the patients received fluid bolus without any clinical evidence of hemodynamic instability, in compared the vital sign with the rest of group patient presented with isolated fracture femur in children that did not received fluid bolus. No any fracture femur patient has required blood transfusion based on initial clinical evaluation of the patients plus hemoglobin and hematocrit ratio were stable. No any patients in the study had hemoglobin less than 8.5 g/dl. The vital sign between these groups were similar, 2–6% incidence with hemodynamic instability has found among multiple injured children with femoral fractures, has excluded from the study. If hemodynamic instability present must search for an alternative source of bleeding. This study has used internationally accepted standards for the assessment of hypovolemic shock. The perception of hypovolemic and decision of fluid bolus resuscitation is still open to inter - observer's variability seen in table 5, also in Fig. 2, and 3. Tachycardia being one of the more sensitive indicators of hypovolemia may reflect coexisting pain or anxiety in a child, making the overall assessment of hypovolemia status less certain.

The management of these fractures observed in table; 6 according to the age of child, those age group from birth to five years, were 22 patients admitted to emergency hospital, 97% (21 patients out of 22) treated by conservative method, 3% were treated by surgical reduction plus fixation, were severely displaced out of criteria in table; 1 (angles and shortening acceptable criteria). The child age group 6–10 year old were 24 patients, 65% of them (16 out of 24 patients) were treated by conservative method,

mostly within acceptable criteria and non-displaced fractures femur, 35% (8 out of 24 patients) were treated by surgical intervention, they were displaced unstable fracture femur, out of acceptable criteria in table;2. However, child more than 11 year (54 patients out of 100) 23% of them 12 patients were treated by conservative way, 77% (42 patients) treated by surgical method with different fixation implants (intramedullary flexible nailing, rigid trochanteric entry nailing, and plating Submuscular plating with screws) confirmed that results in table 6, Fig. 4 .

the results were demonstrate in tables 5, Fig. 3; the child receiving indicated blood, with non-indicated blood transfusion were excluded from study, which were associated injured patients group other than fracture femur traumatic damage. However, no any isolated femur fractures received any blood transfusion. The total patients number of the study were 100 patients (26 patients receiving fluid, plus 74 patients were not receiving any fluid or blood). From the results of vital sign, we detected no any clinical criteria requirements of blood transfusion according to the mean of vital sign of isolated fractures femur in children, these confirmation observed in tables 4, 5. Also all features represent blood loss within or less than 10% of total body volume (less than 500 ml of loss). No any features of vasovagal syncope, with preservation of all other vital sign within normal range supported in tables 3, and 4, plus Figs. 3, and 4.

Discussion:

Fractures Femur in children is the most common fractures of long bones .Treatment concentrated on the age of child, specified for bone age, plus size of a child affected the treatment plan. The choice of management may be determined by surgical experience and local trends in practice. The conservative management involved the major principles in most cases. However, the current practical directed toward operative fixation reason beyond that primarily of early mobilization and shorter time of hospitalization. [18, 19] Still the age play major roles in plan of management conservative or surgical method; this is supported in our study.

The treatment of shaft femur fractures in children still remains controversial in management, multi modalities available using different methods in treatment. the guidelines produced by American Academy of Orthopaedic Surgeons published in 2010. The intramedullary elastic nailing is presented the treatment of choice in children aged 5–11. However, other modalities using rigid nail treatment for those age groups depend on bone age and weight of child, some other center depend on non-operative management in the young age group and the use of locked intramedullary nailing in the older. The American Academy evaluated the rigid trochanteric entry nailing, Submuscular plating and flexible intramedullary nailing as treatment options for children aged eleven to skeletal maturity. Early spica casting or traction with delayed spica casting for children aged 6 months to 5 years (with < 2 cm of shortening) is the management protocol for femur fractures in children. [20, 21] These plans of management were supported by our results in the choice of treatment principle shown in table 7 and Fig. 4.

From the results and conclusion in Journal of Trauma, in the Injury Emergency Department, Children's Hospital at Westmead, NSW of Australia, patients with additional trauma showed significant decreases in

both hemoglobin concentrations and hematocrit levels, comparison with the patients who had only isolated femoral fractures not affected. If there is an obvious decrease in hematocrit and/or hemoglobin concentration in a child with a femoral fracture, the availability of associated traumatic injuries should be evaluated. [22] This results supported by our study of isolated fracture femur in children are hemodynamic stable, not required blood transfusion, the hemoglobin hematocrit were normal initially and later on, the requirements of blood transfusion only in associated injuries of other organ or bilateral fracture femur.

Femur fracture must be looking for the details of physical examination, with observation of associated other injured sites in the body. Hypotension rarely results from an isolated femoral fracture. Waddell's triad of femoral fracture, intra-abdominal or intrathoracic injury, plus head injury is associated with high-velocity automobile injuries. Multiple trauma patients requirements the rapid stabilization of femoral shaft fractures to facilitate overall care, this observation concentrated on associated trauma with head injury or vascular disruption. Admitted to Causality and Traumatic Departments in Ugandan teaching hospitals, between December 2016 and June 2017. This is support our study in excluded fractures femur in children associated with open or compound fractures which lead to bleeding plus features of hypotension. [23] These results were confirmed our finding of the isolated fractures femur in children is hemodynamic stable, not required blood transfusion.

All children presented with associated trauma, or other injuries to the body organ, and compound fractures were excluded from the study. Laboratory Assessment for the routine laboratory testing and cross match are not recommended for healthy patients with isolated closed femoral shaft fractures, hypotension and significant decreases in hematocrit have not been shown in these Children's Hospital at Westmead, NSW of Australia, patients with additional trauma showed significant decreases in both hemoglobin concentrations and hematocrit levels, comparison with the patients who had only isolated femoral fractures not affected. If there is an obvious decrease in hematocrit and/or hemoglobin concentration in a child with a femoral fracture, the availability of associated traumatic injuries should be evaluated. [22] This results supported by our study of isolated fracture femur in children are hemodynamic stable, not required blood transfusion, the hemoglobin hematocrit were normal initially and later on, the requirements of blood transfusion only in associated injuries of other organ or bilateral fracture femur. Femur fracture must be looking for the details of physical examination, with observation of associated other injured sites in the body. Hypotension rarely results from an isolated femoral fracture. Waddell's triad of femoral fracture, intra-abdominal or intrathoracic injury, plus head injury is associated with high-velocity automobile injuries. Multiple trauma patients requirements the rapid stabilization of femoral shaft fractures to facilitate overall care, this observation concentrated on associated trauma with head injury or vascular disruption. Admitted to Causality and Traumatic Departments in Ugandan teaching hospitals, between December 2016 and June 2017. This is support our study in excluded fractures femur in children associated with open or compound fractures which lead to bleeding plus features of hypotension. [23] These results were confirmed our finding of the isolated fractures femur in children is hemodynamic stable, not required blood transfusion. All children presented with associated trauma, or other injuries to the body organ, and

compound fractures were excluded from the study. Laboratory Assessment for the routine laboratory testing and cross match are not recommended for healthy patients with isolated closed femoral shaft fractures, hypotension and significant decreases in hematocrit have not been shown in these fractures patients. Hemodynamic stability was detected with patients presented in the casualty hospital department of Orthopedics and Rehabilitation in USA, the patients with complete neurologic and vascular assessment of the affected limb should be performed. Vascular injuries have been less chance to occur in this group of patients with closed femur fractures, reported incidence of 0.1–2%. [24]

There was no significant difference confirmed in table 6 found in the initial vital signs between patients who received fluid bolus and those didn't received in our study. Hemoglobin and hematocrit values were not decreased with closed fractures femur in children. This evidence confirmed our results of isolated fracture femur in children of the hemodynamic stability, not required blood transfusion, plus hemoglobin-hematocrit was normal initially and later on.

Conclusion:

No evidence of hemodynamic instability was found in children with traumatic isolated femoral fractures bone. The Hemoglobin and hematocrit ratios early were non dependable later on, not significantly decreased or change to abnormal rate. Depending on vital signs parameters in the femur bone fractures patients after exclusion of bilateral fractures femur, and associated injury or patients with compound fractures, we confirmed that isolated closed femoral fractures are hemodynamically stable.

List Of Abbreviations:

IBR; Ethical and Scientific Committees

Sul. Univ.; Sulaimani University / Faculty of Medicine

Sul. Emergency Hospital; Sulaimaniyah Emergency Hospital in Sulaimaniyah City/Iraq

Declarations:

Statement on ethics approval and consent;

Ethical Committee / School of Medicine Approval

Ethical Committee Number: 6 in 27/3/2012

Scientific Medical Committee- Surgical Department -Sulaimani University Sharing Approval;

Scientific Medical Committee Number: 3 in 26/3/2012

Data availability statements;

Hemodynamic Instability of the Closed Fractures Femur in Children

There is limitation of the data availability supporting the results of the paper. However, still have some data reporting from the paper available in the references subjects of this research. Some of these datasets established from the corresponding author on reasonable request. However, all data generated in this study are included in this published article (supplementary information files supporting this paper).

The restrictions apply to the availability of these data, to keep their data “live” mean “online”, data Information active even in the case of a disruption the network, this state defined the access to data as data availability.

Data Access Advantages of data available and must be;

Confidentiality; meaning the rules and procedures are limited the unauthorized access to sensitive information. This includes measures such as training security.

Integrity; ensuring the accuracy, consistency, and reliability of data. Security teams must take steps to ensure the integrity of data at rest and in transit.

Availability; the ability to the reliable access to data. Organizations must keep crucial data available and shorten data outage times as much as possible. To achieve data availability,

Competing interests;

I have no conflict of interest; also I have competing interest during the submission process, via declarations in the manuscript submission system.

For this purposes I have competing interest as financial and non-financial interests directly or indirectly relation to work.

Also financial competing interests include the funding of research or support have no any payment for the (salaries, equipment, supplies, and other expenses) by any other organizations that may gain or lose financially through this publication.

I have application & disclose and competing interest during the submission process, for the content, declarations for peer reviewed contributions in full.

Funding;

Statement “The author has no conflict of interest”;

Submission declaration generally I did not received any financial Support.

I will pay my requirements for publishing my paper without any extra support from any other, governmental or any support through my college or non-governmental organization.

I will be Using my Credit Cards or bank card for that purposes.

Authors' contributions;

Hemodynamic Instability of the Closed Fractures Femur in Children

This paper contributed to conception and design of the data, and interprets data analysis.

During data collection I participate in writing the draft of article, also revising for the content.

Also I accept the final approval of this research for submitting and any revised version.

I am writing this research plus my work to take public responsibility for appropriate portions of the content, with significantly to the study and contributed agreement for authorship

Permissions & Submission Declaration;

Thank you for Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine, for all Team, Editors, to support plus reproduce this paper copyright work.

I ask Obtaining permission to published my paper with Approved Submission of an article implies that the work described has not been published previously.

With our responsibility plus authorities where the work was carried out, not published elsewhere.

Acknowledgments;

Thank you for Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine

For all Team, Editors, to support plus reproduce this paper copyright work.

Statement "The author has no conflict of interest";

Submission declaration generally I did not received any financial Support.

Approved Submission of an article implies that the work described has not been published previously. With our responsibility plus authorities where the work was carried out, not published elsewhere.

Study design;

This is prospective Study to assess the occurrence of hypovolemic shock in children with traumatic isolated closed fractures femur.

This is common in children and adolescent as result of trivial to high energy trauma, treated by Multi modalities of managements.

This study aims to assess the hypovolemic shock happen in children who have sustained traumatic femoral fracture. Plus assessment rate of the hypovolemic shock in children with traumatic isolated closed femoral fractures, as result of trivial to high energy trauma, treated by different variety of management.

References:

1. Sahlin Y. Occurrence of fractures in a defined population: a 1-year study. *Injury*. 1990 May 1;21(3):158-60.
2. Flynn JM, Hresko T, Reynolds RA, Blasier RD, Davidson R, Kasser J. Titanium elastic nails for pediatric femur fractures: a multicenter study of early results with analysis of complications. *Journal of Pediatric Orthopaedics*. 2001 Jan 1;21(1):4-8.
3. Flynn JM, Luedtke L, Ganley TJ, Pill SG. Titanium elastic nails for pediatric femur fractures: lessons from the learning curve. *American journal of orthopedics (Belle Mead, NJ)*. 2002 Feb;31(2):71.
4. Von Heideken J, Svensson T, Blomqvist P, Haglund-Åkerlind Y, Janarv PM. Incidence and trends in femur shaft fractures in Swedish children between 1987 and 2005. *Journal of Pediatric Orthopaedics*. 2011 Jul 1;31(5):512-9.
5. Anglen JO, Choi L. Treatment options in pediatric femoral shaft fractures. *Journal of orthopaedic trauma*. 2005 Nov 1;19(10):724-33.
6. Kuremsky MA, Frick SL. Advances in the surgical management of pediatric femoral shaft fractures. *Current opinion in pediatrics*. 2007 Feb 1;19(1):51-7.
7. Wright JG, Wang EE, Owen JL, Stephens D, Graham HK, Hanlon M, Nattrass GR, Reynolds RA, Coyte P. Treatments for paediatric femoral fractures: a randomised trial. *The Lancet*. 2005 Mar 26;365(9465):1153-8.
8. Kobbe P, Micansky F, Lichte P, Sellei RM, Pfeifer R, Dombroski D, Lefering R, Pape HC, TraumaRegister DGU. Increased morbidity and mortality after bilateral femoral shaft fractures: myth or reality in the era of damage control?. *Injury*. 2013 Feb 1;44(2):221-5.
9. Willett K, Al-Khateeb H, Kotnis R, Bouamra O, Lecky F. Risk of mortality: the relationship with associated injuries and fracture treatment methods in patients with unilateral or bilateral femoral shaft fractures. *Journal of Trauma and Acute Care Surgery*. 2010 Aug 1;69(2):405-10.
10. Nahm NJ, Como JJ, Wilber JH, Vallier HA. Early appropriate care: definitive stabilization of femoral fractures within 24 hours of injury is safe in most patients with multiple injuries. *Journal of Trauma and Acute Care Surgery*. 2011 Jul 1;71(1):175-85.
11. Lichte P, Weber C, Sellei RM, Hildebrand F, Lefering R, Pape HC, Kobbe P, Trauma Register DGU. Are bilateral tibial shaft fractures associated with an increased risk for adverse outcome?. *Injury*. 2014 Dec 1;45(12):1985-9.
12. Naqvi SZ, Askari R, Ashraf U. Management of simultaneous bilateral femur fractures in a tertiary care hospital: a retrospective review. *National Journal of Health Sciences*. 2017 Feb; 2(1):35.

13. Giannoudis PV, Cohen A, Hinsche A, Stratford T, Matthews SJ, Smith RM. Simultaneous bilateral femoral fractures: systemic complications in 14 cases. *International orthopaedics*. 2000 Nov 1;24(5):264-7.
14. Ippolito JA, Marciano GF, Sabharwal S. Treatment of pediatric closed femoral shaft fractures: A decline in use of external fixators over the last decade. *Journal of Limb Lengthening & Reconstruction*. 2017 Jul 1;3(2):107.
15. Murphy R, Kelly DM, Moisan A, Thompson NB, Warner Jr WC, Beaty JH, Sawyer JR. Transverse fractures of the femoral shaft are a better predictor of non-accidental trauma in young children than spiral fractures are. *JBJS*. 2015 Jan 21;97(2):106-11.
16. Kocher MS, Sink EL, Blasler RD, Luhmann SJ, Mehlman CT, Scher DM, Matheney T, Sanders JO, Watters III WC, Goldberg MJ, Keith MW. American Academy of Orthopaedic Surgeons clinical practice guideline on treatment of pediatric diaphyseal femur fracture. *JBJS*. 2010 Jul 21;92(8):1790-2.
17. Lynch JM, Gardner MJ, Gains B. Hemodynamic significance of pediatric femur fractures. *Journal of pediatric surgery*. 1996 Oct 1;31(10):1358-1361.
18. Sutherland DH, Olshen RI, Cooper L, Woo SL. The development of mature gait. *J Bone Joint Surg Am*. 1980 Apr 1;62(3):336-53.
19. Loder RT, Feinberg JR. Epidemiology and mechanisms of femur fractures in children. *Journal of Pediatric Orthopaedics*. 2006 Sep 1;26(5):561-6.
20. Rasool MN, Govender S, Naidoo KS. Treatment of femoral shaft fractures in children by early spica casting. *South African Medical Journal*. 1989;76(8).
21. Burton VW, Fordyce AJ. Immobilization of femoral shaft fractures in children aged 2–10 years. *Injury*. 1972 Jan 1;4(1):47-53.
22. Anderson WA. The significance of femoral fractures in children. *Annals of emergency medicine*. 1982 Apr 1;11(4):174-7.
23. Hui C, Joughin E, Goldstein S, Cooper N, Harder J, Kiefer G, Parsons D, Howard J. Femoral fractures in children younger than three years: the role of nonaccidental injury. *Journal of Pediatric Orthopaedics*. 2008 Apr 1;28(3):297-302.
24. Bridgman S, Wilson R. Epidemiology of femoral fractures in children in the West Midlands region of England 1991 to 2001. *The Journal of bone and joint surgery. British volume*. 2004 Nov;86(8):1152-7.

Tables:

Due to technical limitations, tables PDF is only available as a download in the Supplemental Files section.

Figures

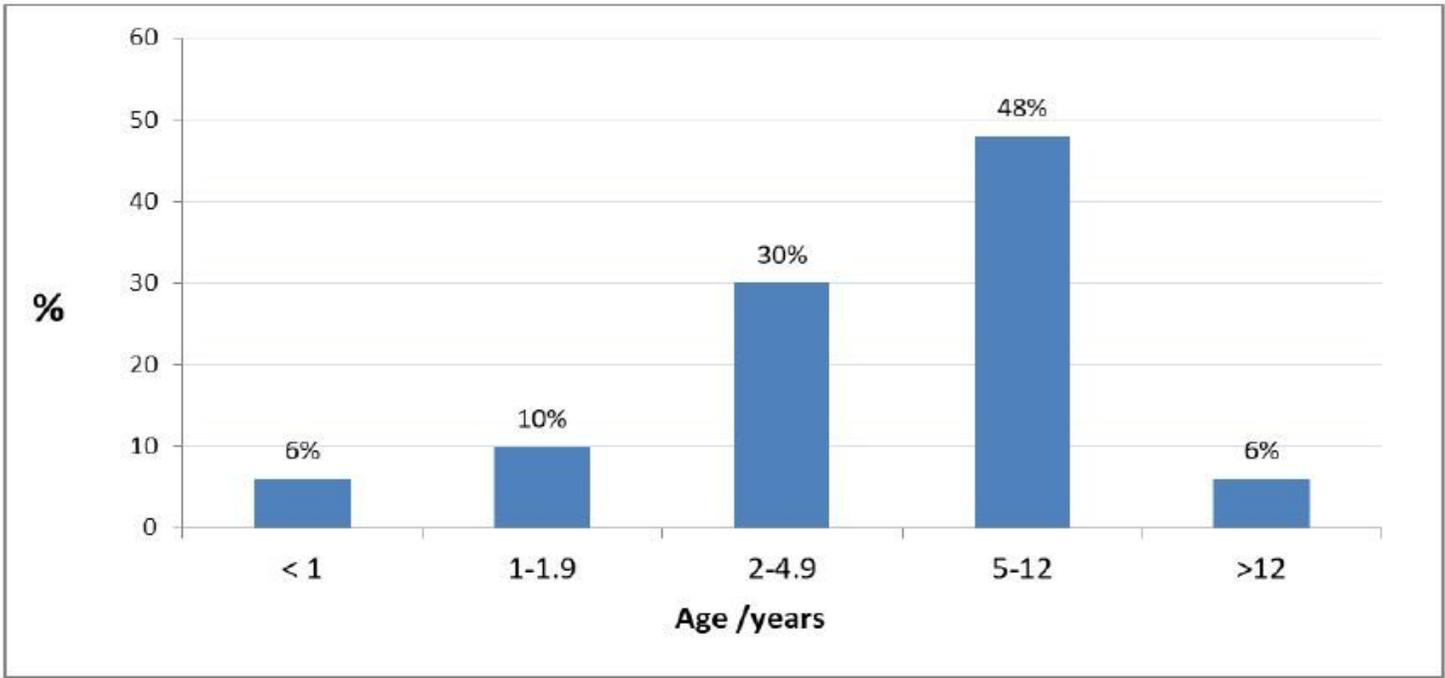


Figure 1

Age of more common affected child age with fracture femur. The percentage of fractures femur in children for each age group affected with these type fractures.

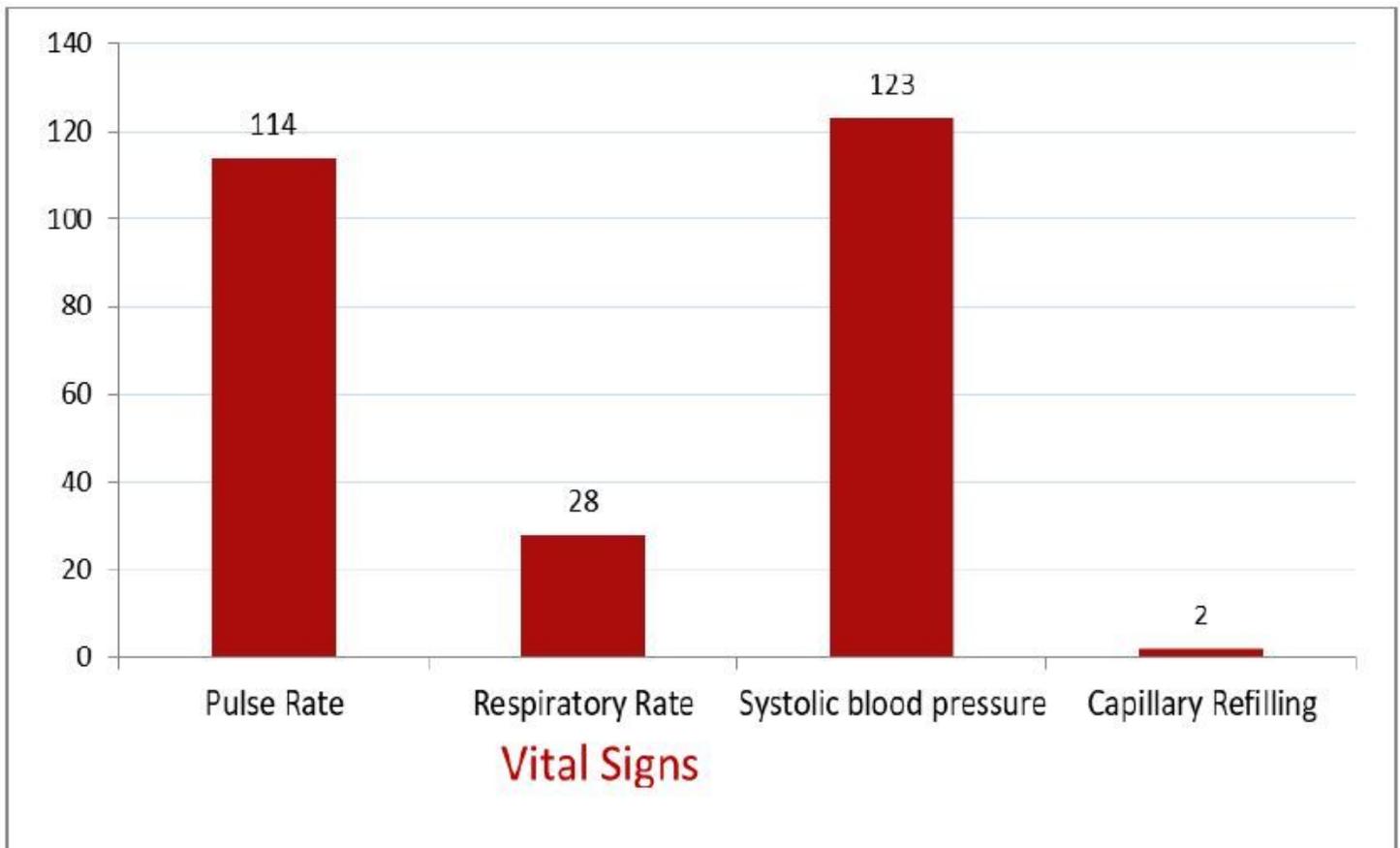


Figure 2

Mean Vital Sign affected child with fracture femur. Vital Sign in the Study Results dependable criteria • Plus Rate • Respiratory Rate • Blood Pressure • Skin Capillary Refilling

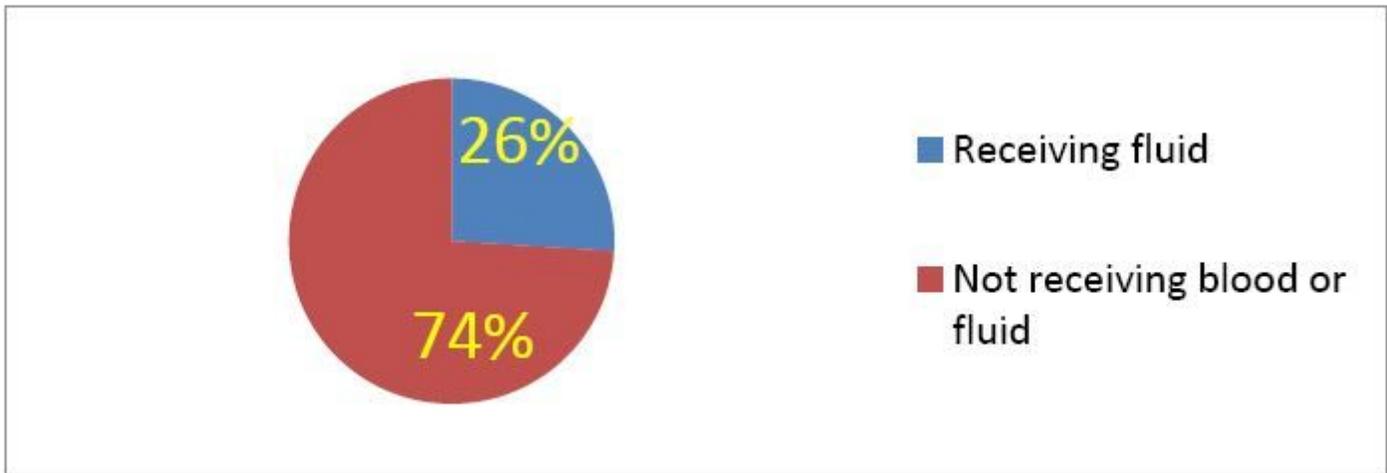


Figure 3

Pie chart Results Receiving or Not Receiving (fluid or blood) in 100%. This figure determined the patients who receiving blood or fluid which is 26% were are not indicated with other patients who did not receiving blood or fluid which was 74%. Demonstrated the hemodynamic stability of fractures femur in children.

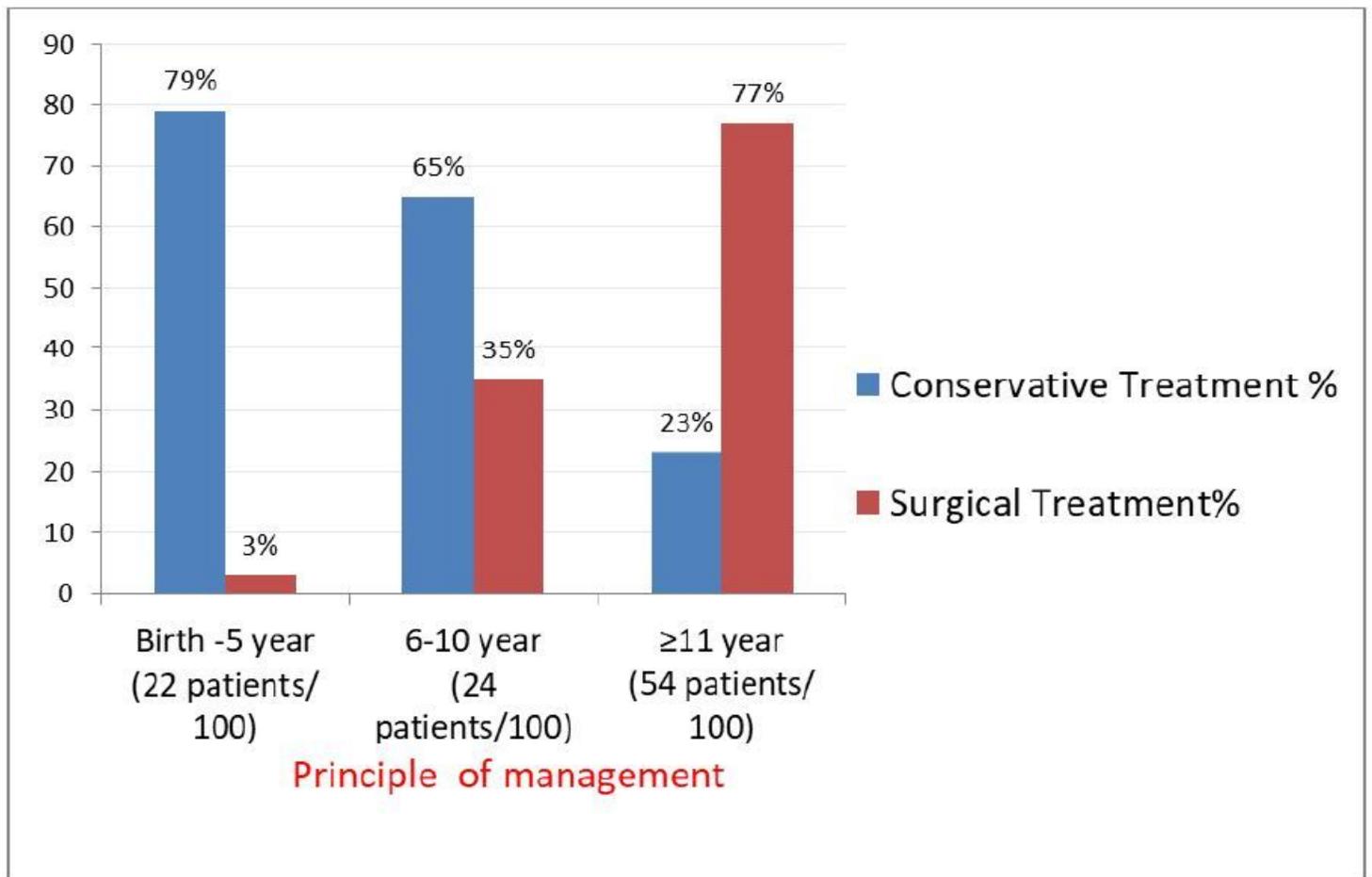


Figure 4

Principles of Management Surgical/ Conservative affected child with fracture femur according to age percentage. This figure demonstrated the treatment of fracture femur in children with different age group, the high rate of conservative from birth age to 5 year in compared to more than 11 years were surgical intervention is higher.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [2.Tables.pdf](#)
- [4.SupplementaryMaterialforArticle.pdf](#)