



Original Article

Evaluation of Hemodialysis Complications among Children with Chronic Kidney Disease at District Head Quarter Hospital, Nankana Sahib

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ARTICLE INFO

Key Words:

Hemodialysis, Children, Complication, Renal Disease, Evaluation

How to Cite:

Naheed, R., Akhtar, S., Perveen, S., Perveen, R., & Mazhar, R. (2023). Evaluation of Hemodialysis Complications among Children with Chronic Kidney Disease at District Head Quarter Hospital, Nankana Sahib : Hemodialysis Complications among Children with Chronic Kidney Disease . NURSEARCHER (Journal of Nursing & Midwifery Sciences), 3(02). <https://doi.org/10.54393/nrs.v3i02.56>

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Received Date: 14th November, 2023

Acceptance Date: 29th December, 2023

Published Date: 31st December, 2023

ABSTRACT

A patient with chronic kidney disease depends on hemodialysis to mechanically remove fluid, electrolytes, and waste products from the blood. Chronic kidney disease (CKD) is a universal matter of concern that affects around 15% of the population globally. **Objective:** To evaluate hemodialysis complications among children with chronic kidney disease. **Methods:** A cross-sectional descriptive study was carried out at the renal department of DHQ hospital. The duration of study was six months from April to September, 2023. The sample size was 45 children on hemodialysis with kidney disease. A purposive sampling technique was used. Data were gathered through self-administrated questionnaire. Data were analyzed through SPSS-25.0 and results were presented in the form of frequencies tables. **Results:** Majority of the participants suggested that initiation of hemodialysis lead to cardiovascular problems (72%), anemia(83%), and metallic taste(79%) in children. Moreover, majority of them complained about skin problem and itching as an adverse effect (78%). Other complications as indicated by participants are headache, restlessness, vertigo, nausea and vomiting(86%). Conversely, some subjects did not considered the hypertriglyceridemia (27%), gastric problems (31%), sleep problems (24%) and muscular pain (34%) as the result of initiation of hemodialysis procedure. **Conclusions:** Findings of present study suggested the most common complications of hemodialysis are hemodynamic instability, anemia and hypertension/hypotension, skin problems and itching. Other complications of hemodialysis as indicated by participants are headache, restlessness, vertigo, nausea, vomiting and decrease concentration in children. However, most of the participants have limited understanding about additional complications of hemodialysis.

INTRODUCTION

Hemodialysis is a procedure used to cleanse a patient blood whose kidneys are not functioning properly. When the kidneys are failing, this kind of dialysis removes waste products like urea and creatinine from the blood [1]. Three renal replacement therapies exist: hemodialysis, peritoneal dialysis, and kidney transplant. The most popular and effective type of renal replacement therapy is hemodialysis [2]. Chronic Kidney Disease (CKD) is a universal matter of concern that affects around 15% of the population globally. In Asian countries, the prevalence of

CKD is very high and China shows the highest with 18.3%, Taiwan 9.83%, 10.6% in Nepal and 23.3% in Pakistan [3]. In Pakistan, an estimated prevalence rate of end-stage kidney disease is 100 per million populations. Moreover, kidney transplant rate is 8-10 cases per million populations, 10% of patients are on hemodialysis, and 3% undergo peritoneal dialysis [4]. Dialysis is necessary when there is a significant electrolyte imbalance, fluid overload, hyperammonemia, or uremic encephalopathy in children with kidney injury. Congenital abnormalities of the kidney

and urinary tract and glomerular disorders are common causes of pediatric kidney failure that necessitates dialysis [5]. Furthermore, congenital anomalies account for the majority of congenital kidney disease (CKD) in children under the age of five. While glomerulonephritis prevail after the age of five and polycystic kidney disease can occur throughout childhood cause kidney disease [6]. A patient in end-stage renal disease depends on dialysis to mechanically remove fluid, electrolytes, and waste products from the blood. A nephrologist determines the numerous factors for a dialysis therapy as well as when hemodialysis is necessary. These consist of the dialyzer's size, blood and dialysis solution flow rates, time of treatment, and frequency (the number of sessions per week). Periodically, the levels of bicarbonate, potassium, and sodium in the dialysis fluid are also modified [7]. For hemodialysis to be most effective, the patient needs good vascular access with an arteriovenous (AV) fistula or an AV graft that provides adequate blood flow. The policies and procedures or clinical tips required to protect and maintain vascular access and prevent complications such as infection, stenosis, thrombosis, and bleeding etc. Children with chronic kidney disease (CDK) have longer periods of hemodialysis and more complications as a result of delay in kidney transplantation [8]. Hemodialysis treats 54% of children with chronic kidney disease but it is also associated with a number of complications, the most prevalent of which are cardiovascular in nature and include hypertension, arrhythmias, and hypotension [9]. The death rate from cardiovascular problems is 10–100 times higher in patients with CKD receiving dialysis than in the general population. Recurrent hospitalizations, hypertriglyceridemia, Gastric ulcers, hypertension, sleep disorders skin and developmental issues in children. Even so, hemodynamic instability was a significant issue. Previous research indicated that in addition to end-stage renal disease, continuous blood loss from hemodialysis lines, the requirement for numerous venipunctures, and the surgical process could also be responsible for anemia. However, there are few data on morbidity in newborns receiving hemodialysis [10]. Furthermore, blood coagulation in the dialysis circuit despite appropriate heparinization was another complication that occurred very frequently in children on hemodialysis. Hemoconcentration brought on by excessive ultrafiltration in relation to the dialyzer surface area most likely caused this problem [11]. Hyperkalemia and hypoglycemia were also the complications of HD. Due to the high fluid consumption, intradialytic hemodynamic instability, and dependence of infants' on fluids for nourishment, creates problems in the elimination of enough fluid [12]. While the main principles of dialysis treatment are the same for adult and juvenile

populations, it is important to take into account the distinct growth, developmental, and psychological needs of children. Since HD presents particular technical difficulties in children, it is important to closely monitor any potential complication that could result in serious morbidity or fatality. Effective and secure hemodialysis also heavily depends on patient monitoring, evaluation, and management of complications including fluid excess or hypotension. Therefore, the aim of present study is to evaluate the hemodialysis complications among children with chronic kidney disease.

METHODS

A cross-sectional descriptive study was carried out at the renal department of DHQ hospital, Vehari. Data were collected from the patients on hemodialysis with chronic kidney disease in the dialysis unit. The duration of study was six months from April to September, 2023. Target population was 52 taken from the OPD register in last 6 months. The sample size was 45 children on hemodialysis with kidney disease and calculated through WHO calculator with 95% level of confidence, 5% margin of error and 70% value of population proportion. A purposive sampling technique was used to engage the participants for data collection. Data were collected from parents of the children having age 1 to 15 years, both male and female with diagnosis of chronic kidney disease and agree to participate in the study. While children who were admitted in intensive care units and suffered from nephritic syndrome and acute illness were excluded. Data were gathered through self-administrated questionnaires. Questionnaire was consisted on two parts i-e demographic profile of study subjects and scale to evaluate hemodialysis complications among children with chronic kidney disease. The scale of hemodialysis complications consisted on 13 questions pertaining to complications as hypertriglyceridemia, anemia, hemodynamic instability, gastric problem, bone pain, sleeping problems and headache etc. The questions were measured on yes and no responses. Ethical approval was taken from the departmental ethical committee of nursing college with reference No.RP/CON/23/79 dated June 15, 2023. Moreover, Permission was taken from the study participants in the dialysis unit before their inclusion in the research and aim of the study was explained to them. The study subjects had the right to refuse and withdraw from the study. The data were analyzed through SPSS-24 and results were presented in the form of frequencies tables.

RESULTS

The result section was consisted on two parts as demographic profile of study participants and scores pertaining to hemodialysis complications among children.

According to demographic characteristics of participants in Table 1, majority of the children on dialysis (67%) were between the ages of 6 to 10 Years. The scores about gender depicted most of study subjects were male (70%) and female child (30%). Whereas the data about education showed that 5(12.0%) were uneducated, 13(28.0%) were able to read / write, 20(45.0%) have done primary and only 7(15.0%) were having intermediate qualification. Upon asking about residency of participants, just 17 percent belong to urban while others were from rural area(83%).

Table 1: Demographics of Study Participants(n=90)

Demographic Characteristics	N (%)
Age	
01-05 Years	5 (11.0)
06-10 Years	30 (67.0)
11-15 Years	10 (22.0)
Gender	
Male	31 (70.0)
Female	14 (30.0)
Education Level of Participants	
Illiterate	5 (12.0)
Able to Read / Write	13 (28.0)
Primary	20 (45.0)
Intermediate	7 (15.0)
Education Level of Participants	
Urban	8 (17.0)
Rural	37 (83.0)

Results of Table 2 indicated that majority of the participants agreed with the statements that initiation of hemodialysis lead to cardiovascular problems (72%) in children. Furthermore, most of the participants were suffered from anemia after the start of hemodialysis(83%) and 79% of children felt metallic taste when they need hemodialysis after its initiations. Patients reported that they were suffered from hypertension (77%) /hypotension (62%) during and after the hemodialysis procedure. Majority participants said that they suffered from skin problem and itching as an adverse effect of hemodialysis (78%). Other sign and symptoms as indicated by participants were headache, restlessness, vertigo, nausea and vomiting (86%). However, some of the participants indicate limited understanding regarding other complications of hemodialysis. As majority participants did not considered the hypertriglyceridemia (27%), gastric problems(31%), sleep problems(24%) bone pain(44%), and muscularpain (34%) as the result of initiation of hemodialysis procedure.

Table 2: Questionnaire about Hemodialysis Complication among children

Parameters	Yes N (%)	No N (%)
Hemodialysis causes hypertriglyceridemia	12(27)	33(73)
Hemodialysis leads to cardiovascular complications	32(72)	13(28)
Children suffering from post-hemodialysis anemia	37(83)	08(17)
Hemodialysis causes gastric problems /gastric ulcer	14(31)	31(69)
Children reported metallic taste when they need dialysis	36(79)	9(21)
Bone pain/fractures as a result of hemodialysis	20(44)	25(56)
hypertension during and post hemodialysis,	35(77)	10(23)
Hypotension during and post hemodialysis,	28(62)	17(38)
skin problems or itching during and post hemodialysis	35(78)	10(22)
Sleep problems/ difficulty sleeping	11(24)	34(76)
Muscle pain Occurrence	15(34)	30(66)
Dysrhythmias occurred since started hemodialysis	19(42)	26(58)
Headache, nausea and vomiting, restlessness, and a lowered level of awareness	39(86)	6(14)

DISCUSSION

The aim of present study is to evaluate the hemodialysis complications among children with chronic kidney disease. Hemodialysis is necessary when there is a significant electrolyte imbalance, fluid overload, hyperammonemia, or uremic encephalopathy in children with kidney disease. Furthermore, congenital abnormalities of the kidney/urinary tract and glomerular disorders are common causes of pediatric kidney failure that necessitates dialysis [5]. The present study suggested that majority of the children on dialysis (67%) were between the ages of 6 to 10 Years. Whereas the data about education showed that 5(12.0%) were uneducated, 13(28.0%) were able to read / write, 20(45.0%) have done primary and only 7(15.0%) were having intermediate qualification. These findings are similar with one of previous study results as majority of sample age ranged from 7-11 years [13]. Furthermore, current study results indicated that initiation of hemodialysis lead to cardiovascular problems (72%), anemia(83%) and 79% of children felt metallic taste when they need hemodialysis after its initiations. Patients reported that they were suffered from hypertension or hypotension (77%) during and after the hemodialysis procedure. These results are consisted with literature where hemodynamic instability was a significant issue. Hemodialysis is accompanied by several complications among which cardiovascular complications are currently the most common among these hypotension, hypertension and arrhythmias are mostly encountered [14]. Previous research indicated that in addition to end-stage renal disease, continuous blood loss from hemodialysis lines, the requirement for numerous venipunctures, and the surgical process could also be responsible for anemia. Another research findings suggested that due to the high fluid

consumption, intradialytic hemodynamic instability, and dependence of infants' on fluids for nourishment, create problems in the elimination of enough fluid [14, 15]. Majority participants said that they were suffered from skin problem and itching a complication of hemodialysis (78%). Other sign and symptoms as indicated by participants were headache, restlessness, vertigo, nausea and vomiting (86%). While the main principles of dialysis treatment are to take into account the distinct growth, developmental, and psychological needs of children. A variety of strategies were employed, including teaching, psychological support, artistic expression, medical clowns, entertainment, parental holding, and in one instance, breastfeeding during dialysis. These exercises must be planned by a multidisciplinary team for the best outcomes [16, 17]. However, some of current study participants indicate limited understanding regarding other complications of hemodialysis. As majority participants did not considered the hypertriglyceridemia (27%), gastric problems (31%), sleep problems (24%) bone pain (44%), and muscular pain (34%) as the result of initiation of hemodialysis procedure. One of the previous study results are against the present study findings. Children undergoing hemodialysis suffered from high level of cholesterol in blood along with gastric ulcer complain [18]. The prognosis for kids with chronic kidney disease (CKD) has significantly improved as a result of better medical care, which includes renal replacement therapy, recombinant growth hormone, erythropoietin, and rigorous nutritional support. Moreover, the likelihood of these complications has decreased by trustworthy monitoring devices, better dialysate delivery systems and automated safety features in hemodialysis equipment [19, 20]. The prevalence of kidney disease in previous studies were from 50 to 70 percent per million of population [21].

CONCLUSIONS

Hemodialysis is a frequently used technique for chronic kidney replacement therapy in children. Findings of present study suggested the most common complications of hemodialysis are hemodynamic instability, anemia and hypertension/hypotension, skin problems and itching etc. Other complications of hemodialysis as indicated by participants are headache, restlessness, vertigo, nausea, vomiting and decrease concentration in children. However, most of the participants have limited understanding about other complications of hemodialysis.

Authors Contribution

Conceptualization: RN

Methodology: SP

Formal analysis: RP

Writing-review and editing: RN, SA, RM

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

- [1] Atikel YÖ, Schmitt CP, Lévai E, Adalat S, Shroff R, Goodman N, et al. The effects of hospital and dialysis unit characteristics on hospitalizations for access-related complications among children on maintenance dialysis: a European, multicenter, observational, cross-sectional study. *Pediatric Nephrology*. 2023 Jul; 38(7): 2189-98. doi: 10.1007/s00467-022-05842-5.
- [2] Chanchlani R, Young C, Farooq A, Sanger S, Sethi S, Chakraborty R, et al. Evolution and change in paradigm of hemodialysis in children: a systematic review. *Pediatric Nephrology*. 2021 May; 36: 1255-71. doi: 10.1007/s00467-020-04821-y.
- [3] Ahmed OF, Hamodat OM, Kakamad FH, Abduljabbar RS, Salih AM, Omar DA, et al. Outcomes of arteriovenous fistula for hemodialysis in pediatric age group. *Annals of Medicine and Surgery*. 2021 Dec; 72: 103100. doi: 10.1016/j.amsu.2021.103100.
- [4] Güngör T, KarginÇakıcı E, Yazılıtaş F, Karakaya D, Çelikkaya E, Bülbül M. Acute intermittent hemodialysis management in childhood: A single center experience. *Therapeutic Apheresis and Dialysis*. 2023 Feb; 27(1): 66-72. doi: 10.1111/1744-9987.13854.
- [5] Zaritsky JJ, Salusky IB, Gales B, Ramos G, Atkinson J, Allsteadt A, et al. Vascular access complications in long-term pediatric hemodialysis patients. *Pediatric Nephrology*. 2008 Nov; 23: 2061-5. doi: 10.1007/s00467-008-0956-1.
- [6] Aksoy GK, Ekim M, Bakkaloğlu SA, Coşkun S, Delibaş A, Conkar S, et al. Evaluation of non-infectious complications of peritoneal dialysis in children: a multicenter study. *Pediatric Nephrology*. 2021 Feb; 36: 417-23. doi: 10.1007/s00467-020-04719-9.
- [7] Inoki Y, Nishi K, Osaka K, Kaneda T, Akiyama M, Sato M, et al. Postoperative management and complications after abdominal surgery in children receiving peritoneal dialysis. *Pediatric Nephrology*. 2023 Oct; 38(10): 3427-34. doi: 10.1007/s00467-023-06009-6.
- [8] Gurbanov A, Gülhan B, Kuşkonmaz B, Okur FV, Ozaltın F, Düzova A, et al. Predictors of kidney complications

- and analysis of hypertension in children with allogeneic hematopoietic stem cell transplantation. *Pediatric Nephrology*. 2023 Feb; 38(2): 461-9. doi: 10.1007/s00467-022-05599-x.
- [9] Wright E, Fischbach M, Zaloszc A, Paglialonga F, Aufricht C, Dufek S, et al. Hemodialysis in children with ventriculoperitoneal shunts: prevalence, management and outcomes. *Pediatric Nephrology*. 2016 Jan; 31: 137-43. doi: 10.1007/s00467-015-3204-5.
- [10] Sheth RD, Brandt ML, Brewer ED, Nuchtern JG, Kale AS, Goldstein SL. Permanent hemodialysis vascular access survival in children and adolescents with end-stage renal disease. *Kidney International*. 2002 Nov; 62(5): 1864-9. doi: 10.1046/j.1523-1755.2002.00630.x.
- [11] Prakash R, Ohri A, Udani A, Ali US. Survival of Tunneled Double Lumen-Cuffed Catheters in Children on Maintenance Hemodialysis-A Retrospective Cohort Study. *Indian Journal of Nephrology*. 2023 Sep; 33(5): 348-55. doi: 10.4103/ijn.ijn_37_22.
- [12] Wasik HL, Neu A, Warady B, Crawford B, Richardson T, De Souza HG, et al. The cost of hospitalizations for treatment of hemodialysis catheter-associated blood stream infections in children: a retrospective cohort study. *Pediatric Nephrology*. 2023 Jun; 38(6): 1915-23. doi: 10.1007/s00467-022-05764-2.
- [13] Shroff R, Wright E, Ledermann S, Hutchinson C, Rees L. Chronic hemodialysis in infants and children under 2 years of age. *Pediatric Nephrology*. 2003 Apr; 18: 378-83. doi: 10.1007/s00467-003-1070-z.
- [14] Mandel-Shorer N, Tzvi-Behr S, Harvey E, Revel-Vilk S. Central venous catheter-related venous thrombosis in children with end-stage renal disease undergoing hemodialysis. *Thrombosis Research*. 2018 Dec; 172: 150-7. doi: 10.1016/j.thromres.2018.10.031.
- [15] Preka E, Shroff R, Stronach L, Calder F, Stefanidis CJ. Update on the creation and maintenance of arteriovenous fistulas for haemodialysis in children. *Pediatric Nephrology*. 2021 Jul; 36: 1739-49. doi: 10.1007/s00467-020-04746-6.
- [16] Baracco R, Chand DH, Chand B, Valentini RP. Vascular Access and Peritoneal Dialysis Catheter Placement in Children. *Handbook of Dialysis Therapy*. 2023 Jan: 669-79. doi: 10.1016/B978-0-323-79135-9.00070-7.
- [17] Fadel FI, Yamamah GA, Hasanin RM, Mostafa EA, Abdalgeleel SA, Salah MM, et al. Hearing assessment in Egyptian children with chronic renal failure on regular hemodialysis and renal transplantation children. *Therapeutic Apheresis and Dialysis*. 2022 Oct; 26(5): 960-8. doi: 10.1111/1744-9987.13783.
- [18] Ambarsari CG, Cho Y, Milanzi E, Francis A, Koh LJ, Lalji R, et al. Epidemiology and outcomes of children with kidney failure receiving kidney replacement therapy in Australia and New Zealand. *Kidney International Reports*. 2023 Oct; 8(10): 1951-64. doi: 10.1016/j.ekir.2023.07.006.
- [19] Shiri S, Naik NM, Lalitha AV, Vasudevan A. Sustained low efficiency dialysis in critically ill children with acute kidney injury: Single-center observational cohort in a resource-limited setting. *Pediatric Critical Care Medicine*. 2023 Mar; 24(3): e121-7. doi: 10.1097/PCC.0000000000003127.
- [20] Pretto CR, Winkelmann ER, Hildebrandt LM, Barbosa DA, Colet CD, Stumm EM. Quality of life of chronic kidney patients on hemodialysis and related factors. *Revista Latino-Americana de Enfermagem*. 2020 Jul; 28: e3327. doi: 10.1590/1518-8345.3641.3327.
- [21] Masalskienė J, Rudaitis Š, Vitkevič R, Čerkauskienė R, Dobilienė D, Jankauskienė A. Epidemiology of chronic kidney disease in children: a report from Lithuania. *Medicina*. 2021 Jan; 57(2): 112. doi: 10.3390/medicina57020112.