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Research Article

Infections in Pediatric Dialysis Patients in Mubarak Al-Kabeer Hospital, Kuwait: 10 Year's Experience

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Abstract

Objective: As the incidence of End Stage Renal Disease (ESRD) worldwide has increased, so has the need for performing Hemodialysis (HD) and Peritoneal Dialysis (PD). We sought to identify risk factors and measure the rate of infections in pediatric patients undergoing dialysis.

Design: A retrospective study

Setting: Single pediatric dialysis center in Kuwait from July 2003-July 2013

Subjects: Pediatric patients undergoing PD or HD

Interventions: Follow up of risk factors and rate of infections incidents

Main outcome measures: Risk factors, incidence rate of infections and microbiological profile of organisms causing dialysis-related infections were determined in HD or PD patients.

Results: A total of 91 patients underwent HD and 63 patients underwent PD. The episodes of infection were documented in 13 patients in each of the two groups. Our rates of infection were found to be one peritonitis episode per 20 patient-months in PD group and 0.41 infection episodes per patient-year in HD group. The commonest organisms isolated in PD-related infections were *Pseudomonas aeruginosa* and Coagulase-Negative Staphylococci (CNST) whereas in HD-related infections CNST was the leading organism. Among the risk factors in both groups, personal hygiene was the most significant with a P-value of <0.05. Mortality related to infection was 7.7% in PD with a median follow up of 6 months and none was reported in HD.

Conclusion: Our infection rates were consistent with international reports and consistent with others in proving poor personal hygiene as a significant risk factor for infection in patients undergoing renal dialysis.

Introduction

The incidence of End-Stage Renal Disease (ESRD) has increased worldwide leading to advancements in dialysis care in order to improve the overall survival rate [1]. However, dialysis access, whether in Hemodialysis (HD) or Peritoneal Dialysis (PD), remains a challenge, especially in pediatric patients. Although dialysis access is the mainstay in ESRD management, it also represents a major source of morbidity for these patients while contributing significantly to health care costs. Infections are a significant, potentially modifiable, contributor to access-related difficulties. In general, infections represent the second leading cause of death in ESRD patients, behind only cardiovascular disease and are a leading cause of hospitalization [1-4]. Concerning PD, exit site infections and peritonitis remain the most common causes of treatment failure. This is largely due to the constant reserve of a dextrose-rich solution in the peritoneal space, which provides a high-risk environment for infection along with frequent daily access manipulation. HD, however, represent a fast and efficient correction of fluid and metabolic abnormalities, better oral intake of food and drugs, and eliminates the active participation of patient or family in the dialysis procedure. Tunneled cuffed Central Venous Catheters (CVCs) inserted surgically, mostly into the superior vena cava, offer long-term option for HD in the pediatric age group [2,3,5].

The aim of this study was to measure the incidence rate and risk factors for the development of infection following HD or PD and examine the microbiological profile of common organisms causing dialysis-related infections. We retrospectively studied incidence of infection in pediatric patients undergoing dialysis at the dialysis center of Mubarak Al-Kabeer hospital in Kuwait from the time of its establishment in July 2003 to June 2013.

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Table 1: Year-wise distribution of number of patients undergoing PD and HD (total and infected) in the dialysis unit of Mubarak Al-Kabeer Hospital during 2003 to 2013.

Year	No. of patients undergoing PD		No. of patients undergoing HD	
	Total	Infected	Total	Infected
2003	11	0	6	13
2004	4	4	13	4
2005	4	5	10	4
2006	5	2	12	3
2007	3	6	12	7
2008	3	6	11	2
2009	5	0	11	3
2010	5	3	8	1
2011	9	6	6	1
2012	8	7	5	2
2013	9	1	3	0
Total		40		40

Methods

All episodes of HD and PD related infections that occurred between July 2003 and July 2013 were reviewed while categorizing them into relapse, refractory or recurrent episodes according to international regulations [6]. Retrospective analyses of all positive blood cultures results (BACTEC 9240 System, Becton Dickinson, USA) from patients were recorded. For patients who underwent PD, incidence of exit-site infections and peritonitis data were collected. The status of personnel hygiene was based on the record made by dialysis nurse taking care of each case.

Results

A total of 91 and 63 patients underwent HD and PD, respectively, during the 10-year period of study. The episodes of infection were documented in 13 patients in each of the two groups.

Peritoneal Dialysis

During the study period, 13 patients (5 males and 8 females) developed PD-related infections. Of these, 70% were Kuwaiti (9/13) with a median age of 6 years (range: 2 months to 12 years). All cases required dialysis because of congenital uropathy except for one case, who was diagnosed as a case of glomerulonephritis . There were a total of 40 episodes of infection in this group with relapses and refractory infections in three patients each, while four patients experienced recurrent infections, who had more than three episodes of infection during the study period (Table 1). Rate of peritonitis was estimated to be one episode of peritonitis per 20 patient month's.

The leading causative organisms were *Pseudomonas aeroginosa* 20% (8/40) and Coagulase Negative Staphylococcus (CNS) 20% (8/40) followed by Klebsiella pneumoniae 12% (5/40). Four episodes were due to more than one organism. Only one case who developed candida infection expired despite removal of the catheter and treatment with intravenous amphotericin B.

In 30 episodes (75%), the access was believed to be the cause of infection. However, access had to be replaced in five episodes only, two of which were associated with Methicillin Resistant *S. aureus* (MRSA) infection and required patients to be switched to HD. The other three infections were due to CNS, *Escherichia coli* and Candida spp. Mortality related to infection was estimated to be 7.7% and was primarily associated with *Candida* infection The most recognized risk factor for developing infection was poor personnel hygiene with a statistically significant difference (P=0.0004).

Hemodialysis

There were 13 patients who developed infections following HD. A total of 40 episodes of infection developed in 9 males and 4 females of which the majority were non-Kuwaiti (62%) (Table 1). Median age at presentation was 6.6 months (range: 1.5 months to 15 months). Only one patient had concomitant Hepatitis C infection. The leading cause of ESRD in the infection group was congenital uropathy (82%). Four (10%) patients had history of failed renal transplant surgery. The rate of infection was one episode per 38.9 months or 0.41 episodes per patient year.

The commonest organism isolated was CNS in 20 episodes (50%) followed by *S. aureus* in 9 (22.5%) cases. Only one infection was due to two organisms; *Corynebacterium spp* and *Klebsiella pneumoniae*. *Candida parapsilosis* was encountered in one patient who survived after removal of the catheter and treated with intravenous conventional amphotericin B. The infection was believed to be catheter related on 26 occasions (65.0 %) with 7 patients developing concomitant Blood Stream Infection (BSI). Of 18 occasions which required change of line, 3 were because of recurrent infection necessitating change of line twice. And poor personnel hygiene was believed to be the most statistically significant risk factor similar to PD-related infection (P<0.0001). There was no record of attributed mortality in any of the cases in this group.

Discussion

No data exist from Kuwait regarding infection rate in dialysis patients. As such, this study contributes to understanding the problem at our institution as compared to the data from other dialysis centers in the world.

In our retrospective study, congenital anomalies were the leading cause of ESRD in pediatric patients requiring either HD or PD. Data from United States are similar to our findings with cystic/hereditary and congenital disorders accounting for 36% followed by glomerular diseases 23% and secondary causes of glomerulonephritis 11% among all cases of ESRD in pediatric patients [1,7].

PD associated infections are commonly caused by CNS with the worldwide rate of occurrence reported as 30% [4,-6]. Our data showed that 20 % of the PD-related infections and 50% of HD related infections were due to CNS. Whereas gram negative bacilli, other than *Pseudomonas* spp., are second only to CNS in causing PD-related infections in the United States, [6] *Pseudomonas aeruginosa* ranked first along with CNS in our patients. Fungal peritonitis occurs rarely and only one case with fatal outcome was reported in our establishment (2.4%) during the study period. Generally, international reports on PD-related fungal infections fall below 5% [6-9]. Furthermore, our data are consistent with others, which showed poor personal hygiene as a significant risk factor for both

PD- and HD- related infections [10]. The infection rates of one case of peritonitis per 20 patient months among our pediatric patients with ESRD undergoing PD were found to be within the acceptable ISPD benchmark of 1 episode per 18 patient months [6]. Also, among patients undergoing HD, the rate of 0.41 episode of BSI per patient year is similar to risk reported worldwide [7].

Conclusion

Although the rates of infection fall within the acceptable range among our pediatric patients undergoing PD or HD, further decrease in the rates is possible with emphasis on good personal hygiene and proper care of the access line used for dialysis.

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