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PREVALENCE OF THE ACUTE RENAL FAILURE IN THE IRANIAN NEWBORNS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Amin AfshariMoghadam
Zabol University of medical sciences, Zabol, Iran
Conflicts of Interest: Nil
Corresponding author: Amin AfshariMoghadam

ABSTRACT

Introduction: Many studies are performed on kidney failure, the evaluation of kidney failure risk factors in neonates and the identification of the causes and the diagnosis and treatment methods seem necessary due to the different conditions of neonatal intensive care units.

Methods: The searches were conducted by two independent researchers and the aim was to find the relevant studies published from 1/1/2000 to 30/5/2019. Finally, a meta-analysis was performed using STATA14 statistical software.

Results: A total of 10461 patients and a total of 7 studies from 4 provinces that met the inclusion criteria were evaluated. According to the random effect model, the total Prevalence of the acute renal in 10461 patients was 3% (3%-4% at a 95% confidence interval, I^2 = 96.2%).

Conclusions: Initial diagnosis and treatment of azotemia will lead to improvement in renal function and urinary output, timely diagnosis and treatment can prevent the development of pre-renal failure to endogenous renal failure and reduce the need of dialysis in neonates.

Key words: Newborn, Dehydration, Acute renal failure , Jaundice.

INTRODUCTION

Acute kidney failure is characterized by the inability to maintain fluid and acid- base homeostasis (1). The prevalence of kidney failure in the neonatal intensive care unit is about 4-21% and increases the risk of child mortality (2). The most common type of kidney failure in neonates is pre-renal failure, which is usually due to reduced milk intake (3). If milk intake reduces, neonatal kidneys may serve as a defense mechanism to retrieve urinary level of minerals and fluid retention, resulting in hypernatremia and pre-renal failure, as well as lung fluid and body fluid secretion due to the insufficient maturation of the infant skin and can exacerbate these problems (4). Neonates, especially premature neonates, are extremely sensitive to water and electrolyte changes, and impaired renal function make them susceptible to the effects of water, electrolyte and acid- base changes (5). During infancy, acute kidney failure is one of the most important, serious, and dangerous diseases and early diagnosis and initiation of appropriate treatment can greatly reduce its complications (6). The incidence of acute kidney failure in the neonatal intensive care units varies from 6 to 23% (7). Although many studies are performed on kidney failure, the evaluation of kidney failure risk factors in neonates and the identification of the causes and the diagnosis and treatment methods seem necessary due to the different conditions of neonatal intensive care units (8).

Methods

Inclusion criteria (eligibility criteria):

The methods used in this systematic review were based on the Checklist (PRISMA) Guidelines. In this research, cross-sectional, case-control, and cohort studies were included and case studies, letters to editors, case reports, clinical trials, study protocols, systematic reviews were excluded.

Participants: All studies of the Prevalence of the acute renal failure in the Iranian newborns.

Findings: The main purpose of this study was to determine the Prevalence of the acute renal failure in the Iranian newborns and the findings were reported.

Sampling Methods and Sample Size: All observational studies were included in the systematic review regardless of their design. The minimum sample size was 25 patients or more.

Search Strategy

The searches were conducted by two independent researchers and the aim was to find the relevant studies published from 1/1/2000 to 30/5/2019. The

researchers searched for published studies in the English language in MEDLINE via PubMed, EMBASETM via Ovid, the Cochrane Library and Trip database. For studies published in other languages, National Database (Magiran and SID, KoreaMed and LILACS), and for unpublished studies, OpenGrey (www.opengrey.eu/), World Health Organization Clinical Trials Registry (who.int/ictrp), and ongoing studies were searched. To ensure that the studies are adequate, the reference lists of the retrieved studies were also searched and studied. Systematic review articles were searched using MeSH and open terms in accordance with publication standards. After the MEDLINE strategy was finalized, the results were compared to search for other databases, as well as PROSPERO was searched for recent or ongoing systematic reviews. The keywords used in the search strategy are: Dehydration, Newborn, Jaundice, Acute renal failure.

Study Selection and Data Extraction

The two researchers independently analyzed the titles and abstracts of the articles according to eligibility criteria. After excluding additional studies, the full text of each study was evaluated on the basis of eligibility criteria and the information about the authors was collected as needed. The general information (the first author, province in which the study was conducted and year of publication), study information (the sampling technique, diagnostic criteria, data collection method, research conditions, the sample size, and risk of bias) and output scale (Prevalence of the acute renal failure) were collected.

Quality Assessment

The extended scale of Hoy et al. was used to evaluate the quality of method and the risk of bias in each observational study. This 10-item scale assesses the quality of studies according to their external validity (items 1 to 4 evaluate the target population, sampling frame, and minimum selection bias) and internal validity (items 5 to 9 evaluate the data collection, problem statement, research scale and data collection tool, while item 10 evaluates the data analysis bias). The risk of bias was measured by two researchers independently and disagreements were resolved by consensus.

Data Collection

All eligible studies were included in the data collection after a systematic review and the data were integrated using the cumulative chart. The random effect model was evaluated based on the overall prevalence of the disease among the participants. The heterogeneity of the initial studies was assessed using the I^2 test. In addition, subgroups were analyzed to determine the heterogeneity by participants' male to female, year of publication, and Province. Finally, a meta-analysis was performed using STATA14 statistical software.

Study Selection

A total of 628 articles were extracted through preliminary searches in various databases. Of the 628 essential studies identified by the analysis of titles and abstracts, 589 ones were eliminated because of irrelevant titles. Of the 39 existing studies, 32 ones were excluded. Of the remaining studies, 7 met the study inclusion criteria. (Fig. 1)

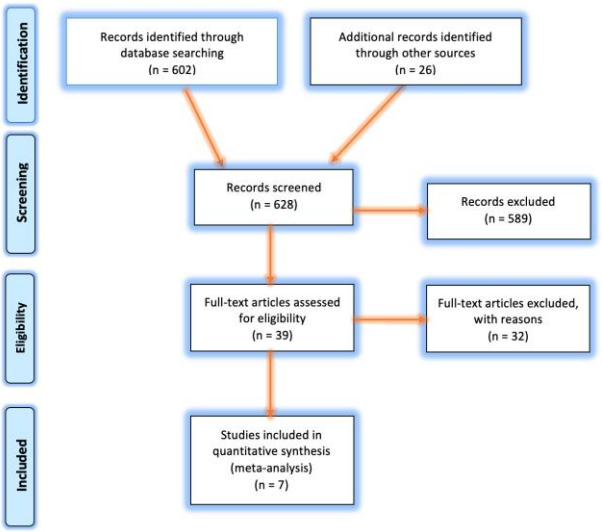

Figure 1: PRISMA flow diagram

Research Properties

A total of 10461 patients and a total of 7 studies from 4 provinces that met the inclusion criteria were evaluated. Of the studies were retrospective. Studies, were from Tehran, Mashhad, Tabriz and Rasht. In most studies the risk of bias was low. Data were originally collected from medical records. The hospital was the main study site. (Table 1)

Table 1: characteristics of the included studies

Author	Publications year	province	Number of patients	prevalence	Mean birth weight	Male to female
Badeli 14	2009	Rasht	252	21.4%	2177.77±936.07	------
Baskabati 15	2015	Mashhad	282	14%	3130±400	159/123
Atighpoor 16	2003	Tehran	220	22.5%	-----	184/136
Malek 17	2009	Mashhad	2400	2.1%	13080±80	30/20
Baskabati 18	2009	Mashhad	750	5%	--------	25/13
Naseri 19	2000	Tehran	515	9%	----------	229/286
Mortazavi 20	2009	Tabriz	6042	2.7%	2769±764.9	100/51

The meta-analysis of the Prevalence of the acute renal failure in the Iranian newborns:

According to the random effect model, the total Prevalence of the acute renal in 10461 patients was 3% (3%-4% at a 95% confidence interval, I^2 = 96.2%). (Fig. 2)

Subgroup Analysis

Meta Regression Results

The results of meta-regression between participants' mean birth weight and the Prevalence of the acute renal failure in the Iranian newborns:

The regression of the study was evaluated by the relationship between the Prevalence of the acute renal failure in the Iranian newborns and participants' mean birth weight and the total rate of acute renal failure. There was no significant linear trend in the univariate meta-regression to explain the effect size of participants' mean birth weight. (Fig. 3)

The results of meta-regression between participants' male to female ratio and the Prevalence of the acute renal failure in the Iranian newborns:

The regression of the study was evaluated by the relationship between the Prevalence of the acute renal failure in the Iranian newborns and participants' male to female ratio and the total rate of acute renal failure. There was no significant linear trend in the univariate meta-regression to explain the effect size of participants' male to female ratio. (Fig. 4)

The results of meta-regression between participants' publication year and the Prevalence of the acute renal failure in the Iranian newborns:

The regression of the study was evaluated by the relationship between the Prevalence of the acute renal failure in the Iranian newborns and participants' publication year and the total rate of acute renal failure. There was no significant linear trend in the univariate meta-regression to explain the effect size of participants' publication year. (Fig. 5)

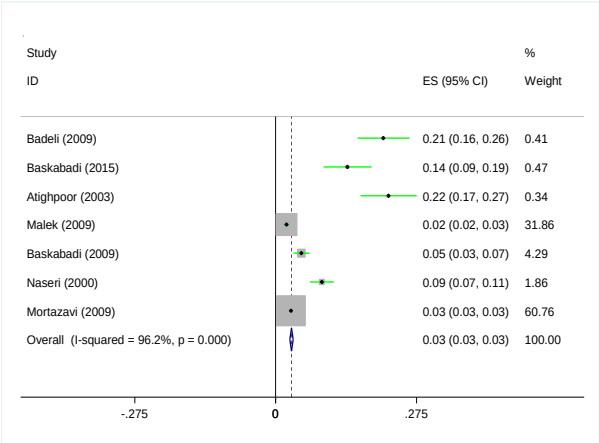

Figure 2: Prevalence of the acute renal failure in the Iranian newborns and its 95% interval for the studied cases according to the year the study was conducted based on the model of the random effects model.

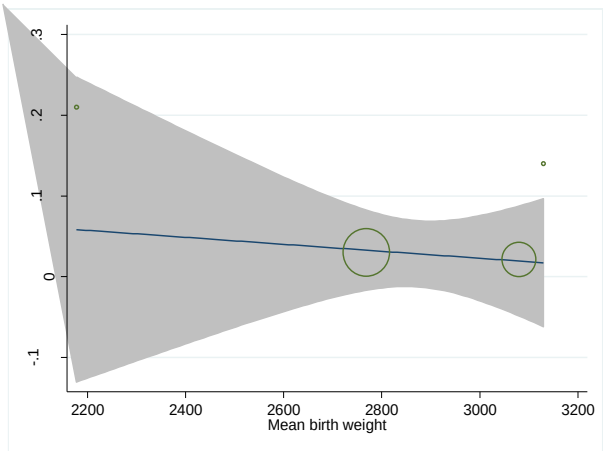

Figure 3: Meta-regression between mean birth weight of study and Prevalence of the acute renal failure in the Iranian newborns

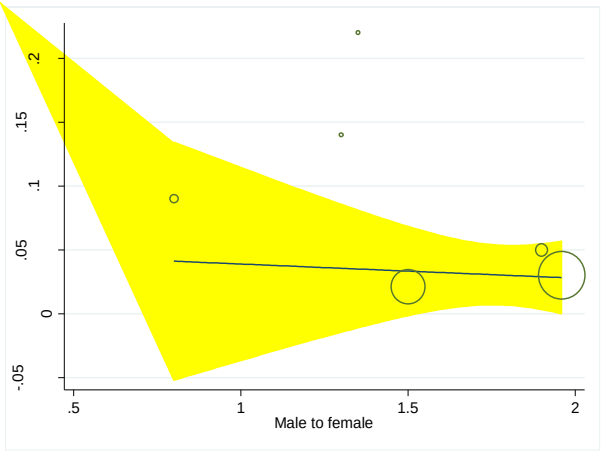

Figure 4: Meta-regression between male to female ratio of study and Prevalence of the acute renal failure in the Iranian newborns

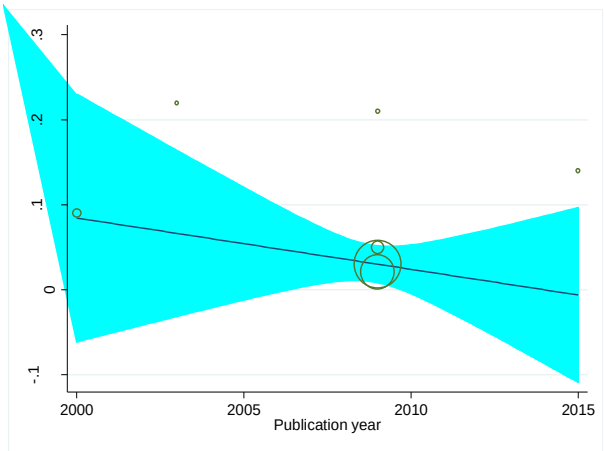

Figure 5: Meta-regression between publication year of study and Prevalence of the acute renal failure in the Iranian newborns

Discussion:

According to the random effect model, the total Prevalence of the acute renal in 10461 patients was 3% (3%-4% at a 95% confidence interval, I^2 = 96.2%). Today, acute kidney failure is commonly associated with neonatal diseases such as asphyxia, sepsis, respiratory distress syndrome, and is one of the most serious and highly prevalent problems of the neonates in the neonatal intensive care units (9). On the other hand, a reduction in milk intake and calorie intake causes a decrease in gastrointestinal motility, and the formation of enterohepatic *cycle* and delays maturation of the *hepatic bilirubin*-conjugating *enzymes*, which is effective in jaundice resulted from breastfeeding in the first week of birth (10). Inadequate breastfeeding of neonates can lead to a variety of complications, including dehydration, uremia, azotemia, and hypernatremia (11). The onset of jaundice and 10% reduction in weight increases the onset of renal injuries and it is necessary to perform and evaluate kidney function tests in these neonates (12). On the other hand, most healthy neonates lose 1 to 2 percent of their body weight on the first days of birth. However, in a healthy neonate, the maximum weight loss is between 7 - 10 percent of birth weight and more than that is abnormal (13). Initially, weight gain begins after the initial weight loss and reaches the initial weight of birth at about 7 to 10 days after birth (14). Dehydration can lead to more jaundice and kidney failure. It is known that the mortality rate will be doubled if kidney failure is associated with functional disorder of the other organs (15). Therefore, kidney failure should be diagnosed very early (16). Neonatal care has changed the renal failure scenario over the years. The acute kidney failure is divided into three groups of pre-renal, endogenous, and obstructive renal failure with pre-renal azotemia being the most severe renal disease in neonates which encompass more than 85% of all the cases (17). Pre-renal azotemia is characterized with inadequate renal perfusion and causes endogenous renal failure if it is severe or prolonged (18). Since the initial diagnosis and treatment of pre-renal azotemia will lead to improvement in renal function and urinary output, timely diagnosis and treatment can prevent the development of pre-renal failure to endogenous renal failure and reduce the need of dialysis in neonates.

References

1. Askenazi DJ, Ambalavanan N, Goldstein SL. Acute kidney injury in critically ill newborns: what do we know? What do we need to learn?. Pediatric nephrology. 2009 Feb 1;24(2):265.
2. Durkan AM, Alexander RT. Acute kidney injury post neonatal asphyxia. The Journal of pediatrics. 2011 Feb 1;158(2):e29-33.
3. Momtaz HE, Sabzehei MK, Rasuli B, Torabian S. The main etiologies of acute kidney injury in the newborns hospitalized in the neonatal intensive care unit. Journal of clinical neonatology. 2014 Apr;3(2):99.
4. Pakzad R, Rafiemanesh H, Ghoncheh M, Sarmad A, Salehiniya H, Hosseini S, Sepehri Z, Afshari-Moghadam A. Prostate cancer in Iran: trends in incidence and morphological and epidemiological characteristics. Asian Pacific Journal of Cancer Prevention. 2016;17(2):839-43.
5. Martinez-Pajares JD, Martinez-Ferriz MC, Moreno-Perez D, Garcia-Ramirez M, Martin-Carballido S, Blanch-Iribarne P. Management of obstructive renal failure caused by bilateral renal aspergilloma in an immunocompetent newborn. Journal of medical microbiology. 2010 Mar 1;59(3):367-9.
6. Selewski DT, Jordan BK, Askenazi DJ, Dechert RE, Sarkar S. Acute kidney injury in asphyxiated

newborns treated with therapeutic hypothermia. The Journal of pediatrics. 2013 Apr 1;162(4):725-9.

7. Bruel A, Rozé JC, Quere MP, Flamant C, Boivin M, Roussey-Kesler G, Allain-Launay E. Renal outcome in children born preterm with neonatal acute renal failure: IRENEO—a prospective controlled study. Pediatric Nephrology. 2016 Dec 1;31(12):2365-73.
8. Youssef D, Abd-Elrahman H, Shehab MM, Abd-Elrheem M. Incidence of acute kidney injury in the neonatal intensive care unit. Saudi journal of kidney diseases and transplantation. 2015 Jan 1;26(1):67.
9. Afshari Moghaddam A. The effect of Tadalafil on lower urinary tract (LUTS) symptoms due to benign prostatic hyperplasia (BPH) in patients treated with conventional medications.
10. Phadke V, Bhardwaj S, Sahoo B, Kanhere S. Maternal ingestion of diclofenac leading to renal failure in newborns. Pediatric Nephrology. 2012 Jun 1;27(6):1033-6.
11. Shah SR, Tunio SA, Arshad MH, Moazzam Z, Noorani K, Feroze AM, Shafquat M, Hussain HS, Jeoffrey SA. Acute kidney injury recognition and management: a review of the literature and current evidence. Global journal of health science. 2016 May;8(5):120.
12. Malary M, Moosazadeh M, Hamzehgardeshi Z, Afshari M, Moghaddasifar I, Afsharimoghaddam A. The prevalence of cervical human papillomavirus infection and the most at-risk genotypes among Iranian healthy women: A systematic review and meta-analysis. International journal of preventive medicine. 2016;7.
13. /Ying SH, Liu XR, Zhang GJ, Nan ZH. Blood purification therapy in treatment of acute renal failure in infants with melamine-induced stones. Chinese medical journal. 2009 Feb 1;122(3):257-61.
14. Boskabadi H, Kalateh Molaee M. PREVALENCE OF ACUTE RENAL FAILURE IN THE NEWBORNS WITH JAUNDICE CAUSED BY DEHYDRATION ADMITTED TO NICU OF GHAEM HOSPITAL. The Journal of Urmia University of Medical Sciences. 2015;26(7):617-24.
15. Atighpoor F, Javanbakht MH. THE ASSESSMENT OF ACUTE RENAL FAILURE FREQUENCY DURING NEONATAL SEPSIS AMONG NEONATES ADMITTED TO NEONATAL WARD OF BAHARLOO HOSPITAL (1998-1999). Razi Journal of Medical Sciences. 2003 Dec 15;10(36):567-71.
16. Malek A, Khazai M R, Afzali N, Malek N. Frequency and causes of renal failure in neonates admitted to intensive care units.
17. Baskabadi H, Mamori Gh, Kani M, Nouri M, Rajabpour M. Evaluation of Acute Kidney Failure in Neonates Admitted to the Neonatal Intensive Care Unit (NICU) of Ghaem Hospital, Mashhad, 2004-2005.
18. Mahresay A, Afshar Pad M,Naderi F, Shokrpour L, Hossein Nejad K, Pourmand Gh.
19. Evaluation of the underlying causes of delay in referral of children with urinary tract infections to Sina and Bahrami hospitals from 2001 to 2007.
20. MORTAZAVI F, Hosseinpour SS, Nejati N. Acute kidney failure in neonatal period.