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Mothers' Knowledge Level about Acute Kidney Injury in Children Under Five Years

Rahma Hidayati[1], Diah Ayu Agustin[2*], Agus Citra Dermawan[3], Ika Melasari[4], Bambang Sucipto[5]
Bina Insan Nursing Academy, Jakarta, Indonesia
Corresponding Author: Diah Ayu Agustin, diahayuagustin@yahoo.com

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A B S T R A C T

Acute Kidney Injury (AKI) in Indonesian children under five increased sharply in 2022. To determine maternal knowledge about AKI in children. A descriptive analytical design was conducted with 400 mothers selected through purposive sampling using an online questionnaire; data were analyzed using univariate and bivariate methods. Most respondents had one toddler (82.5%), were vocational-level graduates (72.5%), and housewives (75.7%). A total of 97.7% expressed anxiety about AKI, while 70.8% had low knowledge of its causes, symptoms, complications, and prevention. Knowledge was significantly associated with age, education, employment status, and anxiety (p=0.000). Maternal knowledge about AKI in children remains inadequate. Nurses need to provide more intensive and targeted education to increase mothers' awareness and ability to handle AKI in children

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INTRODUCTION

Children under five years of age have a very rapid phase of growth and development, especially at the age of 0–1 year. This period is called the Golden Age, The health condition of children plays an important role in determining their growth and development. Children who often experience health problems can experience obstacles in physical growth and mental development (Agustina, Y., Ringo, L.S., Sari, I.M., Rosuliana, N.E., & Agustin, D.A., et al., 2025). One of the health disorders in children under five years is Acute Kidney Injury (AKI).

The World Health Organization/WHO conducted a search and investigation into 66 cases of child deaths in Gambia with a diagnosis of AKI and found the cause was syrup preparations contaminated with diethylene glycol (DEG) and ethylene glycol (EG) that exceeded the permitted threshold (Thiagarajan, 2022)

WHO immediately took anticipatory measures to prevent the spread of this case to other countries through the distribution of drug ingredients and the illegal redistribution of contaminated syrup products by issuing a statement regarding the discovery of 5 syrup preparations that did not meet quality requirements, namely Promethazine Oral Solution, Kofexmalin Baby Cough Syrup, Makoff Baby Cough Syrup, and Magrip N Cold Syrup. Maiden Pharmaceuticals Limited, Haryana, India is registered as the manufacturer of the five drugs and has sold its products to several other countries including Laos, Vietnam, Thailand, Cambodia, the Philippines, Malaysia, and Indonesia, South America, Russia, Poland, and Belarus (Chopra, et.al, 2023).

AKI can occur in all age groups. In recent times, there has been a significant increase in AKI in the 6 months to 18 years of age group. The World Health Organization/WHO (2023), reported that more than 300 cases of acute kidney injury in children were reported in Indonesia. More than half of them result in death (WHO, 2023).

The Ministry of Health of the Republic of Indonesia (2023) released an official report related to the extraordinary occurrence of Atypical Progressive Acute Kidney Injury (APAKI**)** in children which lasted from August to October 2022, there were 189 cases of AKI in children, with the majority of children aged 1–5 years. This figure continues to increase until November 2022, the number of cases reached 323 cases in 28 provinces with the number of deaths reaching 190 people. The most cases of acute kidney injury in children are found in DKI Jakarta province and followed by West Java in second place (Ministry of Health of the Republic of Indonesia, 2023).

This incident is categorized as an Extraordinary Event (KLB) because the surge in cases occurred in a short time and involved many children from various regions. Exposure to liquid compounds called Ethylene Glycol (EG) and Diethylene Glycol (DEG) is strongly suspected to be the cause of acute kidney injury in children. These two compounds are commonly used as solvents in liquid medicine (Faculty of Public Health University of Indonesia, 2022).

The number of syrup preparations in Indonesia found to be contaminated with Ethylene glycol (EG) or Diethylene glycol (DEG) reached 116 syrup products. The discovery of cases of acute kidney injury in children resulting in

death due to syrup preparations contaminated with ethylene (EG) or diethylene glycol (DEG) has had an impact on changing public trust in various parties related to the pharmaceutical sector. Public responses to regulators (in this case the Indonesian Ministry of Health and the Food and Drug Monitoring Agency (BPOM) showed a very low level of public trust (0.0698) although most agreed with the policy of stopping the distribution of syrup (0.7931), and tended to blame BPOM for not properly supervising drug production (0.0416). Public responses to pharmacies that provide direct drug delivery to patients showed a high level of public trust that pharmacies would not hand over dangerous drugs to patients (0.7982 and 0.8074), but pharmacies were still required to be responsible for the distribution of previously contaminated drugs (0.3895). Public response to pharmacists shows that the level of public trust in pharmacists is quite good even though the comparison is small (0.6658) and there are still pharmacists who do not provide direct services to patients to educate about safe syrup drugs (0.6540) as an evaluation for pharmacists, although (0.7292) the public still strongly believes in the ability of pharmacists to solve drug problems (Soegiantoro, 2023).

Acute kidney injury in children must be treated immediately so that it does not continue to become chronic kidney injuryin adulthood. Chronic Kidney Injury disease is characterized by a progressive decline in kidney function (Furth et al., 2018). This disease also often occurs in high-risk hospitalized children and is associated with a high mortality rate (Kaddourahetal, 2017).

Acute kidney injury disease that progresses to chronic kidney injuryis associated with a 30-150 times increase in mortality in children compared to peers their age. Chronic kidney injurycan affect children's growth and quality of life and cause psychosocial stress in the family (Ibrahim & Alao, 2021).

The high incidence and risk of child death due to AKI emphasizes the importance of early detection and efforts to prevent AKI in children under five years The increase in childhood AKI is very important to be followed up with preventive measures through public education, especially in recognizing early symptoms. Acute kidney injury in children is usually characterized by complaints of nausea, vomiting, diarrhea, cough, runny nose, and increased body temperature for 3-5 days. The next symptom is less and less urine production and even not being able to urinate at all (Ministry of Health RI, 2023).

Parents, especially mothers, have an important role in preventing children's AKI. Good maternal knowledge allows for informed decision-making when early symptoms appear. However, various risk factors for AKI such as prerenal conditions, congenital heart disease, comorbidities, long-term use of mechanical ventilation, and sociodemographic factors are often unknown to the elderly. Some studies show that mothers' knowledge of AKI is still low, in fact 42.5% of mothers have high levels of anxiety related to AKI, which can be influenced by the lack of information they have (Chaizuran & Hijriana, 2023).

A cross-sectional study of 50 mothers was conducted in Sukoharjo, Indonesia, in October-November 2023. This study examined mothers' knowledge and attitudes about Atypical Progressive Acute Kidney Injury (APAKI) and self-medication using syrup. Data were analyzed using multiple linear regression.

The analysis showed a positive and significant relationship between knowledge and self-medication (b = 1.147; 95% CI 0.60 to 1.69; p (<0.01) <0.05) and a positive and significant relationship between mothers' attitudes and self-medication (b = 0.306, 95% CI 0.03 to 0.58; p (0.029) <0.05). The Adjusted R2 value of 0.439 means that the knowledge and attitude variables together can explain 43.9% of the variation in self-medication (Pratama & Hastuti, 2024).

A descriptive qualitative study was conducted at the Mokoau Community Health Center, Kendari, Indonesia, in 2023. Data were collected through interviews with five mothers of toddlers aged 0-5 years and one general practitioner at the Mokoau Community Health Center. The results showed that mothers' knowledge about Acute Kidney Injury was still limited, and their attitudes were generally concerned but inactive. Preventive measures implemented were still suboptimal, with mothers tending to rely on self-care before seeking medical help when conditions worsened. This was due to a lack of available information and limited access to adequate health education. These findings emphasize the need for improved health education to improve awareness and effectiveness of preventive measures among mothers (Suharmi, Bahar & Azim (2024).

A cross-sectional study of 141 parents of pediatric patients with AKI in India was conducted at a tertiary pediatric referral center between May and September 2023. The study reported that most parents with severe AKI were unaware of the diagnosis, had poor understanding of AKI risk factors, and were unaware of the risk of nephrotoxins, as well as lacked knowledge of post-hospital care. Parents desired education to improve their knowledge of their child's kidney health (Starr et al., 2024).

Nurses as health workers who interact directly with patients and parents, have a strategic role, consisting of caregivers, advocates, collaborators, and especially educators **(**Agustin, 2018). The role of educators is the key role of nurses in the prevention of AKI through counseling activities to parents, especially mothers, about the definition, risk factors, symptoms, prevention and handling of AKI. Proper education can help parents stay alert and not panic, as well as be able to recognize the early symptoms of AKI and seek medical attention immediately, especially when the child experiences symptoms that lead to acute kidney disease. The level of knowledge of parents, especially mothers, needs to be identified first before education is carried out.

Based on the description mentioned above, the author is interested in conducting a research entitled Mother's Knowledge Level of Acute kidney injury in Children under five years The purpose of the study was to identify the level of maternal knowledge about acute kidney injury in children under five years. The results of the research are expected to be used as a basis in providing AKI education to parents and further research related to AKI cases.

THEORETICAL REVIEW

AKI is a condition of rapid and sudden decrease in kidney filtration function, characterized by an increase in serum creatinine or azotemia levels (increased BUN concentration) and or a decrease until there is no urine

production at all. AKI can be caused due to many factors including: infection processes, dehydration, bleeding, intoxication or other diseases. Other risk factors for AKI include a history of kidney transplantation, sociodemographics, prerenal conditions, history of comorbidities, systemic diseases, congenital heart disease, prolonged use of mechanical ventilation devices and *renal replacement therapy,* and pediatric factors (Alkandari et al., 2018; Bjornstad et al., 2021; Yamane et al., 2019; Pokrajac et al., 2022; Bradshaw et al., 2019; Sutherland et al., 2013)

AKI can occur in all age groups. AKI deaths and hospitalizations increased sharply in Gambia and Indonesia due to the consumption of syrup in October 2022. This incident not only caused panic among the people of both countries but also the international community, which uses the same raw material for the drug (Umar, Jain, & Azis, 2023).

METHODOLOGY

The design of the research is an analytical description. The population in this study is all mothers who have children under five in the north Jakarta area. Meanwhile, the number of samples in this study was calculated using the Slovin formula with the formula:

$$n = \frac{N}{1 + Ne^2}$$

n = number of samples sought
N = total population
e = tolerated margin of error. (5%)

$$\text{Sample Count} = \frac{143{,}801}{1 + (143{,}801 \times 0.0025)}$$

Based on this formula, the number of samples was 398 respondents, taken by purposive sampling technique. The inclusion criteria for this study were patients with kidney failure:

1. Be at least 18 years old
2. Have children aged 0-5 years
3. Can read and write and communicate well
4. Be willing to be a respondent and fill out informed consent

The study sample was mothers with children under five years , a total of 400 people, which was determined by purposive sampling technique. Data collection using an online questionnaire distributed through whatsap. Data analysis was carried out univariate and bivariate. The research was carried out from July to August 2023. The ethical principles applied are: self determination, beneficence, justice, anonymity and confidentiality, and protection from discomfort.

RESULT AND DISCUSSION

Univariate Analysis

Table 1. Distribution of Respondent Characteristics (n=400)

Variabel	Frequency	Percentage (%)
Education		
SD	8	2,0
SMP	38	9,5
SMA	290	72,5
S1, S2, S3	64	16,0
Employment Status		
Not working	303	75,7
Work	97	24,3
Anxiety		
Anxious	391	97,7
Not anxious	9	2,3
Number of Children under five years		
1	330	82,5
2	56	14,0
3	12	3,0
4	2	0,5

The results of the univariate analysis in table 1 show that most of the respondents have a high school/vocational education level (72.5%). Most of the respondents were housewives (75.7%) and had concerns/anxiety about kidney injuryin their children (97.7%). As many as 82.5% of respondents only have 1 toddler, but there are 0.5% of respondents who have 4 children under five years in their family.

Table 2. Respondent Age Description

Variabel	Mean	Median	SD	Min-Max	95% CI
Mother's age	34,84	35	5,49	21-47	34,30–35,38

The results of the analysis in table 2 show that the average age of the mother is 34.84 years with a standard deviation of 5.49. The age of the highest respondents was 47 years old and the lowest was 21 years. The age of the respondents ranged from 34.30 - 35.38 years with a 95% confidence interval.

Table 3. Distribution of Respondents' Knowledge Level (n=400)

Variabel	Frequency	Percentage (%)
Good	117	29,2%
Less	283	70,8%

The results of the analysis in Table 3 show that only 29.2% of respondents have good knowledge about acute kidney injury in children under five years and 70.8% do not have good knowledge about acute kidney injury in children under five years . As many as 59.9% of respondents did not know the cause and 78.2% did not know about the signs and symptoms of acute kidney injury in children under five years . As many as 68.8% of respondents did not know the further impact of acute kidney injury disease for children under five years and 72% of respondents did not know the prevention of this disease.

Bivariate Analysis

The results of the bivariate analysis in Table 4 show that maternal knowledge of acute kidney injury in children under five years is related to three factors, namely: education level, employment and anxiety. The number of children under five years owned has no relation to the mother's knowledge.

Results of bivariate analysis in Table 5 It shows that maternal knowledge of acute renal failure in children under five years is also related to maternal age factors, with the average age of well-informed mothers being 33.46 years and less than 33.35 years.

Table 4. Distribution of knowledge levels about acute kidney injury in children under five years (n=400)

VARIABEL		Knowledge		Frequency	*p value*
		Less	Good		
Level Education	SD	7 (87,5%)	1 (12,5%)	8	
	SMP	3 (797,4%	1 (2,6%)	38	0, 00
	SMA	225 (77,6%)	65 (22,4%)	290	
	College	14 (21,9%)	50 (78,1%)	64	
Status Work	Housewives	246 (81,2%)	57 (18,8%)	303	0,00
	Work	37 (38,1%)	60 (61,9%)	97	
Anxiety	Not Anxious	0 (0,0%)	9 (100,0%)	9	0,00
	Anxious	283 (72,4%)	108 (27,6%)	391	
Number of children under five years	One person	234 (70,9%)	96 (29,1%)	330	0,101
	Two people	42 (75,0%)	14 (25,0%)	56	
	Three people	7	5 (41,7%)	12	

	(58,3%)		
Four people	0 (0,0%)	2 (100,0%)	2

Table 5. Distribution of the relationship between knowledge level and maternal age (n=400)

Variabel	Knowledge	n	Mean	SD	HERS ELF	*P*
Mother's Age	Good	283	35,46	5,63	0,34	0,00
	Less	117	33,35	4,83	0,45	

DISCUSSION

Knowledge is a science that can be learned in general and is useful in building human behavior. Knowledge is obtained through a person's senses, namely the sense of hearing, the sense of smell, the sense of sight, the sense of smell, and the sense of touch. Increased knowledge does not necessarily lead to changes in human behavior, but behaviors based on knowledge will usually last longer than those without knowledge. There are many factors that affect a person's high or low knowledge, including: age, education, experience and information (Notoadmodjo 2018).

Age affects an individual's ability to grasp and mindset. So that as we get older, a person's grasp and mindset will also develop. The results of this study show that there is a meaningful relationship between age and knowledge level. In this study, more than half of the respondents (63%) were mothers aged 21-40 years or belonging to the young adult age group. Cognitively, the age group has been able to solve complex problems with abstract, logical, and rational thinking capacity. This will certainly make individuals ready and mature to receive new information (Notoatmodjo, 2018).

In this study, the percentage of respondents with low knowledge was more, which was 70.8%. Of these, most respondents did not know about the causes, signs and symptoms, further effects and ways to prevent acute kidney injury in children. This is in line with research by Milenia, Siregar, Hamdi, & Malisie (2022) which found that the level of public knowledge is still lacking about kidney disease in children, especially about the symptoms, causative factors, and complications of the disease.

The results of statistical analysis showed that there was a relationship between knowledge and the education level of the respondents (*p = 0.00).* The majority of respondents with a high level of education have good knowledge about acute kidney injury in children under five years . Although it is despicable, the most respondents in this study are not from universities, but from high school education. This is in accordance with data from the Jakarta Central Statistics Agency (2022) which states that the education level of the population aged 15 years and above is high school/vocational school. The level of education affects the level of knowledge. According to Notoatmodjo (2012), the higher a person's

education, the easier it will be for him to understand new things and related problems.

Knowledge is also related to anxiety. Respondents with good knowledge tended not to be worried about the occurrence of acute kidney injury in their children under five, on the other hand, respondents who had less knowledge felt more anxious about acute kidney injury in children under five years . The results of this study support previous research, which found a relationship between the level of knowledge and the level of public anxiety about acute kidney disease in children (Situmeang & Situmeang, 2023).

Anxiety is a psychiatric condition full of worries and fears about what can or may happen. Minimal knowledge about the rampant incidence of kidney injuryin children under five years will create anxiety in the community. This is strengthened by research from Pangase et al (2018), which states that supporting factors for anxiety include media factors, individual experiences, and individual interactions. A person's knowledge and insight will increase when he often gets information through the media.

Information on the increase in children's AKI cases makes parents worry about the problems that can befall their children, as well as the impact that can be caused (Chaizuran & Hijriana, 2023). People who often watch news about syrup drugs that contain substances harmful to the kidneys will be more easily affected by the news, one of which is increasing public anxiety (Situmeang & Situmeang, 2023).

This study also found a meaningful relationship between knowledge and employment status. Respondents who work have good knowledge, on the other hand, most respondents with less knowledge are those who are not working or housewives. Work is an activity that is carried out to earn income to meet the needs of daily life (Ariani, 2012).

Work is one of the factors that affect knowledge. A person who works will often interact with other people so that from these interactions he will have additional knowledge. Integration experience during work will provide knowledge and skills. Experience at work will also be able to improve the ability to make decisions which is the ability to reason about something (Gustina, 2017).

Based on the results of this study, it can be seen that most of the respondents are housewives (not working). This affects the lack of interaction opportunities for respondents with others in increasing knowledge about the presence of acute kidney injury in children under five years . However, there are 18.8% of respondents who do not work but have good knowledge. This can be influenced by other factors such as the mother's education level

The level of knowledge of mothers has no meaningful relationship with the number of children under five years they have. As many as 82.5% of respondents were mothers who only had one toddler. This study did not examine how many children respondents had. The absence of a meaningful relationship between these two variables can be due to the mother's previous experience in caring for her children, which is currently no longer included in the toddler category. Mothers who have only one child have more anxiety about their child's health (Chaizuran & Hijriana, 2023).

The role of nurses is important to increase the level of knowledge of mothers to be more vigilant in prevention and able to handle children's AKI. The results of this research can be used as a basis for nurses to carry out their role as educators, providing education about children's AKI. This educational effort can also increase public knowledge, especially mothers, to prevent health threats in the form of chronic kidney injuryin children under five years.

CONCLUSIONS AND RECOMMENDATION

Maternal knowledge levels is still not optimal. Factors associated with maternal knowledge levels included age, education level, employment status, and anxiety. Nurses need to provide more intensive and targeted education to increase mothers' awareness and knowledge of managing AKI in children.

FURTHER STUDY

This study was limited to descriptive analysis, but the results can serve as a basis for educational activities and further research using qualitative and experimental methods to determine the effect of education on mothers' knowledge levels in managing AKI in children.

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