Jagua Publication

Journal of Applied Health Sciences and Medicine

4(7) (2024): 19 –25

https://doi.org/10.58614/jahsm472

Research Article

The Importance of Screening of Galactosemia in urine of Neonate

Karrar Abdil Aziz Ali Beg[1*]

[1]Jabir Ibn Hayyan University for Medical & Pharmaceutical Sciences, Faculty of Medicine, Department of Pediatrics, Iraq.

*Corresponding author Email: k.alibeg@jmu.edu.iq

Abstract:

Objectives: Galactosemia is metabolic inborn error occurred due to deficient activity in the enzyme incorporated in the metabolism of galactose sugar. Galactosaemia is a common cause of liver metabolic disease in period of childhood, it is important cause of newborn hyperbilirubinemia therefore the study designed to illustrate the Importance of Screening of Galactosemia in urine of Neonate.

Materials and Methods: the study was done on the patients those attended to the Al-Rawan specialist laboratory in Najaf between January 2023 to June 2024. Forty tow patients were incorporated into our study. Tow milliliter of urine sample was taken from each patient to use in galactosemia rapid test in urine and tow milliliter of blood sample was taken from the same patient for the measurement of total serum bilirubin.

Results: Forty-two neonatal patients divided according to the results of galactosemia rapid test in urine in to tow group positive galactosemia group 31(73.8%) and negative galactosemia group 11 (26.2%). The 31 positive galactosemia patients were involved into this study ; 15 were female and 16 were male. In comparison, there were 11 female and 0 male among negative galactosemia group. Also there was a high difference in the mean level of total serum bilirubin between positive galactosemia patients and negative galactosemia patients. The high rate of positive results of galactosemia recorded in age between 1day to 3month although there were no significant differences between age groups p-value 0.22. In this study the sensitivity of the test of galctosemia in urine was 93.75% and the specificity 80%.

Conclusions: Galactosemia neonatal screening may protect infants from complications cause life-threatening if detected in early stages of life.

Keywords: Galactosemia in urine, hyperbilirubinemia, rapid test in urine.

Article History:

Received: April 10, 2024
Accepted: June 25, 2024
Published: August 9, 2024

How to Cite:

Karrar Abdil Aziz Ali Beg (2024). "The Importance of Screening of Galactosemia in urine of Neonate". *Journal of Applied Health Sciences and Medicine. 4*(7): 19 – 25. https://doi.org/10.58614/jahsm472

© 2024 by the authors. The terms and conditions of the Creative Commons Attribution (CC BY) licence apply to this open access article.

INTRODUCTION

Galactosemia is acarbohydrate an inborn error metabolism. According to the enzyme altered four different subtypes have been described in the Leloir pathway (Haskovic et al., 2020;

Coelho AI et al., 2017). Dietary lactose is broken down by lactase into glucose and galactose sugar and then, in a process by three-steps, galactose is converted to glucose. This metabolic pathway is important for the newborn, whose main carbohydrate source is lactose (up to 40% in breast milk and in certain formulas). Any delay in diagnosis might be lead to an irreversible damage to various organs. Prevention of death or permanent neurological complications are dependent on early diagnosis and choose of appropriate therapy (Burton, 1998). Although several countries have included galactosaemia in their universal neonatal screening programme, (Pyhtila et al., 2015a; Kitagawa, 2012) in developing countries such as India, it has not yet been implemented. Galactosemia is a metabolic disease disorder divided in to three major types, and classic galactosemia is the most common (Berry et al., 1993). Poor feeding, poor weight gain, and jaundice are among the most common symptoms. The infant's condition worsens if untreated. Lethargy, hypoglycemia, hypotonia, hemolysis, abdominal distension, vomiting, , and ecchymosis will develop. for a long time Galactosemia has been a common cause of neonatal jaundice (Millis, 1958). Which is shown as direct or prolonged hyperbilirubinemia (Millis, 1958; Kaplan et al., 2015).

MATERIAL AND METHODS

A study was done on the patients those attended to the Al-Rawan specialist laboratory in Najaf between January 2023 to June 2024. Forty tow patients were incorporated into our study. Tow milliliter of urine sample was taken from each patient to use in galactosemia rapid test in urine and tow milliliter of blood sample was taken from the same patient for the measurement of total serum bilirubin.

Urinary Galactose Test Kit (Enzyme chemical reaction method) JYR®－Gal Test Kit Intended Use: Urinary galactose test kit intend to be used for qualitative assessment of urinary galactose.

Test Principle

Crude urine is filtered out of many disturbances by purification device. Under catalysis of enzyme, urinary galactose is hydrolyzed to hexodialdose and hydrogen peroxide. The later can be oxidized by 3, 5-dichloro-2-hydroxybenzenesulfonate developing red color. The intensity of color is in a proportion with urinary galactose concentration.

Sample Requirements

- Based upon weight, calculate the amount of fresh milk the subject need take. 10 kg weight equals to 10 ml fresh milk. (Each adult need drink 485ml for one test.)
- Prior to drink milk, subjects need empty urine beforehand. After drinking milk, subjects must refrain from food and water.
- Urine was discarding in first hour; only glean second hour urine for test.
- Subjects must refrain from rich Vitamin C food and drug for at least 24 hours prior to test.
- Fresh samples without long term storage is recommended for test. Store untested sample at 2-8℃ complete test afterwards within 8 hours.

Assay Procedure

Step1. Prior to test, Kit (stored at 2-8℃) must equilibrate to room temperature (10-30℃).

Step2. The foil pouch was opened and takes out test kit carefully.

Setp3. The foil cover was Tear off cautiously.

Setp4. The seal cap was detached, withdraw 2 mil crude urine by scale pipette and inject it into purification equipment.

Step5. The seal cap was installed, promptly osculate device by hand shaking for 20 min, or by oscillators for 5-10s. (Blend well).

Step6. The seal cap was removed and connected with a syringe. The dripper cap was Take off, the syringe pushed gently and first droplets of purified urine was discarded and 2 droplets to the "Sample was dripped " in hole on the reaction kit, then immediately two drops of standard solution was added to the "Standard "hole.

Step7. The reaction kit was Placed at the room temperature (10-30℃) for 20 min or for ten min in water bath at 37℃ or dry bath at 37℃ for ten min. Then the results was read in five min. (Reject unread results stayed more than five min)

Expect Values

- LoD: galactose concentration : 1mmol/L ; (Yang et al., 1999; Karry et al., 2001; Host et al., 1995) Positive: <1mmol/L; Negative: >1mmol/L.
- The expect values have been established based upon clinical statistic of 120 susceptible but health cases which indicate negative results.

Result Interpretation

- Visually inspect color results in sample hole and control hole. A darker sample hole indicates a negative result; alighter sample hole indicates a positive result.
- As an auxiliary assay kit, test provides a presumptive diagnosis. To evaluate the patient`s syndrome precisely, it must accompany with other clinic data and observation.

RESULTS

Forty-two neonatal patients divided according to the results of galactosemia rapid test in urine in to tow group positive galactosemia group 31(73.8%) and negative galactosemia group 11 (26.2%) as shown in figure 1.

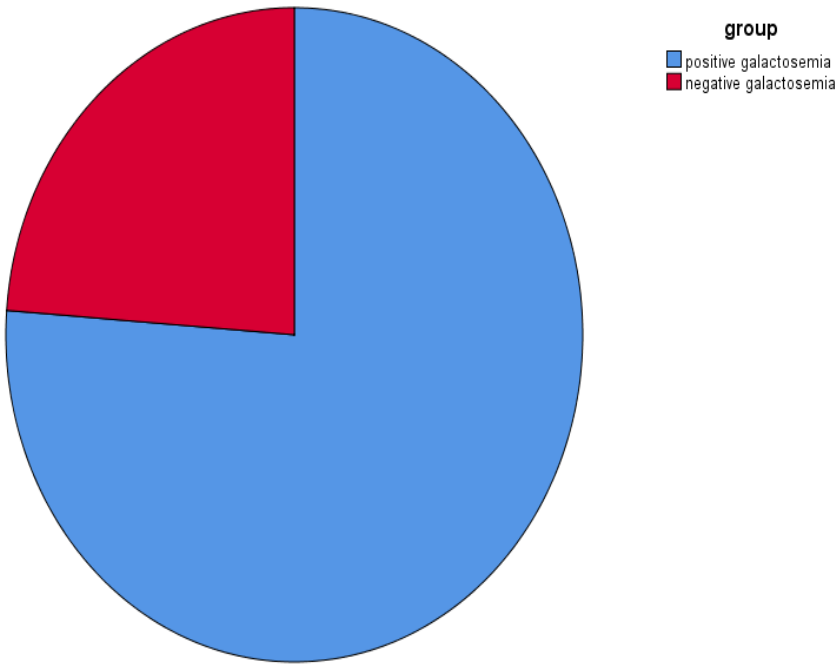

Figure 1. Distribution of patients according to galactosemia results.

In total, 31 positive galactosemia patients were involved into this study; 16 were male and 15 were female. In comparison with negative galactosemia group there were 0 male and 11 female as shown in figure 2.

https://doi.org/10.58614/jahsm472

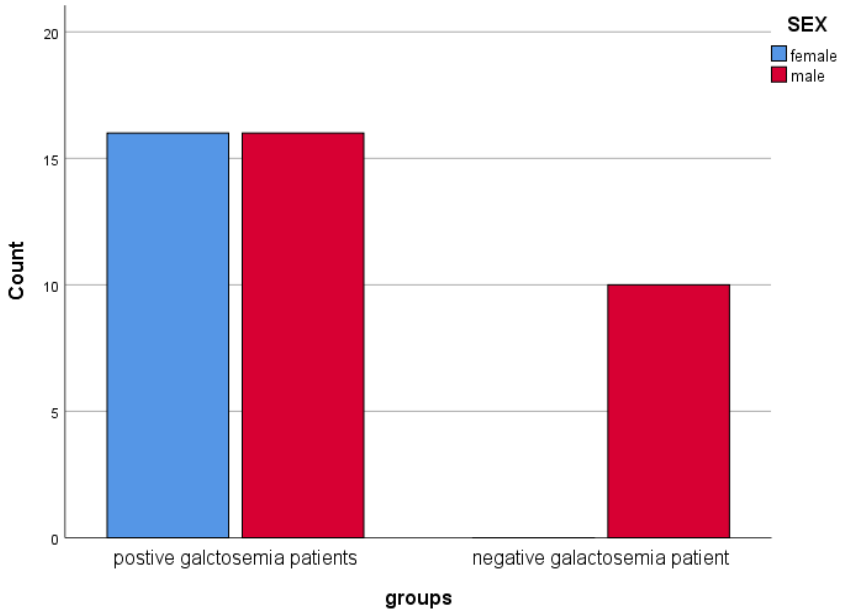

Figure 2. Distribution of patients according to sex in positive and negative galactosemia results.

Table 1 was shown the high rate of positive results of galactosemia recorded in age between 1day to 3month although there were no significant differences between age groups p-value 0.22.

Table 1. Distribution of patients according to age in positive and negative galactosemia results.

Group	One - thirty day	One -three month	three-six month	> 6 month	Total	Statistical analysis
Positive urine galctosemia patients	14	14	2	1	31	chi-square 4.3316 *p*-value 0.22781
Negative urine galctosemia patients	4	3	3	1	11	
Total	18	17	5	2	42	

Table 2. was shown there was a highly difference in the mean levels of total serum bilirubin between positive galactosemia patients and negative galactosemia patients.

Table 2. The mean serum level of total serum bilirubin in positive galactosemia patients and negative galactosemia patients.

	N	Minimum	Maximum	Mean	Std. Deviation		
TSB in positive galactosemia group	31	2.30	16.30	9.9937	3.20251	T test =18.2	P- value sig 0.002
TSB in negative galactosemia group	11	2.10	3.20	2.4800	0.42895		

Table 3. the sensitivity and specificity percentage for the test of galctosemia in urine.

Group	True positive	False negative	Statistical analysis
Positive urine galctosemia patients	29	2	Sensitivity =93.75 % Specificity =80 %
Negative urine galctosemia patients	2	9	
Total	31	11	

In this study the sensitivity of the test of galctosemia in urine was 93.75% and the specificity 80%.as shown in table 3.

DISCUSSION

The impact of newborn galactosemia screening is till now unclear. In any way many studies show its impact on mortality and acute symptomatology by appropriate an early onset of nutritional management especially if results are available at the first week of life. The purpose of the screening was to prevent death and irreversible sequels in galactosemic patients. Moreover, early discovered could have an effect on patients quality of life. Therefore, it is necessary to make studies that deal with long-term outcomes in patients detected by newborn screening. in this study about 31 patient had galactosemia positive result. And The patients described here had hyperbilirubinemia the mean levels of total serum bilirubin recorded significant differences between patients with positive galactosemia and patient with negative galactosemia result, this result was compatible to result recorded by (Takci *et al*., 2020). Who found that a neonate with galactosemia who first was admitted at seven day of life because of indirect hyperbilirubinemia and received intensive phototherapy for two days. She was then sent to another hospital because of poor feeding, jaundice, hepatomegaly, cholestatic, and. Her parents (first cousins) with two abortions and a female neonate with indirect hyperbilirubinemia requiring exchange-transfusion who died after seven days. And (Karadag *et al*., 2013) observed a newborn who was admitted on his third day of life for indirect hyperbilirubinemia and long QT-syndrome with galactosemia. Neonatal screening involving galactosemia is performed in the United States (Pyhtila et al., 2015b), and European nations (Ohlsson et al., 2012), but countries such as Iran have few neonatal screening tests, among which galactosemia is not yet involved (Senemar et al., 2011). Galactosemia equally affects males and females as shown in figure 2. In our study the results of sensitivity and specificity was accepted with the results of (Welling *et al*., 2017) who observed that in many developing countries , these methods still now the commonly utilized methods for the screening the presence of galactosuria in infants.

CONCLUSIONS

Galactosemia neonatal screening may protect infants from complications cause life-threatening if detected in early stages of life.

Informed Consent

written and oral was obtained from the patient's parents.

REFERENCES

Haskovic M, Coelho AI, Bierau J, et al. (2020). Pathophysiology and targets for treatment in hereditary galactosemia: A systematic review of animal and cellular models. J Inherit Metab Dis; 43 (3):392-408. doi:10.1002/jimd.12202.

https://doi.org/10.58614/jahsm472

Coelho AI, Rubio-Gozalbo ME, Vicente JB, Rivera I. (2017). Sweet and sour: an update on classic galactosemia. J Inherit Metab Dis. 40(3):325-342. doi:10.1007/s10545-017-0029-3.

Burton BK. Inborn errors of metabolism in infancy: a guide to diagnosis. Pediatrics (1998). 102:E69.

Pyhtila BM, Shaw KA, Neumann SE, et al. (2015). Erratum to: newborn screening for galactosemia in the United States: looking back, looking around, and looking ahead. JIMD Rep 15:133.

Kitagawa T. (2012). Newborn screening for inborn errors of metabolism in Japan. A history of the development of newborn screening. Pediatr Endocrinol Rev PER 10 (Suppl 1): 8–25.

Berry GT. Classic Galactosemia and Clinical Variant Galactosemia. In: Adam MP, Ardinger HH, Pagon RA, et al, (1993). editors. GeneReviews. Seattle,WA: University of Washington.

Millis SC. Jaundice associated with galactosemia in the newborn. J Indiana State Med Assoc (1958). 51: 1656–7.

Kaplan M, Wong RJ, Sibley E, Stevenson (2015). DK. Neonatal jaundice and liver diseases. In: Martin R, Fanasoff A, Walsh M, editors. Fanaroff and Martin's Neonatal-Peri- natal Medicine. 10th edition. Philadelphia,PA: Elsevier, Saunders; p.1643–5.

Yang YX, He M, Cui H, Bian L, etc. (1999). Study on the incidence of lactose intolerance of children in china. Journal of hygiene research, 28（1）：44~46.

Karry A. Jackson, BS and Dennis A. Savaiano, (2001). PhD. Lactose Maldigestion, Calcium Intake and Osteoporosis in African-, Asian-, and Hispanic-Americans Journal of the American College of Nutrition, Vol. 20, No. 2, 198S-207S.

Host A, Jacobsen HP, Halken S, Holmenlund D. (1995). The natural history of cow's milk protein allergy/intolerance. Eur J Clin Nutr. 49(suppl 1):S13 – S18 .

Takci S, Kadayifcilar S, Coskun T, Yigit S, Hismi B. A (2012). rare galactosemia complication: vitreous hemorrhage. JIMD Rep 5: 89–93.

Kavehmanesh et al. Galactosemia and neonatal profound indirect hyperbilirubinemia319Turk Pediatri Ars 2020; 5 5 (3): 316–9.

Karadag N, Zenciroglu A, Eminoglu FT, et al. (2013). Literature review and outcome of classic galactosemia diagnosed in the neonatal period. Clin Lab 59: 1139–46.

Pyhtila BM, Shaw KA, Neumann SE, Fridovich-Keil JL. (2015). Erratum to: Newborn screening for galactosemia in the United States: Looking Back, Looking Around, and Looking Ahead. JIMD Rep 15: 133.

Ohlsson A, Guthenberg C, von Döbeln U. (2012). Galactosemia screening with low false-positive recall rate: the Swedish experience. JIMD Rep 2: 113–7.

Senemar S, Ganjekarimi A, Senemar S, Tarami B, Bazrgar M. (2011). The prevalence and clinical study of galactosemia disease in a pilot screening program of neonates, southern Iran. Iran J Public Health 40: 99–104.

Welling , Anita Boelen, Terry G.J. Derks, Peter C.J.I. (2017). Schielen, Maaike de Vries, Monique Williams, Frits A. Wijburg, Annet M. Bosch ..Nine years of newborn screening for classical galactosemia in the Netherlands: Effectiveness of screening methods, and identification of patients with previously unreported phenotypes. molecular Genetics and Metabolism Volume 120, Issue 3, March Pages 223-228.

Publisher's Note: All publications contain claims, opinions, and facts that are exclusively the responsibility of the individual author (s) and contributor (s), not JPUB or the editor (s).

https://doi.org/10.58614/jahsm472