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Neonatal Jaundice and Breast Feeding: A Narrative Review

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Abstract. A significant proportion of both term and preterm neonates experience neonatal jaundice. Jaundice is the most common cause of readmission to the hospital in otherwise healthy-term infants. Serum bilirubin levels rise due to red blood cell lysis, which is the main cause of jaundice. The blood carries bilirubin as "unconjugated" bilirubin, mostly attached to albumin. Most term babies have "physiological" jaundice, which doesn't require any special care and can be temporarily alleviated with phototherapy. Neonatal frequently experience unconjugated hyperbilirubinemia, which is typically normal, or the result of breast milk jaundice, which is a benign condition. But neonatal jaundice resulting from underlying cholestasis (and the conjugated hyperbilirubinemia that follows) is invariably pathological and requires immediate medical attention. Severe newborn jaundice is comparatively common in developing nations, and these babies are susceptible to bilirubin-induced brain damage

Highlights:

1. Neonatal jaundice is common, especially in term and preterm infants.
2. Physiological jaundice is benign; phototherapy often provides temporary relief.
3. Severe jaundice risks brain damage, needing urgent care, especially in cholestasis.

Keywords: Neonatal Jaundice, Mothers, Narrative Review

Introduction

One of the most prevalent clinical symptoms among newborns is jaundice. Infants with jaundice will have yellow staining of the skin and sclera, which is a sign of elevated serum bilirubin levels, which lead to bilirubin accumulation in tissues like the skin and mucous membranes. Bilirubin levels of roughly 90 mmol/liter are thought to cause jaundice (1). Although it is more challenging to identify jaundice in infants with darker skin tones, eye examination is an essential component of visual evaluation of jaundice because the sclerae are usually white (2). About 60% of term and 80% of preterm babies get jaundice in the first week of life, and 10% of breastfeeding babies experience it for up to a month (3).

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Neonatal Jaundice

Most neonates have jaundice throughout the first week of life. By day three or four, the blood bilirubin level in term newborns reaches a level that may be clinically detected (4, 5). This reaches the normal childhood serum bilirubin level after progressively declining over the following few days. Physiological jaundice is the common term for this. While "breast milk jaundice" was once thought to be the primary cause of persistent unconjugated jaundice (6, 7).

Bilirubin encephalopathy

Babies who are ill or premature are especially vulnerable to the neurotoxic effects of high bilirubin levels. Pathophysiological routes include, but are not limited to, disturbance of energy metabolism, lowering of action potential, disruption of cell membrane function, and disruption of neurotransmitter synthesis (8, 9). "Kernicterus" was the term used to describe the bilirubin buildup in the brain discovered during the autopsy of newborns who had passed away from acute bilirubin toxicity (10, 11). There have been reports linking the brainstem, hippocampus, cerebellum, globe pallidum, and subthalamic nuclei. Regional cerebral blood flow and elevated metabolic activity may be linked to this anatomical tendency. acidosis, hypercarbia, hypoxia, sepsis, and seizures (12, 13).

Acute bilirubin encephalopathy risk is increased by medications that inhibit p-glycoprotein or interfere with bilirubin albumin binding. Less well-differentiated neurons and astrocytes showed higher rates of apoptosis (10, 14). Demonstrating the significance of the brain's developmental stage in connection to bilirubin poisoning. According to a UK surveillance study, one out of every 100,000 live babies develop kernicterus (15, 16).

Etiology of Neonatal Jaundice

Early jaundice

During the first 24 hours of life, clinical jaundice is usually pathogenic and caused by isoimmunization (usually ABO or rhesus incompatibility) or other causes of severe hemolysis (17, 18). An evaluation of the child's and mother's blood groups and rhesus status should be done. Because of passive antibody transmission, anti-D prophylaxis in rhesus-negative women may result in a slightly positive DAT result. The degree of jaundice is not necessarily correlated with a positive DAT test. Furthermore, the

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reticulocyte count and blood film are neither very sensitive nor specific in detecting hemolysis in newborns (19, 20).

Prolong jaundice

Prolonged jaundice is defined as persistent clinical jaundice in 2-week-old term neonates and 3-week-old preterm infants. This illness, which usually shows up as unconjugated jaundice in breastfed newborns, is commonly referred to in the community (21, 22). The majority of pathological causes can be ruled out by a clinical examination, feeding history, and stool and urine color. Depending on the findings of the first investigations, the investigations ought to be carried out systematically (23, 24).

Conjugated jaundice

Serum-conjugated bilirubin levels of more than 25 mmol/liter are frequently used to diagnose conjugated jaundice. Even while clinical practice occasionally uses an in situations where the total blood bilirubin level is high, a 10% cut-off figure may provide false comfort. Dark urine and pale, chalky stools may be significant concomitant signs (25, 26). Tests for liver function and a look for clotting problems should be part of the initial inquiries. An ultrasonography of the liver can provide further information when obstructive jaundice is suspected. Further testing can rule out aminoacidemias, glucosemia, sepsis, and congenital infections. Conjugated bilirubin fraction in preterm newborns receiving total parenteral nutrition frequently rises noticeably and then progressively decreases once whole parenteral feeding is discontinued (27, 28).

Assessment of neonatal jaundice

In a well-lit space, the infant should be examined for visual evaluation of clinical jaundice. Visual evaluation is unreliable, especially in artificial light and after phototherapy has started. Dark-skinned babies may also find it challenging; in these cases, it's crucial to examine the skin, gums, and pinched areas. Serum bilirubin levels must be assessed for any newborn exhibiting clinical jaundice to facilitate care planning. When a baby's conjugated bilirubin fraction is pale, clinical jaundice often manifests visually at a serum bilirubin level between 80 and 90 mmol/l. This condition eventually gets better once all parenteral nourishment is discontinued (29, 30).

Transcutaneous bilirubin meter use has revolutionized community care for jaundiced infants in the United Kingdom in recent years. These devices' bilirubin measurements show a strong correlation with serum bilirubin levels, which can help

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prevent needless blood tests and/or hospital admissions. The two measurements differed by an average of 12.7±32.9 mmol/liter, even though there was a high association between serum bilirubin measurement and transcutaneous bilirubin meter measurement (31, 32).

neonatal jaundice Management

Distinguishing the rare youngster with a fast-rising bilirubin level who is susceptible to worsening is the goal of treating neonatal jaundice. Encouraging moms and babies to start breastfeeding as soon as possible (pre-discharge and in the community) can reduce the risk of elevated blood bilirubin levels and avoid readmission to the hospital (33, 34)

Unconjugated Jaundice

Phototherapy

The primary line of treatment for newborns with elevated unconjugated jaundice is phototherapy. It reduces the need for exchange transfusions and more invasive therapies. Phototherapy is only effective when bilirubin penetrates the skin and the blood bilirubin level is higher than 80 mmol/liter (35, 36). The effectiveness of phototherapy depends on the dosage, wavelength, and surface area of the baby's body exposed to the light. The dose will be increased by utilizing more phototherapy devices and positioning them at the very least safe distance from the infant. According to the American Academy of Pediatrics, a phototherapy device must have a spectral irradiance of at least 30microW/cm2/nm (37, 38).

Bilirubin levels can be effectively lowered with fiberoptic Bili blankets. When used with an overhead unit, they can be a useful method of administering "double" phototherapy and aid in continuing phototherapy during parent cuddles. Since they produce a negligible amount of heat, they can be put near the baby (39, 40). The main way that bilirubin is eliminated is by irreversible photo alteration, which turns it into lumirubin, a structural isomer that dissolves in water and is eliminated along with bile and urine (41, 42).

Pharmacologic therapy

The only drug used in clinical practice for infants with elevated jaundice levels caused by rhesus or ABO isoimmunization is high-dose intravenous immunoglobulin.

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Even if it shortens the duration required for phototherapy, hospital stays, and exchange transfusions. are eliminated through urine undergo configurational isomerization to produce less toxic and more water-soluble isomers (43, 44).

Exchange transfusion

The emergence of more advanced, extremely effective phototherapy systems and better prenatal care have greatly decreased the necessity for exchange transfusions in recent years. For babies who don't react, it's a crucial intervention. It is also recommended for newborns who have severe anemia from in-utero hemolysis (45, 46). Arterial damage, and biochemical and hematological abnormalities. Before, during, and following the exchange transfusion, the baby must be continuously monitored, and the hematological and biochemical parameters must be checked (47, 48).

Conjugated jaundice

When treating a baby with conjugated jaundice, determining the cause is essential. The baby must be examined in a surgical center for additional testing and care if a congenital blockage is detected (21, 49). To enhance bile flow, ursodeoxycholic acid, and phenobarbital are utilized, and fat-soluble vitamin supplements are also necessary (50, 51).

Breast Feeding

Hyperbilirubinemia and bilirubin accumulation are the results of delayed or insufficient breastfeeding, which impairs gastrointestinal motility and bilirubin excretion. Meconium passage is delayed as a result of inadequate milk. The production of the mother's milk is triggered when the kid is passed through the vagina during delivery. An infant born via cesarean section has a little delayed milk excretion. Due to the moms' discomfort and anesthesia, feeding is postponed; these kids are more susceptible to jaundice. Regardless of whether they gave birth naturally or via caesarian section, mothers should begin breastfeeding as soon as possible (52, 53).

Several documented factors have been linked to the occurrence of kernicterus, also known as bilirubin encephalopathy, which is a disorder caused by severe jaundice in the newborn with bilirubin deposition in the brain that causes brain damage, potentially leading to cerebral palsy, hearing impairment, visual impairment, or dementia. These factors include a brief hospital stay after delivery, delayed post-discharge appointments, an increased frequency of breastfeeding, and pediatric care

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providers' lack of concern about high bilirubin levels in newborns, and delayed recognition and initiation of effective therapy for neonatal jaundice (54, 55). Research indicates that the morbidity rate for kernicterus is 70% and the mortality rate is 10% (56, 57). Most of the difficulties caused by untreated or poorly managed unconjugated hyperbilirubinemia, which are incurable, might be avoided with early detection and effective treatment of newborn jaundice (58).

Conclusion

The most prevalent ailment in neonates that requires medical treatment is newborn jaundice. Once the bilirubin level hits the treatment threshold, most babies respond well to phototherapy, and the majority of these instances start with unconjugated hyperbilirubinemia. Early treatment and attentive monitoring are necessary to prevent bilirubin neurotoxicity in infants with risk factors for developing severe hyperbilirubinemia. Future use of mobile phone cameras as an objective indicator of sclera color may be made easier by current research

References

[1] V. K. Bhutani, "Phototherapy to Prevent Severe Neonatal Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation," American Academy of Pediatrics, Elk Grove Village, IL, USA, 2011, pp. e1046–e1052.

[2] M. J. Khoury, E. E. Calle, and R. M. Joesoef, "Recurrence Risk of Neonatal Hyperbilirubinemia in Siblings," Am. J. Dis. Child., vol. 142, no. 10, pp. 1065–1069, 1988.

[3] C. Battersby, S. Michaelides, M. Upton, and J. M. Rennie, "Term Admissions to Neonatal Units in England: A Role for Transitional Care? A Retrospective Cohort Study," BMJ Open, vol. 7, no. 5, p. e016050, 2017.

[4] R. Keren, V. Bhutani, X. Luan, S. Nihtianova, A. Cnaan, and J. Schwartz, "Identifying Newborns at Risk of Significant Hyperbilirubinemia: A Comparison of Two Recommended Approaches," Arch. Dis. Child., vol. 90, no. 4, pp. 415–421, 2005.

[5] A. M. Tiryag and H. H. Atiyah, "Nurses' Knowledge Toward Obesity in Al-Basra City," Ann. Rom. Soc. Cell Biol., vol. 25, pp. 4667–4673, 2021.

ISSN 3063-8186. Published by Universitas Muhamamdiyah Sidoarjo

https://doi.org/10.21070/ijhsm.v1i1.66

[6] V. K. Bhutani, "Jaundice Due to Glucose-6-Phosphate Dehydrogenase Deficiency," NeoReviews, vol. 13, no. 3, pp. e166–e177, 2012.

[7] H. H. Abdul-Ra'aoof, A. M. Tiryag, and M. A. Atiyah, "Knowledge, Attitudes, and Practice of Nursing Students About Insulin Therapy: A Cross-Sectional Study," Academia Open, vol. 9, no. 1, pp. 1–10, 2024, doi: 10.21070/acopen.9.2024.8795.

[8] J. J. Volpe, "Neonatal Hypotonia," in Neuromuscular Disorders of Infancy, Childhood, and Adolescence, Elsevier, 2015, pp. 85–95.

[9] D. Brites, A. Fernandes, A. Falcão, A. Gordo, R. Silva, and M. Brito, "Biological Risks for Neurological Abnormalities Associated with Hyperbilirubinemia," J. Perinatol., vol. 29, no. 1, pp. S8–S13, 2009.

[10] S. Katar, H. O. Akay, M. Taskesen, and C. Devecioglu, "Clinical and Cranial Magnetic Resonance Imaging (MRI) Findings of 21 Patients with Serious Hyperbilirubinemia," J. Child Neurol., vol. 23, no. 4, pp. 415–417, 2008.

[11] A. M. Tiryag and H. H. Atiyah, "Nurses' Knowledge Toward Bariatric Surgery at Surgical Wards at Teaching Hospitals in Al-Basra City," Indian J. Forensic Med. Toxicol., vol. 15, no. 3, pp. 5152–5159, 2021.

[12] R. P. Wennberg, C. E. Ahlfors, V. K. Bhutani, L. H. Johnson, and S. M. Shapiro, "Toward Understanding Kernicterus: A Challenge to Improve the Management of Jaundiced Newborns," Pediatrics, vol. 117, no. 2, pp. 474–485, 2006.

[13] A. Tiryag, M. Atiyah, and A. Khudhair, "Nurses' Knowledge and Attitudes Toward Thyroidectomy: A Cross-Sectional Study," Health Educ. Health Promot., vol. 10, no. 3, pp. 459–465, 2022.

[14] H. H. Abdul-Ra'aoof, S. B. Dawood, F. A. Jassim, S. K. Jassim, S. S. Issa, and M. A. Akber, et al., "Moderate Proficiency in Suture Techniques Among Nurses: A Cross-Sectional Study," J. Nurs. Educ. Pract., vol. 14, no. 2, pp. 50–58, 2024.

[15] D. Manning, P. Todd, M. Maxwell, and M. J. Platt, "Prospective Surveillance Study of Severe Hyperbilirubinemia in the Newborn in the UK and Ireland," Arch. Dis. Child. Fetal Neonatal Ed., vol. 92, no. 5, pp. F342–F346, 2007.

[16] H. H. Abdul-Ra'aoof, M. A. Akber, F. A. Jassim, A. M. Tiryag, S. S. Issa, and M. A. Atiyah, et al., "The Psychological Impact of Violence on Emergency Department and Intensive Care Unit Nurses: A Cross-Sectional Study," Res. J. Trauma Disabil. Stud., vol. 3, no. 4, pp. 228–233, 2024.

ISSN 3063-8186. Published by Universitas Muhamamdiyah Sidoarjo

https://doi.org/10.21070/ijhsm.v1i1.66

[17] T. S. Leung, K. Kapur, A. Guilliam, J. Okell, B. Lim, and L. W. MacDonald, et al., "Screening Neonatal Jaundice Based on the Sclera Color of the Eye Using Digital Photography," Biomed. Opt. Express, vol. 6, no. 11, pp. 4529–4538, 2015.

[18] A. M. Tiryag, "Revitalizing Hearts: The Transformative Impact of Pacemaker Therapy on Cardiac Conduction Disorders," Academia Open, vol. 9, no. 1, pp. 1–10, 2024, doi: 10.21070/acopen.9.2024.8845.

[19] E. Bakkeheim, U. Bergerud, A. C. Schmidt-Melbye, Ç. A. Akkök, K. Liestøl, and D. Fugelseth, et al., "Maternal IgG Anti-A and Anti-B Titres Predict Outcome in ABO-Incompatibility in the Neonate," Acta Pædiatr., vol. 98, no. 12, pp. 1896–1901, 2009.

[20] E. H. Rahi, Z. M. H. Al-Hejaj, and A. M. Tiryag, "Nurses' Knowledge of Nonalcoholic Fatty Liver Disease: A Cross-Sectional Study," Academia Open, vol. 9, no. 2, pp. 1–10, 2024, doi: 10.21070/acopen.9.2024.10306.

[21] P. Govaert, M. Lequin, R. Swarte, S. Robben, R. De Coo, N. Weisglas-Kuperus, et al., "Changes in Globus Pallidus with (Pre) Term Kernicterus," Pediatrics, vol. 112, no. 6, pp. 1256-1263, 2003.

[22] H. M. Sabty, S. B. Dawood, and A. M. Tiryag, "Nurses' Knowledge and Practices on Influenza Vaccination for Pregnant Women," Jurnal Kebidanan Midwiferia, vol. 10, no. 2, pp. 50-59, 2024.

[23] S. Mitra and J. Rennie, "Neonatal Jaundice: Aetiology, Diagnosis and Treatment," British Journal of Hospital Medicine, vol. 78, no. 12, pp. 699-704, 2017.

[24] M. A. Akber, A. M. Tiryag, and A. I. H. Alobaidi, "Nurses' Knowledge Regarding Cast Complications of Limb Fractures: A Cross-Sectional Study," Central Asian Journal of Medical and Natural Science, vol. 5, no. 2, pp. 195-200, 2024.

[25] T. B. Newman and M. J. Easterling, "Yield of Reticulocyte Counts and Blood Smears in Term Infants," Clinical Pediatrics, vol. 33, no. 2, pp. 71-76, 1994.

[26] A. M. Tiryag, S. B. Dawood, and S. K. Jassim, "Nurses' Knowledge and Attitudes about Enteral Feeding Complications by Nasogastric Tube in Intensive Care Units," Rawal Medical Journal, vol. 48, no. 3, pp. 689-693, 2023.

[27] M. Maisels, J. DeRidder, E. Kring, and M. Balasubramaniam, "Routine Transcutaneous Bilirubin Measurements Combined with Clinical Risk Factors

ISSN 3063-8186. Published by Universitas Muhamamdiyah Sidoarjo

https://doi.org/10.21070/ijhsm.v1i1.66

Improve the Prediction of Subsequent Hyperbilirubinemia," Journal of Perinatology, vol. 29, no. 9, pp. 612-617, 2009.

[28] M. A. Mohammad, H. H. Abdul-Ra'aoof, K. A. Razzaq Manahi, and A. M. Tiryag, "Parents' Knowledge and Attitudes Toward Testicular Torsion," Bahrain Medical Bulletin, vol. 46, no. 1, 2024.

[29] D. M. Campbell, K. C. Danayan, V. McGovern, S. Cheema, B. Stade, and M. Sgro, "Transcutaneous Bilirubin Measurement at the Time of Hospital Discharge in a Multiethnic Newborn Population," Paediatrics & Child Health, vol. 16, no. 3, pp. 141-145, 2011.

[30] M. A. Akber, A. M. Tiryag, and A. Alobaidi, "Nurses' Knowledge Concerning Developmental Dysplasia of the Hip: A Cross-Sectional Study," American Journal of Pediatric Medicine and Health Sciences, vol. 2, no. 4, pp. 155-160, 2024.

[31] A. M. Connolly and J. J. Volpe, "Clinical Features of Bilirubin Encephalopathy," Clinics in Perinatology, vol. 17, no. 2, pp. 371-379, 1990.

[32] M. Jabbar, M. Mohammad, and A. Tiryag, "Changes in Male Reproductive Hormones in Patients with COVID-19," Georgian Medical News, vol. 342, pp. 42-46, 2023.

[33] M. Davenport, N. Kerkar, G. Mieli-Vergani, A. Mowat, and E. Howard, "Biliary Atresia: The King's College Hospital Experience (1974–1995)," Journal of Pediatric Surgery, vol. 32, no. 3, pp. 479-485, 1997.

[34] Z. S. Dawood, K. M. Jassim, A. M. Tiryag, and A. S. Khudhair, "Nurses' Knowledge and Attitudes Toward Deep Vein Thrombosis: A Cross-Sectional Study," Bahrain Medical Bulletin, vol. 45, no. 4, 2023.

[35] K. Tan, "The Pattern of Bilirubin Response to Phototherapy for Neonatal Hyperbilirubinemia," Pediatric Research, vol. 16, no. 8, pp. 670-674, 1982.

[36] K. M. Jassim, A. S. Khudhair, Z. S. Dawood, and A. M. Tiryag, "Nurses' Knowledge About Electrocardiogram Interpretation: A Cross-Sectional Study," Rawal Medical Journal, vol. 48, no. 4, pp. 850-854, 2023.

[37] H. J. Vreman, R. J. Wong, and D. K. Stevenson, "Phototherapy: Current Methods and Future Directions," in Seminars in Perinatology, Elsevier, 2004.

ISSN 3063-8186. Published by Universitas Muhamamdiyah Sidoarjo

https://doi.org/10.21070/ijhsm.v1i1.66

[38] M. A. Mohammad, A. Y. Al-Timary, and A. M. Tiryag, "Safety of Tubeless Double Access Percutaneous Nephrolithotomy Compared to Single Access Approach," Bahrain Medical Bulletin, vol. 45, no. 2, 2023.

[39] J. F. Watchko, M. J. Daood, and M. Biniwale, "Understanding Neonatal Hyperbilirubinemia in the Era of Genomics," in Seminars in Neonatology, Elsevier, 2002.

[40] A. A. A. Al-Iedan, M. A. Akber, S. B. Dawood, A. I. H. Alobaidi, S. S. Issa, and H. H. A. Raaoof, "Bridging the Gap: Enhancing Open Fracture Care in Emergency Nursing," Academia Open, vol. 9, no. 1, pp. 10.21070/acopen.9.2024.8847, 2024.

[41] T. B. Newman, P. Liljestrand, and G. J. Escobar, "Jaundice Noted in the First 24 Hours After Birth in a Managed Care Organization," Archives of Pediatrics & Adolescent Medicine, vol. 156, no. 12, pp. 1244-1250, 2002.

[42] M. Mohammad, F. Jassim, and A. Tiryag, "Retrograde Intrarenal Lithotripsy Using Disposable Flexible Ureteroscope," Georgian Medical News, vol. 348, pp. 44-46, 2024.

[43] R. Gottstein and R. Cooke, "Systematic Review of Intravenous Immunoglobulin in Hemolytic Disease of the Newborn," Archives of Disease in Childhood-Fetal and Neonatal Edition, vol. 88, no. 1, pp. F6-F10, 2003.

[44] M. A. Mohammad, F. A. Jassim, and A. M. Tiryag, "Single-Use Flexible Ureteroscope for the Treatment of Renal Stone," Revista Latinoamericana de Hipertension, vol. 18, no. 7, 2023.

[45] K. Yokochi, "Magnetic Resonance Imaging in Children with Kernicterus," Acta Paediatrica, vol. 84, no. 8, pp. 937-939, 1995.

[46] Z. Abbass, S. K. Jassim, A.-F. Sadeq, S. Hafedh, A. M. Tiryag, and H. H. A. AL-Hadrawi, "Determination of Self-Efficacy Level: The Capacity of Patients with Hypertension to Manage Their Chronic Disease," Indonesian Journal on Health Science and Medicine, vol. 1, no. 2, pp. 10.21070/ijhsm.v1i2.15, 2024.

[47] W. J. Keenan, K. K. Novak, J. M. Sutherland, D. A. Bryla, and K. L. Fetterly, "Morbidity and Mortality Associated with Exchange Transfusion," Pediatrics, vol. 75, no. 2, pp. 417-441, 1985.

[48] F. A. Jassim, A. M. Tiryag, and S. S. Issa, "Effect of Bad Habits on the Growth of School Students: A Cross-Sectional Study," Indonesian Journal on Health Science and Medicine, vol. 1, no. 1, pp. 10.21070

ISSN 3063-8186. Published by Universitas Muhamamdiyah Sidoarjo

https://doi.org/10.21070/ijhsm.v1i1.66

[49] K. M. Jassim, Z. Abbass, and A. M. Tiryag, "A Study of Diabetes-Correlated Emotional Distress Among Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Study," Academia Open, vol. 9, no. 2, pp. 10.21070/acopen.9.2024.10292, 2024.

[50] S. Willot, S. Uhlen, L. Michaud, G. Briand, M. Bonnevalle, R. Sfeir, et al., "Effect of Ursodeoxycholic Acid on Liver Function in Children After Successful Surgery for Biliary Atresia," Pediatrics, vol. 122, no. 6, pp. e1236–e1241, 2008.

[51] M. F. Hasan, W. F. Hussein, A. M. Tiryag, I. J. Ali, and Z. M. Shaker, "Nurses' Knowledge Toward Lower Back Pain: A Cross-Sectional Study," Academia Open, vol. 9, no. 1, pp. 10.21070/acopen.9.2024.10363-10.21070/acopen.9.2024.10363, 2024.

[52] R. Semmalar, "A Study to Assess the Effectiveness of Kangaroo Mother Care on Responses Among Low Birth Weight Neonates in the Postnatal Ward of Government Rajaji Hospital at Madurai," College of Nursing, Madurai Medical College, Madurai, India, 2011.

[53] M. K. Mutashar, K. J. Awad, and M. A. Atiyah, "Hyperactivity Disorders: An Assessment of Kindergarten Teachers' Knowledge," Indonesian Journal on Health Science and Medicine, vol. 1, no. 2, 2024.

[54] H. Habib, M. Lohani, H. Khan, and M. H. Khan, "Infant Morbidity Leading to Infant Mortality," Gomal Journal of Medical Sciences, vol. 7, no. 2, 2009.

[55] M. J. Maisels, "Neonatal Hyperbilirubinemia and Kernicterus—Not Gone but Sometimes Forgotten," Early Human Development, vol. 85, no. 11, pp. 727–732, 2009.

[56] K. M. Edmond, C. Zandoh, M. A. Quigley, S. Amenga-Etego, S. Owusu-Agyei, and B. R. Kirkwood, "Delayed Breastfeeding Initiation Increases Risk of Neonatal Mortality," Pediatrics, vol. 117, no. 3, pp. e380–e386, 2006.

[57] A. A. Al-Mussawi, K. J. Awad, A. F. Kareem, Z. A. Hasan, N. S. Kadhim, I. H. Yaseen, et al., "Assess Knowledge of Nurses Who Provide Prenatal Care Concerning Toxoplasmosis in Basra City," International Journal of Nursing Didactics, vol. 6, no. 4, pp. 1–4, 2016.

ISSN 3063-8186. Published by Universitas Muhamamdiyah Sidoarjo

https://doi.org/10.21070/ijhsm.v1i1.66

[58] I. Zainel, H. Abdul-Ra'aoof, and A. Tiryag, "Mothers' Knowledge and Attitudes Towards Her Children with Neonatal Jaundice: A Cross-Sectional Study," Health Education and Health Promotion, vol. 10, no. 3, pp. 565–570, 2022.