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Study of Blood Glucose Levels in Neonatal Sepsis and Its Outcome-A Cross Sectional Study

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Abstract:

Sepsis significantly contributes to morbidity and mortality in neonates, affecting glucose levels and causing both hypoglycemia and hyperglycemia. This study aimed to examine the clinical profile of neonatal sepsis patients and correlate blood sugar levels with outcomes. Ninety neonates under 28 days old with probable and culture-proven sepsis admitted to the NICU were included. Analyses covered glucose levels, complete blood count, CRP levels, sepsis screening, lumbar puncture, neurosonogram, urine culture, and blood culture and sensitivity. Results showed GRBS scores of <40 for 24 subjects, 41-100 for 39, 101-200 for 22, and >200 for 5. Among clinically diagnosed cases, 57 (63.3%) were male and 33 (36.7%) female. Clinical presentations included poor feeding in 82 (91.1%), convulsions in 19 (21.1%), rapid breathing in 51 (56.7%), severe chest indrawing in 39 (43.3%), temperature in 25 (27.8%), fever in 43 (47.8%), and decreased activity in 88 (97.8%). In conclusion, glycaemic status alteration in septic neonates correlated with higher mortality.

INTRODUCTION

Neonatal sepsis is a significant cause of illness and death among newborns, especially in regions with limited resources. Over half of newborns admitted to neonatal intensive care units (NICUs) are diagnosed with probable sepsis upon discharge. The symptoms of neonatal sepsis are not specific, and the condition carries a high risk of fatality. Several microorganisms, such as Klebsiella pneumonia, Staphylococcus aureus, and Group B Streptococcus, are associated with neonatal sepsis.

The signs of neonatal sepsis can include difficulties with feeding, seizures, lethargy, rapid breathing (more than 60 breaths per minute), severe chest indrawing, and an abnormal temperature of either above 37.5°C or below 35.5°C. The current threshold for diagnosing neonatal sepsis is a blood glucose level below 40 mg/dL (or plasma glucose below 45 mg/dL).

Hyperglycemia refers to a plasma glucose level of over 145 mg/dL. It is a common complication in neonatal sepsis, which is caused by the release of neuroendocrine and inflammatory mediators. The excessive production of stress hormones such as glucagon, growth hormone, catecholamines, and glucocorticoids, along with an increase in pro-inflammatory cytokines like interleukin 1 and 6 (IL-1, IL-6), and tumor necrosis factor (TNF)-alpha, are important factors that contribute to hyperglycemia in these patients. A high or low blood glucose level can have a significant impact on the outcomes of culture-proven and probable neonatal sepsis patients.

OBJECTIVE:

To estimate study of blood glucose levels in neonatal sepsis and its outcome.

METHODOLOGY:

The study included 90 neonates under 28 days old who were admitted to the NICU at Meenakshi Medical College and Hospital in Kanchipuram with confirmed or suspected neonatal sepsis. The inclusion and exclusion criteria were used to select these patients for the study. The glucose levels of all the neonates were measured and recorded within one hour of admission using a glucometer and glucose oxidase strips by trained staff nurses. The glucose levels were categorized into four groups: < 40 mg/dl, 40-100 mg/dl, 101-200 mg/dl, and >

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200 mg/dl. The patients were then divided into two groups based on their weight: < 2.5 kg and 2.5 kg.

RESULTS:

A total of 90 subjects clinically diagnosed with neonatal sepsis were studied. Out of 90 (100%) subjects, 48 (53.3%) subjects were aged between 1 to 3 days, followed by 22 (24.4%) aged between 4 to 7 days. General random blood sugar (GRBS) scores were < 40 for 24 subjects, 41 to 100 for 39 subjects, 101 to 200 for 22 subjects and > 200 for 5 subjects. 18 (75%) subjects who were aged 1 to 3 days had GRBS scores <40, and 20 (51.3%) subjects had scores of 41 to 100.The Chi-square test showed a statistically significant association between age and GRBS scores (p=0.04) Males were predominantly higher, i.e., 57 (63.3%) as compared to females 33 (36.7%). Most of the females, i.e., 16 (41%) and 23 (59%) of males had GRBS scores of 41 to 100.There was a statistically significant association between gender and GRBS scores (p=0.034). Early-onset sepsis (EOS) was seen in 51 (56.7%) subjects, whereas late-onset sepsis (LOS) was seen in 39 (43.3%) subjects. Culture proven (CP) was seen in 55 (61.1%) subjects, and probable sepsis (PS) was seen in 35 (38.9%) subjects. 18 (54.5%) females had LOS, whereas 36(63.2%) males had EOS. CP was higher in both males and females with 19 (57.6%) and 36 (63.2%), respectively.

Out of 6 (6.7%) inborn subjects, 3 subjects had GRBS scores of 41 to 100 and 4 (66.7%) subjects had EOS and CP sepsis. Similarly, out of 84 (93.3%) outborn subjects, 36subjects had GRBS scores of 41 to 100, 47 (56%) subjects had EOS, and 51 (60.7%) had CP sepsis. Out of 52 (57.8%) lower segment cesarian section (LSCS) subjects, 23 subjectshad GRBS scores of 41 to 100, 34 (65.4%) subjects had EOS, and 31 (59.6%) had CP sepsis. Similarly, out of 38 (42.2%) normal vaginal delivery (NVD) subjects, 16 subjects had GRBS scores of 41 to 100, 21 (55.3%) subjects had EOS, and 24 (63.2%) had CP sepsis. (Tables 1 and 2) The Chi-square test showed a statistically significant association between gestational age and EOS/LOS (p=0.005). Furthermore, there was also a statistically significant association between birth weight and EOS/LOS (p=0.041).

Out of 8 (8.9%) subjects without feeding difficulties, 4 subjects had GRBS scores of 41 to 100. Similarly, out of 82(91.1%) subjects who had feeding difficulties, 35 subjects had GRBS scores of 41 to 100. Out of 71 (78.9%) subjects with a history of no convulsions, 34 subjects had GRBS scores of 41 to 100. Whereas, out of 19 (21.1%) subjects who had convulsions, 12 subjects had GRBS scores < 40. A statistically significant association between GRBS scores and convulsions was observed (p=0.001).

Out of 51 subjects having EOS, 44 (86.3%) subjects were not feeding well, 9 (17.6%) had convulsions, 37 (72.5%) had fast breathing, 30 (58.8%) had severe chest indrawing, 17 (33.3%) had a temperature, 15 (29.4%) had fever, 50 (98%) had decreased activity of admission. A statistically significant association was seen between sepsis and fast breathing (p=0.001), severe chest indrawing (p=0.001), and fever (p=0.00) and between CP/PS sepsis andfast breathing (p=0.011), severe chest indrawing (p=0.007), temperature (p=0.023).

Among 25 (27.8%) subjects who died, 9 (23.1%) had GRBS scoring of 41 to 100, and 8 (36.4%) subjects had GRBS scoringof 101 to 200. There was a statistically significant association between GRBS scores and outcome (p=0.023). Out of thosesubjects, 17 (68%) had EOS, 8 (32%) had LOS sepsis, 20 (80%) had CP sepsis, and 5 (20%) had PS sepsis. There wasa statistically significant association between outcome and CP/PS sepsis (p=0.023) .

CONCLUSION:

Our study identified birth weight, neonatal age, meconium, the reason for cesarian section (CS), and the duration of stay on admission among CS deliveries as risk factors significantly associated with neonatal sepsis. Clinical presentation in sepsis showed that subjects were not feeding well, had convulsions, fast breathing, severe chest indrawing, temperature, fever and decreased activity of admission. GRBS score and convulsion, CP/PS sepsis and fast breathing, severe chest indrawing, and temperature were found to be significantly associated. Therefore, through the study outcomes, it was concluded that neonatal hypoglycaemia and hyperglycaemia are associated with the overall mortality in neonatal sepsis.

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