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Original Article

Hypoglycemia Incidence in Newborns Identified to Be at Risk, Data from a Tertiary Care Hospital in Turkey

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Abstract

Background: Neonatal hypoglycemia (NH) is one of the most prevalent neonatal problems. We aimed to describe frequency and patterns of NH in neonates at risk of hypoglycemia.

Methods: In this single-center retrospective descriptive cross-sectional study, the incidence of hypoglycemia in newborns at risk of NH born at Mersin University Hospital between Jan 2017 and Jan 2023, was investigated. The blood glucose level being lower than 40 mg/dL was defined as NH.

Results: Overall, 506 neonates at risk of hypoglycemia were included: 53 SGA infants (10.5%), 127 LGA infants (25.1%), 212 infants of diabetic mothers (41.9%), and 230 late preterm infants (45.5%). Hypoglycemia developed in 113 out of 506 at-risk newborns (22.3%). Symptomatic hypoglycemia developed in nine infants (1.8%), while asymptomatic hypoglycemia developed in 104 infants (20.5%). Recurrent hypoglycemia incidence was 4.2%. Severe hypoglycemia developed in 13 infants (2.6%). All symptomatic hypoglycemic infants and 8 asymptomatic hypoglycemic infants requiring IV glucose, 17 infants (17/506, 3.4%), were hospitalized in the NICU. The targeted blood glucose level was reached in 1 hour at the latest in all hypoglycemic infants.

Conclusion: With the algorithm applied, we did not see recurrent hypoglycemia after the first day of life in risky newborns, and we reached the targeted glucose values in hypoglycemic newborns within the desired period.

Keywords: Hypoglycemia; Newborns; Screening

Introduction

Hypoglycemia is the most common metabolic disturbance occurring in the neonatal period. Yet, a clear definition of neonatal hypoglycemia (NH) is lacking. Diagnosis is challenging, considering the different suggested operational thresholds for NH (<36, <40, <45, <47 or <50 mg/dl) (1,2). NH can lead to neurological sequelae and cause a burden on caregiver, family, and society (3,4). Since NH is a well-known cause of brain injury that could be prevented and up to 30% of infants belong to commonly accepted NH risk categories, major academic societies, the American Academy of Pediatrics (AAP) and the Pediatric Endocrine Society, recommend screening NH at-

risk infants (5). In Turkey, the recommendations of the AAP are followed in dealing with neonates with a risk of hypoglycemia (6,7).

At birth, the plasma glucose concentration of the infant is approximately 80% of the mother's venous plasma glucose concentration, and this concentration is reduced within an hour after birth. This temporary decrease in plasma glucose concentration is a normal part of the mammals' adaptation to postnatal life. Infants born healthily can overcome this physiological glucose decrease without a problem, however, there is a risk of NH for small for gestational age (SGA), infants, large for gestational age (LGA) infants, late preterm infants, and infants of diabetic mothers (IDM) (3,8).

Since the reported incidence of NH is variable and there is still a lack of consensus on the management of NH, recent research and reviews emphasise that more studies are required to further improve the early identification and treatment of NH (2,5,8). Sharing experiences related to routine screening of infants at risk and treatment when hypoglycaemia is detected may contribute to the existing literature. This study aimed to determine the NH incidence in neonates at risk of hypoglycemia in a tertiary hospital and share experience regarding the NH algorithm which is adopted in line with the recommendations of the AAP.

Materials and Methods

Study design and participants

In this single-center retrospective descriptive cross-sectional study, the incidence of hypoglycemia in newborns at risk of NH born at Mersin University Hospital between Jan 2017 and Jan 2023, was investigated. The demographic and clinical characteristics of the neonates screened for glucose homeostasis and treated in line with the consensus report of the Turkish Neonatal and Pediatric Endocrinology and Diabetes Societies titled "approach to hypoglycemia in the newborn" (6,7) were examined.

This study was performed in accordance with the Declaration of Helsinki and Mersin University Clinical Research Ethics Committee approved this study (MEU; 6 Jul 2022/196).

The study inclusion criteria were being an SGA infant (birth weight ≤ 10 percentile), a LGA infant (birth weight ≥ 90 percentile), a late preterm infant (born at 34-$36^{6/7}$ gestational weeks), and an IDM (maternal type 1 diabetes, type 2 diabetes, or gestational diabetes). The exclusion criteria were being an infant with a congenital anomaly or and being an infant, whose blood glucose (BG) measurement was made for some reason other than hypoglycemia screening. IDM and LGA neonates fed and whose BG levels showed a normal course were screened for 12 h, while late preterm and SGA neonates were screened for 24 h. In the neonates diagnosed with hypoglycemia, BG level before routine feeding was measured at least three times until it was measured to be ≥45 mg/dL.

Screening and management of newborns at risk for hypoglycemia (first 24 h of life)

Asymptomatic neonates (first 4 h of life)

They were fed within the first hour. BG levels were measured 30 min after the first feeding. If it was found to be<25 mg/dL, IV glucose infusion (6-8 mg/kg/min) was started, and BG levels were checked 60 min later; if it was measured as 25-40 mg/dL, the infants were fed again, IV glucose infusion (6-8 mg/kg/min) was started if necessary, and BG levels were checked again 60 min later. Subsequent BG measurements were performed at 3-hour intervals before feeding to continue monitoring.

Asymptomatic neonates (4 to 24 h of life)

If BG level was <35 mg/dL, feeding was continued, IV glucose infusion (6-8 mg/kg/min) was started, and 60 min later, BG level was checked; if the BG value was between 35-45 mg/dL, the neonate was fed again, IV glucose infusion (6-8 mg/kg/min) was started if necessary, and BG level was checked 60 min later. Subsequent BG measurements were performed at 3-hour intervals before feeding to continue monitoring.

Symptomatic neonates

Neonates with low BG values (<25 mg/dl) accompanied by one or several symptoms such as irritability, tremors, jitteriness, exaggerated Moro reflex, weak or high-pitch crying, convulsions, hypotony, lethargy, cyanosis, apnea, and feeding difficulty were administered IV minibolus glucose (2 mL/kg dextrose 10%), and started on IV glucose infusion (6-8 mg/kg/min), with BG checked 30 min later. If the BG was between 25-40 mg/dL accompanied by mild neuroglycopenic symptoms, the neonate was fed and started on IV glucose infusion (6-8 mg/kg/min), with BG checked 30 min later. The same procedure was repeated until the BG level reached ≥45 mg/dL.

BG measurements were made using a bedside glucometer. Capillary heel blood samples were collected by the neonatal intensive care nurses, and BG levels were measured with Freestyle Optimum Neo H (Abbott Diabetes Care, United States) device that makes measurements with the peroxidase method. If the BG level measured at the bedside screening was at the treatment threshold, the blood sample was sent to the laboratory, and treatment was initiated without waiting for the results.

The BG level being lower than 40 mg/dL was defined as hypoglycemia. The measurement of a BG level below 40 mg/dL again in 24 h despite the successful treatment of the first hypoglycemic episode was defined as recurrent hypoglycemia. The BG level being <25 mg/dL in the first four hours and the BG level being <35 mg/dL between the 4th and 24th h was accepted as severe hypoglycemia.

Statistical Analysis

SPSS 21 statistics software (IBM Corp., Armonk, NY, USA) was used for statistical analyses. Data were analyzed for normality using histograms and the Kolmogorov–Smirnov test. Median (25th-75th percentile), mean ± SD, and percentages were reported. Groups determined according to the development of hypoglycemia were compared. The student's *t*-test and the Mann–Whitney U test were used to compare continuous variables. Categorical variables were tested with the Chi-square test. All statistical tests were 2 sided, and $P< .05$ was considered statistically significant.

Results

Overall, 506 neonates at risk of hypoglycemia were included in the study: 53 SGA infants (10.5%), 127 LGA infants (25.1%), 212 IDMs (41.9%), and 230 late preterm infants (45.5%). Hypoglycemia developed in 113 out of 506 at-risk newborns (22.3%). The median gestational week of the neonates who developed hypoglycemia was found to be shorter compared to those without hypoglycemia (36.9 vs. 37.7 wk, P=0.030) (Table 1).

The incidence of hypoglycemia in different risk groups is presented in Fig. 1. Hypoglycemia developed in 84 out of 399 newborns (21.1%) with a single hypoglycemia risk factor. Hypoglycemia developed in 27 neonates (27.6%) out of 98 neonates with two hypoglycemic risk factors and in 2 neonates (22.2%) out of 9 neonates with three hypoglycemic risk factors. There was no statistically significant difference between the incidence of hypoglycemia in the neonates with a single risk factor and those with ≥ 2 risk factors (21.1% vs. 27.1%, P=0.182).

Table 1: General characteristics of newborns who did and did not become hypoglycemic

Variable	All newborns (n=506)	Hypoglycemic (n=113)	Not hypoglycemic (n=393)	*P*
Gender, male	277 (54.7)	63 (55.8)	214 (54.5)	0.807*
Gestational age (weeks)	37.3 (36-38.1)	36.9 (36-38)	37.7 (36-38.3)	0.030**
Late preterm	230 (45.5)	58 (51.3)	172 (43.8)	
Early term	191 (37.7)	41 (36.3)	150 (38.2)	0.386*
Term	76 (15.0)	13 (11.5)	63 (16.0)	
Late term	9 (1.8)	1 (0.9)	8 (2.0)	
Birth weight (g)	3050 (2580-3720)	2915 (2560-3693)	3087 (2595-3740)	0.274**
Delivery type				
Caserean	387 (76.5)	87 (77.0)	300 (76.3)	0.932*
Vaginal	119 (23.5)	26 (23.0)	93 (23.7)	
Single/multipl birth				
Singleton	451 (89.1)	96 (85.0)	355 (90.3)	0.106*
Twin	55 (10.9)	17 (15.0)	38 (9.7)	
Maternal				
Age (y)	30.1 ± 6.4	30.6 ± 7.1	29.9 ± 6.2	0.417***
Gravidity	3 (1-4)	3 (1-4)	2 (1-4)	0.304**
Parity	1 (0-2)	1 (0-2)	1 (0-2)	0.479**
Risk factor				
Small for gestational age	53 (10.5)	14 (12.4)	39 (9.9)	0.451*
Large for gestational age	127 (25.1)	28 (24.8)	99 (25.2)	0.929*
Infant from a diabetic mother	212 (41.9)	44 (38.9)	168 (42.7)	0.469*
Late preterm	230 (45.5)	58 (51.3)	172 (41.7)	0.155*
Number of risk factor				
1	399 (78.9)	84 (74.3)	315 (80.1)	
2	98 (19.3)	27 (23.9)	71 (18.1)	0.384*
3	9 (1.8)	2 (1.8)	7 (1.8)	

*Chi-square test. **Mann-Whitney U test. ***Student's *t*-test

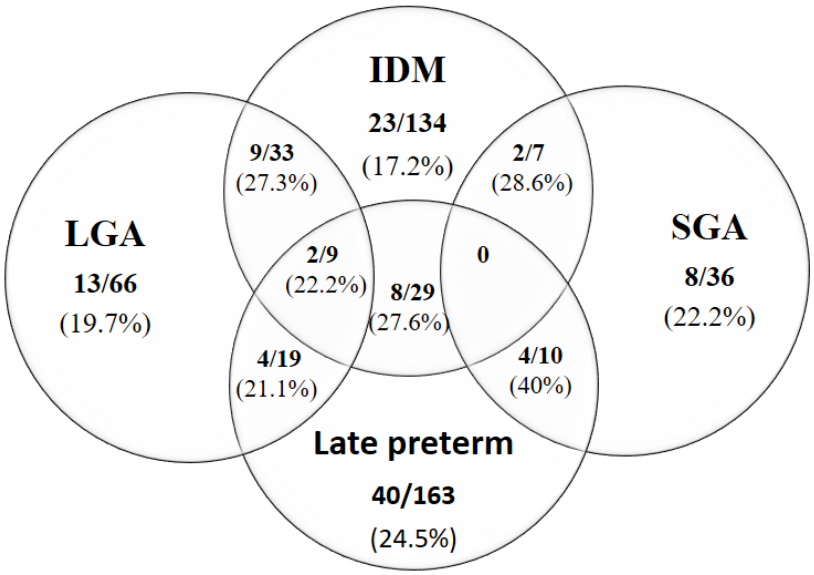

Fig. 1: The incidence of neonatal hypoglycemia in different risk groups

Overall, the lowest level of BG concentration (median 48 mg/dL) was measured in the first postnatal hour, and the median BG level was measured between 52.5-63.5 mg/dL in the subsequent hours (Fig. 2). In all risk groups, hypoglycemia was observed the most in the first hour. Hypoglycemia was not observed as of the 15th hour in the LGA group, the 18th h in the IDM group, the 21st h in the late preterm group, and the 24th hour in the SGA group (Table 2).

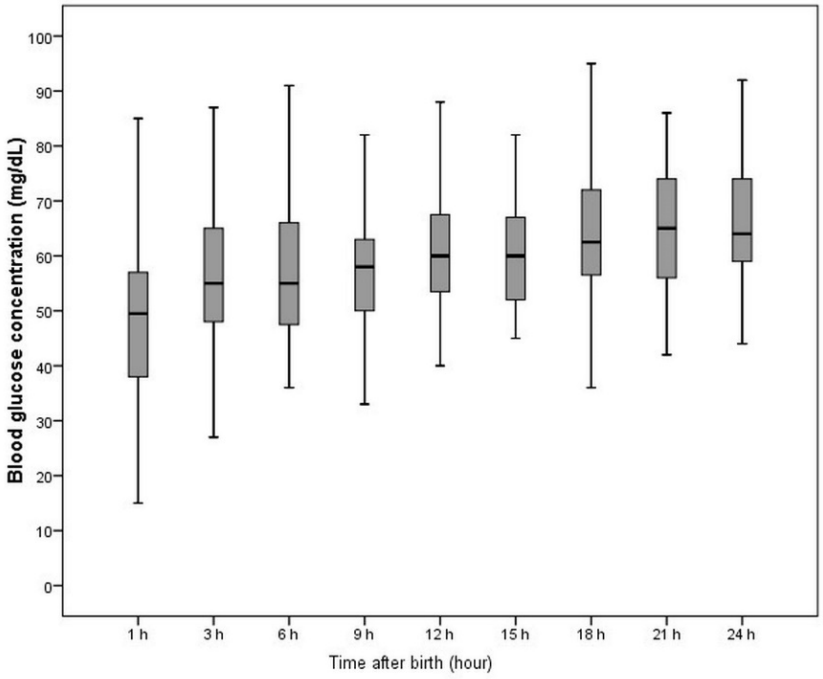

Fig. 2: Blood glucose concentration of total newborns according to time after birth

Table 2: Timing of hypoglycemia after birth and incidence of hypoglycemia and recurrent hypoglycemia according to risk groups

Variable	All new-borns (n=506)	Late pre-term (n=230)	IDM (n=212)	LGA (n=127)	SGA (n=53)
0-1 h	74 (14.6)	40 (17.4)	28 (13.2)	20 (15.7)	9 (17.0)
> 1-3 h	21 (4.2)	14 (6.1)	9 (4.2)	4 (3.1)	1 (1.9)
> 3-6 h	19 (3.8)	11 (4.8)	7 (3.3)	2 (1.6)	3 (5.7)
> 6-9 h	8 (1.6)	4 (1.7)	2 (0.9)	2 (1.6)	2 (3.8)
> 9-12 h	6 (1.2)	4 (1.7)	2 (0.9)	0 (0)	1 (1.9)
> 12-15 h	3 (0.6)	0 (0)	2 (0.9)	1 (0.8)	0 (0)
> 15-18 h	4 (0.8)	3 (1.3)	2 (0.9)	0 (0)	0 (0)
> 18-21 h	4 (0.8)	3 (1.3)	0 (0)	0 (0)	1 (1.9)
> 21-24 h	1 (0.2)	0 (0)	0 (0)	-	1 (1.9)
Hypoglycemia	113 (22.3)	58 (25.2)	44 (20.8)	28 (22.0)	14 (26.4)
Symptomatic	9 (1.8)	8 (3.5)	2 (0.9)	0	1 (1.9)
Asymptomatic	104 (20.5)	50 (21.7)	42 (19.9)	28 (22.0)	13 (24.5)
Recurrent hypoglycemia	21 (4.2)	16 (7.0)	5 (2.4)	2 (1.6)	3 (5.7)

Data are number (percentage). IDM; infants from diabetic mothers, SGA; small for gestational age, LGA; large for gestational age, h; hour

Symptomatic hypoglycemia developed in nine infants (1.8%), while asymptomatic hypoglycemia developed in 104 infants (20.5%). Recurrent hypoglycemia incidence was 4.2% (Table 2). No statistically significant difference was determined between the incidence of recurrent hypoglycemia in the neonates with a single risk factor and the incidence of recurrent hypoglycemia in the neonates with ≥ 2 risk factors (4.3% vs. 3.7%, *P*=0.810). Severe hypoglycemia developed in 13 infants (2.6%). The incidence of severe hypoglycemia in the first 4 h was 2% (n=10), while the incidence of severe hypoglycemia between the 4th and 24th h was 0.6% (n=3).

The clinical and laboratory values as well as prognoses of the hypoglycemic infants are summarized in Table 3. All symptomatic hypoglycemic infants and 8 asymptomatic hypoglycemic infants requiring IV glucose, a total of 17 infants (17/506, 3.4%), were hospitalized in the NICU. 96 asymptomatic hypoglycemic infants managed by exclusively feeding (96/506, 19%) were kept in postnatal wards with their mothers. The targeted BG level was reached within 30 min in all symptomatic and 60 min in all asymptomatic hypoglycemic infants.

In all infants with symptomatic hypoglycemia and 84.6% (88/104) of infants with asymptomatic hypoglycemia, feeding was continued with breast milk and formula. 11.5% (12/104) of asymptomatic infants continued to be fed exclusively with breast milk, and 3.9% (4/104) continued to be fed exclusively with formula.

Table 3: Clinical and laboratory characteristics, and management of newborns with hypoglycemia

Hypoglycemia (N=113)	N (%)	Blood glucose (mg/dl)	Risk factor(s)	Clinical signs	Management	Prognosis	Recurrent hypoglycemia
Symptomatic hypoglycemia	9 (8.0)						
Within min after birth	3 (2.7)	< 25	LPT	Poor feeding and floppiness	IV 'minibolus' of glucose* and a continuous infusion of glucose** Screening 30 min later	Achieving target BG ≥ 45 mg/dl within 30 min. Begining and maintaining feeding.	-
In 1-4 h	2 (1.7)	< 25	LPT				In 1 newborn at the 3rd hour
	3 (2.7)	25-40	LPT (n=1), LPT + SGA (n=1), IDM (n=1)	Irritability (n=2) Poor feeding and floppiness (n=1)	Feeding (n=2) Feeding and a continuous infusion of glucose (n=1) Screening 30 min later	Achieving target BG ≥ 45 mg/dl within 30 min. Maintaining feeding.	In 3 newborns in the 6 to 12 h
In 4-24 h	1 (0.9)	35-45	LPT + IDM	Weak crying and irritability	Feeding		-
Asymptomatic hypoglycemia	104 (92.0)						
In 0-1 h	4 (3.5)	< 25	IDM (n=2), LPT (n=1), More than 1 risk factor (n=1)	-	A continuous infusion of glucose** and feeding Screening 60 min later	Achieving target BG ≥ 45 mg/dl within 60 min. Maintaining feeding.	In 1 newborn at the 6th hour
	57 (50.4)	25-40	LPT (n=17), IDM (n=9), LGA (n=9), SGA (n=6), more than 1 risk factor (n=16)		Feeding		In 7 newborns in 6 to 12 h
In 1-4 h	1 (0.9)	< 25	IDM + SGA		A continuous infusion of glucose** and feeding Screening 60 min later		-
	19 (16.8)	25-40	LPT (n=9), IDM (n=4), LGA (n=1), More than 1 risk factor (n=5)		Feeding		In 7 newborns in 6 to 18 h
In 4-24 h	3 (2.7)	< 35	LPT (n=1), LGA (n=1), SGA (n=1)		A continuous infusion of glucose** and feeding Screening 60 min later		-
	20 (17.7)	35-45	LPT (n=6), IDM (n=7), LGA (n=2), SGA (n=1), more than 1 risk factor (n=4)		Feeding		In 2 newborns in 21 to 24 h

*2 mL/kg dextrose 10%. **6-8 mg/kg/min. LPT; late preterm, IDM; infants from diabetic mothers, LGA; large for gestational age, SGA; small for gestational age, BG; blood glucose

Discussion

In the present study, the overall NH incidence in neonates at risk of hypoglycemia was found to be 22.3%. In previous studies which defined hypoglycemia as the BG level being lower than 40 mg/Dl, as our study, NH incidence was found to be 11.7%, 27%, 11.6%, and 17.8% (9-12). Harris et al. defined hypoglycemia as the BG level being below 2.6 mM (47 mg/dL) and found NH incidence to be 51% in neonates at risk (13). The incidence we found is within the range of incidences from the literature. Different incidences reported seem to be attributed to the lack of uniformity in the definition of NH and variations in the distribution of at-risk newborn groups included in the studies. We suggest that multicenter studies are needed to estimate accurate NH incidence at national level in Turkey.

The mean gestational age of the neonates who developed hypoglycemia was found to be lower than those who did not develop hypoglycemia. Yet already, lower gestational-age is associated with increased risk for NH (14). Reducing preterm births will result in a reduction in the incidence of NH, both locally and globally.

Hypoglycemia incidence was 41.5%-45% in IDMs when the threshold value was accepted as ≤47 mg/dL and 20.5% when the threshold value was accepted as <40 mg/dL (15,16). In the present study, hypoglycemia incidence in IDMs was 20.8%. Hypoglycemia incidence in LGA infants was reported as 47% when the threshold value was accepted as ≤47 mg/dL and 12.7%-30.8% when the threshold value was accepted as ≤40 mg/dL (12,13,17). The hypoglycemia incidence in LGA infants was determined as 22% in the present study. The NH incidence was 16% in LGA infants with non-diabetic mothers (18), was 19.7% in the present study. When the threshold value was accepted as ≤40 mg/dL, hypoglycemia incidence was 19.4% in SGA infants, 40.7%-44.4% in preterm SGA infants, and 14.4% in term SGA infants (19,20). Those incidence rates in this study were 26.4%, 40%, and 22.2%, respectively. The frequency of hypoglycemia was 28.4% in preterm appropriate for gestational age infants (20), while in our study, this frequency was 24.5%. When the threshold value was accepted as ≤40 mg/dL, hypoglycemia incidence was between 15%-16% in late preterm infants (21), this was determined as 25.2% in the present study. The incidences we found in IDM and LGA risk groups are in compatible with existing literature. However, the incidences we found in LGA infants with non-diabetic mothers, in term SGA infants and in late preterm infants seem to be quite higher than some incidences presented in the literature. More studies are then required to reconsider prevention strategies for NH particularly in these risk groups, in Turkey.

Neonates with multiple risk factors do not have higher hypoglycemia incidence (3). We also did not find statistically significant differences in the frequencies of hypoglycemia and recurrent hypoglycemia between newborns with single risk and multiple risks.

In a previous study, 81% of hypoglycemia was seen in the first 24 h and 19% in the 24th-48th h in the infants at risk (10). In the present study, no hypoglycemia was observed after the 24th hour, and it was seen that the LGA infants and IDMs could develop hypoglycemia after the 12th hour as well with an incidence rate of 0.8% and 0.9%, respectively. Then, NH is likely no longer a problem after the first 24 h of life, on the other hand, screening LGA infants and IDMs for 12 h may cause the one in a thousand LGA infants or IDMs who develop hypoglycemia on the first day of life to be missed. Hosagasi et al. (12), in the same algorithm as we did, reported that hypoglycemia developed in the first 4 h in 75.7% of the hypoglycemic infants and in the 4th-24th h in 13.5%. In the present study, the highest incidence of hypoglycemia was also observed between 0-3 h, especially in the first hour. Blank et al. measured the lowest BG level in neonates at risk in the postnatal first hour (median ~45mg/dL) and reported that the median BG remained stable between 56-61 mg/dl in the subsequent hours (22). The mean BG concentrations observed in our study during the first 24 h represents a pat-

tern quite similar to the glucose concentration trends reported by Blank et al (22).

Most infants with low glucose concentration do not show symptoms (3). In a study evaluating hospitalized hypoglycemic newborns, it was observed that very few of the newborns showed symptoms such as low response, irritability, startle reflex, and feeding difficulties (23). A previous study, including the same risk groups as our study, found the frequency of symptomatic hypoglycemia to be 2.4% in all at-risk newborns and 13.5% in newborns with hypoglycemia (12). In our study, these incidence rates were 1.8% and 8%, respectively.

In this study, 18.9% of hypoglycemic infants had recurrent hypoglycemia and 11.5% of hypoglycemic infants had severe hypoglycemia. The incidence of recurrent hypoglycemia determined in the present study was 1/5 of hypoglycemic infants, consistent with the literature (10,13). The frequency of severe hypoglycemia detected in the present study was lower than the values of 19%, 29%, and 38% in the literature (10,12,13). Half of the NH episodes may last longer than 1 hour and 1/10 may last 3 h or longer (10). Hypoglycemia may still persist 1 hour after the intervention in 40% of hypoglycemic SGA, LGA, IDM, or late preterm risk groups (12). In our study, the targeted BG level was reached in 1 hour at the latest in all hypoglycemic infants. Considering the long-term undesirable consequences of recurrent, severe, and prolonged hypoglycemia, our findings are promising.

With the algorithm we applied, 3.4% of the newborns at risk and 15% of the newborns with hypoglycemia required NICU hospitalization. These incidence rates were 2.5% and 9.5% in the study of Stark et al (10), and 2.5% and 9.4 in the study of Bülbül et al (24). These low incidence rates reported by the centers following the AAP recommendations indicate that glucose homeostasis was successfully managed, and follow-up alongside mother was prioritized in newborns at risk. The follow-up for healthy, at-risk newborns, who are feeding well, should be conducted alongside the mother in terms of NH (25). 96.6% of the infants in our study were also infants whose BG monitoring was completed alongside the mother. Since our hospital is a baby-friendly hospital, all newborns in the present study were breastfed within the first hour. However, exclusive breastfeeding could be maintained in 10.6% of infants who developed hypoglycemia. In a previous study from Turkey, which included the same NH risk groups as our study, 14% of at-risk newborns needed formula support (12). In the present study, that frequency was observed as 19.9%. In the light of these findings, we suggest that greater efforts are needed in Turkey to reduce in-hospital formula supplementation and increase exclusive breastfeeding in NH risk groups.

Most of the risky infants who developed asymptomatic hypoglycemia were provided with normoglycemia through feeding, and those (3.7%) who needed IV dextrose developed earlier and more severe hypoglycemia (26). Consistently, in the present study, normoglycemia was achieved through feeding in 92.3% of the infants who developed asymptomatic hypoglycemia, while 7.7% needed IV dextrose, and half of those who received IV dextrose were infants who developed hypoglycemia within the first hour and below 25mg/dL.

The most important limitation of our study is that it is single-centered and retrospectively designed. Multicenter prospective studies examining the nutritional, growth, and neuromotor development characteristics of newborns at risk for hypoglycemia will support the reliability of the applied algorithm. Since there is no certainty about hypoglycemia risk groups and threshold values (27), our findings and literature discussion will undoubtedly change when analysis is made according to different risk groups and different threshold values. It is recommended that newborns with risk factors such as perinatal stress, post maturity, and intrauterine growth retardation, which we did not include in the present study, should also be screened for postnatal hypoglycemia (28). The incidence of hypoglycemia may be reviewed with future studies including all these risk groups. Since no hypoglycemia was observed after the 24th h in our study, no findings of persistent hypoglycemic disorders were

presented. Our experience does not include the use of dextrose gel, as it is not yet available in Turkey.

Conclusion

By sharing the experiences of different centers, a precise approach to NH can be developed and the neurodevelopmental outcomes of risky infants can be improved. With the algorithm applied in the present study, we did not see recurrent hypoglycemia after the first day of life in risky newborns, and we reached the targeted glucose values in hypoglycemic newborns within the desired period.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Conflict of interest

The authors declare that there is no conflict of interests.

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