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Meconium-stained liquor and low birth weight increases the odds of low fifth-minute apgar scores in public health facilities of arba minch town, southern Ethiopia: a cross-sectional study

Abstract

Background: Low Apgar scores in the childbirth period increased risk globally and significantly contributes to both newborn morbidity and mortality. Hence, it is very essential to update information on the status of low fifth-minute Apgar scores and factors affecting. Some studies were conducted, but most are retrospective and record reviews. Besides, there is limited study in country-Ethiopia. Therefore, this study aimed to assess the recent status of low fifth-minute Apgar scores and factors affecting in the study setting.

Methods: A facility-based cross-sectional study was conducted among 286 newborns in public health facilities of Arba Minch town, southern Ethiopia from February 6 to March 9, 2019. Study participants were selected using a systematic random sampling method. Pre-tested interviewer-administered questionnaires and checklist were used to collect the data. Data were entered into Epi data version 3.1 and exported to Stata version 15 for analysis. A crude and adjusted odds ratio was computed in the binary logistic regression model. In this study, P-value, < 0.05 was considered to declare factors as a statistically significant association.

Results: In this study, 17.8% (95%CI: 13.8%, 22.7%) of neonates had low fifth-minute Apgar scores. Condition of labor (induced/augmented) (AOR=3.33, 95%CI: 1.24, 8.90), meconium-stained liquor (AOR=3.37, 95%CI: 1.17, 9.74), and birth weight (AOR=3.48, 95%CI: 1.23, 9.86) were significantly associated with neonate's low fifth-minute Apgar scores.

Conclusions: This study indicated that a significant number of newborns resulted in low fifth-minute Apgar scores. Strengthen the provision of health information during antenatal care; avoid delay in screening high-risk mothers during pregnancy and delivery, and give immediate interventions should be recommended.

Keywords: apgar scores, newborns, arba minch

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Abbreviations: AOR, adjusted odds ratio; CS, cesarean section; CI, confidence interval; COR, crude odds ratio; SVD, spontaneous vaginal delivery

Background

The Apgar score is a tool used to assess newborns' wellbeing immediately after delivery. It consists of five variables: appearance, pulse, grimace, activity, and respiration. Low Apgar scores are defined as Apgar score≤3 at first (golden) minute or <7 at fifth minutes have used as an indicator of baby with a problem.[1–3] Besides, neonates whose fifth-minutes Apgar score lessens seven considered as having parental asphyxia.[4] Low Apgar scores in the childbirth period increased risk globally and significantly contributes to both newborn morbidity and mortality.[1,5,6] Evidence showed that a low Apgar score significantly increased the risk of neonatal and infant death and neurologic disability.[7–11] A pocket of studies showed low Apgar scores contributed 13.6% of causes of neonatal morbidity and mortality.[4,12] The rate of deaths due to perinatal asphyxia is approximately 10 times that of developed countries though accurate estimates of neurodevelopment sequels from asphyxia in sub-Saharan Africa are not available likely that these sequels are many times more prevalent in developing countries in developed countries.[13] Studies conducted in West and sub-Saharan, and North African showed the percentage of receiving a low Apgar score was 3.9%, and 1.8% respectively. Besides, a study conducted in North-west, Ethiopia reported 13.8%.[15] Non-vertex fetal presentation, prolonged and condition labor, meconium-stained liquor, low birth weight, gestational age, multiple pregnancies, cesarean mode of delivery, and body mass index were significantly associated with low fifth-minute Apgar scores.[15–18] A few studies were conducted on the status of low fifth-minute Apgar scores.[14,15] Nevertheless, most are retrospective and record reviews. Besides, there is limited study in country-Ethiopia. Therefore, this study aimed to assess the recent status of low fifth-minute Apgar scores and factors affecting in the study setting.

Methods

Study setting, design, and period

This cross-sectional study was conducted in public health facilities of Arba Minch town, Gamo zone, southern Ethiopia from February 6 to March 9, 2019. Arba Minch town is the capital of Gamo Zone, which is 505 km away from Addis Ababa and 275 km from Hawassa. There are four public health facilities in Arba Minch town (Arba

Minch general hospital, Secha health center, Woze health center, and Sikela health center). Arba Minch general hospital services inpatient and outpatient service. It has a total of 470 beds and more than 456 working staff. Secha health center opened in 2012; situated plain surface found in Arba Minch town. There are more than 32 working staffs. Sikela health center started delivering health care services to the public since 1966. There are 93 staff working in the health center with a different shift. The health center provides delivery services for 24 hours a day. Woze health center has recently upgraded from health post and has 18 working staff.

Population

Source population

The source population for this study was all live births in public health facilities of Arba Minch town, southern Ethiopia.

Study population

All live births in public health facilities of Arba Minch town, southern Ethiopia during the study period were study population for this study.

Inclusion criteria

All mothers whose age ≥18 years old with singleton live births were involved.

Exclusion criteria

Those newborns who referred from other health institutions and home-delivered and neonates with gross congenital malformation were excluded from this study.

Sample size determination

The separate sample size was calculated for each objective in Epi info7 Stat Calc. For the first objective (to assess the status of low fifth-minute Apgar score), the single population was used by the following assumption: P=0.138 from the study conducted in Ethiopia,[15] 95% level of confidence, and 4% margin of error and the estimated sample was 286. For the second objective (to identify associated factors), two sample comparison proportion was used by using the following assumption: P_1=0.355 (birth weight: 1500-2499g) and P_2=0.109 (birth weight: ≥2500g) from the study conducted in Ethiopia,[15] 95% level of confidence, Ratio 1:1, and Power=90. Based in this assumption the calculated sample size was 136. Therefore, the sample used for this study was 301 after adding a non-response rate of 5% to the larger sample size from the estimated sample size for the study objectives.

Sampling procedure

A systematic random sampling method was used to reach each study participant. The determined sample size was achieved by taking monthly average deliveries from preceding year-registered data.

Data collection methods

A pre-tested structured interviewer-administered questionnaire and checklist were used to collect the data. The tools were developed after reviewing different works of literature, and national and international guidelines. Well-trained data collectors assigned to collect the data from the delivery and immediate postnatal ward. The data collectors gave information about the study aim and the possible procedures for study participants before interviewing and abstracting the medical records.

Study variables

The dependent variable for this study was low fifth-minute Apgar scores and independent variables were socio-demographic characteristics, obstetric, and neonatal factors.

Measurements

Apgar scores computed by using five components. 1. Appearance: two points for pink, 1 point for bluish extremities, 0 points for blue. 2. Pulse rate: 2 points for ≥100 beats/minute, 1 point for <100, and 0 points for none. 3. Grimace: 2 points for crying, 1 point for whimpering, and 0 points for silence. 4. Activity: two points for active, 1 point for moderate, and 0 points for limp. 5. Respiration: 2 points for regular breathing, 1 point for irregular and < 30 breath/minute, and 0 points for none. Low fifth-minute Apgar scores were determined as a score of <seven at the fifth minute after summing the scores.[3,15,19]

Data quality control

A pretested as a standard tool was used to collect the information. Extensive training was given for data collectors to standard the ways of measurement and data collection. Data were checked for completeness, accuracy, clarity, and consistency before entered into the software. Multiple imputation techniques were used for some of the missed information. Proper coding and categorization of data maintained for the quality of the data.

Data analysis and processing

The data coded, cleaned, edited, and entered into Epi data version 3.1 and then exported to Stata version 15 for analysis. Descriptive analysis done by computing proportions, and summary statistics. The crude odds ratio (COR) and adjusted odds ratio (AOR) along with 95% confidence interval (CI) were estimated in the binary logistic regression model. All the assumptions were checked for the model and log-likelihood ratio (LR) was used to test the goodness of fit. All variables with P<0.2 in the bivariate analysis were included in the final model of multivariable analysis. The standard error of ≥2 considered for the existence of multi co-linearity. In this study, P-value, < 0.05 considered to declare a result as a statistically significant association. Then the information was presented by using simple frequencies, summary measures, Tables.

Ethics approval and consent to participate

Ethical clearance was obtained from Arba Minch University, College of Medicine and Health Sciences, Institutional Research Ethics Review Board (IRB). All the study participants informed about the purpose of the study, their right to refuse, and written and signed voluntary consent obtained from all study participants before the interview. The respondents were also been told that the information obtained from them was treated with complete confidentiality and do not cause any harm to them.

Results

Socio-demographic characteristics

In this study, 286 study participates involved, which gave a response rate of 95%. The mean and standard deviation of the age of mothers was (25.79±4.14). Married respondents constituted 268 (93.7%), and Orthodox Christian religion followers had 134 (46.9%). Of the participants, 230 (80.40) had a family size of three to five, and 193 (67.5%) were urban dwellers (Table 1).

Table 1 Socio-demographic characteristics in public health facilities of arba minch town, southern Ethiopia, 2019(n=286)

Variables	Frequency	Percentage
Age		
18-34	270	94.4
≥35	16	5.6
Educational status		
No formal education	16	5.6
Grade 1-8	114	39.9
Grade 9-12	85	29.7
College and above	71	24.8
Occupation of mother		
Government employer	28	9.8
Merchant	97	33.9
Private worker	45	15.7
Housewife	111	38.8
Other*	5	1.7

*Daily laborer and student

Obstetric information

One hundred seventy-one (59.8) of the mothers were multigravida. Two hundred eighty (97.9%) of the mothers had antenatal care during the index pregnancy, and from them, 204 (72.9%) were four or more visits. Only one (0.3%) of the mother faced amniotic fluid disorder pregnancy, three (1.0%) had a fever during labor time, and two (0.7%) had a history of neonatal deaths. Out of the study participants, four (1.4%) were chronic diseases, and three (1.0%) had a history of bleeding during pregnancy (antepartum hemorrhage) (Table 2).

Table 2 Obstetric characteristics in public health facilities of arba minch town, southern Ethiopia, 2019(n=286)

Variables	Frequency	Percentage
Condition of labor		
Spontaneous	251	87.8
Induced/Augmented	35	12.2
Duration of labor		
<12 hour	161	56.3
≥12 hour	125	43.7
Duration of rupture of membrane before the onset of labor		
<18 hour	243	85.0
≥18 hour	43	15.0
Mode of delivery		
SVD	240	83.9
CS	46	16.1
Fetal presentation		
Vertex	240	83.9
Non-vertex	46	16.1
Meconium-stained liquor		
Yes	25	8.7
No	261	91.3
Hypertensive disorder during pregnancy		
Yes	30	10.5
No	256	89.5
Gestational age		
< 37 week	52	18.2
≥ 37 week	234	81.8
Birth weight		
<2500g	60	21.0
≥2500g	226	79.0

SVD, spontaneous vaginal delivery; CS, cesarean section

Factors associated with the neonate's low fifth-minute Apgar scores

This study founded that, 17.8% (95%CI: 13.8%, 22.7%) of neonates had low fifth-minute Apgar scores. In the multivariable model, condition of labor (induced/augmented), meconium-stained liquor, and birth weight were significantly associated with neonate's fifth-minute Apgar scores. Mothers who induced/augmented during labor were 3.33 times, and who had meconium-stained liquor were 3.37 times more likely gave neonates with low fifth-minute Apgar scores (AOR=3.33, 95%CI: 1.24, 8.90) and (AOR=3.37, 95%CI: 1.17, 9.74) respectively. The odds of low fifth-minute Apgar scores were 3.48 among neonates whose birth weight had less than 2500g (AOR=3.48, 95%CI: 1.23, 9.86) (Table 3).

Discussion

Low fifth-minute Apgar scores significantly contributed to the neonatal morbidity and mortality in developed, developing, and underdeveloped countries. A few studies were conducted on the given topic, specifically, in-country Ethiopia. Therefore, this study was aimed to assess the status of low fifth-minute Apgar scores and factors affecting in the study setting. The overall status of low fifth-minute Apgar scores among singleton neonates was 17.8% (95%CI: 13.8%, 22.7%). This study identified that condition of labor (induced/augmented), meconium-stained liquor, and birth weight were significant factors associated with neonate's low fifth-minute Apgar scores. The magnitude of low fifth-minute Apgar scores in this finding was higher than studies conducted in West and sub-Saharan Africa (3.9%), North Africa (1.8%)[14], resource-constrained settings (2.3%)[13], and a study conducted in North-west Ethiopia (13.8%) [15]. The reason for this difference related to socio-economic status, health-seeking behavior of pregnant mothers, socio-cultural factors, and methodological aspects (study setting, period, design, and measurements).

Citation: Mersha A, Shibiru S, Bante A. Meconium-stained liquor and low birth weight increases the odds of low fifth-minute apgar scores in public health facilities of arba minch town, southern Ethiopia: a cross-sectional study. *J Pediatr Neonatal Care*. 2020;10(3):86–90. DOI: 10.15406/jpnc.2020.10.00417

In this study, the condition of labor (induced/augmented) and meconium-stained liquor were significantly associated with the low fifth-minute Apgar scores. This is congruent with a study conducted in North-west, Ethiopia[15]. This is in fact that induction/augmentation indicated to shorten labor for the mother with prolonged labor. Consequently, the progress of labor, as well as the drug administered for that, hurts the fetus that results for low fifth-minute Apgar scores. Besides, meconium-stained liquor is one of the indications of fetal distress and other intrapartum complications, and result for aspiration. Therefore, those newborns are most likely has low fifth-minute Apgar scores. As showed by this survey, low birth weight (<2500g) was identified as factor associated with low fifth-minute Apgar scores. This is in line with studies done in Brazil, and Ethiopia[15, 20]. The reason for this is that, lowest birth weight associated with prenatal complications. These complications result in adverse fetal and neonatal outcomes, such as birth asphyxia, low Apgar scores, stillbirth, early and late neonatal mortality, and other morbidities. Fetal presentation and duration of labor were not significantly associated with low fifth-minute Apgar scores. This is inconsistent with a study done in Ethiopia[15]. The inconsistency may be due to differences in methodological aspects, and accessibility and availability of nearby health facilities to manage different complication that result for the above stated conditions.

Table 3 Factors associated with the neonates low fifth-minute apgar scores in public health facilities of arba Minch town, southern Ethiopia, 2019(n=286)

Variables	Low fifth-minute Apgar scores		(95% CI)	
	Yes	No	Crude OR	Adjusted OR
Gravidity				
Primigravida	21(18.3%)	94(81.7%)	1.05(0.57, 1.94)	1.18(0.53, 2.65)
Multigravida	30(17.5%)	141(82.5%)	1	1
Fetal presentation				
Vertex	31(12.9%)	209(87.1%)	1	1
Non-vertex	20(43.5%)	26(56.5%)	5.19(2.59, 10.38)	2.41(0.80, 7.24)
Meconium-stained liquor				
Yes	12(48.0%)	13(52.0%)	5.25(2.23, 12.36)	3.37(1.17, 9.74)*
No	39(14.9%)	222(85.1%)	1	1
Condition of labor				
Spontaneous	34(13.5%)	217(86.5%)	1	1
Induced/Augmented	17(48.6%)	18(51.4%)	6.03(2.85,12.83)	3.33(1.24,8.90)*
Mode of delivery				
SVD	32(13.3%)	208(86.7%)	1	1
CS	19(41.3%)	27(58.7%)	4.57(2.28, 9.16)	1.77(0.59, 5.32)
Gestational age				
<37 week	23(44.2%)	29(55.8%)	5.83(2.97, 11.46)	2.39(0.79, 7.32)
≥37 week	28(12.0%)	206(88.0%)	1	1
Birth weight				
< 2500g	29(48.3%)	31(51.7%)	8.67(4.44, 16.96)	3.48(1.23, 9.86)*
≥2500g	22(9.7%)	204(90.3%)	1	1
Hypertensive disorder during pregnancy				
Yes	12(40.0%)	18(60.0%)	3.71(1.66, 8.31)	1.88(0.60, 5.85)
No	39(15.2%)	217(84.8%)	1	1
Duration of labor				
<12 hour	26(16.1%)	135(83.9%)	1	1
≥12 hour	25(20.0%)	100(80.0%)	1.29(0.71, 2.38)	0.91(0.39, 2.11)
Duration of rupture of membrane before the onset of labor				
<18 hour	37(15.2%)	206(84.8%)	1	1
≥18 hour	14(32.6%)	29(67.4%)	2.69(1.29, 5.56)	1.51(0.55, 4.11)

* Significant at P-value<0.05

Citation: Mersha A, Shibiru S, Bante A. Meconium-stained liquor and low birth weight increases the odds of low fifth-minute apgar scores in public health facilities of arba minch town, southern Ethiopia: a cross-sectional study. *J Pediatr Neonatal Care*. 2020;10(3):86–90. DOI: 10.15406/jpnc.2020.10.00417

Limitation of the study

The main limitation of the study was that the study might subjected to recall bias. As this was institution based study, some of the varibles that addressed in the community setting (e.g. wealth index, household food insecurity, etc.) were missed. The causal association was under caution as the study design was cross-sectional.

Conclusions

This study showed that a significant number of newborns resulted in low fifth-minute Apgar scores. There are different factors during the continuum of care for pregnant mothers that result in low fifth-minute Apgar scores. Therefore, early identification and intervention for those conditions are very vital to improve neonatal health. In general, this study identified that condition of labor (induced/augmented), meconium-stained liquor, and low birth weight (<2500g) were independent associated with low fifth-minute Apgar scores. Strengthen the provision of health information during antenatal care, avoid delay in screening high-risk mothers, and give immediate interventions for those conditions. The other scholars do further investigation to identify other factors by using other study designs in a large group of the population, typically experimental or follow-up studies.

Authors' contributions

AM designed the study, involved in data collection, done analysis and interpretation of the result and drafted the paper and participated in preparing all versions of the manuscript. SS and AB assisted in the design and the proposal development, monitored data collection, assisted during analysis and revised subsequent drafts of the paper. All authors read and approved the final manuscript.

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Conflict interest

All authors assert that they have no competing interests.

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