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Incidence and Determinants of Depressed Apgar score In Neonates Born at Jinja Regional Referral Hospital, Jinja District, Uganda between April to August, 2022

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ABSTRACT

This study was conducted at Jinja Regional Referral Hospital in Uganda to evaluate the prevalence and determinants of depressed Apgar scores in neonates born there. The study included 69 infants with low Apgar scores (19.3%), compared to 288 (80.7%) considered normal. Socio-demographic determinants of depressed APGAR scores included women under 20 being five times more likely to give birth to infants with low Apgar scores than women aged 34 and older. Women with no formal education were three times more likely to give birth to babies with poor Apgar scores compared to those with college level education. Women with just one child had a one-time increased risk of having newborns with poor Apgar scores compared to those with more than three children. Women in formal employment were three times more likely to have newborns with low Apgar scores compared to those in rural areas. The study found that women who did not follow up on their antenatal care (ANC) attendance were eight times more likely to have babies with poor Apgar scores than those who did. Induced laborers were twice as likely to deliver infants with poor Apgar scores as spontaneous laborers. Pre-term and post-term pregnancies were three times more likely to result in low Apgar scores than term pregnancies. Non-vertex of fetal presentation was two times more likely to produce babies with low Apgar scores compared to those with vertex of fetal presentation. The study concluded that 19.3% of singleton new babies have low Apgar scores.

Key words: Neonates, Apgar scores, pregnancy, Women, Hospital

INTRODUCTION

Worldwide in 2019, 3.6 million neonates died before they became one month old throughout the world, with over half of these fatalities occurring in the first day of life and seventy percent occurring in the first week of life [1]. The neonatal period, the first 28 days of life, has the greatest mortality rate, with 19 fatalities per 1,000 live births [1]. Neonatal mortality accounts for 46% of all fatalities in children under the age of five, with the majority of deaths happening in depressed- and middle-income nations [2]. The overall progress in reducing neonatal mortality rates has been slower than that reported in under-five mortality; while neonatal mortality declined by 49 per cent from 1990 to 2016, the under-five mortality rate declined by 62 per cent within the same period [2]. Despite the fact that the worldwide neonate mortality rate has reduced from 37 deaths per 1,000 live births in 1990 to 19 deaths per 1,000 live births in 2019, the rate remains unacceptably high in several areas and nations throughout the world [1]. Sub-Saharan Africa (SSA) has one of the highest rates of neonate death (38%) in the world, with substantial variance between nations and only slight decreases over the previous two decades [3].

Because of decades of political instability, conflicts, poor quality of healthcare governance, insufficient health financing and human health resources, depressed standard health service delivery, and poor socioeconomic status, countries in the Great Lakes region (Burundi, Democratic Republic of Congo (DRC), Kenya, Rwanda, Tanzania, and Uganda) contribute to this burden [4]. Preterm delivery issues, intrapartum-related difficulties, birth asphyxia, congenital defects, and infections such as neonate sepsis, tetanus, meningitis, and pneumonia are all well-known causes of neonatal death [2]. These factors are frequently worsened by underlying variables that may be connected to the neonate's surroundings — whether it be a poor family, a marginalized neighborhood, or a conflict-torn nation. These underlying variables include socioeconomic issues, maternal lifestyle factors, health service factors, and environmental factors, all of which can be addressed by a system-wide strategy that enhances health systems to offer high-quality treatment. According to studies, the vast majority of neonatal deaths can be avoided by improving access to high-quality maternal and neonate health services delivered by skilled health

professionals, as well as clean water, proper antenatal and postnatal nutrition for both mother and neonate, disinfectants, and skin-to-skin contact [5]. Notwithstanding, in resource-constrained countries that have experienced long periods of conflict and political instability, such as those in the Great African Lakes region, interventions that target the most significant underlying factors are critical to assisting in proper planning and strategic allocation of scarce resources. As a result, the goal of this study was to determine the most important determinants related with neonate mortality across nations in the Africa Great Lakes area in order to aid in policy prioritizing at the national and regional levels. The findings of this study will add to the body of evidence supporting the need for better health care quality in addressing the problem of neonate death, as well as aid in the formulation and assessment of health policies and programs [1].

This same Apgar score is used to compare neonate outcomes at different obstetrical institutions across the world in order to assess the quality of obstetrical treatment, independent of the underlying reason. Despite alternative accessible means of showing birth asphyxia, such as umbilical cord acid base balance monitoring, the Apgar score still describes the degree of birth asphyxia according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). Depressed Apgar scores of fewer than seven at five minutes have been linked to infant mortality and morbidity, including respiratory distress and neurological issues [6].

Nonetheless, the great majority of children with an Apgar score of 7 at 5 minutes (AS5 min 7) will be healthy throughout their neonatal period and subsequently in life. Several risk factors for depressed Apgar scores or asphyxia have been identified in previous national and international research, albeit the results and classifications differ. Socioeconomic, demographic, and medical risk variables are all examined in the research. Smoking, depressed socioeconomic level, the mother's single civil status, maternal small height, and maternal obesity have all been linked to a depressed Apgar score. Medical risk factors related with a depressed Apgar score include the manner of birth, intrauterine meconium discharge, and abnormalities in cardiotocography (CTG) [7].

Every year, 8.2 million children under the age of five die throughout the world, with neonatal fatalities accounting for more than 40% of these deaths, which occur before the age of 30 days. Every year, 1.2 million babies die in Sub-Saharan Africa [8], and among the 186 nations evaluated in 2013, Sub-Saharan Africa had the highest risk of neonatal fatalities [9]. In Uganda, one out of every 16 children does not live to see their fifth birthday, and neonatal fatalities account for 42 percent of all mortality among children under the age of five [9]. The Millennium Development Goal of increasing under-five survival, where neonate mortality accounts for a large proportion of all deaths among children under the age of five, was not met [11]. Since neonate death has been stable over the previous decade, Uganda's existing objectives for the UN Sustainable Development Goal of reducing neonatal mortality risk being missed. According to Kananura et al. [8], sepsis/pneumonia, tetanus, diarrhea, preterm, and birth asphyxia are the leading causes of neonate fatalities in Uganda [12]. Other studies have linked depressed access and usage of health care during pregnancy and labor to neonate fatalities, particularly the large percentage of births without experienced birth attendants. High rates of infant death have also been linked to mothers who are too young (under the age of 18), too elderly (35 and older), have short birth intervals, and have too many children [13]. Similarly, Ikamari [14] discovered that mother age at delivery and the time between births were risk factors for neonate mortality. However, there is a paucity of research on the demographic and socioeconomic characteristics that have been consistently linked to neonate fatalities in Uganda throughout time. If high-risk infants can be diagnosed and handled properly, perinatal morbidity and death can be decreased. The goal of this study is to determine the incidence of infants in JRRH who had a depressed Apgar score at 5 minutes, as well as the variables that contributed to this. The study aims to evaluate the prevalence and determinants of depressed APGAR scores in neonates born at Jinja Regional Referral Hospital in Jinja district, Uganda. Specific objectives include assessing the incidence, identifying socio-demographic and obstetric factors, and determining the APGAR score in these neonates.

METHODOLOGY

Study Design

A cross-sectional study was conducted at the JRRH post-natal ward from April to August, 2022.

Study Area

JRRH is located in Jinja Municipality which is situated on the northern shore of Lake Victoria and the east shore of the Victoria Nile at a point where River Nile issues from Lake Victoria in the former Rippon Falls (It is located at the source of the River Nile). The hospital has a 600-bed capacity and serves the eastern towns of Iganga, Kamuli among others.

Inclusion criteria

All neonate live births after 28 weeks of gestation during the study period will be included.

Exclusion Criteria

Deliveries of unknown gestational age (unknown last normal menstrual Period and no ultrasound estimation) will not be included.

Sampling Size Determination

Due to limited time and other limiting factors, a sample size of 150 respondents will be considered for the study. The sample size was estimated by using Kish and Leslie formula as expressed;

$$n = \frac{t^2 xp(1-P)}{m^2}$$

Where:

t = confidence level at 95% (standard value1.96);
p = 89%women who use herbal medicines in Uganda;
m = margin of error at 5% (standard value 0.05)

$$n = \frac{1.96^2 x0.89(1-0.89)}{0.05^2}$$

n = 150.43 approximately 150 participants.

Sampling procedures

Systematic random sampling technique will be used to reach at each participant. By taking a monthly average of 150 deliveries from preceding year report and considering a skip interval of 4, the calculated sample size may be achieved in the three months of data collection period.

Data collection methods and management

The mother socio-demographic and obstetric characteristics will be included in the questionnaire. Variables relating to the infant will also be included. On a daily basis, a senior midwife who is also the maternity ward chief will assess the completeness of the data and the relative accuracy of the Apgar score calculation.

Data analysis

The information gathered will be evaluated using manual tally and Microsoft Excel spreadsheets, and then displayed in the form of tables, percentages, graphs, and pie charts in a Microsoft Word document.

Quality control

To ensure the research instrument's validity, the researcher will seek the advice of specialists in the subject (for example, professors, doctors, nurses, and the researcher's supervisor). This will make it easier to revise and modify the study tools as needed, improving validity. The sample questionnaires will be filled out by the chosen research assistants to ensure that they are familiar with the study topics.

Ethical Considerations

The interviewees' identities were kept completely private during the study. The study will employ initials rather than patient names, backed up by patient I.P. numbers. Before beginning data collecting, the researcher must obtain authorization from the JRRH Authorities to proceed with the project.

RESULTS

Demographic characteristics of the respondents

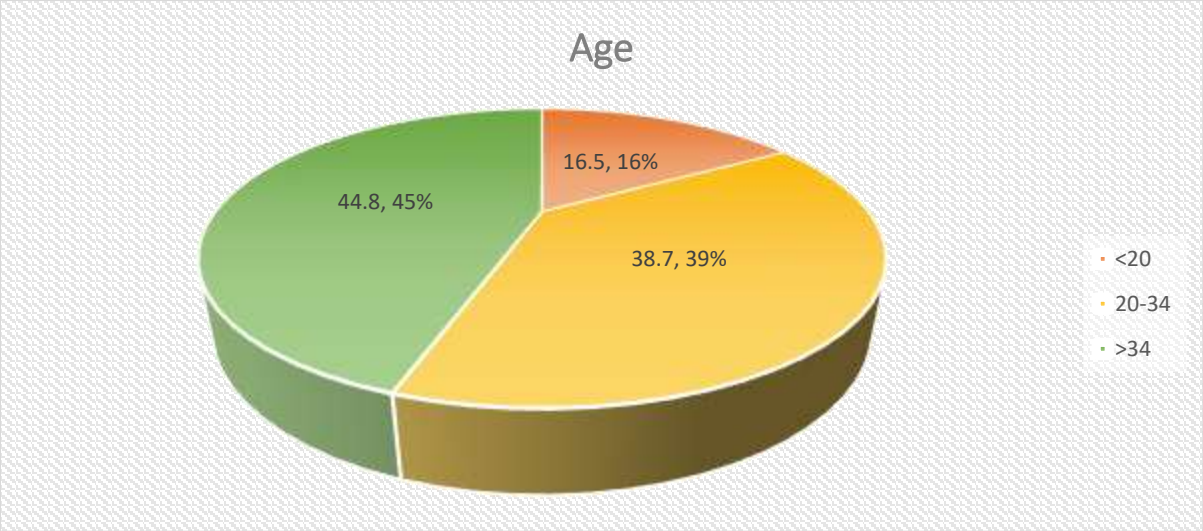
357 mothers in all participated in the study. Table one indicates the demographic characteristics of the study participants;

Table 1: Showing the demographic characteristics of the sample

Variable	Frequency (n=357)	Percentage (%)
Age categories		
<20	59	16.5
20-34	138	38.7
>34	160	44.8
Level of education		
No formal education	43	12.0
Primary education	87	24.4
Secondary education	120	33.6
College and above	107	30.0
Marital status		
Married	261	73.1
Never married	57	16.0
Separated/divorced	39	0.9
Parity		
1 child	88	24.6
2/3 children	173	48.5
>3 children	96	26.9
Occupation		
Self employed	193	54.1
Causal	73	20.4
Formal employment	91	25.5
Residence		
Urban	184	51.5
Rural	172	48.5

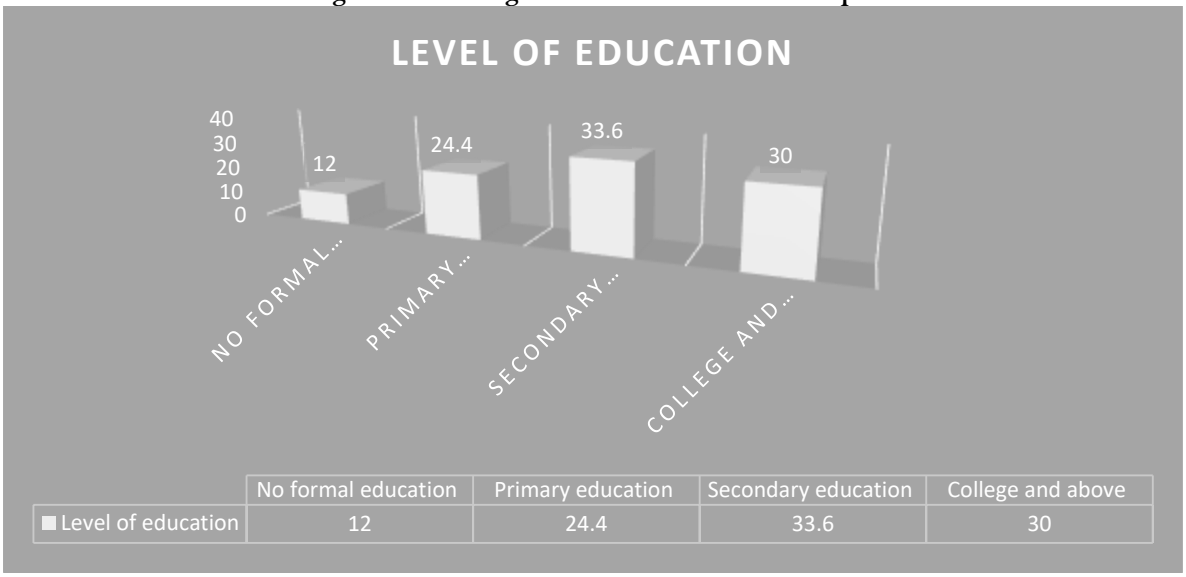
According to figure 1 below, the bulk of participants were under the age of 20 (59%) and between the ages of 20 and 34 (138%) and 160 (44.8%);

Figure 1:showing age group of the respondents



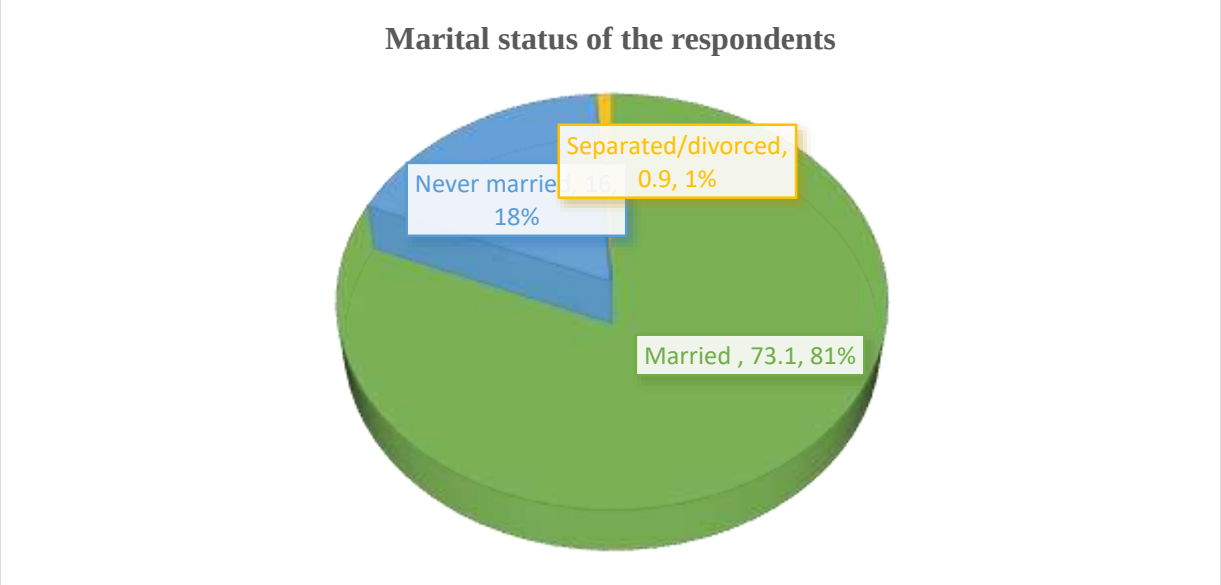
Most of the respondents i.e.120 (33.6%) had at least a secondary education, while 43 (12%) had none at all. The results are displayed in the following figure.

Figure 2: Showing educational level of the respondents



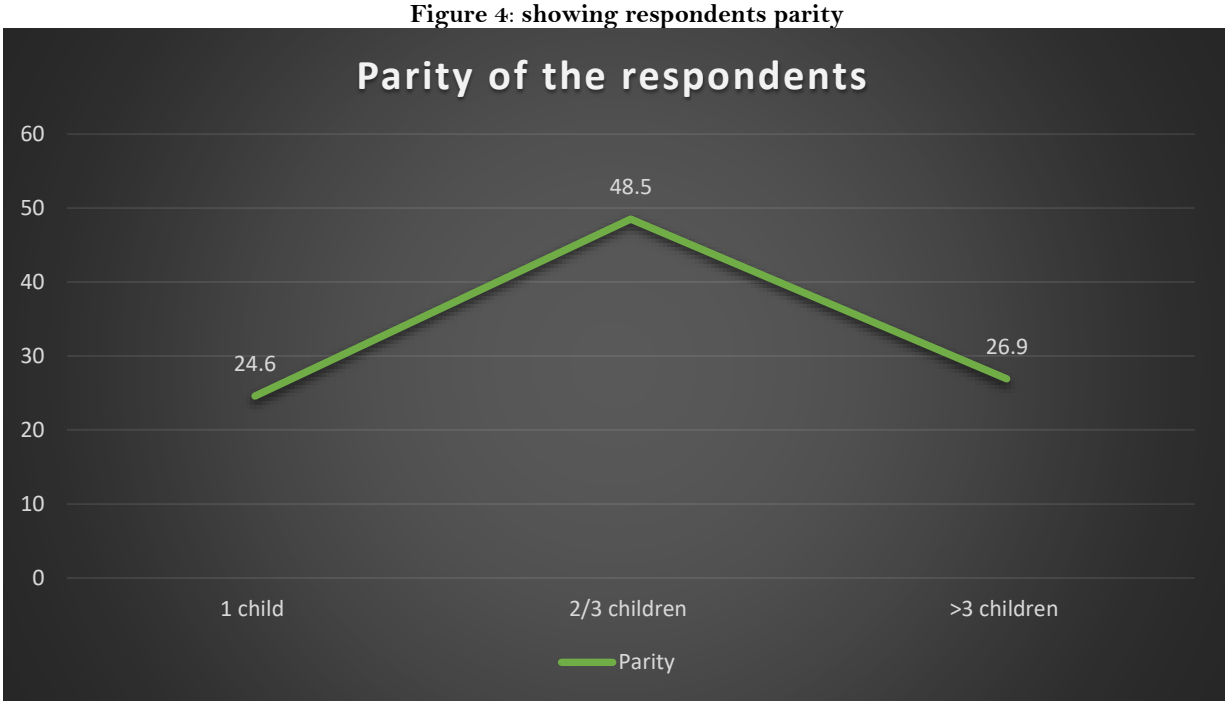
Majority 261(73.1%) were married, 57(16.0%) were single while the least 39(0.9%) separated as shown in figure three below.

Figure 3: Showing marital status of the respondents



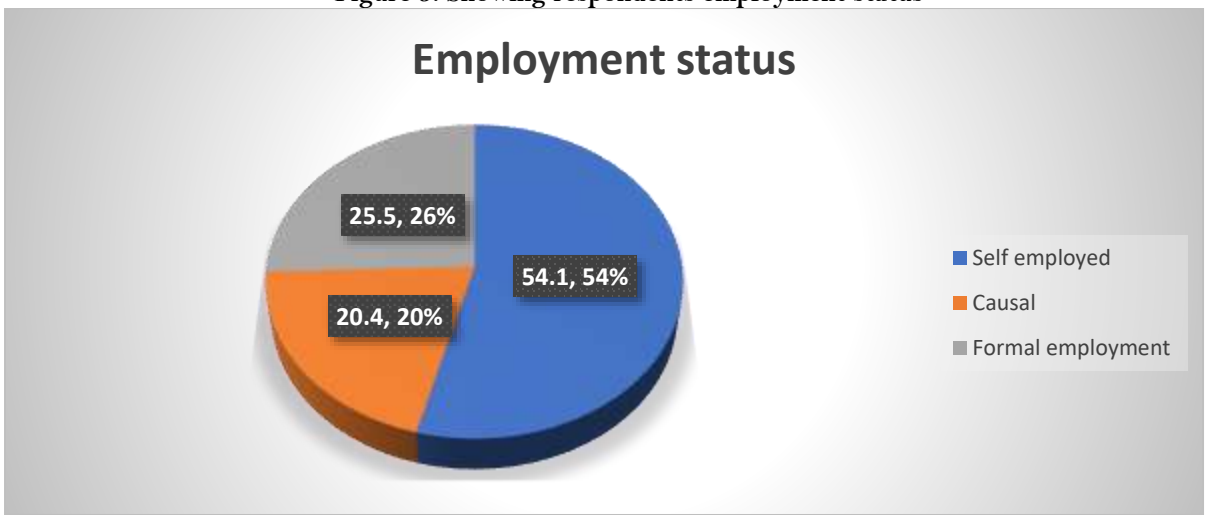
Most of the respondents, 173 (48.5%), had two or more children, followed by 96 (26.9%), who had three or more, and 88 (24.6%), who had just one.

Figure 4: showing respondents parity



Nearly half (93) were self - employed, while 73 (20.4%) were temporary workers.

Figure 5: Showing respondents employment status



Most 184(51.5%) belonged to urban setting while the least 172(48.5%) belonged to rural setting.

Incidence of depressed APGAR score in neonates born at JRRH

Among all responses, 69 (19.3%) neonates had an Apgar score below 7 after five minutes, whereas 288 (80.7%) were considered normal.

Table 2 showing incidence of depressed APGAR score in neonates

Proportion	Frequency (n=357)	Percentage (%)
Apgar depressed (< 7)	69	19.3
Normal (≥ 7)	288	80.7

Socio-demographic determinants of depressed APGAR score in neonates born at JRRH

Age categories, level of education, parity and occupation were statistically significantly associated with low Apgar score among babies of women attending at Jinja regional Referral Hospital in the model at 5% level. Women in age group <20 years were 5times more likely have babies with low Apgar score as compared to those who belonged to age group of 34 years and above (OR =5.73: 95%CI, 2.31-28.4: P<0.001). Women with no formal education were 3times more likely to produce babies with low Apgar score as compared to those who attained college level of education (OR=**3.29**: 95%CI, **1.94–5.57: P<0.001).** Women with only one child were 1 time more likely to produce babies with low Apgar score as compared to those who had more than 3 children (OR=1.28: 95%CI, **0.69-10.16**: P=**<0.030**). Women who had formal employment were 3times more likely to produce babies with low Apgar score as compared to those who had casual work (OR=**3.87**: 95%CI, **0.72–4.91**: **P=0.001).** Mothers who lived in urban were 1 time more likely to produce babies with low Apgar score as compared to those lived in rural areas (OR=1.19: 95%CI, 0.55-11.34: P=0.038).

Table 3: Showing association between the demographic characteristics and low fifth minute Apgar score among singleton newborn babies

Variable	Low Apgar score		OR (95% CI)	P-Values
	Yes	No		
Age categories	**n=69**	**n=288**		
<20	19(32.2%)	40(67.7%)	**5.73(2.31-28.4)**	**<0.001**
20-34	26(18.8%)	112(81.2%)	0.71(1.34-1.31)	0.054
>34	24(15%)	136(85%)	Ref	
Level of education				
No formal education	15(34.9%)	28(65.1%)	**3.29 (1.94–5.57)**	**<0.001**
Primary education	28(32.2%)	59(67.8%)	1.27 (0.44–3.68)	**0.014**
Secondary education	23(19.1%)	97(80.8%)	ref	
College and above	3(2.8%)	104(97.2%)	0.47 (0.86–2.53)	0.620
Marital status				
Married	52(19.9%)	209(60.5%)	0.61 (0.77–1.85)	0.061
Never married	8(14.0%)	49(86%)	ref	
Separated/divorced	9(23.1%)	30(76.9%)	0.33 (0.41–1.78)	0.052
Parity				
1 child	15(17.0%)	73(83.0%)	1.28(0.69-10.16)	0.030
2 - 3 children	35(20.2%)	138(79.8%)	ref	
>3 children	19(19.8%)	77(80.2%)	2.24((1.76-9.35)	0.042
Occupation				
Self employed	18(9.3%)	175(90.7%)	0.88 (0.63–1.23)	0.391
Causal	19(26.0%)	54(74.0%)	ref	
Formal employment	32(35.2%)	59(64.8%)	**3.87 (0.72–4.91)**	**0.001**
Residence				
Urban	29(15.8%)	155(84.2%)	1.19(0.55-11.34)	0.038
Rural	40(23.3%)	132(76.7%)	ref	

Obstetric determinants of depressed APGAR score in neonates born at JRRH

At a 5% confidence level, it was discovered that low Apgar scores were most statistically significantly associated with ANC follow-up, labor duration, delivery method, gestational age at birth, birth weight, history of neonatal death, gravidity, and fetal presentation in women visiting Jinja regional Referral Hospital.

Compared to women who followed up on their ANC attendance, those who didn't were eight times as likely to deliver infants with low Apgar scores (OR=8.83: 95%CI, 2.07-37.11: P0.001).

In addition, compared to women who gave birth naturally, those who experienced an induced condition of labor were twice as likely to have infants with poor Apgar scores (OR=2.39; 95%CI, 1.74-15.84; P=0.041).

Whereas compared to women whose labor lasted between 3 and 24 hours, those whose labor lasted more than 24 hours (prolonged) were 7 times more likely to have infants with low Apgar scores (OR=7.43: 95%CI, 5.59-16.26: P=0.001). Preterm (37 weeks) and postterm (>42 weeks) mothers had a threefold increased risk of having babies with low Apgar scores compared to term (37–42 weeks) mothers (OR=3.79: 95%CI, 0.57–13.01; P=0.002).

Table 4 showing Association between depressed Apgar score and obstetric factors

Variable	Low Apgar score		OR (95% CI)	P-Values
	Yes n=69	**No** n=288		
ANC follow up				
Yes	48(15.6%)	259(84.4%)	ref	
No	21(42.0%)	29(48.0%)	8.83(2.07–37.11)	<0.001
Parity				
1 child	15(17.0%)	73(83.0%)	1.28(0.69-10.16)	0.030
2 - 3 children	35(20.2%)	138(79.8%)	ref	
>3 children	19(19.8%)	77(80.2%)	2.24((1.76-9.35)	0.042
Condition of labor				
Spontaneous	47(18.2%)	211(81.7%)	ref	
Induced/Augmented	22(22.2%)	77(77.8%)	2.39(1.74–15.84)	0.041
Duration of labor				
3–24hrs (normal)	39(14.7%)	226(85.3%)	Ref	
>24 hrs (prolonged)	30(32.6%)	62(67.4%)	7.43(5.59–16.26)	<0.001
Mode of delivery				
SVD	52(29.5%)	124(70.5%)	5.72(0.83–9.28)	0.001
Instrumental	9(11.5%)	69(88.4 %)	Ref	
C/S	8(7.8%)	95(92.2%)	2.51 (1.55–8.06)	0.631
Gestational Age at Birth				
Preterm (< 37 wks)	23(27.4%)	61(72.6%)	3.79(0.57–13.01)	0.002
Term (37–42 wks)	32(14.7%)	185(85.3%)	Ref	
Post term (>42 wks)	14(25%)	42(75%)	0.97(0.65–7.35)	0.042
Birth weight				
Low (1500–2500 gm)	19(23.5%)	62(76.5%)	4.74(2.37–13.91)	0.050
Normal (2500–4000 gm)	50(18.1%)	226(81.9%)	Ref	
History of Neonatal death				
Yes	24(33.8%)	47(66.2%)	6.97(2.73–15.28)	<0.001
No	45(15.7%)	241(84.3%)	Ref	
Gravidity				
Primigravida	13(11.3%)	102(88.7%)	0.97(0.65–1.35)	0.730
Gravid ≥ 5	15(37.5%)	25(62.5 %)	3.54(0.57–11.01)	0.001
Gravid 2–4	41(20.3%)	161(79.7%)	Ref	
Fetal presentation				
Vertex	45(17.4%)	213(82.6%)	Ref	
Non-vertex	24(24.2%)	75(75.8%)	2.93 (1.21–4.05)	0.003

Compared to those who delivered via instrumental delivery, those who used SVD had a 5 times higher chance of producing infants with low Apgar scores (OR=5.72: 95%CI, 0.83-9.28: P=0.001).

When compared to women without a history of neonatal mortality, newborns born to women with a history of neonatal death were six times more likely to have poor Apgar scores (OR=6.97: 95%CI, 2.73-15.28; P=0.001).

In comparison to women who had a vertex of fetal presentation, those who did not were twice as likely to have newborns with low Apgar scores (OR=2.93: 95%CI, 21.21-4.05: P=0.003).

DISCUSSION

Incidence of depressed APGAR score in neonates born at JRRH

Among all responses, 69 infants (19.3%) had low Apgar scores (less than 7), whereas 288 (80.7%) were considered to be normal. The prevalence mentioned above was higher than that of a different institution-based study conducted in South-West Ethiopia by Gudayu [15] which had a prevalence of 13.8%.

Socio-demographic determinants of depressed APGAR score in neonates born at JRRH.

According to this study, women under the age of 20 were five times more likely to give birth to infants with low Apgar scores than women aged 34 and older (OR =5.73: 95%CI, 2.31-28.4: P0.001). The aforementioned findings were in contrast to those of a Swedish study by Molina-Garca [16] which found that advanced maternal age was linked to a higher risk of preterm birth, low birth weight, low Apgar scores at 5 and 10 minutes, and higher mortality during the first month of life.

In comparison to women who reached college level of education, women with no formal education were 3 times more likely to give birth to babies with poor Apgar scores (OR=3.29: 95%CI, 1.94-5.57: P0.001). The aforementioned findings were in direct opposition to those of Abebe et al., [17] which revealed that education was substantially related to low Apgar scores.

Compared to women who had more than three children, women with just one child had a one-time increased risk of having newborns with poor Apgar scores (OR=1.28: 95%CI, 0.69-10.16; P=0.030). Compared to women who worked casually, women in formal employment were 3 times more likely to have newborns with low Apgar scores (OR=3.87: 95%CI, 0.72-4.91: P=0.001).

Compared to mothers who resided in rural regions, mothers who lived in urban areas were 1.19 times more likely to have newborns with poor Apgar scores (OR=1.19: 95%CI, 0.55-11.34: P=0.038).

Obstetric determinants of depressed APGAR score in neonates born at JRRH.

The results of this study showed that women who did not follow up on their ANC attendance were eight times more likely to have babies with poor Apgar scores than those who did (OR=8.83: 95%CI, 2.07-37.11: P0.001). The aforementioned results are consistent with those of a study by Carlo et al., [5] that showed a link between poor prenatal attendance and an increased occurrence of low Apgar scores.

Induced laborers were twice as likely to deliver infants with poor Apgar scores as spontaneous laborers (OR=2.39; 95% CI, 1.74-15.84; P=0.041). The aforementioned results are related to those of a study conducted in South-West Ethiopia by Gudayu [15], which found that mothers who had induction of labor were more likely to have infants with low Apgar scores than those who underwent spontaneous labor.

Compared to women whose labor lasted between 3 and 24 hours, those whose labor lasted more than 24 hours (prolonged) were 7 times more likely to have infants with low Apgar scores (OR=7.43: 95%CI, 5.59-16.26: P=0.001). Low Apgar scores may be the outcome of fetal distress brought on by a protracted labor. Compared to women who delivered via instrumental delivery, SVD mothers were five times more likely to have infants with low Apgar scores (OR=5.72: 95%CI, 0.83-9.28: P=0.001). The above findings were in with the findings of the study by Maheshwari et al., [18] which revealed that mothers who had SVD mode of delivery were more likely to produce babies with low Apgar score compared to those who produced with other methods.

Preterm (37 weeks) and postterm (>42 weeks) pregnancies were 3 times more likely than term (37–42 weeks) pregnancies to result in infants with low Apgar scores (OR=3.79: 95%CI, 0.57–13.01: P=0.002). The research by Yeshaneh et al., [19], which found that preterm birth problems were among the leading causes of infant death in China, supports the findings of the study mentioned above. They found that low Apgar scores were most frequently related with preterm birth difficulties.

Mothers who had history of Neonatal death were 6 times more likely to produce babies with low Apgar score compared to those who had history of neonatal death (OR=**6.97**: 95%CI, **2.73–15.28**: P=<0.001). The above results are in line with the study findings by Hegyi, et al., [19] who revealed that women who had history of Neonatal death were more likely to produce babies with low Apgar score compared to those who had history of neonatal death.

Those who had non-vertex of fetal presentation were 2 times more likely to produce babies with low Apgar score compared to those who had vertex of fetal presentation (OR=**2.93**: 95%CI, **21.21–4.05**: P=0.003). The above findings are supported by the study finding by Mu et al., [19] which revealed that mothers who present non-vertex of fetal are more likely to produce babies with low Apgar score compared to those who had vertex of fetal presentation.

CONCLUSION

The study highlighted that the prevalence of low Apgar score is at 19.3%

Mainly obstetrics factors (ANC follow up, duration of labor, mode of delivery, gestational Age at Birth, birth weight, history of Neonatal death, gravidity, fetal presentation) were significantly associated with low 5th minute Apgar score among singleton new babies at Jinja regional referral Hospital.

Recommendations

As per the results of this study, the researcher recommends the following;

- It is advised that more research be done in order to improve the predictive value of the 10-minute Apgar score for neurological or respiratory impairments.
- The findings, however, serve as a starting point for further research by highlighting statistical variations in outcomes. These studies would necessitate an evaluation of the precise labor room procedures for newborns with 1 min Apgar scores below 4.
- The MOH must educate the public about low Apgar score care and outcomes.
- When a mother's labor period is approaching, the healthcare professionals must continually remind them to visit their health facilities on time.
- A long-term investigation into the causes and effects of low apgar scores in preterm newborns is required.

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