

St Paul's hospital Millennium Medical College

Department of Obstetrics and Gynecology



**St. Paul's Hospital
Millennium Medical College**
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FACTORS ASSOCIATED WITH LOW 5 MINUTE APGAR SCORE AT SAINT PAUL HOSPITAL MILLENIUM MEDICAL COLLEGE

Thomas Donguande, MD, Obstetrics and Gynecology Resident,
Email: thomasdouande2016@gmail.com

Thomas Mekuria, MD, Assistant professor in Obstetrics and Gynecology,
Email: tomlithe@gmail.com
Sisay Tina, MPH, Assistant Professor, Email: sisaytina@yahoo.com

A research dissertation submitted to the department of obstetrics and gynecology in partial fulfillment of the requirements for the award of the Specialist Certificate in obstetrics and gynecology.

DECLARATION

I, THOMAS DONGUANDE PALET do hereby declare that the work submitted in this dissertation has been done by me and has not been submitted for award of a degree in any hospital.

Name:_____

Signed:_____ Date:_____

Supervisor Dr Thomas Mekuria assistant professor: obstetrics and gynecology

Signed:_____ Date_____

DEDICATION

This book is dedicated to my parents, my family and friends, their understanding and support for the time and effort required to complete this project was essential.

INTRODUCTION

BACKGROUND

Introduction

World Health Organization defined birth asphyxia as “the failure to initiate and sustain breathing at birth. The exact definition of birth asphyxia was given by the ACOG, AAP includes existence of 3 factors: Metabolic or mixed acidemia ($\text{pH} < 7$) which is determined by umbilical cord arterial blood samples; Apgar score of this definition is designed for use in hospital-based settings which requires evaluation.

Worldwide Doctors uses Apgar score for describing the wellbeing of new-born at birth because it is a clinical indicator commonly used to describe the new-born's physical condition at birth. In many cases, the timing of asphyxia cannot be established with certainty that is why the severity of asphyxia is widely assessed by the Apgar score, at 1 and 5 min after birth. Commonly the first 1 min after birth which is the “golden minute” the baby should be breathing well. The ACOG stated that a low Apgar score beyond 5 min is a suggestive criterion for an estimate of the severity of asphyxia.

The birth process takes only few hours but it is the most hazardous period of life and is associated with a number of complication and mortality. Failure to breathe spontaneously causes progressive asphyxia later resulting in metabolic acidosis and multi-organ failure. Perinatal asphyxia is associated with very high incidence of neurological damage (25%) including cerebral palsy, and mental retardation and epilepsy. Moreover Cognitive and behavioral difficulties which lead to memory loss and attention deficit hyperactivity disorder (ADHD), autism and schizophrenia have been reported.

The prevalence of birth asphyxia is increasing; in 1990s the incidence of asphyxia was reported as 5.4/1000 live births while in the 2006 the ACOG reported 25–73/1000 live births in developed countries an incidence of 1–6/1,000 live births, and birth asphyxia (23%) represents the third most common cause of neonatal death and 5–10/1000 live births in developing countries with 24–29% of neonatal deaths up to 99% of these deaths occurred in LMIC.

Despite significant advances in the west, neonatal death have remained stagnant because of high newborn mortality in Africa. Africa accounts for 11% of the world's population but disproportionally accounts for more than 25% of the world's new-born deaths. One in Four child mortality in Africa is aged 28 days or less. In Ethiopia NMR accounts 29/1000 live birth. A large proportion of this death occurs during the first 48 h after delivery.

Various maternal, obstetrical, and fetal factors cause hypoxia in the fetus and asphyxia in the new-born. The cause can be grossly classified as ante partum (50%), intra-partum (40%) and postpartum (10%) In occurrence. The factors contributing to this include inadequate and inappropriate resuscitative measures, and lack of equipment; and transport services to facilitate referral of babies from peripheral hospitals to neonatal intensive care. In most African countries including Ethiopia the prevalence of birth asphyxia is not well studied. This study aims to asses the prevalence of birth asphyxia in the highest case volume maternal and child health in Ethiopia.

Problem statement

Birth asphyxia accounts for 23% of neonatal deaths globally, and 8% of all deaths in children under five years of age (WHO1996). In Ethiopia birth asphyxia is accounts for 23% of 29/1000 live birth neonates mortality.

A review of pediatrics ward records at St' Paul's Hospital from July to December (period of 6 months 2018) shows that asphyxia is among top three major cause of neonatal death and the factors affecting low A/S were not well documented in saint Paul's Hospital

Justification of the Study

Although low Apgar score is associated with poor neonatal outcome and it is also an indicator of poor obstetric care, there was no study on low Apgar score done in St' Paul Hospital to determine factors associated with it, therefore we believe this research will serve as a baseline to fill that knowledge gap.

Research Questions

1. What are the risk factors associated with low A/S in St' Paul Hospital?
2. What are the obstetric factors associated with low A/S in St' Paul Hospital?
3. What are the demographics of the mothers whose babies have low A/S?

Objectives of the Study

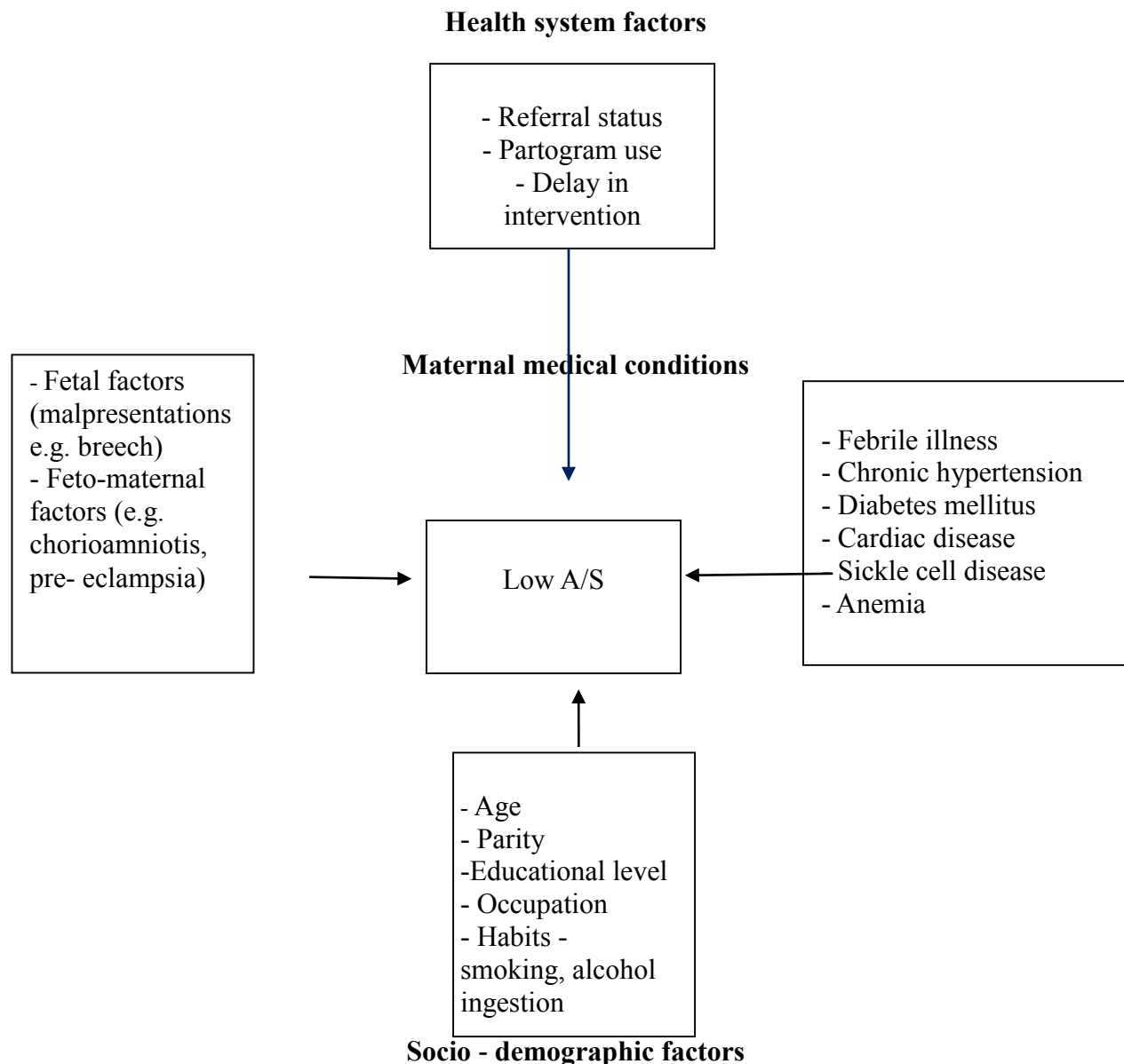
General objective

To identify risk factors associated with low Apgar score at St' Paul Hospital Millennium medical college

Specific objectives

- (1) To determine obstetric risk factors associated with low Apgar score
- (2) To describe the demographic characteristics of mothers who delivered babies with low A/S.
- (3) To identify maternal medical conditions and health system factors associated with low Apgar score at Saint Paul Hospital Millennium medical college

Conceptual frame work



MATERIALS AND METHODOLOGY

Study Area:

This study was conducted at SPHMMC maternity unit.

Study Design

- Unmatched case control study (1:1 ratio) where by mothers who gave birth to babies with low A/S were cases and those who gave birth to babies with normal A/S were controls.

Study Population

All mothers delivered at Saint Paul Hospital during the study period.

Study period

The study was conducted from February 15, 2020 to March 31, 2020

Inclusion Criteria

Mothers delivered at Saint Paul Hospital during the study period from February 15, 2020 to March 31, 2020 and consented to participate in the study, those who gave birth to babies with A/S of 6 and below were recruited as a case while those who gave birth to babies with A/S of 7-10 were recruited as controls.

Exclusion criteria

1. Mother who were unconscious at the time of delivery or at the time of filling questionnaire
2. Babies whose mothers died soon after delivery.
3. Critical mother during delivery.
4. Stillbirth

Sample size estimation

The sample size will be estimated based on the Fleiss formula (1981).

$$n_1 = \frac{\left[Z_{\alpha/2} \sqrt{(r+1)pq} + Z_{1-\beta} \sqrt{p_1q_1 + p_2q_2} \right]^2}{r(p_1 - p_2)^2}$$
$$n_2 = r n_1$$

Where

n_1 = Number of cases (with low A/S score)

n_2 = Number of controls (with normal A/S score)

$Z_{\alpha/2}$ = Standard normal deviate for two-tailed test based on alpha level (95%)

Z_{β} = Standard normal deviate for one-tailed test based on beta level (80%)

r = ratio of cases to controls (1:1)

p_1 = proportion of cases with exposure (55%) and $q_1 = 1-p_1$

p_2 = proportion of controls with exposure (38%) and $q_2 = 1-p_2$

$$\bar{p} = \frac{p_1 + rp_2}{r+1} \text{ And } \bar{q} = 1 - \bar{p}$$

The proportion of the exposure among mothers of babies with low Apgar scores as a risk factor will be taken as 0.55 from results of a similar study by C. Ondoa-Onama in 2003.

Substituting it in the formula, $n_1 = 140$ (cases), $n_2 = 140$ (controls).

The total sample size is $140 + 140 = 280$ (mothers).

Informed consent

The nature of the study and benefits to the participants was explained in simple and precise language which was Amharic. But the study was not carried any risk to the participants, Written consent was obtained by signature or thumb print, all infants with low Apgar scores and any delivery complications managed accordingly as per protocol.

Sampling procedure

After delivery. Neonates were evaluated and the Apgar at 5th minute were assessed by trained advanced life support neonatal nurses. The principal investigator was responsible for assigning the case and controls based on the A/S, for every mother who delivered a baby with low A/S a consecutive sampling of the next mother with normal A/S baby were recruited.

Data Collection

All mothers delivered at Saint Paul Hospital during the study period ,and consented to participate in the study they were randomly recruited immediately after delivery, the recruitment was consecutive the control for each case was the mother who delivered immediately after the case.

Data collection tool

The principle investigator or trained research assistant administered pretested and standardized questionnaires to all participants who fulfilled the inclusion criteria. The questionnaire was focus on the maternal socio demographic, obstetric history, and physical examination of the babies (A/S birth weight and gross malformations), detail of the delivery were obtained from clinical/delivery notes and principal investigator reviewed the files to confirm the clinical diagnosis. The research assistants were advanced life support neonatal nurses.

Study Variables

The outcome variable was low Apgar score.

Independent factors were

- A) Socio demographic characteristics: - low socioeconomic status others age, tribe, level of education, marital status, occupation, smoking and alcohol ingestion.
- B) Obstetric factors which includes
 - i. Fetal factors; Meconium aspiration, neonatal birth weight,
 - ii. Maternal factors e.g. parity, place of booking for ANC and mode of delivery.
 - iii. Feto maternal factors, Prolong labour ,Preterm labour ,Preëclampsia, Post term pregnancy,
 - .
- C) Health system factors:
 - Delay in intervention, Referral status, partogram use

Quality control

Apgar scoring was carried out by advanced life support neonatal nurses on duty who may or may not be part of the research. Babies' were assessing at five minutes using the Apgar scoring method which consisted of the five physical signs of heart rate, respiratory effort, reflex irritability, muscle tone and color. Babies who need resuscitation were resuscitated.

Data Entry and analysis

Filled questionnaires were checked for completeness before entering them in a locked file cabinet. The collected data were entered into a password protected computer using Microsoft excel, then data were import into STATA 13 software for analysis, and summarized in narrative, bar graphs, pie charts and frequency forms.

Univariate analysis

Were carried out and here data were described. Categorical variables: Age of the mother, sex of the newborn, religion, mode of delivery etc. were summarized using frequency, proportions and bar charts. Continuous variables: Parity etc. were summarized using means, standard deviations and median.

Bivariate analysis; Cross tabulation was done to find out factors associated with low Apgar score P values of less than 0.05 were taken as statistically significant association.

Multivariate analysis; It was done for the factors which were found to be statistically significant at bivariate level to exclude confounding and interaction.

Ethical considerations

The study was presented and reviewed by the Department of Obstetrics and Gynecology- St. Paul's Hospital the Faculty of Medicine Research Ethical Committee- and the Saint Paul Hospital Institution Review Board.

Informed consent was sought from all study participants in a language they understood and was documented. Study participants were identified by study codes and not their names. Data collected was kept confidential and only disclosed to authorized personnel.

The filled questionnaires were kept in a locked file cabinet and its key was kept by the principal investigator. Data were entered in a password protected computer by the principal investigator.

Enrollment was totally free and voluntary and participant could withdraw at any time without consequence.

Study Limitations

1. A/S was a clinical examination, so scoring differs from one clinician to another.
2. Gestational age was estimated based on self- reported LNMP, which was presumably subject to some degree of measurement error or bias.

Dissemination of Results

Study findings will be disseminated to;

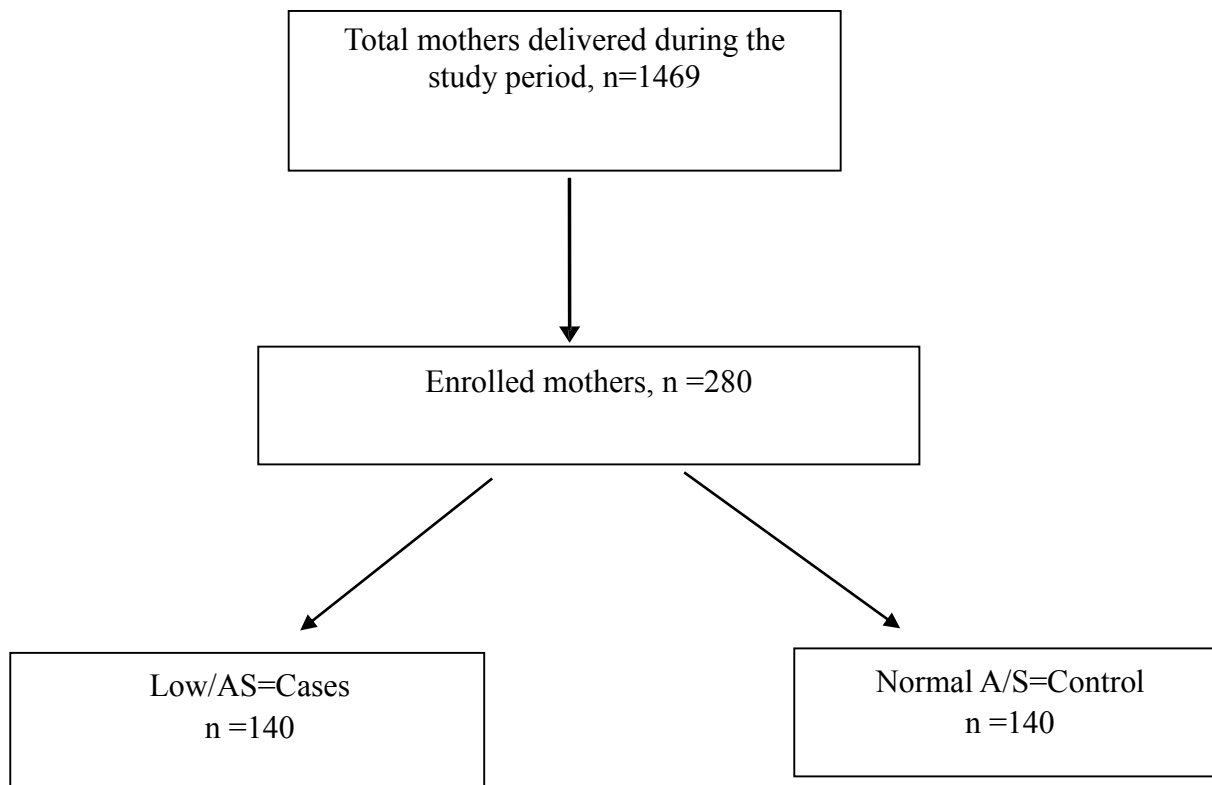
1. The Department of Obstetrics and Gynecology St. Paul's Hospital
2. Library of St. Paul's Hospital
3. St. Paul's Hospital annual researches dissemination conference
4. Appropriate journals for publication

RESULTS (Data Analysis)

Study Profile and Design

This study was conducted at SPHMMC a total of 1469 deliveries occurred during the study period, for every mother who delivered a baby with low A/S a consecutive sampling of the next mother with normal A/S baby were recruited. After data cleaning the final sample size of 280 was considered that comprised of 140 mothers who gave birth to babies with low A/S (Cases) and 140 mothers who gave birth to babies with normal A/S (Controls).

Fig. 1: FLOWDIAGRAMON RECRUITMENT



Univariate Analysis

Categorical Variables

The following table presents summary of different demographic characteristics of study participants by cases and controls.

Table 4.1 Summary of Mother Demographic Characteristics for all study participants

Mother demographic characteristics		Case		Control	
		N	Percentage	N	Percentage
Education	No education	23	51.1	22	48.9
	Primary	53	49.5	54	50.5
	Secondary	40	54.8	33	45.2
	Tertiary	24	43.6	31	56.4
Marital Status	Divorce	2	66.7	1	33.3
	Married	132	49.1	137	50.9
	Single	6	75	2	25
Occupation	None	90	54.9	74	45.1
	Peasant	14	50	14	50
	Professional	20	50	20	50
	Business	11	44	14	56
Religion	Muslim	41	52.6	37	47.44
	Orthodox	69	48.3	74	51.7
	Other	1	100	0	0
	Protestant	29	50	29	50
Family Income/month	0-600	30	60	20	40
	601-1651	52	63	30	37
	1651-3200	38	61	24	39
	3201-5251	18	55	15	45
	5251-7800	10	63	6	38
	7801-10900	17	63	10	37
	>10900	27	54	23	46
History of known medical disease	No	109	48.9	114	51.1
	Hypertension	22	66.7	11	33.3
	Diabetes Mellitus	1	12.5	7	87.5
	Sickle cell disease	0	0	1	100
	HIV	3	75	1	25
	Urinary tract infection	2	40	3	60
	Others	2	66.7	1	33.3

Continues Variables

Table 4.2 presents summary of mother demographic characteristics with continuous variables. The result reveals that, the median age and gestational weeks of mothers in the case and control group are similar which is 26 and 40, respectively (Table 4.3).

Table 4.2: Summary of continuous variables by cases and controls

Variable	Cases, N=140 (n%)	Control, N=140 (n%)
Mother's Age, median (IQR)	26(23-29)	26(23-30)
Mother's Weight, median (IQR)	65(58-72)	66(60-72)
Mother's Height, median (IQR)	1.6(1.56-1.67)	1.6(1.58-1.65)
Husband's age, median (IQR)	32(27-37)	32(28-38)
Gravity, median(IQR)	1.5(1-2)	2(1-3)
Parity, median(IQR)	1 (1-2)	1(1-2)
Gestational week, median(IQR)	40(38-41)	40(39-41)
Number of ANC visits, median(IQR)	6(4-7)	5(4-7)
Apgar score, median(IQR)	6(5-6)	8(8-8)
New born weight, median(IQR)	2.8(2.4-3.2)	3(2.7-3.32)

Bivariate Analysis

Table 4.3 Summary of Bivariate Analysis results by base line social demographic characteristics of study population

*p-value<0.05

<u>Variables</u>	<u>Case, N=140(n%)</u>	<u>Control=140(n %)</u>	<u>P Value</u>
Education			
None	23(51.11)	22(48.89)	0.6661
Primary	53(49.53)	54(50.47)	
Secondary	40(54.79)	33(45.21)	
Tertiary	24(43.64)	31(56.36)	
History of Disease			0.266
No	109(48.88)	114(51.12)	
Hypertension	22(66.67)	11(33.33)	
Diabetes Mellitus	1(12.5)	7(87.50)	
Sickle cell disease	0(0.00)	1(100)	
HIV	3(75)	1(25)	
Urinary tract infection	2(40)	3(60)	
Others	2(66.67)	1(33.33)	
Family income			0.006*
NA	4(66.67)	2(33.33)	
≤600	3(75.00)	1(25.00)	
601-1651	46(56.1)	36(43.90)	
1651-3200	31(62)	19(38)	
3201-5251	9(27.27)	27(72.23)	
5251-7800	22(35.48)	40(64.52)	
7801-10900	8(50)	8(50)	
>10900	17(62.96)	10(37.04)	
Marital status			
Married	132(49.07)	137(49.93)	0.297
Single	6(75)	2(25)	
Divorced	2(66.67)	1(33.33)	
Occupation			0.737
None	90(54.88)	74(45.12)	
Business	11(44)	14(56)	
Peasant	14(50)	14(50)	
Professionals	20(50)	20(50)	
Religion			0.710
Muslim	41(52.56)	37(47.44)	
Orthodox	69(48.25)	74(51.75)	
Protestant	29(50)	29(50)	
Others	1(100)	0(0.00)	

Table 4.4 Summary of Bivariate Analysis results by Pregnancy and labor characteristics of the study population

Variable	Cases=140(n%)	Control=140(n%)	Pvalue
Place of ANC service			
Government hospital	4(66.67)	2(33.33)	0.039*
Health Center	115(51.34)	109(48.66)	
Private(Hospital/Clinic)	6(85.71)	1(14.29)	
Referral(teaching Hospital)	14(33.33)	28(66.67)	
NA(missing)	1(100)	0(0.00)	
Gestational age			
<39	37(53.62)	32(46.38)	0.404
39-40	50(45.05)	61(54.95)	
>=40	53(53)	47(47)	
Mode of Delivery			
Breech	5(71.43)	2(28.57)	0.000*
CS	82(63.08)	48(36.92)	
Forceps delivery	7(70)	3(30)	
SVD	36(31.58)	78(68.42)	
Vacuum extraction	9(50)	9(50)	
NA	1(100)	0(0.00)	
Number of times a women pregnant			
	68(56.67)	52(43.33)	0.332
Gravid 2	43(46.74)	49(53.26)	
Gravida 3	12(44.44)	15(55.56)	
Gravida4	10(38.46)	16(61.54)	
Gravida5	2(33.33)	4(66.67)	
Gravida6	1(50)	1(50)	
Gravida7	0(0.00)	2(100)	
Attend antenatal care			
No	5(83.33)	1(16.67)	0.091
Yes	133(48.9)	139(51.1)	
NA	2(100)	0(0.00)	
Onset of Labour			
Induced	28(43.08)	37(56.92)	0.094
Spontaneous	111(53.11)	026(18.6)	
NA	1(16.67)	5(83.33)	
Partogram usage during labour			
Not used	39(44.32)	49(55.68)	0.158
Partially used	73(56.15)	57(43.85)	
Used	9(36)	16(64)	
Not applicable	16(53.33)	14(46.67)	
Sex of Baby			
Female	65(50.78)	63(49.22)	0.810
Male	75(49.34)	77(50.66)	
Complication during labour			
Pre-eclampsia	28(62.22)	17(37.78)	0.028*
Eclampsia	0(0.00)	1(100)	
Obstructed labour	2(50)	2(50)	
Cord Prolapse	1(50)	1(50)	
Premature labour (<37 weeks)	11(91.67)	1(8.33)	
Post term pregnancy (> 42 weeks)	12(60)	8(40)	
Antepartum hemorrhage	3(50)	3(50)	
Prolonged labour	18(66.67)	9(33.33)	
Meconium	23(53.49)	20(46.51)	
Chorioamnitis	0(0.00)	1(0.00)	
Prolonged prom	6(27.27)	16(72.73)	
Malpresentation	1(33.33)	2(66.67)	
GDM	0(0.00)	2(0.00)	
RH –VE	0(0.00)	1(100)	
No	4(30.77)	9(69.23)	

*p-value<0.05

4.3 Multivariate Logistic Regression Analysis

Table 4.5 Multivariate Logistic Regression Analysis

Factor	OR	95%CI	P-Value
Parity	1.287	(1.048,1.601)	0.018
Newborn weight	1.932	(1.310, 2.928	0.001
Mode of delivery (ref: Breech)			
CS	1.463	(0.302,10.493)	0.656
Forceps Delivery	1.071	(0.126,10.557)	0.873
SVD	5.416	(1.11,39.092)	0.046
Vacuum extraction	2.50	(0.414,20.834)	0.34
Delay in intervention (ref:No)			
Yes	0.372	(0.221,0.617)	0.001

DISCUSSION

In our study, the only sociodemographic variable associated with low Apgar score was low socio-economic status. This is theoretically plausible association as low socioeconomic status is associated with a myriad of obstetric complications (E.g.- IUGR, intraamniotic infection) that result in low Apgar score, in comparison with the study was done in Swedish that found maternal socioeconomic position and a persistent low Apgar Score. Although other studies have identified significant association between low APGAR score and age, this study didn't find any, in disagreement with a case control study done in Mulago National Referral hospital that found maternal age to have significant associated with low Apgar Score. The similar finding found in a prospective study done in Qatar that found increase maternal age to have significant associated with low Apgar score. This is because increase maternal age interfere with comorbidity such as APH, preterm labour, CHTN, and increase CS rate these can predispose to low neonate Apgar score. A retrospective cohort study done in USA between 1995 and 2000, in disagreement with our current study, also found low Apgar score and neonatal mortality, were higher in teenage pregnancy. Teenagers pregnancy usually are at higher risk of prolong labour, anemia, obstructed labour, and preeclampsia which in turn lead to low neonate Apgar score.

Marital status also had significant associations with low APGAR score but were not mirrored in our study. Opposed a prospective case control study done at tertiary hospital in Yaoundé-Cameroon that found marital status to have significant association with low Apgar Score, this disagreement could be explained by culture difference.

New born weight, Meconium aspiration found to be associated with low A/S as fetal factors, disagree with the study done in Mulago National Referral Hospital which found birth injuries and cord accidents (prolapse, entanglement, cord presentation, tight cord around the neck) to be significantly associated with low A/S ($p=0.002$ and 0.002 respectively) (C.Ondoa et al., 2003). Feto maternal factors which includes prolong labour, Post term, Preterm, and preeclampsia were found significantly associated with low Apgar score. Prolong labour in this study found to be associated with low 5 min A/S. Similar finding in agreement with our finding was report in Cameroon where prolong labour found to be significantly associated with low Apgar score. Prolong labour can result in infection, higher risk for neonatal aspiration, and intrapartum APH mainly APH (etc.) these are risk for low Apgar score. Preeclampsia in current

study found to be statistically associated with low Apgar score. The same finding reported in Pakistan (2004) by Muhammad A, where preeclampsia found to have significantly associated with low Apgar score. Preeclampsia lead to a decrease in placental blood flow. Loss of placental integrity, and damage of endothelial cells, all these phenomena can lead to an inadequate fetal placental blood flow with fetal hypoxia causing growth retardation and birth asphyxia. Premature labour found to have significantly associated with low Apgar score in this study. This finding in agreement with the study reported in Sweden where preterm labour was associated with low Apgar score. Premature babies are at higher risk of being injured oxygen deprivation and this is due to immature respiratory system. Post term pregnancy found to have association with low Apgar score in this study, Normally it is associated with perinatal morbidity as meconium aspiration, fetal asphyxia, oligohydramnios (etc.), Maternal medical conditions (e.g. chronic hypertension, anemia, diabetic Mellitus, sickle. disease, etc.) were not found to have significant association with low Apgar score in contrary to a study done in Mulago National Referral Hospital (which found medical disease to be associate with low Apgar score these include diabetes mellitus, malaria and anemia, this finding was expected as we didn't have enough cases with medical conditions to evaluate outcome. The place of ANC follow up, Parity, mode of delivery and new born birth weight had a statistically significant association with low Apgar score in our study. New born birth weight have significant associated with low Apgar Score in our study, in agreement with the study done at teaching hospital in Ghana that found low birth weight significantly associated with low Apgar Score. Low birth weight can result from prematurity or IUGR both of these conditions predispose to new born low Apgar score due to immature organs development or placenta insufficiencies. Mode of delivery had significant associated with low Apgar Score in our study in comparison with the study done in Mulago that found abnormal delivery (delivery other than by spontaneous vertex delivery) associated with low Apgar Score. This is because, instrumental delivery and caesarean section are done for High risk pregnancy and obstetric complication during labour. Primaturity, congenital anomaly and cord accident, are common with breech delivery and this can result in low Apgar score. Prim parity associated with low Apgar score in our study in agreement with the study done in Mulago that found Prim parity associated with low Apgar score, usually it is associated with contracted pelvis, cephalopelvic disproportion, these conditions may prolong or obstructed labor, eventually can lead to low Apgar score. Multiparity associated with congenital malformation which in turn lead to neonatal low

Apgar score this finding found in study done at Muhimbili National hospital Dar es Salaam Tanzania, but in our study there was no any finding. Place of ANC follow up found to have significant associated with low Apgar score in our study in agreement with the study done in SALUSIANO EM in Sao Paulo that found place of ANC booking to have significant associated with low Apgar score. As most of the ANC follow up are at health centers, risk factors that can predispose to low Apgar score may not be detected timely, as most of the health professionals are low to middle level health professionals. Other factor which had significant association with low Apgar score in our studies delay in intervention of (P, value, 0.001) (, OR, 0,372), (95%CI, 0, 221, 0,617) as a health system factors

CONCLUSION:

Factors associated with low 5 Min Apgar score in this study were mainly obstetric factors, maternal medical condition not found to have association with low Apgar score in this study. The only socio demographic factor that had a significant association with low 5min Apgar score in this study was low socioeconomic factors. Delay in intervention found to have significant association. With low Apgar score as a health system factor.

RECOMMENDATIONS:

From this study, the following recommendations are made to be follow

Recommendations to Saint Paul's Hospital Millennium Medical College

- Health care providers should know that delayed intervention strongly associated with low Apgar score of the newborns and early intervention is very important.
- Early detection of obstetric complications and anticipation of low Apgar score should be done and prepare for it to minimize the neonatal complications
- This study was done in a single center with small sample size showing family income, place of ANC service, mode of delivery, complications during labor and delayed interventions were associated with low APGAR score and we recommend a multicenter study to get a better knowledge.
- Early detection and management of patients with preeclampsia
- To conduct specialized support supervision to lower health unit

LIST OF ABBREVIATIONS AND ACRONYMS

AAP	American Academy of Pediatrics
ACOG	American College of Obstetricians and Gynecologists
ARM	Artificial Rupture of Membranes
A/S	Apgar score
BMI	Body Mass Index
C/S	Caesarian Section
CP	Cerebral Palsy
H.I.E	Hypoxic Ischemic Encephalopathy
ICU	Intensive Care Unit
MAS	Meconium Aspiration Syndrome
SPHMMC	St. Paul's Hospital Millennium Medical College
NRP	Neonatal Resuscitation Program
SCD	Sickle Cell Disease
SGA	Smaller for Gestational Age
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Low Apgar score: Apgar score of <7 at 5 minutes after delivery.

Asphyxia: Failure to initiate and sustain default breathing at birth (WHO; 1996). Infant depression with Apgar score < 3 at 5 minutes plus umbilical artery pH values < 7.00. (Moster D et al., 2001)

Case: Mother who delivers a baby with low A/S.

Control: Mother who delivers a baby with normal A/S (7 and above).

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Appendix

In order to assess the association between Apgar score statuses (low, normal) with different categorical factor, a chi-squared test statistics were carried out. Summary of results presented below.

Significant factors	Non-significant factors
Mode of delivery, delay during delivery, Complications during labour, Family income, Place of antenatal care, reason for decision delay to delivery	Tribe, religion, marital status, education, occupation, ANC, Previous disease history, Onset of Labor, Partogram usage during labour, complications during labour, sex of a baby, personnel who conducted the delivery, gestational age,

Note: For continuous factors, to see the impact of each covariate on Apgar score status (low, normal), a logistic regression model fitted and the results reveals that:

Significant factors	Non-significant factors
Weight of new born, parity	Mother weight, mother age, parity, BMI

Apgar score by mother demographic characteristics

Apgar Score	Education*				Occupation*			
	Illiterate N(%)	Primary N(%)	Secondary N(%)	Tertiary N(%)	None N(%)	Peasant N(%)	Professional N(%)	Business N(%)
Low	23(51.11)	53(49.53)	40(54.79)	24(43.64)	90(54.88)	14(50)	20(50)	11(44)
Normal	22(48.89)	54(50.47)	33(45.21)	31(56.36)	74(45.12)	14(50)	20(50)	14(56)

*At 5% level of significant, there is no statistical association with Apgar score status of a child.

Apgar score by obstetrics factors

Apgar Score	Mode of delivery ⁺				
	Breech N(%)	CS N(%)	Forceps delivery N(%)	SVD N(%)	Vacuum extraction (%)
Low	5(71.43)	82(63.03)	7(70.0)	34(31.58)	9(50.0)
Normal	2(28.57)	48(36.92)	3(30.30)	78(68.42)	9(50.0)

⁺At 5% level of significant, there is statistically significant association (P-value <0.05) between Apgar score and mode of delivery.

Apgar Score	Delay during delivery ⁺		Attend antenatal care ⁺		Previous disease history [*]	
	No N(%)	Yes N(%)	No N(%)	Yes N(%)	No N(%)	Yes N(%)
Low	34(34)	101(58.05)	5(83.33)	133(48.90)	109(48.88)	31(54.39)
Normal	66(66)	73(41.95)	1(16.67)	139(51.1)	114(51.12)	26(45.61)

⁺At 5% level of significant, there is statistically significant association (P-value <0.05) between Apgar score and mode of delivery.

*At 5% level of significant, there is no statistical association with Apgar score status of a child.

Apgar Score	labour complication ⁺							No complication N(%)
	Pre-eclampsia N(%)	Premature labour (<37) N(%)	Post-term labour N(%)	Antepartum hemorrhage N(%)	Prolonged labor N(%)	Meconium N(%)	Prolonged prom N(%)	
Low	28(62.2)	20(83.33)	12(54.6)	7(63.64)	22(70.97)	44(64.71)	25(54.35)	4(30.77)
Normal	17(37.78)	4(16.67)	8(45.4)	4(36.36)	9(29.03)	24(35.29)	21(45.65)	9(69.23)

⁺At 5% level of significant, there is statistically significant association (P-value <0.05) between Apgar score and cause of labour complication.

Apgar Score	ANC booking Place ⁺				Referral status*	
	Gov. Hospital N(%)	Health center N(%)	Private N(%)	Referral N(%)	Not referred N(%)	Referred N(%)
Low	4(66.67)	115(51.34)	6(85.71)	14(33.33)	21(39.62)	117(53.42)
Normal	2(33.33)	109(48.66)	1(14.29)	28(66.67)	32(60.38)	102(46.58)

⁺At 5% level of significant, there is statistically significant association (P-value <0.05) between Apgar score and ANC booking place.

*At 5% level of significant, there is no statistical association with Apgar score status of a child.