Journal of Public Health in Africa
Received 26 Sep 2021 | Accepted 16 May 2022 | Published Online 25 Oct 2022

DOI: https://doi.org/10.4081/jphia.2022.2045
JPHIA 13 (3), 2045 (2022)

ISSN (O) 2038-9930 IF:0.0

ORIGINAL ARTICLE

# Maternal factors associated with immediate low Apgar score in newborn babies at an intermediate hospital in Northern Namibia

Justina Lungameni[1] | Emma Maano Nghitanwa[1*] | Laura Uusiku[1] | Abel Karera[2]

[1]School of Nursing and Public Health, University of Namibia, Windhoek, Namibia

[2]School of Allied Health, University of Namibia, Windhoek, Namibia

Abstract

**Background**. All newborn infants are required to undergo the Apgar score/assessment immediately after birth and again at five minutes. This vital examination is performed to determine how well the infant is adjusting to the birthing process and the outside environment. Some newborns may have a normal Apgar score, while others may have a low score. The purpose of this study was to identify factors associated with low Apgar scores among newborns at an intermediate hospital in Northern Namibia.

**Objective.** To identify maternal factors associated with an immediate low Apgar score in newborns at an intermediate hospital in Northern Namibia and to examine the association between maternal factors and an immediate low Apgar score. Quantitative, retrospective, descriptive research methodology was employed. A document review checklist was utilized to collect data at Onandjokwe Intermediate Hospital between August 2020 and October 2020.

**Results.** Gravidity (p0.021), parity (p0.029), haemoglobin after the first ante-natal care visit (p0.011), ante-partum haemorrhage (APH) (p0.004), membrane status (p0.000), duration of labour (p0.000), type of delivery (p0.000), and caesarean section type and indication (p0.000) were found to be associated with an immediate low Apgar score.

**Conclusions**: The study identified maternal factors that influence an infant's initial low Apgar score. Strengthen maternal health education regarding gravidity and parity, diet, and recognizing danger signs during pregnancy. In addition, strict monitoring of patients with a partograph, cardiotocography, accurate record keeping, and prompt referral of patients with risk factors is strongly advised.

Keywords: Maternal factors, immediate low Apgar score, newborn, babies.

## INTRODUCTION

All babies born must pass an important test in their life one minute after delivery, and again at five minutes, and that examination is called Apgar score. This test was originally developed in 1953 by Virginia Apgar, an anesthesiologist in America.[1] Apgar score is defined as a test given to a baby immediately after birth, checking how well the baby is tolerating the birth process, and at five minutes, checking how well the baby is tolerating the environment outside the uterus.[2] Over two-thirds of babies with low Apgar score may result in perinatal mortality.[3] A study conducted in Namibia in 2018 shows that 24% of newborn babies had an Apgar score of between 0-2 out of ten at one minute.[4] Statistics of neonatal deaths reported in Onandjokwe Hospital due to low Apgar in 2018 were 16 (41%), and increased to 23 (58.9%) in 2019. Despite those figures, the maternal factors that lead to low Apgar score remain unknown.

## MATERIALS AND METHODS

### Ethical considerations

The study was approved by the University of Namibia, Research Ethical Committee (SON N2020). Approval was also obtained from the Ministry of Health and Social Service Research Ethics Committee and from Onandjokwe Hospital management. Confidentiality was ensured by not using the patients' names from the maternity records but using pseudonymous numbers instead.

### Study design

This study used a case-control quantitative, retrospective descriptive, analytical research design.

### Study setting

The data was collected from 388 maternal record files, consisting of 194 files with low Apgar score, and 194 with normal Apgar score at the Onandjokwe maternity ward, for the period from 1 January 2019 to 31 December 2019. The study population was all maternal files for deliveries conducted at Onandjokwe Intermediate Hospital, from 1 January 2019 to 31 December 2019. A simple random sampling method was used. The sample size was determined by using Yamane's Formula ($n = \_N\_\_\_\_1+N(a)_2$). The researchers used 95% confidence level and 5% or 0.05 as the margin of error. The inclusion criteria for this study are all the maternity records of mothers, regardless of delivery type. All maternal files with home deliveries and those that were referred from other facilities after deliveries were excluded.

### Data collection and analysis

Data were collected from June 2020 to August 2020, using a document review checklist developed by the researchers in English. The validity and reliability of the data collection tool were ensured. To ensure validity, the data collection tool was given to an obstetric doctor who has been an expert in the field for more than five years to assess the clarity, relevance and simplicity of the content of the instrument. The instrument was piloted on 10% of maternal records as a pilot study before the actual study to ensure that all important variables of concern were covered for reliability. Data were analysed using the Statistical Package for the Social Sciences (SPSS) v. 26. The Chi-square test was used to determine the maternal factors associated with immediate low Apgar score, with a significance level of 0.05.

## RESULTS

### Sociodemographic characteristics

The mean age was 29 years and the maximum was 36 years**.** The majority of the participants, 227 (58.6%), were aged between 21 to 34 years, and fewer participants 77 (19.8%) were less than 20 years old. Furthermore, participants above 35 years were 84 (21.6%). The majority of the participants were multigravida, 191 (49%), followed by primigravida, 124 (32%), while grand multigravida were 73 (19%).

**Supplementary information** The online version of this article (Tables/Figures) contains supplementary material, which is available to authorized users.

**Corresponding Author:** *Emma Maano Nghitanwa, University of Namibia, P/Bag 1330, Windhoek, Namibia.*
*E-mail: enghitanwa@unam.na*

On parity, most participants, 148 (38%), were multiparous, followed by 133 (34%) nulliparous, 71 (18%) were primiparous and 36 (9%) were grand multiparous. Most participants 290 (75%) were from the Evangelical Lutheran Church in Namibia (ELCIN), and fewer participants, 6 (2%), were from revival churches. The majority, 378 (97%), were Namibian and 10 (3%) were Angolan. Furthermore, the majority, 331 (85%), were unemployed. The study results show that the majority of the participants, 346 (89%), were from a rural area, and very few 16 (4%) were from a semi-urban area. Regarding educational levels, most participants, 254 (65%), had secondary education, and only a few participants 14 (4%) had no formal education. The majority, 336 (87%), were single, and the majority, 385 (99.23%), were non-smokers.

**Association between sociodemographic characteristics and immediate low Apgar score**

The study results did not find statistically significant association between the immediate Apgar score and age ($p>0.897$), religion ($p>0.365$), ethnicity ($p>0.341$), nationality ($p>0.424$), employment status ($p>0.831$), marital status ($p>0.110$), alcohol ($p>0.782$) and smoking ($p>0.073$). However, the immediate low Apgar score showed a statistically significant association with gravidity ($p<0.021$) and parity p-value of 0.029 as displayed in Table 1.

**Obstetric characteristics of participants**

The majority, 376 (97.68%), had attended antenatal care, and 51 (13%) indicated having started antenatal care during the first trimester. The highest number, 71 (18.3%), were diagnosed with human immunodeficiency viruses (HIV), followed by 17 (4.4%) diagnosed with hypertension. However, the majority, more than 90% of mothers, were not suffering from any medical conditions. Most were recorded to have moderately low hemoglobin Apgar score, 152 (39%), and hemoglobin on admission for delivery 39 (10%) recorded moderately low hemoglobin. Less than 5% of mothers were recorded to have pregnancy complications, such as 11 (2.8%) antepartum hemorrhage, and 6 (1.5%) cephalo-pelvic disproportion. Most of the mothers, 56 (73.7%), with babies with low immediate Apgar score were referred from district hospitals. The study shows that the majority, 284 (73%), had normal blood pressure, normal pulse, 290 (75%), and normal temperature, 223 (57%). In addition, the majority, 276 (71%), had normal respiration, normal haemoglucostic (HGT), 61 (16%). However, 320 (82%) HGT were not recorded on maternal files. The majority of the participants, 191 (49%) were recorded with moderate contractions, and a few participants, 48 (12%), were recorded as not presented with contractions on admission. More than half of the participants, 222 (57%), had their membranes intact, 264 (68%) had clear amniotic fluids, 103 (27%) had meconium-stained amniotic fluid, 1 (0%) participant had bloody stained amniotic fluid, and 19 (5%) not recorded.

Moreover, 179 (46%) spent 12-19 hours in labor, and fewer spent more than 20 hours in labor, 36 (9%). The majority of mothers, 264 (68%), had their babies through normal vaginal deliveries, breech 9 (2%) and vacuum delivery 1 (0%) were recorded in a few cases. Types of cesarean section operation results show that most cesarean section (CS) operations were performed in emergencies 89 (23%), and elective cesarean sections were 22 (6%). Mothers who were operated under spinal anesthesia were 97 (25.0%), while 14 (3.6%) were operated under general anesthesia. The majority, 37 (64.9%), of mothers augmented had babies with low Apgar score compared to the 20 (35.1%) who had normal Apgar score. The mother complications during delivery and uncooperative mothers were more, 5 (1.3%), compared to those who experienced shoulder dystocia (0.5%), and those with poor maternal effort.

**Associations of obstetric characteristics with immediate Apgar score**

There was no statistically significant association between the immediate Apgar score and antenatal care of mothers ($p>0.397$) and gestation weeks ($p>0.399$). There was no statistically significant association found among all medical history and immediate low Apgar score. However, there was a statistically significant association between hemoglobin during the $1^{st}$ ANC visit and immediate low Apgar score ($p<0.011$). There was a statistically significant association found between some pregnancy complications and immediate low Apgar score such as antepartum hemorrhage ($p<0.04$), cephalo-pelvic dispro-

portion (p<0.010) as well as other pregnancy complications (p<0.027). A statistically significant association was found between blood pressure (p<0.020), pulse (p<0.025), temperature (p<0.050) and symphysial fundal heights (p<0.040) and immediate low Apgar score. There was no statistically significant association found between immediate low Apgar score and respiration (p>0.795) and hemo glucose test (HGT) (p>0.473). As displayed in Table 2, the study found a statistically significant association between contractions and an immediate low Apgar score (p<0.001). membranes status (p<0.000), amniotic fluid (p<0.000), and meconium grades (p<0.000). In addition, there was a statistically significant association between duration of labor categories and immediate low Apgar score duration of labor on admission (p<0.000) and total duration of labor (p<0.000). There was a statistically significant association found between augmentation of labor (p<0.006) and medications administered for augmentation (p<0.019) and immediate low Apgar score. A statistically significant association was found between the types of deliveries conducted and the immediate low Apgar score (p<0.000) as displayed in Table 3. Further, a statistically significant association was found between immediate low Apgar score and indications for cesarean section (p<0.000) and types of cesarean section (p<0.000) (Table 4). A statistically significant association was found between types of anesthesia and medication used for anesthesia (p<0.000) with immediate Apgar scores. There was no statistically significant association found between immediate low Apgar score and shoulder dystocia (p>0.137), poor maternal effort (p>0.069) as well as uncooperative mothers (p>0.579).

## DISCUSSION

The findings in this study show no association between maternal age and immediate low Apgar score (p>0.897). Similarly, studies conducted in Iran and Malaysia found no association between maternal age groups and low Apgar scores.[5,6] However, Ibrahim[7] from Ethiopia found an association between maternal age 15-25 years old which is different from the findings of this study. Gravidity and parity were associated factors for immediate Apgar score in this study (p<0.021 and p<0.029). Being a primigravida was highlighted to be a common factor in this study, as they indicated a larger percentage of 58.3%. Likewise, in Malaysia and Ethiopia, Tewesa[5] and Getachew[8] had similar findings that inadequate experience of pain in primigravida may lead to uncooperative mothers. Furthermore, nulliparous recorded 56.8% delivered low Apgar score in this study. Similarly,[6,9] it was observed in Iran that previous live birth associated with high odds of low Apgar score. Contrarily, in Tanzania and Nigeria, studies found grand multiparous and primiparity at great risk of low Apgar score.[10−12]

Even though the majority of the mothers, 132 (46%), were Christian, religion was not found to be associated with low Apgar score (p>0.365). Similarly, studiesin Ethiopia found that there was no association between religion and low Apgar score.[12,13] Similarly, ethnicity and nationality were not an associated factor for low Apgar score (p>0.341 and p>0.424). The majority of participants in this study belonged to Oshiwambo ethnic group and they were Namibian citizens (97.42%). This could be because the Onandjokwe Hospital is situated in the Northern part of Namibia, where the majority of Oshiwambo speakers are based, as it was reported in the Namibia Intercensal Demographic Survey[14] that in the four Northern regions of Namibia more than 90% of the population are Oshiwambo speakers, and they are the main ethnic group in Namibia. Evangelical Lutheran Church in Namibia (ELCIN) is a religion in Namibia that constitutes the majority of the Namibian population, recorded 44% by Namibia Demographic and Health survey.[15] Regarding the employment status, 86.42% were unemployed, contrary to the study conducted in the United Kingdom, which recorded 13.3% of unemployment.[16]However, in Ethiopia, Gudaya et al[17] stated that unemployment had the risk of low Apgar score. Unemployment, lower monthly income and not being affiliated to the social service can endanger the development of pregnancy as the mother will not be able to buy nutritious food that is needed for fetal growth to avoid intra uterine growth retardation (IUGR), which is a risk for low Apgar score.[18] The majority of mothers (89.18%) were

from rural areas. Similarly, in Ethiopia, Getachew[8] recorded that 52.3% of the participants in his study were from rural areas. In Malawi, a study found that mothers from villages that were far from health facilities had reduced antenatal care visit opportunities to provide ongoing obstetric care, which risked assessment during pregnancy, which resulted in low Apgar score.[3] The study did not find the mother's education level as an associated factor of low Apgar score (p>0.313). Similarly, some studies in Brazil and Malawi did not find an association between mothers' educational level and low Apgar score.[5,19]

Marital status was not an associated factor for low Apgar score in this study (p>0.110), although this study recorded a number of single mothers (45.8%) with low Apgar score. Chiabi[20]recorded 54.4% of single mothers delivering low Apgar score babies in Cameroon, which was higher than the findings of this study, while Gudayu[17] in Nigeria recorded 95% of married mothers delivering low Apgar score babies, which is high and similar to the findings of this study, that recorded 57,7% of married mothers. Studies in Colombia, Brazil and Cameroon, found that marital status was an associated factor for low Apgar score.[19–21] This is possibly because partners living with expectant mothers would meet all their pregnancy needs. The presence of a partner in the house provides social and financial support that promotes regular antenatal care consultations that prevent risk factors leading to low Apgar score.[20]

The results of the present investigation showed that a higher percentage of pregnant mothers (85.30%) do not consume alcohol, and 0.79% of pregnant mothers smoke. This finding concurs with the results of Hamulka,[22]who found that 22% of his study participants smoked, and 7% consumed alcohol. Mothers who consumed alcohol and smoked were at risk of preterm babies that are associated more with low Apgar score. These results differ due to the fact that the current study was conducted retrospectively, and social history information was not recorded. Mothers that booked for antenatal care in this study were 47.6%, which is almost similar to the findings in Brazil, which recorded 42.3%, while in Ethiopia similar studies recorded that 88% of mothers attended antenatal care, which is higher than the findings of this study.[17,19] Furthermore, during the gestational weeks, the timing when mothers started antenatal care was not associated with low Apgar score in this study (p>0.399). Mothers who started antenatal care in the second trimester (16-28 weeks) constituted 28.6% of this study, while the study conducted in Nigeria reported that 73.6% of mothers started antenatal care in the second trimester.[23]

Maternal illness in this study such as pregnancy-induced hypertension (PIH) (p>0.156), diabetes mellitus (p>0.298), HIV (p>0.442), and UTI (p>0.140) was not found to be associated with immediate Apgar score. On the contrary, in a study done in Turkey, diabetes mellitus was found to be associated with low Apgar score.[24] The current study recorded 71.4% of mothers had PIH as one of the factors associated with low Apgar score. Similarly, mothers whose PIH was not diagnosed and treated on time turned into eclampsia, which results in bad neonate outcomes such as IUGR, and preterm that are at risk of low Apgar score (Seyom, 2015;[25] Adebami, 2015;[26]). In the present study, a mother's hemoglobin (HB), which was taken during the first antenatal care visit was associated with low Apgar score (p<0.011), while hemoglobin that was taken on admission for delivery was not associated with low Apgar score (p>0.489). The majority of mothers who had their HB taken either prior to the beginning of antenatal care or on admission for delivery, were in low Apgar score group in this study. This was similar to what was reported in Nigeria by Adebami et al.[26], who stated that pregnant mothers with HB less than 11g/dL were at risk of delivering low Apgar score babies, as a result of APH and intra-uterine anemia. On the contrary, other studies suggest that mothers who had iron deficiency anemia in their $2^{nd}$ trimester or who neglected healthy dietary habits could cause low nutrients thereby not meeting the nutritional needs of fetal growth and development that leads to the newborn baby having low Apgar score.

The results of this study also demonstrate that the following pregnancy complications are associated with low immediate Apgar score. Similar findings were reported in Brazil, where Santos and others established that prolonged second stage of labor as a result of improper vaginal examination might lead to CPD that is associated with low Apgar score.[19] On the contrary, Tewesa[5] found no association between

APH, CPD and low Apgar score. The mothers being referred from other health facilities was regarded as an associated factor of low Apgar score in this study ($p<0.000$). Since Onandjokwe Intermediate Hospital is a referral hospital in the region, the majority of mothers with complications such as fetal distress, cord prolapse and prolonged labor were referred from district hospitals, health centers and clinics.

Respiration and hemoglucose test (HGT) were the only vital signs regarded as factors associated with low Apgar score, while other vital signs such as blood pressure (BP), pulse, temperature and symphysial fundal height (SFH) were not associated factors in this study. Different findings in India suggest that mothers with high diastolic blood pressure had poorer pregnancy outcomes of lower Apgar score, and a high temperature of 38 degrees Celsius as a result of chorioamnionitis.[27] Contractions were found to be an associated factor for low Apgar score ($p<0.001$) in this study. This finding correlates with Peebles,[28] who similarly found ($p<0.001$) that contractions with long intervals may increase fetal cerebral oxygen saturation that results in low Apgar score. In excessive uterine activity, the compromised fetus increases the risk of adverse fetal outcomes as this decreases umbilical artery blood flow and fetal oxygen saturation.[29]

The rupturing of membranes before the onset of labor and their amniotic fluid status was an associative factor for low Apgar score($p<0.00$). The study indicated that 67.0% of neonates were delivered through meconium-stained amniotic fluid. This figure is very high compared to other similar studies conducted in Ethiopia that recorded 18.5% of neonates delivered through meconium-stained amniotic fluid.[30] Furthermore, the study established that there was a significant association between the meconium grades and the immediate Apgar score ($p<0.000$) and that can be explained by the high percentage of new-born babies delivered through meconium-stained amniotic fluid with either meconium grade 2 (3.1%) or grade 3 (96.9%). These results were consistent with studies by Sori,[30] who recorded that in 74.8% of the cases, liquor was either grade 2 or grade 3 meconium stained. Therefore, the thickness of meconium in the amniotic fluid and aspirated by the fetus can be a sign of intra-uterine fetal asphyxia that results in low Apgar score than thin meconium. Mothers that had their labor augmented and the medication that was used for augmentation were found as associated factors of low Apgar score in this study ($p<0.006$ and $p<0.019$). A similar study done in Ethiopia showed similar findings that augmentation of labor was associated with low Apgar score.[17] This similarity can be due to the fact that the medication for augmentation is given in high doses but not monitored and can cause contractions of the uterus to occur more often and this interferes with uterine blood flow to the fetus, which could further affect Apgar score.

This study also showed that type of delivery was associated with low Apgar score ($p<0.00$). Similar findings to this study stated that breech delivery and cesarean section after failed vacuum extraction had high odds of low Apgar score.[31] This is due to the fact that the second stage of labor can be prolonged and that causes fetal acidosis. In addition, certain types of cesarean section and their indications are associated with low Apgar score ($p<0.000$). The magnitude of low Apgar score was associated with emergency cesarean section due to cord prolapse.[32] Fetal distress and eclampsia were reported both in this study and in China as top leading indications for cesarean section associated with immediate low Apgar score [18.] This study found that newborn babies with low Apgar score were high among mothers who were under general anesthesia compared to spinal anesthesia. Similarly, Saham[33] study found that babies from mothers who had caesarean section under general anesthesia had low Apgar score. This is due to the fact that the presence of anesthesia medication concentration in maternity can cause cardiovascular depression to the mother and this affects placental perfusion and feto-placental exchange and interferes, possibly resulting in low Apgar score.[34] In addition, Bupivacaine and Fentanyl was the most medication used by expectant mothers in this study, unlike Sodium Thiophen and Thiobartinemo.[33] These results differ from the earlier studies elsewhere depending on the countries of anesthesia protocols.

## LIMITATIONS

The study was conducted in one hospital, so the findings could not be generalised. Furthermore, poor recordkeeping in some maternal records may affect the study finding.

## CONCLUSIONS

The findings of this study have identified maternal factors associated with low Apgar score such as gravidity, parity, haemoglobin after the first antenatal care visit, Ante-partum hemorrhage, membrane status, duration of labor, type of delivery and cesarean section type and indication. Midwifery care and health education should be strengthened to detect the risk factors for low Apgar score to prevent complications.

## INFORMATION

**Acknowledgments.** The researchers would like to thank the University of Namibia Research Ethic Committee, the Ministry of Health and Social Services in Namibia and Onandjokwe Hospital management for giving permission to conduct the study.

**Authors' contributions.** JL: study design, data collection and data analysis, final approval of the version to be published**;** EMN: study design, manuscript writing, final approval of the version to be published; LU: study design manuscript review, final approval of the version to be published**;** AK: data analysis, manuscript review, final approval of the version to be published.

**Conflict of interest.** The authors declare no potential conflict of interest.

**Funding**. None.

**Availability of data and materials.** All data generated or analyzed during this study are included in this published article.

## REFERENCES

1. Carlos. R., Degrandi, O. The Legacy of Virginia Apgar. British Journal of Anesthesia 2020;124:e185-e186.

2. Khalid, M. A., Ghani, R., Khalid, M. F., et al. Association of delivery procedure with APGAR scores among neonates born to healthy Pakistani mothers: a pilot study. F1000 Research 2018;7:346.

3. Jeganathan, R., Karalasingam, S. D. Hussein, J., et al. Factors associated with recovery from 1-minute Apgar score<4 in live, singleton, term births: An analysis of Malaysia National obstetrics Registry data 2010-2012. BMC Pregnancy and Childbirth 2017;17:110.

4. Hanyanya, J. Assessment of management of newborn babies with neonatal asphyxia at maternity units of a state hospital in Windhoek, University of Namibia. 2018.

5. Tewesa, E. Chirwa. E., Majamanda, M. D., et al. A. Associative Factors for Birth Asphyxia at Queen Elizabeth Central Hospital, Malawi. Journal of Biosciences and Medicines 2017;5.

6. Nayeri, F., Shariat, M., Dalili, H., et al. Perinatal risk factors for neonatal asphyxia in Vali-e-Asr hospital, Tehran-Iran. Iranian Journal of Reproductive Medicine 2012:137-140.

7. Ibrahim, N. A., Muhye, A, Abdulie. S. Prevalence of Birth Asphyxia and Associated Factors among Neonates Delivered in Dilchora referral Hospital, in Dire Dawa Ethiopia. Clinics Mother Child Health 2017;14:4.

8. Getachew, B., Etefa, T., Asefa, A., et al. Determinants of Low fifth minute Apgar score among Newborns Delivered in Jimma University Medical Centre, Southwest Ethiopia. International Journal of Paediatrics 2020;2020:9896127.

9. Abukari, A.S., Awuni, N., Yakuhu, et al. Factors associated with low fifth minute Apgar score interm and preterm singleton live births in A Ghanaian hospital. Journal of Neonatal Nursing 2021;27:476-82.

10. Mgaya, A.H., Massawe, S. K., Kidanto, H. L., Mgaya, H. N. Grand multi parity is it still a risk in pregnancy? BMC regnancy and Childbirth,

2013;13:241.

11. Bikisu, G. I., Muhammad, . A., Abdullahi, M., et al. Prevalence and Risk Factors For Perinatal Asphyxia as seen at a Specialist Hospital in Gusau, Nigeria. Sub-Saharan African Journal of Medicine 2015;2:64-69.

12. Yimer, N.B., Tenaw, Z., Solomon, K., Mulatu. T. Inadequate Prenatal Visit and Home delivery as Determinants of Perinatal Outcomes: Does Parity Matter? Journal Pregnancy 2019;2019:9024258.

13. Wosenu, L., Worku, A. G., Teshome, D. F., Gelagay, A. A. Determinants of birth asphyxia among live birth newborns in university of Gondar referral hospital, northwest Ethiopia: A case-control study. PloS ONE 2018;13:9.

14. Namibia Inter-censal Demographic Survey Report. Namibia tatistic Agency (NSA). Windhoek, Namibia. 2016.

15. Namibia Demographic and Health Survey. Ministry of Health and Social Services, Namibia tatistic Agency. Windhoek, Namibia. 2013.

16. Odd, O., Lewis, G., Gunnell, D., Rasmussen. Risk of low Apgar scores and socioeconomic status over a 30-year period. The journal of maternal-foetal & neonatal medicine. 2014;27:603-7.

17. Gudayu, T. W. Proportion and factors associated with low fourth minute Apgar score among singleton new-born babies in Gondar University referral hospital, north-west Ethiopia. Africa Health Sciences 2017;17:1- 6.

18. Li, F. Wu, T. Lei, X. et al. The Apgar score and Infant mortality. PLoS One 2013;8:e69072.

19. Santos, N. C. P., Vogt, E.S., Duarte, D. E., et al. Factors associated with low Apgar in newborns in birth center. Rev Bras Enferm. 2019;72:297-304.

20. Chiabi, A., Nguefack, S., Mah, M., et al. Risk factors for birth asphyxia in an urban health facility in Cameroon. Iranian Journal of Child Neurology 2013;7:46-54.

21. Torres-Munoz, J., Rojas, C., Mendoza-Cuero, D., et al. Risk factors associated with the development of perinatal Asphyxia in neonates at the Hospital Universitario del Valle, Cali, Colombia. Biomedica 2017;37:51-6.

22. Hamulka, J., Zielinska, M.A, Chadzynska, K. The combined effects of alcohol and Tobacco use during pregancy on birth outcomes. Rocz Panstw Zakl Hig. 2018;69:45-54.

23. Ndidi, E. P., Oseremen, I. G. Reasons Given by pregnant women for late initiation of antenatal care in the Niger Delta. Ghana Medical Journal 2010;44:47-51.

24. Kebapcilar, L, Kebapcilar, A.G., Ilhan, T.T, et al. Is the Mean Platelet Volume a Predictive Marker of a Low Apgar Score and Insulin Resistance in Gestational Diabetes Mellitus? A Retrospective Case-Control Study. Journal of Clinical and Diagnostic Research. 2016;10:OC06-OC10.

25. Seyom, E., Abera, M., Tesfaye, M. Maternal and fetal outcome of pregnancy related hypertension in Mettu Karl Referral Hospital, Ethiopia. Journal Ovarian Res. 2014 8:10.

26. Adebami, O. J. Maternal and Foetal determinants of mortality in babies with birth asphyxia at Osogbo, Southwestern Nigeria. Global Advanced Research Journal of Medicine and Medical Science 2015;270-276.

27. Burgess, A., Katz, J. E., Moretti, M., Lakhi, N. Risk factors for intrapartum fever in term Gestations and Associated maternal and neonatal sequelae. Gynecol Obstet Invest. 2017;82:508-516.

28. Peebles, D.M, Spencer, J.A, Edwards A. D, et al. Relationship between frequency of uterine contractions and human fetal cerebral oxygen saturation studied during labour by near infrared spectroscopy. Br J Obstet Gynaecol. 1994;101:44-8.

29. Bakker, P.C.A, van Geijn, H.P. Uterine activity: Implications for the condition of the fetus. J Perinat Med. 2008;36:30-7.

30. Sori, D.A., Belete, A, Wolde. Meconium Stained Amniotic Fluid: Factors affecting Maternal and Perinatal Outcomes at Jimma University Specialized Teaching Hospital, South West Ethiopia. Gynecol Obstet 2016;394.

31. Omokhodion, F. O., Roberts, O.A., Onadeko, M. O., et al. I. Social, obstetric and environmental determinants of low Apgar score among infants born in four selected hospitals in Ibadan, Nigeria. Journal of Obstetrics and Gynecology 2018;38:454-60.

32. Obsa M.S., Getahun, M. S., Misrak, W. M., et al. Factors associated with Apgar score among Newborns Delivered by Cesarean Sections at Gandhi Memorial Hospital, Addis Ababa. Journal of Pregnancy 2020;2020:5986269.

33. Sahanak S. Comparison of Apgar score in Neonates: spinal versus General Anaesthesia for Elective Caesarean section. Journal of Evolution Medical and Dental Sciences 2014;539-544.

34. Bakhsha. F, Yousefi, Z., Aryai, M., et al. Comparison of Apgar score in newborn by vaginal delivery and spinal anesthesia and its relationship with contributing factors. J Bas Res Med Sci. 2015;10-15.

**How to cite this article:** Lungameni J., Nghitanwa E.M., Uusiku L., Karera A. **Maternal factors associated with immediate low Apgar score in newborn babies at an intermediate hospital in Northern Namibia**. Journal of Public Health in Africa. 2022;13:2045. https://doi.org/10.4081/jphia.2022.2045

**Table 1. Association between gravidity and parity and Immediate Apgar score.**

| Variables | Low Apgar Score (%) | Normal Apgar score (%) | Total % | P-value |
|---|---|---|---|---|
| **Gravidity** | | | | 0.021 |
| Primigravida | 70 (58) | 50 (42) | 100 | |
| Multigravida | 81 (43) | 109 (57) | 100 | |
| Grand multigravida | 32 (44) | 40 (56) | 100 | |
| **Parity** | | | | 0.029 |
| Nulliparous | 75 (56) | 57 (43) | 100 | |
| Primiparous | 26 (37) | 45 (63) | 100 | |
| Multiparous | 68 (48) | 75 (52) | 100 | |
| Grand multiparous | 14 (39) | 22 (61) | 100 | |

**Table 2. Association between membrane status and immediate low Apgar scores.**

| Variables | Low Apgar Score (%) | Normal Apgar score (%) | Total % | P-value |
|---|---|---|---|---|
| **Membrane's status** | | | | 0.000 |
| Intact | 106 (47.7) | 116 (52.3) | 100 | |
| Ruptured | 75 (57.3) | 56 (42.7) | 100 | |
| **Amniotic fluid** | | | | 0.000 |
| Clear | 106 (40.2) | 158 (59.8) | 100 | |
| Meconium | 69 (67.0) | 34 (33.0) | 100 | |
| Bloody | 1 (100.0) | 0 (0.0) | 100 | |
| **Meconium grades** | | | | 0.000 |
| Grade 1 | 19 (45.2) | 23 (54.8) | 100 | |
| Grade 11 | 19 (73.1) | 7 (26.9) | 100 | |
| Grade 111 | 31 (96.9) | 1 (3.1) | 100 | |
| No meconium | 106 (40.0) | 159 (60.0) | 100 | |

**Table 3. Association between types of delivery and immediate Apgar score.**

| Variables | Low Apgar Score (%) | Normal Apgar score (%) | Total % | P-value |
|---|---|---|---|---|
| **Types of delivery** | | | | 0.000 |
| Normal Vaginal Delivery | 93 (35.2) | 171 (64.8) | 100 | |
| Breech Delivery | 8 (88.9) | 1 (11.1) | 100 | |
| Vacuum Extraction delivery | 1 (100.0) | 0 (0.0) | 100 | |
| Caesarean section (CS delivery | 83 (72.8) | 31 (27.2) | 100 | |

**Table 4. Association between caesarean section and immediate Apgar score.**

| Variables | Low Apgar score | Normal Apgar score | Total% | P-value |
|---|---|---|---|---|
| **Type of caesarean section** | | | | 0.000 |
| Elective C/S | 11 (50.0) | 11 (50.0) | 100 | |
| Emergency C/S | 70 (78.7) | 19 (21.3) | 100 | |
| **Indications for C/S** | | | | 0.000 |
| Obstructed labour | 1 (100.0) | 0 (0.0) | 100 | |
| Antepartum haemorrhage | 4 (100.0) | 0 (0.0) | 100 | |
| Cephalopelvic disproportion | 3 (60.0) | 2 (40.0) | 100 | |
| Cord prolapses | 7 (100.0) | 0 (0.0) | 100 | |
| Eclampsia | 12 (92.3) | 1 (7.7) | 100 | |
| Failed induction | 1 (100.0) | 0 (0.0) | 100 | |
| Foetal distress | 23 (79.3) | 6 (20.7) | 100 | |
| Macrosomia | 2 (66.7) | 1 (33.3) | 100 | |
| Malpresentation | 5 (55.6) | 4 (44.4) | 100 | |
| Meconium-stained liquor | 6 (100.0) | 0 (0.0) | 100 | |
| Multiple pregnancy | 4 (66.7) | 2 (33.3) | 100 | |
| Poor maternal effort | 1 (100.0) | 0 (0.0) | 100 | |
| Previous C/S | 8 (44.4) | 10 (55.6) | 100 | |
| Prolonged labour | 9 (75.0) | 3 (25.0) | 100 | |