

## Factors Contributing to Neonatal Deaths in 2013 at a National Hospital in Namibia.

Saara Kerthu Hatupopi<sup>1</sup>

University of Namibia, Faculty of Health Sciences, School of Nursing, Department of Midwifery

### Abstract

The incidences of neonatal deaths are often associated with various factors, some of which are preventable. Most causes of neonatal deaths in sub-Saharan Africa are related to health worker factors and as such avoidable.

**Aim:** This study investigated avoidable and unavoidable factors contributing to neonatal deaths recorded in 2013 at a national hospital in the Khomas region of Namibia.

**Methods:** The study used a quantitative research approach with a retrospective descriptive design to investigate avoidable and unavoidable factors contributing to neonatal deaths. The primary data were collected from a population of 231 record files of all neonates who died during the period 1 January to 31 December 2013 while admitted at the national hospital.

**Findings:** The study noted the avoidable factors, which were related to healthcare providers and could be avoided, as well as congenital abnormalities that were deemed as unavoidable factors.

**Conclusion:** The study concluded that most of neonatal deaths are the result of actions or inactions of the healthcare providers and hence can be avoided.

**Recommendations:** Based on the results of the study, further research is required to assess the knowledge, skills, and behaviours of the healthcare providers.

**Keywords:** Avoidable, unavoidable, neonatal deaths, healthcare provider

### Introduction

Neonates less than 28 days old accounted for about 40% of deaths among children under the age of 5 globally, thus hindering the achievement of Millennium Development Goals (MDG 4) and reducing the under-5 mortality rate by two-thirds by 2015 (Buchmann,2014). The above-cited author projected that a continuation of neonatal deaths, which represent a larger share of total deaths in the aged under 5 years, in developing countries would result in the world failing to achieve its target of reducing under-five mortality by two-thirds in 2026.

The incidence of neonatal deaths is often associated with many factors, some of which are preventable. Intrapartum asphyxia and birth trauma is one of the key roots of neonatal mortality in less developed countries. Buchamann, (2014) stated that major causes of neonatal death

included foetal distress, noted as one of the most avoidable factors contributing to neonatal deaths in sub-Saharan Africa, which occurs unnoticed during the intrapartum period. Finally, Liu, et al., (2014) indicated that most neonatal deaths are caused by health worker-related factors.

Recent literature outlines health worker-related factors that lead to neonatal deaths. The outlined factors include foetal distress not detected during labour that results in birth asphyxia with a good example being the case of a Healthcare provider (HCP) who might be unable to read and interpret the cardiocotograph (CTG). Sometimes HCPs do not monitor the foetal heart, which leads to undetected foetal distress (Liu, et al., 2014). HCPs are responsible for applying the electronic foetal monitor and as such they should be able to understand and interpret the CTG. Poor clinical skills and poor recording of clinical findings on CTG are also the avoidable contributors to neonatal deaths and illness (Liu et al., 2014). The above authors stated poor intervention or no intervention at all for a prolonged second stage of labour, lack of knowledge on resuscitation as possible further contributors to fetal distress, and neonatal death. HCP failure and delays in referral of patients also potentially puts the lives of pregnant women or neonates in danger. Finally, the unavailability of experts, delays in calling for expert assistance and not paying attention to early rupture of the membranes is another HCP factor considered avoidable.

Various studies attribute neonatal mortality to HCP performance. A study by Lloyd, (2013) shows that 44% of neonatal mortality caused by intrapartum asphyxia was associated with HCP-related avoidable factors. Another study conducted by Sepeku & Kohi (2011) in Tanzania shows that 45% of asphyxiated neonates had not received required medicines during resuscitation. These HCP failures might have been due to lack of knowledge regarding which, when, and how to administer the necessary drugs.

In addition, a study by Nyamtema ,(2010) in Tanzania recorded that 67.7% of neonatal deaths were related to avoidable factors arising from health providers' activities. Poor health workers' practices accounted for 67.7% of neonatal deaths Merali et al., (2014) also documented similar evidence and concluded that most of the avoidable factors that led to neonatal deaths were poor practice by HCPs.

Congenital abnormality is one of the unavoidable factors causing neonatal deaths. According to the WHO, (2008) congenital abnormalities could be defined as physical or functional abnormalities, which include metabolic syndromes that could be present at birth. Furthermore, the WHO, (2008) estimates that about 260 000 deaths globally or about 7% of all neonatal deaths are caused by congenital abnormalities.

In addition, Saugstad (2011) stated that congenital abnormalities could be prevented if all pregnant women are provided with folic acid in order to prevent myelomeningocele and cleft lip. Improved surgical services should also be made available within a reasonable time. The performance of sonar during the first trimester of pregnancy will be of advantage, as liberal abortion practices will be an option for malformed fetuses.

The implementation of neonatal resuscitation is one strategy that can reduce neonatal death in low resource settings (Newton & English 2006). The Neonatal Resuscitation programme (NRP) involves techniques and attempts seeking to ensure a patient's airway, suctioning, ventilation, administering oxygen, chest compressions and provision of required medicine (Kattwinkel,2006). A methodical execution of resuscitation by skilled personnel has potential to prevent 192 000 intrapartum-related neonatal deaths that are considered as avoidable (Hole et al., 2012). Curriculums with components of the NRP have enhanced HCPs' knowledge, skills, and attitudes in less developed countries and can lessen neonatal deaths arising from avoidable factors by up to 65.7% (Bhutta, 2010).

The report of the WHO & UNICEF (2013) estimated that Namibia's neonatal death rate stands at 21.80/1000 live births. A total of n=333 neonatal deaths were recorded in 2013 at the national hospital under study. Although the causes of neonatal deaths are multifactorial, most of these, such as errors and negligence of the HCPs, are avoidable (MoHSS, 2014). No evidence study has been conducted to this date to investigate the avoidable and unavoidable factors that contribute to neonatal deaths in this hospital. The MoHSS is now calling for a new model that includes outreach to neonates in the crucial early weeks after birth and making neonatal care an on-going process. Therefore, this study aimed at ascertaining avoidable and unavoidable factors that contribute to neonatal deaths at the selected national hospital in Namibia, by conducting a retrospective audit of death records.

### **Objectives**

The objectives of this study are to:

1. To identify avoidable factors contributing to neonatal deaths in a national hospital in Namibia.
2. To identify unavoidable factors contributing to neonatal deaths in a national hospital in Namibia.

### **Methodology**

#### **Research design**

A quantitative, descriptive design and retrospective records audit was employed in this study. This design enabled the researcher to audit and analyse the death records of neonates who died while admitted at the selected national hospital in Namibia.

#### **Population and sampling**

The study's population consisted of records of all neonates (n=231) who died while admitted at the national hospital before 28 completed days of life from 1 January to 31 December 2013. A census sampling technique was, therefore, used. This period was selected because of the highest rates of neonatal deaths recorded during this period.

**Data collection**

Data collection, which took one month, began after the researcher had attained consent from all required authorities. The researcher reviewed all recorded 231 neonatal deaths. Archival records were retrieved with the assistance of the clerks in the archives department and the researcher assessed the notes from recorded cases.

**Ethical considerations**

Ethical approval was obtained from the University of the Western Cape Senate Research Committee and from the Ministry of Health and Social Services in Namibia.

**Validity and reliability**

The subject experts and a review of available literature ensured the clarity, relevance and simplicity of the content of the instrument. In this study, reliability of the audit tool was ensured by piloting the tool and training two data collectors on how to use the tool. The trainees were assessed during a test-retest carried out prior to collecting data with the tool, to ensure that it was stable and consistent. The test-retest result was 0.895, which is within the range of good reliability.

**Results**

**Table1: Apgar scores at 1 and 5 minutes**

<b>1minute percentage</b>	<b>5minutes</b>	<b>Frequency</b>
<3/10 - <3 /10	39	16.9%
3-6 /10 - 3-6 /10	81	35.1%
>7 / 10 - 7 /10	65	28.1%
<b>Not recorded</b>	46	19.9%
<b>Total</b>	231	100%

The results Table 1 show that (n=39), 16.9% of the neonates had a low Apgar score of <3/10 at 1 minute and maintained a similar Apgar score of <3/10 at 5 minutes. Of the neonates who died, (n=81) 35.1% had a low Apgar score of 3–6/10 at 1 minute and no improvement (3–6/10) at 5 minutes. However, 28.1% (n=65) of the neonates who died had a normal Apgar score of >7/10 at 1 and 5 minutes. In (n=46) 19.9% of the cases, the Apgar scores at birth were not ascertained or recorded.

**Table 2: Resuscitation and steps taken to resuscitate neonates**

		Frequency	Percentage
Resuscitation	Yes	81	35.1%
	No resuscitation needed	63	27.3 %
	Not recorded	87	37.6 %
	Total	231	100%
<b>Steps taken to resuscitate</b>			
	Suctioning bag and mask ventilation	56	24.2
	Suctioning, intubation	20	8.7
	Ventilation and cardiac massage or chest compression	4	1.7
	Not recorded	96	41.6
	No steps taken to resuscitate the neonate	55	23.8
	Total	231	100%

The above Table 2 shows that in 23.8% (n=55) no steps were taken or no resuscitation was needed, and there are no records on the types of steps taken in 41.6% (n=96) of the cases. It further indicates resuscitation steps taken. These resuscitation steps consisted of the performance suctioning and bag and mask ventilation was used in 24.2% (n=56) of the neonates, suction and intubation in 8.7% (n=20), and ventilation and cardiac massage or chest compression in 1.7% (n=4).

**Table 3 Duration of resuscitation**

Duration of resuscitation	Frequency	Percentage
< 5 minutes	3	1.3
5-10 minutes	5	2.2
>10 minutes	7	3.0
Not recorded	154	66.7
No resuscitation needed	62	26.8
<b>Total</b>	<b>231</b>	<b>100</b>

Table 3 above shows that the duration of resuscitation on neonates varied with 1.3% (n=3) neonates being resuscitated for < 5 minutes. Another 2.2% (n=5) resuscitated for 5-10 minutes, while 3.0% (n=7) were resuscitated for > 10 minutes. However, 66.7% (n=154) 26.8 (n=62) had no records on whether resuscitation was performed or not and 26.8% (n=62) show that no resuscitation was needed.

**Table 4 Drugs administered and types given**

		Frequency	Percentage
<b>Drugs given</b>	Yes	25	10.8 %
	No	95	41.6 %
	Not recorded	110	47.6 %
	Total	231	100 %
<b>Types of drugs given</b>			
<b>Types of drugs given</b>	Adrenaline	24	10.4 %
	No drugs given	95	41.1 %
	Not recorded	112	48.5
	Total	231	100 %

Table 4 shows that of the total sample of 231 neonates who died, only 10.8% (n=25) were given drugs. It also shows that 41.6% (n=95) were not given drugs, and in 47.6% (n=110) of cases it was not recorded whether drugs were given or not during resuscitation. Further results indicate

that 10.4% (n=24) were given adrenaline, while 41.1% (n=95) were not given drugs as indicated in the records, and 48.5% (n=112) had nothing recorded in the files to indicate whether drugs were given or not.

**Table 5 Assessment and record of immediate management**

		Frequency	Percentage
<b>Assessment</b>	Yes	197	85.3
	No	16	6.9
	Not recorded	18	7.8
Total		231	100
<b>Record</b>			
<b>Record</b>	Referred	201	87.0
	Not referred	16	6.9
	Not recorded	14	6.1
	Total	231	100

Table 5 above shows that assessment was carried out on 85.3 % (n=197) of the neonates who died, while 6.9% (n=16) had no assessment and there was no evidence whether assessment was carried out or not on 7.8% (n=18) of the cases. Furthermore, the results show that of the neonates who died, 87.0% (n=201) were referred on time, while 6.9% (n= 16) were not referred on time and 6.1% (n=14) indicated nothing about referrals.

**Non- avoidable factors**

**Table 6: Congenital abnormalities present at birth and types**

		Frequency	Percentage
<b>Congenital abnormalities</b>	Yes	44	19.0 %
	No	187	81.0 %
	Total	231	100 %
<b>Types of abnormalities</b>	Multiple abnormalities	11	25
	Congenital heart disease	12	27.3

	Hydrocephalus	6	13.6
	Gastrochisis	6	13.6
	Duodenal atresia	2	4.5
	Down syndrome	2	4.5
	Spina bifida	2	4.5
	Not recorded	3	7
	<b>Total</b>	44	100

Table 6 reveals that of the neonates who died, 81.0% (n=187) had no congenital abnormalities, while 19.0% (n=44) died due to congenital abnormalities. The table further shows the types of congenital abnormalities that contributed to early and late neonatal deaths. These types included multiple abnormalities at 4.8% (n=11), congenital heart disease 5.1% (n=12), hydrocephalus 2.6% (n=6), gastroschisis 2.6% (n=6), duodenal atresia 0.9 (n=2) and Spinal bifida – 0.9 (n=2). In addition, 1.2% (n=3) of the deaths were not recorded and 81.0% (n=187) had no congenital abnormalities.

**Discussion**

It is an international standard that all newly born neonates should be given an Apgar score at 1 and 5 minutes after delivery to know whether the neonate might require resuscitation or not. This study has shown that sixteen percent of neonates who died at the hospital under study had an Apgar score of 3–6/10 at 1 minute and remained the same at 5 minutes. This means that these neonates had a high chance of surviving if proper care, such as proper resuscitation, had rendered. These findings are supported by Ramaboea, (2014) with regards to South Africa who identified that 13% of the neonates who died in that study had an Apgar score below 3/10 at 1 minute and 27% an Apgar score below 7/10 after 5 minutes.

Furthermore, two-thirds of the neonates who died in the current study had normal Apgar scores of > 7/10 at both 1 and 5 minutes, which indicates that they were healthy neonates and had a high rate of survival. If proper care was rendered, unfortunately the neonates died. The analysis of current study considered solely what was recorded on the files of neonates who died. Therefore, this study did not look at whether the neonates were given a correct Apgar score at birth or not. However, the researcher is of opinion that perhaps some neonates were accorded incorrect Apgar scores. Failing to ascertain the correct Apgar score for neonates at birth could badly influence their outcomes, as it would delay the implementation of necessary interventions.

It is worth noting that the current study shows that 35% of neonates who had an Apgar score of < 3/10 at 1 minute and remained the same at 5 minutes were big neonates weighing > 2500g above. According to the records, most of neonates who died developed brain injury before death due to



asphyxia, and presented with hypoxic ischaemic encephalopathy. The findings by Lansky et al., (2015) that intrapartum asphyxia caused 18% of neonatal deaths in Brazil concur with the current study findings that the neonates who died were full-term neonates and 40.9% had an Apgar score < 7 at 5 minutes. In addition, Nelson et al., (2012) notes that low Apgar scores at 1 and 5 minutes are indicative of a great risk of neonatal death. A similar study identified that an Apgar score <7 can put neonates at risk of developing severe neurological impairment (Esdal et al 2012).

This study indicates, with regards to resuscitation that the records of the 35% of neonates, who died, showed that they were resuscitated at birth. It further emerged that about thirty-seven of these neonates were not recorded as having needed resuscitation during birth or not, while no resuscitation was carried out on 27. The resuscitation of 35% of neonates suggests that neonates had a 10% rate of survival, an assumption proven fruitless as all neonates died. The possible interpretation is that the neonates probably did not receive a proper resuscitation. This assumption supported by the findings of Lloyd & De Witt, (2013) which indicate that neonatal deaths caused by intrapartum asphyxia were related to HCP-related avoidable factors in 44% of the cases, as no proper resuscitation were recorded. Merali et al., (2014) also support this finding in their audit, which found out that most of the avoidable factors that attributed to neonatal deaths were the result of substandard practice by health workers. Most of the neonatal deaths were indeed avoidable had the HCPs performed better.

The provision of enough equipment for neonatal resuscitation and the training of HCPs on neonatal resuscitation to reduce neonatal deaths are paramount Velaphi & Rhoda (2012). The NRP plays a major role in preventing deaths and problems of cerebral palsy due to asphyxia. One study reports that the performance of resuscitation by skilled personnel has the potential to prevent 192 000 intrapartum-related neonatal deaths worldwide per year, which amounts to 5–10% of deaths related to preterm complications Hole et al.,(2012).

The study results show that the steps of resuscitation that were carried out on 41% of the resuscitated neonates were not recorded. Nevertheless, neonates suctioning and bag and mask ventilation was used in 24% of the cases, suction in 8%, intubation , ventilation and cardiac massage or chest compression used in only 1%. This is alarming, and might point to a possible lack of understanding of the steps necessary to resuscitate neonates, or could be due to negligence among the health personnel in record keeping.

This study's results concerning steps taken to resuscitate the neonate are inconsistent with those noted in a study done by Ramaboea, (2014) in South Africa, where 32% of neonates were resuscitated by suctioning bag, 32% using a mask and 6% were suctioned and intubated. In addition, study conducted by Sepeku & Kohi, (2011) in Tanzania shows that only 40% of all asphyxiated neonates had suctioning performed on them. This is not surprising since the implementation of the NRP in developing countries has been particularly challenging Esdal et al (2012). Nonetheless, techniques for securing or opening a neonate's airway, suctioning, ventilation, administering oxygen, chest compressions and the provision of required medicine

are all part of the NRP and these can play a major role in reducing neonatal deaths (Orapiriyakul et al.,2008).

This study demonstrated that close to 66% of neonates who died did not have the duration of resuscitation recorded. This worrisome observation means that it was difficult to determine the adequacy of their resuscitation procedures, as nothing was recorded to prove that the required care was offered. This study reported, about the not recorded duration of resuscitation, result of 66.6%, which is lower than that noted in a study conducted by Ndlovu, (2013), which reported that in 71% of neonates who died, no duration of resuscitation recorded. Berglund ,(2008) reveals that resuscitation should be initiated within 10 minutes in cases of severe asphyxia. In line with this, [26] stated that teaching neonatal resuscitation in the hospitals decreases the occurrence of intrapartum-related deaths because most of the neonates only require instant management such as drying, warming and simple neonate care. The training of HCPs in neonatal resuscitation affirmed to reduce early neonatal deaths by 38% (Esdal et al 2012). Therefore, the noted significance of training and the reality that the requirement of help or resuscitation during birth is always unforeseen makes the on-going training on neonatal resuscitation among the HCPs of paramount importance.

This study identified that it was not recorded whether the required drugs were administered during resuscitation or not in a substantial number of neonates (close to a half) who subsequently died. An analysis of the documents revealed that the resuscitative drug, epinephrine, is the only one that was given to neonates. The findings of this study are consistent with those observed by Sepeku & Kohi, (2011) in Tanzania that identified that, 45% of the asphyxiated neonates had not received required medicines during resuscitation. The same study found that the deaths resulted from insufficient knowledge on how to administer drugs, when to administer them and which drug to administer. This could be the same reason why medicine not given in current study. This is also supported by a study conducted by Berglund, (2008) in South Africa, which found that only 2% of neonates received resuscitation; however, the study did not state why drugs were not given

The assessment of neonates is an ongoing process. That is, an examination for emergency signs and the need to provide immediate management is followed by a continued the assessment of the neonates. The results from the assessment determine the choice of the most suitable interventions for the neonate. According to the current study findings, an assessment was done on more than 85% of the neonates who died. Although an assessment was carried out on most of the neonates during delivery, the process did not play a major role in the prevention of neonatal deaths. This finding resonates with the findings noted in a study on South Africa by Berglund, (2008) where there were assessments done on 88% of the neonates, with no record of further assessment in the remaining 12%.

The aim of immediate management is to provide emergency care to the neonate, by ensuring warmth, resuscitation, giving oxygen and Konakion to prevent internal bleeding. The current study findings reveal that of the neonates who died, 87% were given immediate management and

on time from the place of delivery to a neonatal unit. This shows that although most neonates received immediate management and referrals on time, the action did not have much effect on the prevention of neonatal deaths. The immediate management of neonates is likely to be hindered if health personnel do not have the skills and knowledge on what to do, and lack the proper equipment. Equally important is the immediate neonatal time where issues could be avoided or recognised and managed earlier.

The higher incidence of HCP-related avoidable factors and concurrent avoidable neonatal deaths identified here are in agreement with findings from a previous study conducted in Africa by Nyamtema, (2014) where health worker-oriented factors were the most common and accounted for 67.7% of neonatal deaths. In the study above the authors identified that deficient health worker practices caused most deaths and accounted for 28.5% of maternal and perinatal deaths.

The current study demonstrated that around 19% of neonates died due to congenital abnormalities. This implies that these unavoidable factors are a great burden on and are major cause of early neonatal deaths. It seems that these unavoidable factors were difficult to control and influenced neonatal deaths severely. The most affected neonates in this study died within 24 hours following birth. This study reported a rate amounting to 19% of congenital abnormalities as unavoidable factors, which is higher than the 11.3% of neonatal deaths as caused by congenital abnormalities reported in a survey conducted by Indongo (2014) in Namibia. A possible explanation for such a difference might be that the survey targeted many hospitals around the country while the current study targeted one tertiary hospital that treats neonates with severe abnormalities that would have been referred from other regions. Thus, the results between two studies should be compared with caution.

Finally, a study by Kouame et al (2015) in Abidjan, Cote de Ivoire, identified a higher rate of 65% of neonatal deaths due to congenital abnormalities unlike in the current study where 19% of neonatal deaths were due to congenital abnormalities. Both studies reported that deaths were more common on the first day of life with most of these deaths being observed as unavoidable.

### **Limitations**

The study's major limitation is in the use of a retrospective design, which makes its validity applicable only to the studied population. The other limitations are that, data gathering was also wearisome and time-consuming, as the hospital had gone through reconstruction and some files were misplaced. The researcher only gained access to 231 files instead of 333 files; having more files to assess could have increased the power of the evidence of this study. Time and financial constraints also limited the researcher from including more research sites to increase the validity of the evidence and recommendations. The researcher also contended with poor record keeping of documents by both medical and nursing staff. As the data were taken from hospital records retrospectively, there was a possibility that the cause of death in some neonates was not properly diagnosed and that errors may have crept into the hospital charts.

## Conclusion

The current study considered avoidable factors and identified factors related to HCP was responsible for neonatal deaths at this national hospital in Namibia. Various avoidable HCP-related factors contributed to the neonatal deaths. Therefore, this study concluded that most neonatal deaths arise from the actions or inactions of the HCP and could be avoided.

## Recommendations

Therefore, the results of this study warrant the implementation of a neonatal resuscitation education programme for healthcare providers. Workshops about the importance of record keeping at the participating hospital should also be carried out, as the study noted that aspects of care, such as duration of resuscitation and nature of drugs given, which should be addressed during in-service education sessions were not recorded.

**Acknowledgements** The researcher would like to thank the Mo HSS for the provision of a study leave with full benefits while engaged in this study.

Declarations: The researcher declare no conflict of interest

Funding: None

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