







Challenges Faced by Midwives who Care for Neonates in Neonatal Intensive Care Units of Public Hospitals in Limpopo Province, South Africa

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Abstract:

Background: Providing quality neonatal care is one of the most challenging healthcare service issues globally. Ensuring quality care during pregnancy and delivery is paramount to improving health outcomes and reducing mortality among neonates. About 2.9 million neonatal deaths occur worldwide, accounting for 40% under 5 years' deaths. Midwives in the neonatal intensive care units of public hospitals in Limpopo province encounter challenges such as shortage of staff, inadequate and malfunctioning equipment, *etc.* when rendering care to small and sick neonates.

Objective: The purpose of this study was to explore and describe the challenges encountered by midwives who provide care to neonates at neonatal intensive care units of Public hospitals in Limpopo province, South Africa.

Methods: A qualitative, explorative, descriptive and contextual research designs were used. A non-probability purposive sampling was employed to select twelve (12) midwives who constituted the sample. The sample size was not pre-determined, however, it was determined by data saturation. Data were collected through one-on-one semi-structured interviews using an interview guide. Tesch's eight steps were utilised to analyse data wherein themes and sub-themes emerged.

Results: The results revealed that midwives encounter several challenges such as shortage of staff, inadequate infrastructure or structure of NICU, work overload, lack of equipment and supplies, *etc.*, when providing care to neonates in NICUs of the public hospitals.

Conclusion: The study recommended the implementation of hiring additional staff, staff training in neonatal care specialty and short courses, renovations of NICUs, consistent provision of equipment and material resources to improve the quality of neonatal care and reduce neonatal mortality.

Keywords: Midwives, Neonates, Neonatal intensive care unit, Neonatal care, Quality of care, Hospitals.

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1. INTRODUCTION

Midwives incorporate a fundamental component of maternal and neonatal health care delivery in countries such as South Africa. Nonetheless, the success and

efficacy of the health care services depend densely on adequate and skilled midwives and neonatal nurses [1]. The provision of quality care during pregnancy and delivery is paramount to improving health outcomes and reducing mortality among neonates [2]. However,

midwives in the Neonatal Intensive Care Units (NICUs) of public hospitals in Limpopo province encounter challenges when rendering care to neonates. About 2.9 million neonatal deaths occur worldwide, accounting for 40% under 5 years' deaths [3]. Poor quality care in NICUs is thought to be one of the factors for the slow progress in the reduction of neonatal deaths [4]. Furthermore, poor quality care is not just about the availability of resources in a health institution, nor is it just about the absence of services [5]. However, in South Africa, the midwives providing care to small and sick neonates usually lack experience and competence and this is aggravated by a shortage of midwives and a lack of training in neonatal care or speciality. The optimum midwifery services are among the most effective ways of rendering high-quality neonatal care, finally reducing neonatal mortality. More important, maternal health care plays a major role in neonatal health and outcomes [6].

Neonatal mortality is an important health issue in low-income countries, 44% of global deaths occur in these five countries of the world: Nigeria (7.2%), Pakistan (6.9%), China (6.4%), India (27.8%) and Democratic Republic of Congo (4.6%). In Brazil, the neonatal mortality rates were 11.1/1000 in 2011-2012 and 38.3% and 30.5% of these deaths occurred in the Northeast and Southeast regions, respectively [3]. South Africa is one of the developing countries with high NMRs which account for approximately 40% of all deaths under 5 years of age [3]. Reduction of neonatal mortality is one of the priorities of the Sustainable Development Goals and it is a major concern in Africa, including South Africa. In addition, the outcome of neonatal care in public hospitals reflects the evidence-based practice used and the overall quality of services provided. The Neonatal Mortality Rates (NMRs) in Limpopo province accounted for 48.3% during the years 2012-2013, and 2014/2015 mortality rates of 24.7 per 1000 live births were recorded [7].

The Limpopo Initiatives for Newborn Care (LINC) model was established in 2003. The aim was to assist healthcare workers including the midwives to improve the quality of care; however, the current neonatal mortality rates remain a considerable concern in the Limpopo Province [8]. Therefore, the current study attempts to explore and describe the challenges faced by midwives who care for neonates in NICUs of public hospitals, in Limpopo Province, thus improving the quality of care and reducing neonatal mortality rates. "The results of this study are expected to bring change and improvement in the quality of care provided to neonates at NICUs in Limpopo province and beyond". The findings from this study might increase the likelihood of desired neonatal health outcomes and identify the gaps in the knowledge of care of the neonates to be addressed. In addition, the findings will be useful for the midwives, neonatal-trained nurses and managers working in NICU to improve the quality of neonatal care and stimulate quality awareness among healthcare providers of maternal and neonatal care.

Regardless of the efforts to reduce the NMRs in the

NICUs of the hospitals under study through workshops, training programs for midwives, clear guidelines and recommendations set by the Saving Babies, World Health Organisation, Limpopo Initiative for Newborn Care and United Nations International Children's Emergency Fund, neonatal mortality remains a constant challenge in South Africa [6]. In spite of the high number of neonatal deaths recorded in Limpopo Province, to date, no research has been done on quality care provided to sick neonates [7]. The researcher identified a gap in many studies conducted in the past by [9-11], which pay attention to factors contributing to high neonatal mortality rates, not to the provision of quality care. Therefore, it is against this background that the researcher identified the need to explore and describe the challenges faced by midwives who care for neonates in NICUs of public hospitals.

2. MATERIALS AND METHODS

2.1. Research Methods and Design

A qualitative, explorative, descriptive and contextual research designs were adopted in order to explore and describe the challenges faced by midwives who provide care to neonates in NICU. Exploratory designs are concerned with establishing the facts to collate data and to gain new insights into the phenomena [12]. Descriptive design was utilized to describe the challenges faced by the midwives when providing care to neonates in the NICU.

2.2. Sampling and Sample

"The population comprised all midwives who were providing care to neonates at NICUs of the selected public hospitals of Limpopo province, South Africa. A non-probability purposive sampling was employed for this study to obtain the midwives who answered the research question under investigation. The sample size was determined by the data saturation which was reached with interviewing twelve (12) participants who gave their consent to participate in the study.

2.3. Setting

The context of the study was two (2) NICUs of the public hospitals (1 tertiary and 1 regional hospital) in Limpopo province, South Africa. The tertiary hospital receives the neonates transferred from the regional hospitals and district hospitals in the province. The tertiary and regional hospitals were selected because they offered neonatal intensive care to neonates. The midwives allocated in NICUs were selected because they held the same characteristics that were of interest to the researcher.

2.4. Data Collection

The researcher contacted the hospital management to request permission to conduct a pilot study after obtaining ethical clearance. The permission to conduct a pilot study was granted after submitting the ethical clearance, Department of Health permission and the proposal. The date to conduct a pilot study was agreed upon, and the researcher went to the field and conducted a study. The

purpose of the study and the visit was indicated to the midwives, who later gave verbal consent and a consent form was signed. A central question and two probing questions were rephrased after the pilot study to improve the clarity of the questions. Data were collected by the researcher at the NICUs of the public hospitals through one-to-one semi-structured interviews utilizing an interview guide. The interview guide was piloted on 5 midwives prior used for data collection for the main study. A central question asked to all participants was “*Could you please tell me about the challenges you faced when rendering care to neonates in your unit?*” The in-depth information was obtained through probing questions which were based on the participant's responses after the central questions were asked. Data collection was achieved by use of a voice recorder and writing of the field notes for capturing the non-verbal cues with the consent of the participants. The duration of the interviews was between 35 to 45 minutes. Data collection took place from December 2019 to February 2020 and was interrupted by the National lockdown due to corona-virus/ Covid-19 pandemic and it was resumed in August to September 2020.

2.5. Data Analysis

Data analysis was done utilizing the Tesch's eight steps in the coding process with the involvement of the independent coder [12]. The researcher listened to the audio recorder repeatedly to get a sense of the whole information and transcribed it verbatim. The researcher carefully read through the data a couple of times and got sense of the whole concept of neonatal care from the interviewees' responses. The field notes and transcripts were read also to get a sense of the data. A list of all topics was made, and similar topics were clustered together as themes and sub-themes were developed. The process of determining themes was through identifying key issues from the abstract ideas that summaries the entity being researched [13]. The researcher and the independent coder reached consensus on the finalization of the themes and sub-themes during data analysis. The identified themes and sub-themes are presented in Table 1.

2.6. Trustworthiness of the Study

Measures to ensure trustworthiness were adhered to throughout the study to ensure the authenticity and accuracy of the study [13]. Transferability was ensured by providing a thick description of the phenomenon under study to allow the readers to have a good understanding of it and by the use of purposive sampling. Dependability was ensured by spending time with the participants until there was data saturation and by the involvement of an independent coder. Field notes, voice recorder and transcripts were kept of the entire research process and were made available to the supervisors as an audit trail to ensure confirmability. Furthermore, collected data was not shared with anyone who did not form part of the study. Credibility was ensured by gathering information from the participants without assisting them or being biased and by using, a detailed description of the methodology. In

addition, triangulation, which included audio recordings of semi-structured interviews and field notes were used in this study.

Table 1. Themes and sub-themes.

S.No	Themes	Sub-themes
1	Challenges of midwives in neonatal intensive care units	1.1 Shortage of midwives. 1.2 Shortage of neonatal equipment and material resources in neonatal ICU (negative and positive feelings). 1.3 Inadequate neonatal unit infrastructure. 1.4 Increase in rate of nosocomial infection and neonatal mortality. 1.5 Increased workload. 1.6 Inadequate quality neonatal care due to lack of job training in NICU.
2	Feelings of the midwives regarding neonatal care.	2.1 Neonatal care described as hectic. 2.2 Working beyond the scope of practice
3	Suggested solutions to improve the quality of neonatal care	3.1 Training on neonatal intensive care speciality and on-the-job training. 3.2 Continuous monitoring of the neonatal units by the provincial Department of Health. 3.3 Adequate material and human resources in NICU. 3.4 Adherence to neonatal protocols.

2.7. Ethical Consideration

Ethical clearance was attained from the Turfloop Research and Ethics committee (TREC/80/2019: PG). Permission to conduct a study was granted by the Limpopo Department of Health (DoH) and the chief executive officers and nursing service management of the public hospitals. The purpose of the study was explained to the participants who gave verbal and written informed consent. Participants were informed that participation was voluntary. The privacy, confidentiality, and anonymity of participants were ensured throughout the study. Professional counselling was prepared beforehand, however, no participants suffered harm.

3. RESULTS

3.1. Presentations of Research Findings

Explorations of the theme and sub-themes on the challenges faced by midwives when providing care to small and sick neonates in NICUs of the public hospitals in Limpopo province are presented in Table 1.

3.1.1. Theme 1: Challenges of Midwives in Neonatal Intensive Care Units

“The participants maintained that they experience numerous challenges when providing neonatal care to small and sick neonates in Neonatal Intensive Care Units. The sub-themes emerged from this theme and are discussed below”.

3.1.1.1. Sub-theme 1.1. Shortage of Midwives in Neonatal Intensive Care Units

The results on the shortage of staff imply that the shortage of midwives is persistent although several

researchers recommended hiring additional staff to reduce the increased workload of the midwives. Most of the time a midwife was responsible for about four (4) neonates during the day and during the night only two (2) midwives nursed all the neonates in the NICUs with the assistance of other nurses without midwifery or neonatal training. Although nursing more than two (2) neonates on mechanical ventilators was not a recommendation for intensive care units, however, it was a practice. This was confirmed by the following quotes:

Participant 002 maintained: *"We are short staffed, you see that you can't just uh...uh. According to intensive care unit one-is-one (1:1) more especially nursing ventilated babies you can't nurse two (2), but it happens sometimes, you nurse a ventilated... like today I was nursing a ventilated baby with the other one who is on DuoPAP or sometimes maybe on nasal prongs"*.

Participant 0012: *"You find that sometimes we are just four (4) and babies are eight (8) sometimes they are ten (10), you find that one sister is nursing three (3) babies, others two (2)"*.

3.1.1.2. Sub-theme 1.2. Shortage of Equipment and Material Resources in Neonatal ICU

Midwives had different feelings regarding the availability of equipment and material resources. Some maintained that the equipment and material resources were adequate and functional whereas others concluded that there was a shortage and some of the available equipment were non-functional. The following quotes were indicated by the midwives:

Participant 004 stated that: *"Eish! The equipment at the moment... in ICU each baby must have their own monitor because in ICU each and every baby must have a monitor, so if you find that maybe we are 3 or 4 and if is 4 that means we are going to monitor 4 babies correctly the other ones must move during the vitals, it won't be continuous but if we are having 8 monitors that means it will be continuous because as ICU each one must have own monitor, so now at the moment we are having 4"*.

This was supported by participant 0010: *"A shortage of equipment, sometimes some of the equipment are malfunctioning, not working properly like sometimes you find that we want to put the baby in an incubator, you find that, that incubator is not warm and also the linen is not enough for us. Sometimes even the hand towels for drying our hands, but the soap is always available"*.

According to participant 0012: *"Sometimes we experience our equipment some are broken not working but they try their level best to check every now and then maybe to call those who have brought the machines to come and fix it and to come service it"*.

3.1.1.3. Sub-theme 1.3. Inadequate Neonatal Unit Infrastructure

Midwives expressed different views about the NICU infrastructure. Some believed that the structure was adequate, whereas others showed their dissatisfaction

with the NICU structure. The results revealed that the infrastructure or structure of the NICU was inadequate due to the number of babies admitted and transferred from peripheral hospitals. Moreover, it was indicated that sometimes they admitted beyond the unit capacity of nine (9) beds and during the era of COVID-19 it was worse because 1.5 m distance was required, and it was not possible due to the limited space.

This was supported by participant 001 who indicated that *"The space is small as well, so and when they are many the staff is very small, the movements are limited because the thing of 11 or 10 instead of 8, there must be a monitor, there must be suction, so when the mothers are coming to feed their babies the space is very small. Like now during this period of coronavirus the distance is not 1.5 m there will be a spread of infection"*.

Participant 007 indicated *"The space is not enough. Our unit is too small, like this time of COVID-19 because they say we should not be many. We are always many, nurses, doctors, and dieticians. Our unit doesn't have a linen room. We don't have a line room here, we don't have a sluice room in our unit, and we are using the other unit"*.

Participant 008 indicated a different view that *"Our infrastructure in ICU, the space is okay, I can say. ICU is 8-bedded, you find that there is a baby who needs to be ventilated. We put babies there when they are more than 8 and N1 (nursery) does not have medical air. We nurse sick babies in high care, sometimes they are forced to be nursed in the ICU because of space. We are okay with the space; the problem is we get more babies. The 8-bed for an ICU is okay, but the number of babies we receive... they are many."*

3.1.1.4. Sub-theme 1.4. Increase Rate of Nosocomial Infection and Neonatal Sepsis

Midwives expressed their dissatisfaction with the increased rates of nosocomial infections and neonatal mortality which they believed were caused by inadequate structure or space and delayed referral of neonates. Participants indicated that most of the deaths occurred because of inadequate NICU structure which had a negative impact on nosocomial infections. This was supported by the following quotes:

Participant 007 said: *"I think one of our challenges is late referral. Sometimes babies are referred very late. Some of them are born with multiple congenital abnormalities beyond our control. Those are some of the contributing factors to mortality"*.

Participant 0012: *"According to infection control, it must be 1.5 to 2 m apart but sometimes if we are having 10 it can't be, there would be cross-infection but if it is 8 bedded and it is 1.5 to 2 m it is okay"*. Participant 003: *"I have noticed there is an increased rate of infection, nosocomial infections. And the other thing is, we admit patients from other hospitals so most of them when they come the condition is very bad and the prognosis is very poor."*

3.1.1.5. Sub-theme 1.5. Increased Workload

Participants reported increased workload due to the increased number of admissions beyond the unit bed capacity which had an impact on the workload. They had to add extra beds to accommodate the new admissions who require intensive care services. This is indicated in the following excerpts:

Participant 0012 stated: *“The challenges we have, sometimes you see in neonatal intensive care unit you must nurse 8 babies, sometimes it happens that there are more than 8 babies”*.

Participant 004: *“Due to overflow of patients... sometimes you find that we are nursing eight (8) babies neeh, sometimes you find that they are ten (10) or they are twelve (12)”*.

Participant 006: *“We admit more than eight babies sometimes. We have extra oxygen points, if there is a push, we admit three, and you find that the total is eleven (11). Sometimes we admit 11 sometimes we admit 10 because this is a referral hospital. If there is a push, we admit”*.

3.1.1.6. Sub-theme 1.6. Inadequate Quality Neonatal Care due to Lack of Training in NICU

Midwives who are providing care to small and sick neonates in NICUs should undergo neonatal intensive care training. The majority of the midwives who participated in this study were not trained as neonatal intensive care nurses. Participants complained of a lack of neonatal intensive care specialties although they are working in NICU caring for critical patients. Other participants stated that they were only trained for LINC, however, they still needed a specialty because they are working in ICU or on LINC which is a short course for all midwives working in neonatal units. The following quotations support this perception:

Participant 0011 alluded that: *“Eh, if it was... you see us we are just trained for small neonates after delivery and the caring of that baby, there is no midwife who is specialised with neonates. There should be two (2) with a speciality so that we can nurse with them and then they have more knowledge than us. We only did LINC we didn't do the speciality of neonates, only midwifery with LINC. It is important to have a well-trained speciality nurse with neonates. At the moment we don't have, but due to the experience we have, and the training of LINC is then that we could manage the babies”*.

Participant 002 said that: *“Okay, the biggest problem here is that we are not neonatally trained. We do not have the speciality to work in Intensive Care Unit (ICU)”*.

3.1.2. Theme 2: Feelings of the Midwives Regarding Neonatal Care

The midwives felt that neonatal care was hectic and they also worked beyond the scope of practice indicated by the sub-themes following:

3.1.2.1. Subtheme 2.1: Neonatal Care described as Hectic

The midwives describe the neonatal care as hectic because sometimes they are very busy to the extent that they do not get the time to eat. This was supported by the following quotes:

Participant 0010 stated that: *“Sometimes while you are busy resuscitating that one, another aspirate in the nursery then you must... those who are in N2 (nursery 2) they must rush the baby to ICU because always there must be 4 sisters there then they must run”*.

Participant 0012 showed that: *“Regarding the care is just that this area is too hectic”*.

Participant 003 indicated that: *“As you go in that side is a kitchen even if we are seated there when there is an emergency we can come and assist but normally we don't go for tea at the same time, we relieve each other but you can find that two (2) is out, 2 is left but the ward is hectic we can see that we must just leave the tea and come and assist”*.

Participant 005 alluded that: *“Sometimes we are so busy in such a way that we can even knock off with our food not eaten”*.

3.1.2.2. Subtheme 2.2: Working beyond the Scope of Practice

The finding revealed that sometimes midwives have to work beyond their scope of practice in order to save the lives of small and sick neonates. Furthermore, they do the activities that are meant to be performed by doctors as their scope, pending the availability of the doctor. This is supported by the following quote:

Participant 0012 alluded that: *“Insertion of a drip is not our scope, but sometimes we do try to assist if you see that the baby is in a critical condition, so you have to assist”*.

Participant 005 stated that: *“Sometimes you find that the doctor is still busy in theatre and the baby needs a blood transfusion, we do give the first unit which is supposed to be given by the doctor, in order to save the baby's life.”*

3.1.3. Theme 3: Suggested Solutions Minimise the Challenges and Improve the Quality of Neonatal Care

Midwives pointed out their suggestions that they believed could improve the quality of neonatal care and reduce neonatal mortality rates.

3.1.3.1. Sub-theme 3.1: Training on Neonatal Intensive Care Speciality and On-the-job Training

Management of small and sick neonates requires extra training in neonatal intensive care and neonatal care. Midwives indicated the need for training on neonatal intensive care speciality and on the job training. The following quotes support:

Participant 0012 said that: *“Even if they don't train people for ICU but those that have experience and are*

interested to come and assist in neonatal, they need to be in-serviced, is just a matter of a day just to orientate people and we are on the way of living”.

Participant 009 supported indicating that: “If we can have enough equipment then maybe they hire 2 with the speciality of neonates and maybe they hire the speciality and yaah...”

3.1.3.2. Sub-theme 3.2: Continuous Monitoring of the Neonatal Units by the Provincial Department of Health

The participants expressed the need for unannounced visits by the Department of Health or peers in the hospital for observation, monitoring and support. The quote below supports:

Participant 003 said that: “Can I say the staff from the province to come regularly to check the service that is provided in each and every hospital, just to see if we are working within. Yes, because I think it will be much better and also if they can give us the report where we can improve so that we can do better next time”.

Participant 001 supported saying: “If we can have peer reviews, they just come without telling us that they are coming so that they may observe the true reflection of our situation, maybe their report to the management can bring changes”.

3.1.3.3. Sub-theme 3.3: Adequate Material and Human Resources in NICU

Participants suggested the provision of adequate material and human resources that will be compatible with the demand [10, 12, 13] to admit referrals and to provide care according to the intensive care unit ratio of at least 1:1. This is supported by the following quotes:

Participant 004 said: “I think if they can add more area and add staff to prevent shortage”.

Participant 009 stated: “Starting with resources if we can get enough resources Continuous Positive Airway Pressure (CPAP) and the circuits to put babies on ventilators, clean and sterile. I think there will be much more improvement and also hiring more staff and taking our sisters for training, it will be much better”.

Participant 005 indicated: “I can say eight (8) bedded, we need equipment, we must have enough equipment, such things”.

3.1.3.4. Sub-theme 3.4: Adherence to Neonatal Protocols

Participants recognized the paramount importance for them to adhere to the neonatal protocols, however, it was a challenge when neonates were many.

Participant 007 stated that: “Even when the midwives nurse two sick neonates on the mechanical ventilator or Continuous Positive Airway Pressure (CPAP), they should ensure that protocols must always be adhered to, however, when sick neonates are many, it is not easy or possible do follow the protocols”.

Participant 002 supported by saying: “And then you must eh...make sure that those two (2) are nursed according to the protocols, but if babies are more you can't do that”.

Participant 0011 said: “ I think if the doctors can develop some protocols and also update the available protocols to suit the current guidelines that could also assist us to work smoothly”.

4. DISCUSSION

The findings revealed that the main challenge influencing the quality of neonatal care in NICUS of the public hospitals in Limpopo province was the shortage of staff. This shortage of staff results in an increased workload of the midwives. All of the midwives who participated in this study felt that, given the workload at NICUs, there was an inadequate number of midwives on duty at any given time to deliver quality neonatal care. The shortage of midwives had a negative impact on the workload. The midwife-to-neonate ratio in NICU should be 1:2, and at least one midwife should nurse a maximum of two (2) neonates, however, that was not a practice. Due to a shortage of staff most of the time one midwife nurses a maximum of four (4) neonates on mechanical ventilators but still it was expected that quality neonatal care should be provided. Midwives could not provide quality neonatal care with an inadequate staff.

Another study concurs with the current study, which revealed that the impact of inadequate midwives was related to sub-optimal care as a result of increased workload [14]. Therefore, there is a need for the Department of Health to implement the hiring of more midwives for the provision of quality care and reduction of neonatal mortality.

Inadequate equipment and material resources in NICUs divulged in another study found to be affecting [15] the quality of care provided to small and sick neonates. There was also an indication of a lack of equipment and material resources such as incubators, monitors, medication, phototherapy lamps, ventilators, etc, of which most of them resulted in prolonged waiting time for neonatal care. Inadequate equipment and material resources compromise the competency of midwives when providing care to neonates [15]. Adequate equipment and material resources are of paramount importance in the provision of quality care in NICUs. Some of the midwives spoke negatively regarding the level of equipment availability.

The other problem was that there may be enough equipment but it was not always functioning as it should be and could not be used. Some of the midwives were satisfied with the available equipment because they didn't improvise a lot when providing care to neonates. Availability of functional equipment remains a challenge in the NICUs of the public hospital which impacts negatively on the quality of neonatal care. The findings align with that of another study which found that the challenges of the participants were around medical equipment that is not maintained, replaced, or repaired [16]. Therefore, a

shortage of medical equipment at the hospital occurred in the form of unavailability of equipment, low quality and poor maintenance of the few that were available which had an impact on neonatal care. Another study found that functional equipment and equipment distribution systems challenges were widespread [17].

The findings revealed that adequate and reliable spaces in the two (2) study sites were a challenge. Midwives had different feelings regarding the infrastructure or NICU structure. Some midwives felt that the infrastructure or NICU structure was adequate, and others felt that it was inadequate, however, all of the midwives complained of overcrowding of neonates. Overcrowding has formerly been described as a promotor of nosocomial transmission for several infections [18]. Both of the two (2) hospitals in the two districts of Limpopo Province had not more than a nine (9) bed capacity, however, sometimes more than nine and up to twelve neonates were admitted in NICUs. The findings of another study revealed that there is a need for having an adequate NICU structure for caring for small and sick neonates as crowded units lead to complications such as neonatal sepsis [19]. According to the participants, inadequate infrastructure and overcrowding of neonates had an impact on nosocomial infections and sepsis.

The midwives commented that they experienced an increased workload in the NICU due to the increased number of admissions beyond the bed capacity of 9 beds and due to a shortage of staff. Small and sick neonates are unpredictable, and their conditions can change at any given time. The neonate might change condition while the midwife is still busy with the other neonate, when the midwife notices the change in condition such as desaturation, she might rush to save the neonate's life without hand washing. However, if the midwife is allocated only one mechanically ventilated neonate, she will be able to notice whenever the neonate changes condition, even if she does not get time to wash her hands there will be no cross infection because she would be caring for only one neonate. This implies that if the midwife-to-neonate ratio is 1:1, the transmission of infection between neonates will be minimised. This also calls for the implementation of hiring more staff in NICUs.

A study that recently published recommendations for perinatal centres suggests a midwife-to-neonate ratio of 1:1 for neonatal intensive care, 1:2 for neonatal intensive monitored patients, which is those with non-invasive ventilation such as CPAP or blender, and 1:4 for neonatal special care [18]. Furthermore, caring for more than two (2) neonates by the same midwife clearly increases the risk of nosocomial infections. Midwives perceive the neonatal intensive care environment as hectic because most of the time they find themselves busy with neonatal care.

The majority of the midwives were not satisfied with the number of infections and mortality they experienced in their units. Most of the deaths occurring in the regional and tertiary hospitals were for neonates transferred from other hospitals as compared to the inborn neonates. A

complaint on delayed transfer to specialised hospital was emphasised as the major factor for mortality of transferred neonates. There is a need for the NICU transfer protocols to be revisited to align with the current situation or NICU environment. Transfer of small and sick neonates to a NICU for the provision of specialised care has been shown to improve the neonatal outcomes, however, if neonates' transfers are delayed, conditions may deteriorate further, and complications may arise. Nosocomial infections threaten the survival and neuro-developmental outcomes of neonates admitted to NICU and increase the cost of care [18]. One study found that transfers often occur outside of normal working hours and take place at short notice [20]. The findings contradict the findings of the current study.

The results divulged that most of the midwives allocated in NICUs were not trained in neonatal intensive care and short courses such as LINC however, they were expected to provide care to critically ill neonates. Furthermore, the enhancement of the in-service training was also revealed by the results. Midwives in the NICU need to be trained due to the fragile population of neonates they care for [21]. Moreover, it is important for them to be abreast with new developments and ground their neonatal nursing practice on the current evidence available. Other studies concur with the current study results, which indicate that even if midwives are exposed to neonatal care training as part of a course or program, they have to take part in continuous professional development to remain abreast of the changes and trends [21, 22].

Midwives felt that if their challenges could be addressed, the quality of neonatal care would be enhanced and neonatal mortality may be reduced. Midwives suggested that all midwives working in NICUs should be trained in neonatal speciality so that they do not apply their experience only in the provision of neonatal care. The study findings suggested that continuous unannounced visits and monitoring of the neonatal units by the Department of Health could assist a lot as they would be able to observe how the care is being provided and the challenges they face in NICU.

Midwives further suggested that the issue of inadequate human and material resources should be taken into consideration for the smooth running of neonatal care services. Adherence to protocols was also highlighted as the midwives believed it could also assist in the improvement of the quality of neonatal care. These cannot be achieved without adequate human and material resources including adherence to neonatal protocols. Furthermore, midwives felt that outdated protocols in NICUs should be updated. In addition, the formulation of the protocols for the management of other neonatal conditions that were without protocols should be considered. All good NICUs follow a protocol-based management of small and sick neonates for uniform standard clinical care [5]. Furthermore, consenting to follow the developed protocols serves as a catalyst for new ideas to improve neonatal care.

CONCLUSION

Shortage of midwives and neonatal nurses, equipment and material resources, inadequate neonatal unit infrastructure, increased rate of nosocomial infection and neonatal mortality and increased workload were perceived as the challenges encountered by the midwives. Training on neonatal intensive care speciality and on-the-job training, continuous monitoring of the neonatal units by the provincial Department of Health, adequate material and human resources and adherence to neonatal protocols were viewed as suggestions that can minimise the challenges midwives face in NICUs. Based on the study finding, hiring additional staff, availability and maintenance of available equipment and neonatal care training were recommended.

SUMMARY AND IMPLICATION TO PRACTICE

The study has divulged the need for neonatal intensive care and short courses training so that midwives who provide neonatal care can be addressed as neonatal nurses due to the neonatal qualification they acquired. The findings of this study will be useful for the midwives, neonatal-trained nurses and managers working to improve the quality of neonatal care and stimulate quality awareness among healthcare providers of maternal and neonatal care. The DoH and hospital management may also benefit by improving the policies and procedures for good-quality neonatal care. This research suggest that DoH and hospital management implement staff establishment and constantly provide adequate resources and equipment.

LIMITATIONS OF THE STUDY

The study findings are limited to neonatal intensive care units of the public hospitals of Limpopo province which were the study settings and may not be generalized to NICUs of the other provinces and the private sectors.

AUTHORS' CONTRIBUTION

M.G. M, a PhD. student at the University of Limpopo conducted the interviews during the data collection period and started the drafting of the manuscript, M.A.B. supervised the Doctor of Philosophy in Nursing and reviewed the manuscript. T.E.M and T.I R co-supervised the study and reviewed the manuscript and all authors approved the manuscript to be published in this journal.

LIST OF ABBREVIATIONS

CPAP	=	Continuous Positive Airway Pressure
DoH	=	Department of Health
LINC	=	Limpopo Initiatives for Newborn Care
NICUs	=	Neonatal Intensive Care Units
NMRs	=	Neonatal Mortality Rates
TREC	=	Turfloop Research and Ethics committee

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study involved human participants and ethical clearance for approval of the study was obtained from the

Turfloop Research Ethics Committee (TREC/80/2019: PG). Permission to collect data was granted by Limpopo DoH, district managers, chief executive officers and nursing managers of public hospitals. The participants provided their written informed consent to take part in this study.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Written informed consent was obtained from the participants for the publication data included in this article.

STANDARDS OF REPORTING

COREQ guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The raw data that support the findings of this study are available from the corresponding author [M.G.M], will be made available on request.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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