

Risk factors and Outcome of Neonatal Admission to Neonatal Intensive Care Unit in Governmental and Private Hospitals, Al-Madinah Al-Monawarah 2015

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ABSTRACT

Introduction: Various risk factors had been established to be associated with neonatal admission to the intensive care units. These risk factors are laid down in three key groups including maternal factors, fetal and delivery factors. The present study was undertaken to access the risk factors and the outcomes of admission to the neonatal intensive care units in the government and private hospitals in Al-Madinah Al-Monawarah, Saudi Arabia. The research entails collecting data from the records of the participant hospital in order to analyze and come up with the information to validate the hypothesis.

Materials and Methods: The present retrospective study was carried out among 349 neonates and their mothers who were admitted and either discharge or died in NICU at governmental and private hospitals in Al-Madinah Al-Monawarah. An abstract form was used by the researcher to collect the data documented in the medical record of the neonatal patients and their mothers. Demographic data, maternal and fetal risk factors, neonatal causes of admission to NICU were studied.

Results: 49.28% of the neonatal patients were admitted to NICU because of Respiratory distress syndrome. 43.27% due to low birth weight and 39.83% of neonates due to prematurity were admitted to NICU respectively, while neonatal seizures and birth asphyxia are responsible for (4.30%) and meconium aspiration syndrome is responsible for (0.86%) of neonatal admission to NICU. The risk factor of Parity has been noticed in multigravida having the higher risk than primigravida

(55.87%) and (44.13%) correspondingly. Cesarean section delivery reported as the highest delivery factor (53.87%), resuscitation in delivery room (53.58%), and low Apgar score after 1 min contributed with (31.23%), while nuchal cord and vaginal delivery with obstetric complications are the least delivery factors for neonatal admission to NICU (3.15%), (0.86%).

Conclusion: To ensure that the neonatal risk factors are eliminated or rather minimized, it is essential to make sure that the labor, delivery and after birth care should be commenced in a proper manner to avoid complications.

Keywords: Delivery; Maternal Factors; Neonatal Intensive Care Unit; Respiratory Distress Syndrome.

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INTRODUCTION

Any child below 28 days of age is referred to as a neonate. It is during this stage of life when the child is exposed to high chances of mortality and morbidity due to increased exposure to diseases. This increased exposure is a result of the inferiority of the immune system encountered during the extremes of age.¹

Neonatal intensive care unit (NICU) is a space area in the hospital where neonates who are in need of intensive medical attention are admitted for observation and treatment. It is in this area where one will find the highly sophisticated technology used to provide life

support and other medical services to the sick neonates. These units are also sub-divided into areas where babies who are not so sick but requires intensive nursing care can be admitted.²

The rate of admission of the neonates to the intensive care unit increases proportionately with the increase in some exposures to various disease agents. Apart from providing care for the sick neonates born at term, these facilities also provide care to the premature babies who are born below 37 weeks of gestation and those born with low birth weight even if they had reached term.

Low birth weight children are those who weigh less than 2.5kg. Other indications of NICU admissions include having medical conditions that require special care, for instance, heart diseases, neonatal sepsis, birth asphyxia, jaundice, meconium aspiration syndrome (MAS), and birth anomalies.³

Reports from various studies indicated that about 10% of all newborn babies born to adult mothers needed particular attention in intensive care units.⁴

Various risk factors had been established to be associated with neonatal admission to the intensive care units. In summary, these risk factors are laid down in three key groups including maternal factors, fetal and delivery factors.

Maternal risk factors include age, parity, history of diabetes, hypertension, vaginal bleeding, pre-eclampsia, drug or alcohol use, smoking, history of sexually transmitted diseases, multiple pregnancies, abnormal amniotic fluid, abruptio placentae and premature rupture of membrane (PROM).⁵ Whereas most of these factors are preventable at different stages of care, they are still the major determinants of neonatal admission to the NICU. This fact, therefore, provokes the need for further research on how these problems can be addressed.

It is also important that every player in the health sector has the political goodwill to help in the eradication of the challenges faced by pregnant mothers ranging from the prenatal, antenatal, labor, delivery and the postnatal period that puts the neonates at risk of ill health.

In 2015, a selected review collecting data about mortality rates of neonatal intensive care unit from more than 1865 article reported that the mortality rates ranged from 4 to 46% in developed countries and 0.2 to 64.4% in developing countries.⁶

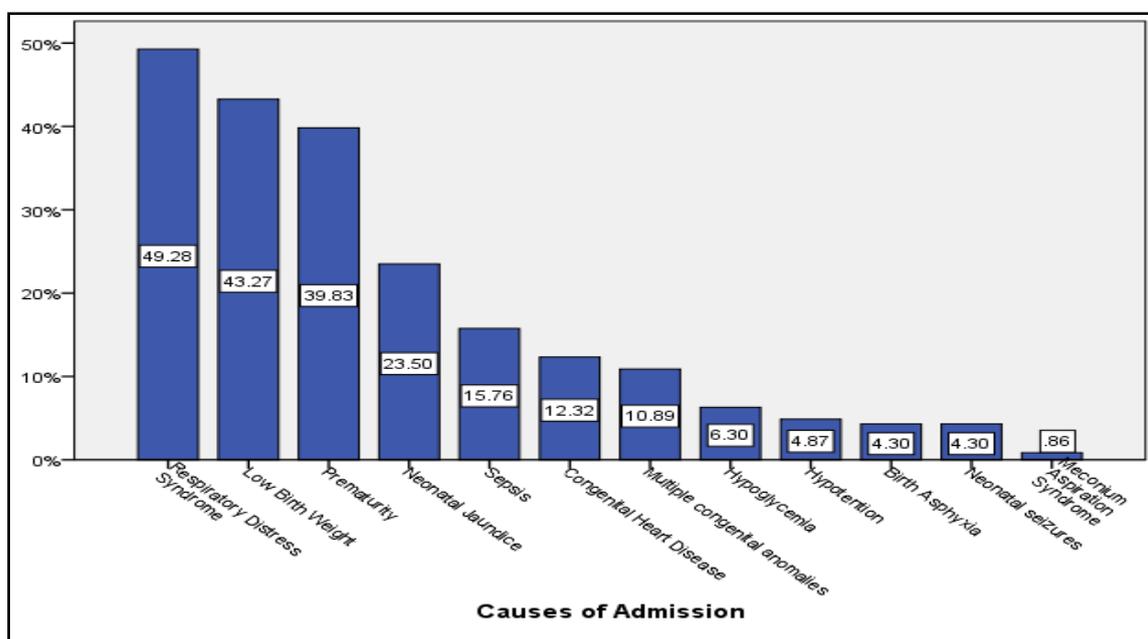
The present study was undertaken to access the risk factors and the outcomes of admission to the neonatal to the neonatal intensive care units in the government and private hospitals in Al-Madinah Al-Monawarah. The research entails collecting data from the records of the participant hospital in order to analyze and come up with the information to validate the hypothesis.

MATERIALS AND METHODS

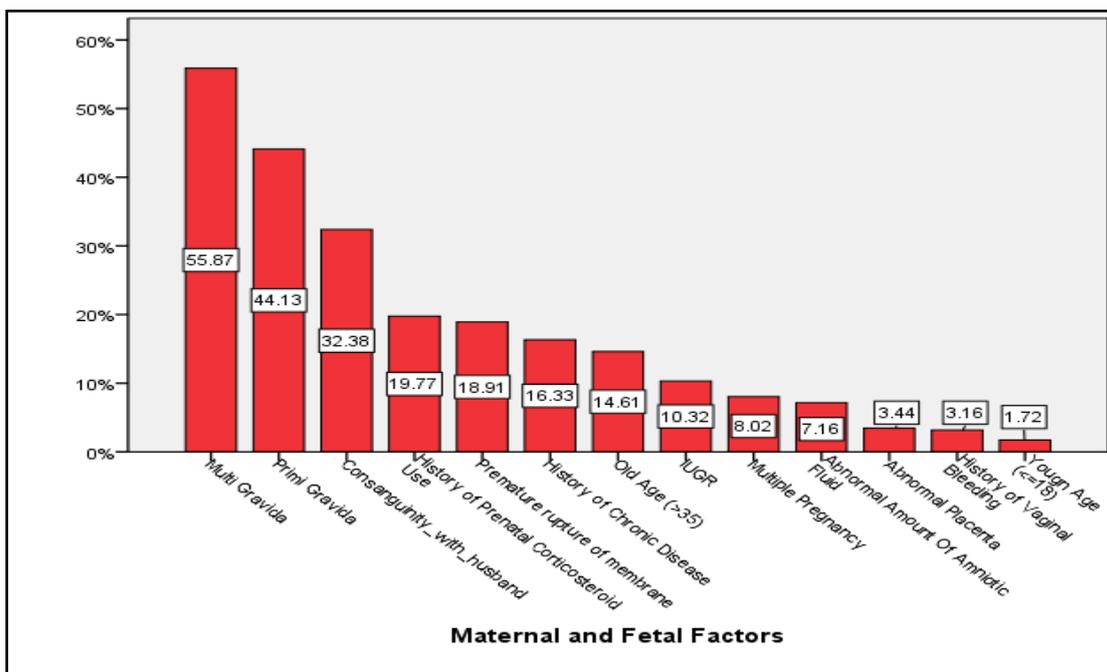
The present retrospective study was carried out at governmental and private hospitals in Al-Madina Al-Monawarah, Saudi Arabia. It was carried out in 4 hospitals; two governmental and two private hospitals. The study included all neonates and their mothers who were admitted and either discharge or died in NICU at governmental and private hospitals in Al-Madinah Al-Monawarah between January and December 2015. 349 neonates were selected for the study using multistage sampling technique was used. The sample was estimated by using Epi Info according to the total number of NICU admission in all hospitals (4134 patients), and putting into consideration, that the frequency is 50% to get the maximal sample size, 95% CI and power of 80%. Simple random technique was used to choose the patients from each hospital after putting them in separate sampling frames.

Ethical approval was obtained from the institutional review board (IRB) before study initiation. An abstract form was used by the researcher to collect the data documented in the medical record of the neonatal patients and their mothers. This abstract contained a list of prepared questions that were planned to obtain the data required to come up with the results that would inform policy development as far as neonatal care is concerned.

Neonates were the main participants of this study as they are the subjects affected by the research variables. Maternal and fetal risk factors(age, parity, consanguinity with husband history of diabetes, history of the maternal chronic disease, vaginal bleeding, multiple pregnancy, abnormal amniotic fluid, abnormal placenta, premature rupture of membrane and IUGR), delivery factors (outborn delivery, mode of delivery, meconium, fetal distress, nuchal cord, APGAR score after 1 minute and 5 minutes and resuscitation in the delivery room) and neonatal causes of admission to NICU (prematurity, LBW, RDS, sepsis, CHD, neonatal jaundice, MAS, congenital or chromosomal anomalies, hypoglycemia, birth asphyxia, hypotension and seizures) were studied. Data collected were analyzed using Statistical Package for Social Sciences (SPSS).



Graph 1: Bar diagram for Causes of neonatal admission to NICU



Graph 2: Bar diagram for Maternal & Fetal factors

RESULTS

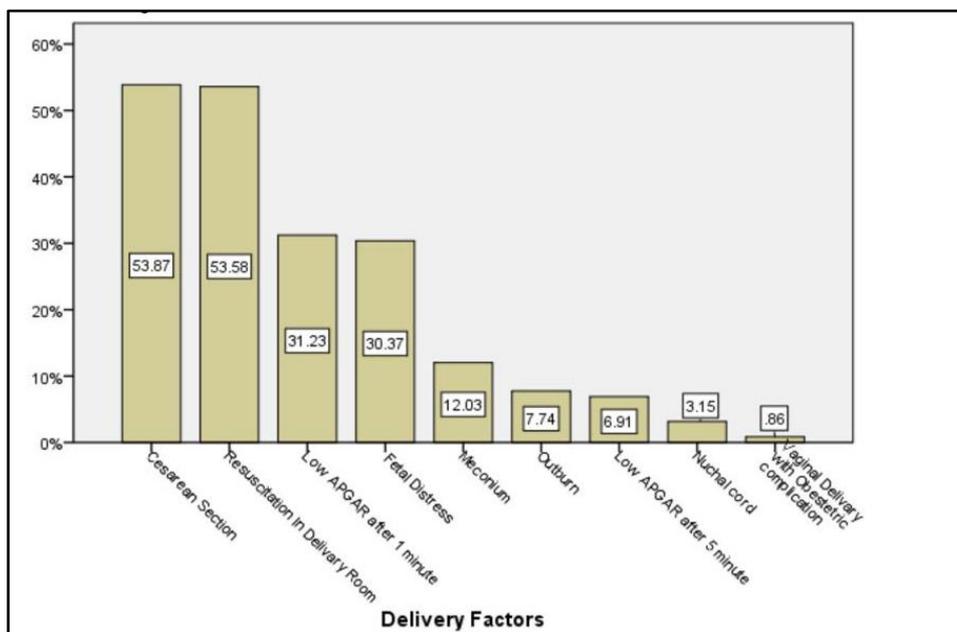
Graph 1 shows that 49.28% of the neonatal patients were admitted to NICU because of Respiratory distress syndrome. There are also some other causes such as low birth weight and prematurity which are causing 43.27% and 39.83%, of neonates to be admitted to NICU respectively, while neonatal seizures and birth asphyxia are responsible for (4.30%) and meconium aspiration syndrome is responsible for (0.86%) of neonatal admission to NICU.

The risk factor of Parity (graph 2) has been noticed in multigravida having the higher risk than primigravida (55.87%) and (44.13%) correspondingly. While Consanguinity with husband has been seen in the case of (32.28%) of patients, the other noticeable risk factors are PROM (18.91%) and history of the maternal chronic disease (16.33%). While Maternal Age showed a wide difference between young and old maternal age, we find that

(14.61%) were maternal age more than 35, and (1.72%) 18 years of age and younger. Lastly, abnormal amniotic fluid, abnormal placenta, and history of vaginal bleeding are the least causes of neonatal admission to NICU (7.16%), (3.44%) and (3.16%).

Graph 3 shows that cesarean section delivery reported as the highest delivery factor (53.87%), resuscitation in delivery room (53.58%), and low Apgar score after 1 min contributed with (31.23%), while nuchal cord and vaginal delivery with obstetric complications are the least delivery factors for neonatal admission to NICU (3.15%), (0.86%).

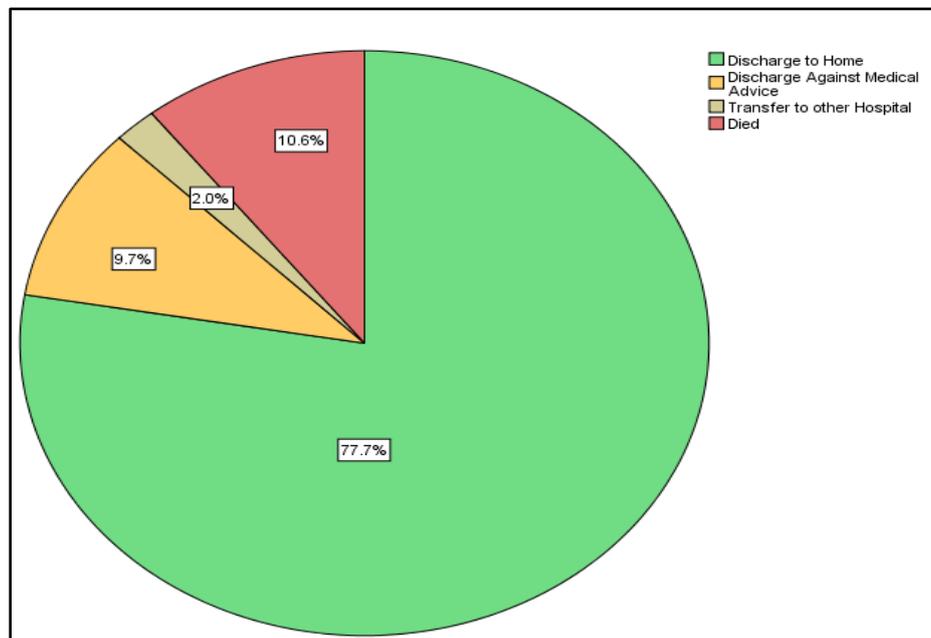
Table 1 and graph 4 shows descriptive analysis of neonatal outcome after admission to NICU. 77.7% of the admitted neonatal patients discharged to home, and the other is either discharged against medical advice (9.7%) or transfer to another hospital (2%). But 10.6% of the neonates died after admission.



Graph 3: Bar diagram showing delivery factors for neonatal admission to NICU.

Table 1: Descriptive analysis of neonatal outcome after admission to NICU

Outcome	Frequency	Percent
Discharge to Home	271	77.7
Discharge Against Medical Advice	34	9.7
Transfer to other Hospital	7	2.0
Died	37	10.6
Total	349	100.0

**Graph 4: Pie chart of neonatal outcome after admission to NICU**

DISCUSSION

The present retrospective record review was carried out to evaluate the neonatal causes for admission to NICU in governmental and private hospitals and to predict maternal, fetal and delivery factors for these admissions. Also, this study was done to determine an outcome of neonate after admission to NICU. Besides, it compares between governmental and private hospitals regarding neonatal causes, risk factors and outcome of neonatal admission to NICU.

The data collected and analyzed was used to answer all the above as a way of providing the solutions to the high number of deaths that arise amongst the neonates as a result of the many risk factors that lead to admission to the NICU.

The first objective of this study was to determine causes of neonatal admission to NICU. After investigating all neonates admitted to NICU (n=349) the researcher found that RDS stood at the top of the list with an aggregate percentage of (49.28%). The literature review also shows respiratory complication is the leading causes of admission. Other very close causes include LBW, prematurity, neonatal jaundice, neonatal sepsis, and congenital anomalies which is very close the result of a study done before.³ Some of the factors that are thought of being fatal including birth asphyxia and MAS were found to be the least causes of neonatal admission to the intensive care unit. Birth asphyxia management through resuscitation is always very successful and thus associated with the least number of admissions. Most of the asphyxiated babies are admitted to the new unit for observation, and most are eventually discharged in a very healthy state. There

has been a very close association between MAS and birth asphyxia as most of the neonates who have been exposed to different grades of meconium are often born with asphyxia.

On the other hand, the relationship of the husband and the neonate's mother is found as the major cause of maternal risk factors for neonatal admission to NICU. This is often referred to in science as consanguinity of the mother with the husband. This research found that consanguinity contributed 32.38% of all the admissions to the NICU. In a study performed earlier in Saudi Arabia, the same topped the list with an overall outcome of 53.4%. Among these were 31.4% of the first cousins and 22.9% composed of the marriage with other relatives.⁷ Unfavorable outcomes except prematurity and LBW were recorded in consanguineous marriages in all the pregnancies that were studied with the result standing at over 50%. Research has shown that most of the neonatal and infant deaths are mostly associated with consanguineous marriages. Perinatal, infant and neonatal mortality were recorded at 62%, 60.3%, and 57.9% respectively. At this time, the difference between the unrelated marriages and total consanguinity in the perinatal and death categories were significantly found to be 0.05.⁸ This supports the high effect that is still being witnessed at the current research done in the same country where it is still the largest cause of neonatal admission to NICU. Several other factors including PROM, history of chronic diseases as well as all the factors that lead to IUGR were found to be among the highest contributors of neonatal admission to the NICU.⁹

Maternal complications during pregnancy, for example, those that are related to placental abruption remains least associated with the various causes of admission to NICU. This can be attributed to the fact that these factors have been put to book and can always be managed when they arise to prevent further damage that could arise and harm the neonate.

The major contributors of neonatal admission to NICU delivery by cesarean section, neonatal resuscitation at the delivery room among others. The factors include fetal distress, meconium stain, outborn, nuchal cord and obstructed labor.

Most of the causes were found to be having great associations with a significant number of risk factors to the admission of neonates. However, the degree of association varies, and therefore the tendency of developing a cause specific to given risk factor varies amongst the risk factors themselves.

The delivery factors considered in this study are the type of delivery either cesarean section or vaginal delivery with obstetric complication, resuscitation in the delivery room, fetal distress, meconium stain and nuchal cord. All of the above factors have a different degree of association with neonatal admission to NICU.

In a nutshell, discharge to home on regaining full health contributing 77.7%, discharge against medical advice (9.7%), referral to other facilities (2%) and death (10.6%) are the major outcomes of neonatal admission to the health center. This study entailed following the neonate as the sample right from inclusion to recovery, death regardless of whether the neonate was transferred to another facility or not. This was guided by the fact that the theoretical framework recognized that the environment has no much impact on the outcome of the neonatal admission. According to this research, there are various factors that predict the outcome of the neonatal admission amongst the documented causes.

In a research conducted by the world health organization, more than half of the approximately 7.5 million infant deaths in the world occur in the first four weeks after birth. With further analysis of figures, they noted that most of these deaths happened in the developing regions, most probably due to the low levels of care. In the developing nations, the neonatal mortality rate was found to be six times that of the developed countries, and in the least developed countries, the number is often eight times larger. In developed nations like the United States, there is increased access to NICU facilities where sick neonates can receive surfactant therapy and antenatal corticosteroids, and consequently, have a better chance of survival.¹⁰

According to WHO, infant mortality rate is an important indicator of how effective healthcare of a country or a region is. It also helps in the evaluation of the various factors that interplay to facilitate the admission of the neonates to the intensive care units. This factor includes the environmental factors and socioeconomic status of the people living in the target population. It is therefore important to note that the reduction in the infant mortality rate is an indication of an improved socioeconomic status of the individuals as well as the overall improvement in health care delivery and quality of services. Understanding of causes of neonatal death and changes in mortality rates is essential for prenatal counseling, making decisions, quality control and improvement in management.¹⁰

In a study carried out in 2006 in Saudi Arabia, they found that the infant mortality rate had declined to a total of 22 deaths per 1000

live births. In this study, the leading causes of neonatal mortality were related to perinatal and postnatal conditions. They, therefore, recommended that in the efforts to reduce the infant mortality rate, it was important to focus on eradicating the causes of neonatal mortality which accounted for 50-70% of the deaths that occurred in infancy. The researchers' findings raised a concern about the significance of developing adopting simple low-cost interventions even outside NICUs as, in their report, most of the deaths were due to prematurity, birth asphyxia, and sepsis; and those conditions are preventable and can be controlled via low-cost interventions available everywhere without being necessarily admitted a NICU.¹¹

Further reports showed the mortality rate was reduced from 90 in 1990 to 46 deaths per 1,000 live births in 2013.¹² This was a great move towards the attainment of the millennium development goals which had been reviewed and branded standard development goals (SDGs). SDGs outlined by the United Nations in 2005 required that by the year 2015, the mortality rate of children under five years should be reduced by 60%. This reduction targeted 40% of the deaths that occurred during the neonatal period which was further broken down to 75% occurring during the first week of life and 20-45% occurring during the first 24 hours after birth.¹³ The researchers described these figures as those obtained by keen analysis of both the crude mortality rates and the case fatality rates and harmonizing the data to the above provisions.

The main limitation of this study was attributed to the filing system. Data were collected from paper files rather than electronic records. Therefore, the process was time-consuming and not very accurate. Some data were also missing during the data-collection process. Some hospitals still use the paper system rather than an electronic, leading to a very prolonged and exhausting process for collecting data. The second main limitation was related to some hospital policies. Some hospitals refused to give us access to collect data from their files, whereas others did not accept data collection for the matter patients' privacy. This study digs far and wide in an attempt to bring this problem that is being witnessed in current Saudi Arabia to book. Most of the hospitals still find it an issue that needs exceptional attention to reduce the overall mortality and morbidity of the neonates in the health facilities.

The researcher, therefore, recommends that in a bid to attain the standard development goals outlined by the United Nations organization, it will be essential to address the factors that endanger the life of the neonates. The number of maternal visits to the antenatal clinic during pregnancy should be revised by the world health organization in order to schedule different visits to the mothers who have high-risk pregnancies that have always remained a threat to the health of the neonates. Among these mothers are those living with chronic illnesses including hypertension, diabetes and HIV/AIDS. Nursing care modality adopted from the care of both the mother and the neonate on admission to the hospital should develop in such a way that the care meets the intended demand according to the needs of the clients. A patient-centered modality should be the first option by every facility that is offering ICU facilities.

CONCLUSION

Maternal factors majorly associated with neonatal admission were found to be consanguinity with the husband, premature rupture of membranes among other important factors. The factors

predispose the baby to various health risks that warrant admission, for example, respiratory distress syndrome and sepsis. To ensure that the neonatal risk factors are eliminated or rather minimized, it is essential to make sure that the labor, delivery and after birth care is done in a proper manner to prevent any complications that may arise. Hygiene before and after delivery should be the epitome of any activity to reduce the likelihood of introducing micro-organisms to the body of the neonates as they have an inferior defense system.

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