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IAA Journal of Scientific Research 10(3):41-54, 2023. ISSN: 2736-7319

Factors Affecting Neonatal Sepsis Prevalence in Babies Receiving Care at the Kampala International Teaching Hospital in Bushenyi District, Western Uganda

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ABSTRACT

The study aimed to identify factors contributing to neonatal sepsis among neonates attending KIU-TH in Bushenyi district, Uganda. A cross-sectional and quantitative study was conducted, interviewing 80 mothers/caretakers of neonates. The majority (71%) were aged 12-35 years, while 28% were aged 36-50 years. Only 10.3% of mothers reported receiving antibiotics before delivery, with 89.7% not receiving them. All those who received antibiotics received them within less than four hours. Additionally, 24.4% of babies' cords were cut using unsterile scissors, while 27% used sterile scissors. Only 5.1% had invasive procedures before sepsis. The study suggests that mothers should be educated on the dangers of using unsterile scissors and washing hands before holding or feeding their neonates to reduce the risk of infection. Unwashed hands can harbor germs responsible for neonatal infections, making it crucial to wash hands before handling or feeding the neonates.
Keywords: prevalence, neonatal sepsis, neonates.

INTRODUCTION

Neonatal sepsis has been defined in different ways by different researchers. Neonatal sepsis refers to the infection occurring within the neonatal period which is with in the first 28 days after birth for a term baby and up to 4 weeks beyond the expected date of delivery in a preterm bay [1]. It can also be defined as the clinical syndrome characterized by the blood stream infection of the neonates and inflammatory response mounted by the neonate. It usually presents as septicemia, pneumonia, meningitis and rarely as urinary tract infection. Superficial infections like oral thrush and pustules are termed as local infection [3].

The word sepsis was derived from a Greek work PUTRID which refers to the decomposition of organic matter in presence of bacteria. The term was introduced by Hippocrates in the 4th century. Hippocrates viewed sepsis as the dangerous odiferous biological decay that occurred in the body of human beings. Galen (129-199 AD) was a prominate Roman physician of Greek origin who was also well revered for his historical figures in the study of the theories of sepsis.

Depending on the time of onset of the disease neonatal sepsis is classified as early onset sepsis that is starts within 48 hours after birth [4]. In early neonatal sepsis the bacteria ascend from the birth canal and invade the amniotic fluid. The fetus is secondarily infected because the fetal lungs are in direct communication with the amniotic fluids. The infants have pneumonia and secondary bacteremia/septicemia. The risk of early neonatal sepsis increases if there has been prolonged labor and premature rupture of amniotic membranes, and when chorioamonitis is clinically evident like when the mother has fever, presentation with respiratory distress and temperature instabilities [5]. Late onset sepsis which starts after 72 hours after birth. It is usually due to the nosocommially acquired organisms hence being called Health care acquired infection [4, 6]. In intensive neonatal care unit, the main causes of sepsis include in dwelling central venous catheter for parenteral nutrition, invasive procedures which break the protective barrier of the skin and tracheal tubes. Coagulase staphylococcus is the most

common causing pathogen [5]. The main causes are indwelling central venous cat Majority of the Late onset sepsis occurs in premature neonates that is below 37 weeks of gestation and in low-birth-weight babies below 2500grames. The incidence of late onset sepsis ranges from 16 to 30% and approximately 50% in neonates born with less than 1000 grams [7].

Neonatal mortality and morbidity have remained high in most developing countries and are affecting their attainment their Millennium Development Goal (MDG) 4. A study by Wardlaw et al, 2014 indicated 2.8 million neonatal deaths occur globally accounting for 40% of the death in the under 5 years of age. They indicated that if the situation was to continue in all countries, it would still be impossible for the world to accomplish the target of cutting the neonatal death by 2/3 by the year 2026 [8].

METHODOLOGY

Study approach and design

A cross section qualitative [9] and quantitative study will be used to determine the factors contributing to the prevalence of neonatal sepsis among neonates who attend KIU-TH in Bushenyi western Uganda in which mothers with neonates will be interviewed. A quantitative research attempts to establish statistically significant relationships, addresses questions by measuring and describing which is based on objective measurement and observation and is concerned with correlation and causation [10]. Also, across sectional quantitative study will ascertain the number of neonates attending KIU-TH with neonatal sepsis and those at a risk of getting neonatal sepsis, since its relatively quick, economical, and easy to manage [11].

Study area

This study will be conducted in KIU-TH in Bushenyi district, Ishaka-Bushenyi municipality western Uganda where almost all neonates from around are admitted due to different conditions.

Study population and selection criteria

The study will be conducted among the neonates admitted in KIU-TH.

Inclusion criteria

Inclusion criteria refers to the are set of predefined characteristics used to identify the subjects who will be used in the research study [12]

Neonates attending KIU-TH whose mothers have consented will be included in the study.

Exclusion criteria

These are standards set before the study and these standards are used to determine whether the individual should be excluded from the study [13].

Mothers who will decline taking part in the study and those that will partial information required for the research will be excluded from the study.

Sample size determination

Determination of sample size will be by Kish Leslie (1965) formula.

$$n = \frac{Z^2P(1-P)}{E^2}$$

Where:

n= Estimated minimum Sample size.

Z =1.96 for 95% Confidence interval.

P = Proportion of a characteristic sample (18.2%) (Uganda maternal and newborn health disparities, country profile 2015)

E = Margin of Error (E = 5%)

$n = 1.96^2 x (0.182) (1-0.182) / 0.05^2$

n = 228 neonates

Sampling procedure

Sampling is the process of selecting a proportion of the population to represent the entire Population so that inferences about the population can be made. A simple random sampling will be used.

Data collection methods and procedures

Burns and Grove [13], assert that data collection could be defined as the procedure of gathering data from the participants. Data will be collected after obtaining consent from the hospital administration, the head of department of pediatrics and the mothers of the neonates. Open structured questionnaire will be administered to the mothers and will be guided on how to fill them. I will be around during data collection so that in case data collectors encountered a problem it would be solved immediately.

Data analysis

Data analysis is the process of cleaning, transforming, inspecting and modeling data with the goal of uncovering valid

information, support decision making and suggest conclusions [14]. Data analysis will be done in consultation with my supervisor and with help of data analysts. Variables will be cross-tabulated using Bivariate and multinomial logistic regression models, and results will be presented in simple frequency tables, pie charts and graphs, central tendencies, dispersion and rank correlation coefficients.

Ethical consideration

Study will be conducted upon approval by the supervisor. This shall be followed by obtaining of a letter of introduction from the office of the Dean faculty of Clinical Medicine and Dentistry of Kampala International University Western Campus which will then be presented to the Hospital management upon arrival at the facility. I will then seek permission from the hospital management to be allowed to proceed with the research before embarking on data collection.

The participants shall be explained to, the importance of their participation in the study and possible benefits of the findings to their communities. The investigator shall also take measures in obtaining informed consent from the participants by giving them consent forms to fill before taking part in the study and ensuring that the freedom, dignity, confidentiality and autonomy of the participants as independent human beings will be respected allowing for willful joining and exit from the study [15]. I will not use any coercive methods or intimidation or any rewards in the process of obtaining data from the participants.

RESULTS

A total of 80 mothers/caretakers of neonates attending at KIU training hospital in Bushenyi district were interviewed. Seventy one percent (71%) were in the age group 12-35 years, 28% were in the age group 36-50 years and the rest were above 50 years as represented in the figure 1 below.

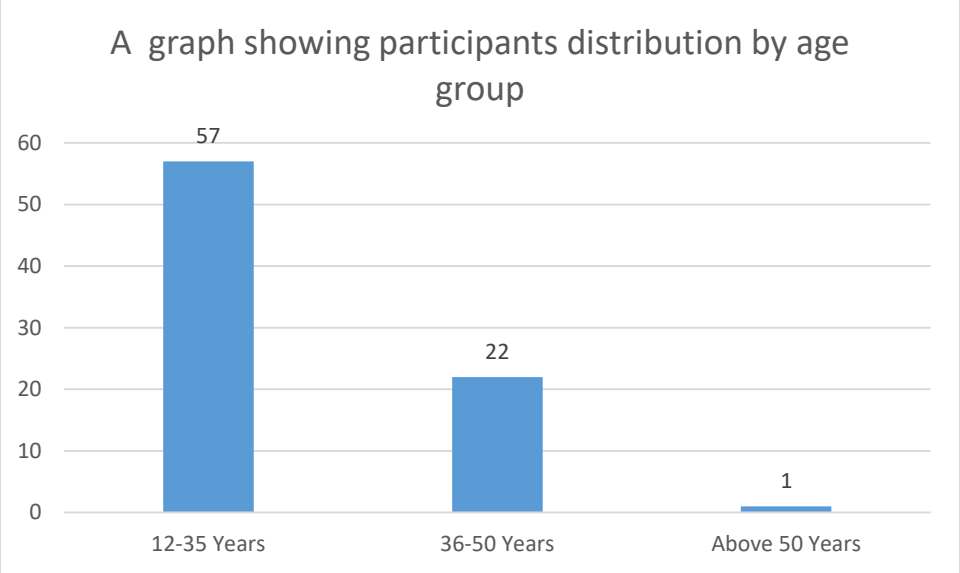

Figure 1: Participants' distribution by age group.

Majority of the respondents never went to school or stopped in primary level represented by 38.8% and 35% respectively. A few participants at least had secondary (17.5%), tertiary (6.3%), and university (2.5%) levels of education. Majority of the respondents were housewives (47.5%) and farmers (37.5%). A few respondents were traders (6.3%), 6.3% reported being unemployed and only 2.5% were doing other economic activities. Over seventy percent of the respondents reported being married, and 27% were

single mothers whereas 2.5% were widowed as shown in table 1 below

Table 1: Key Demographic characteristics of participants

VARIABLE	FREQUENCY	PERCENTAGE (%)
EDUCATION		
Never went to school	31	38.8
Primary	28	35.0
Secondary	14	17.5
Tertiary	5	6.3
University level	2	2.5
OCCUPATION		
House wife	38	47.5
Farmer	30	37.5
Trader (business women)	5	6.3
Other	2	2.5
Unemployed	5	6.3
MARITAL STATUS		
MARRIED	56	70.9
DIVORCED	21	26.6
WIDOWED	2	2.5

Majority of the mothers had 1-2 parity comprising 70%, while 5%, and 25% had 3-4 and >5 parity respectively. More than half of mothers had drainage of liquor before delivery 47 (59.5%) had membrane rapture 24 hours before delivery 57 (57.5%), and 41 (51.9%) received a greenish stained fluid from the vagina as shown in *table 4.2 below.*

Table 2: Maternal factors contributing to neonatal sepsis

VARIABLE	FREQUENCY	PERCENTAGE
PARITY		
1-2	56	70
3-4	20	5
>5	4	25
TEMPERATURE RECORDING (n=16)		
37.6-38.5	1	5.3
38.6-40	3	15.8
Above 40	4	21.1
Don't know	11	57.9
Drainage OF LIQUOR BEFORE LABOUR		
Yes	47	59.5
No	32	40.5
Duration from the rupture of membranes to delivery		
< 4 hrs	4	8.5
5-12 hrs	6	12.8
12-24 hrs	10	21.3
>24 hrs	27	57.5
MECONIUM		
Yes	41	51.9
No	37	46.8
Don't know	1	1.3

Thirty-six participants reported history of dysuria or pain on passing urine during pregnancy while 44 mothers also reported experiencing foul smelling vaginal discharge or amniotic fluid during pregnancy as shown in figure 4.2 below.

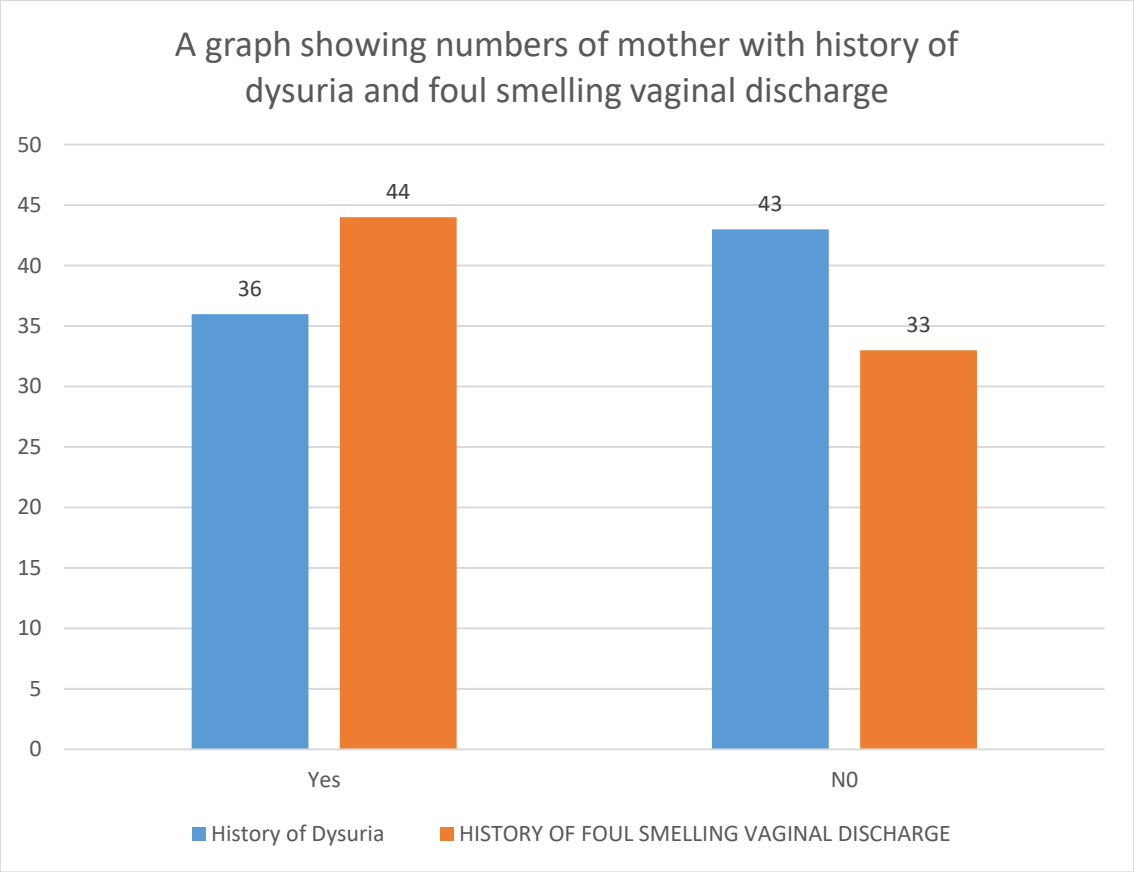

Figure 2: Number of mothers with history of dysuria and smelling vaginal discharge

Only 8 (10.3%) of mothers reported receiving antibiotics before delivery with majority 70 (89.7%) reported not receiving antibiotics prior to time of delivery. However, among those who reported receiving antibiotics, all of them received it within less than four hours before delivery. Additionally, 19 (24.4%) reported that the babies cord was cut using unsterile scissors while other 27% of mothers sterile scissors were used to cut the cord and only 5.1% of mother had invasive procedure before sepsis.

Table 3: Nature of services given to mothers before delivery

Variable	Frequency	Percentages
ANTIBIOTIC GIVEN BEFORE DELIVERY (n=78)		
Yes	8	10.3%
No	70	89.7%
TIME ANTIBIOTICS GIVEN (n=8)		
Less than 4 hours to delivery	8	100%
Greater than 4 hours to delivery	0	00%
What was used to cut cord after delivery (n=78)		
Sterile scissors	21	27%
Unsterile scissor	19	24.4%
Unknown	38	48.7%
Invasive procedures before sepsis (N=78)		
Yes	4	5.1%
No	74	94.9

Twenty (28) mothers reported a history of abdominal tenderness 3 days before delivery and also sixteen (16) mothers reported fever in 3 days before delivery. On the other hand, 51 (64.6%) and 63 (79.7%) did not experience fever and abdominal tenderness 3 days before delivery respectively as shown in figure 3 below.

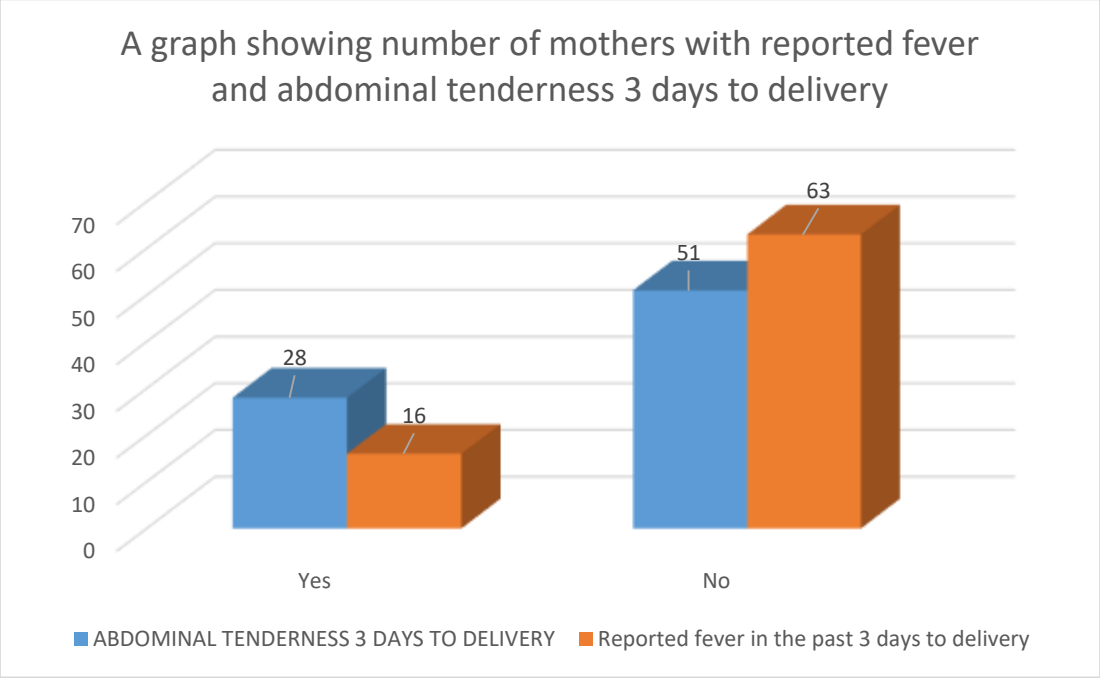

Figure 3: Number of mothers reporting abdominal tenderness and fever 3 days before delivery

Most of the neonates were males (74%) while only 26% were females. Over half (64.9%) of neonate were 0-7 days old with only 36.1% being 8-28 days old. Majority of

neonate were of birth order 1-2 (72.4%), followed by birth order 3-4 with 23.7% and a few babies were in birth order 5-7 (3.9%). The mean weight of neonate was 2.4 kg with majority of neonate in weight rage 1 to 2.5 kg and 2.6 to 3.5 kg constituting 57.3% and 33.3% respectively as shown in table 4 below.

Table 4: Composition of neonate's demographics

Variable	Frequency	Percentage
Child Birth Order		
1-2	55	72.4%
3-4	18	23.7%
5-7	3	3.9%
Age of child		
0-7 days	50	64.9%
8-28 days	27	36.1%
Sex of child		
Male	57	74%
Female	20	26%
Birth Weight (kg) (n=75)		
1- 2.5	43	57.3%
2.6-3.5	25	33.3%
Above 3.6	7	9.3%

Sixty four percent (64%) of participants reported that their children cried spontaneously after deliver, 34 % did not cry [Figure 4], while only 4% of participant did not know whether their babies cried or did not cry spontaneously. However, all of 34% neonates who did not cry were immediately resuscitated after birth. A few neonates 2 (2.7%), and 5 (6.5%) surgical invasive procedures and neonate central line prior to sepsis respectively. Majority 97% of neonate never had any conditions like umbilical and central venous line prior to sepsis as shown in table 5 below.

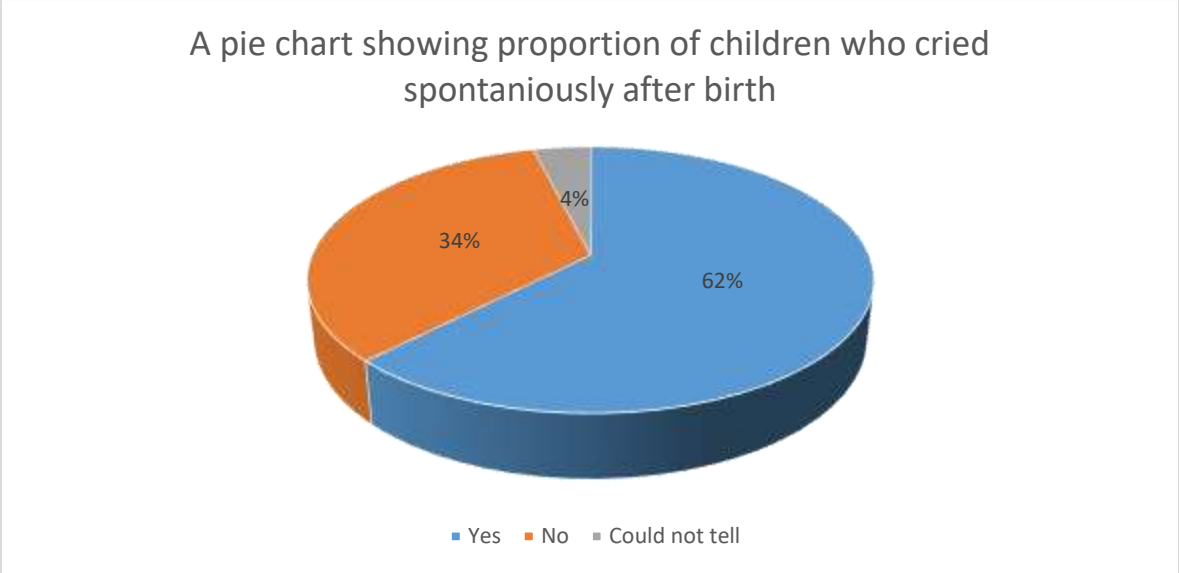

Figure 4: Proportion of Neonate who cried spontaneously after birth

Table 5: Neonatal conditions after birth

Variable	Frequency	Percentage
Baby cries after delivery		
Yes	48	62.3%
No	26	33.8%
Could not tell	3	3.9%
Neonate resuscitation		
Yes	26	100%
No	0	00%
APGAR Score		
At first minute	1	1.4%
At fifth minute	2	2.8%
Don't Know	68	95.8%
Baby surgical or invasive procedures		
Yes	2	2.7%
No	72	96%
Don't know	1	1.3%
Neonate conditions		
Inserted central catheter line	0	00%
Umbilical line	1	1.3%
Central Venous Line	1	1.3%
None	73	97.3%
Neonate central line		
Yes	5	6.5%
No	72	93.5%

Majority of mothers delivered from hospital 45 (58.4%), while the other 20.8% and 18.2% delivered from TBA and Private clinic respectively. More than half of participants (71.4 %) live in permanent houses with few living in semi-permanent and temporary housing structures as shown in Table 4.6. Majority of mothers delivered through SVD (74%) with a few 19 % and 4% delivering by C-section and AVD respectively as shown in figure 5.

Table 6: Participants place of delivery and housing type

Variable	Frequency	Percentage
Place of delivery		
Hospital	45	58.4%
TBA	16	20.8%
Private Clinic	14	18.2%
Other	2	2.6%
Housing type		
Permanent	55	71.4%
Semi-permanent	14	18.2%
Temporary	8	10.2%

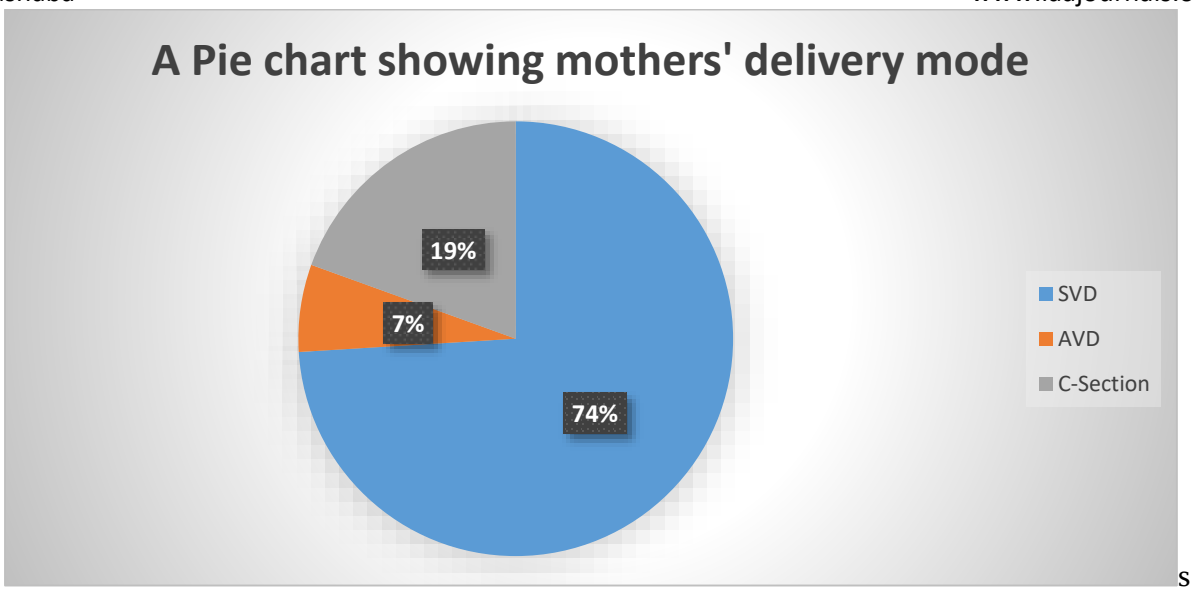

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Figure 5: Proportion of mothers by delivery mode

Majority of participants reported having toilets in their households 72 (93.5%) with only 5 (6.5%) reporting having no toilets. Only 20 (26.3%) reported not sharing a basin with the neonate and also less of than half participants (31.2%) reported washing their hands before handling the neonate as shown in table 7 below. However more participants reported collecting water from tap and well with Well 31 (40.8%) and 29 (38.2%) respectively. Other participants reported collecting domestic water from Borehole 8 (10.5%) and Swamp 8 (10.5%) as shown in figure 6 below.

Table 7: Sanitation practices among participants

Variable	Frequency	Percentage
Presence of toilet		
Yes	72	93.5%
No	5	6.5%
Sharing of basin with neonate		
Yes	56	73.7%
No	20	26.3%
Washing hands with soap before handling baby		
Yes	24	31.2%
No	53	68.8%

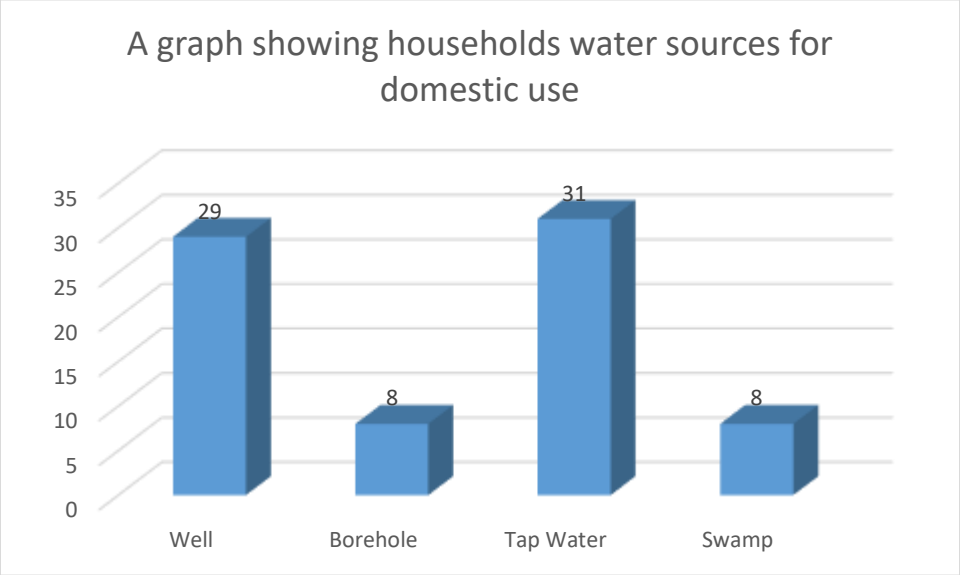

Figure 6: Domestic water collection sources

Majority (68.8%) of the mothers/caretakers reported that they do not wash hands with soap before handling babies and only 31.2% reported washing hands with soap before handling babies. Most of those who reported not washing hands with soap were less educated with 43.4% who did not attend school and 34% who stopped in primary school. Other participants who reported not washing hands with soap before handling babies had at least stopped in secondary (17%), tertiary (1.9%) or university (3.8%) levels of education. Over seventy three percent of the mothers/caretakers reported sharing basins with neonates of whom 37.5% reported not attending any level of school education and 35.5% reported stopping in primary. 19.6% reported stopping in secondary and only 7.1% reported attending tertiary education as shown in the table 8.

Table 8: Association between education and sanitary practices

	SANITARY PRACTICES			
	Wash hands with soap before handling a baby		Share a basin with the neonate	
EDUCATION	Yes (n=24)	No (n=53)	Yes (n=56)	No (n=20)
Never went to school	29.2% (7/24)	43.4% (23/53)	37.5% (21/56)	40% (8/20)
Primary	37.5% (9/24)	34% (18/53)	35.7% (20/56)	35% (7/20)
Secondary	16.7% (4/24)	17% (9/53)	19.6% (11/56)	10% 2/20)(
Tertiary	16.7% (4/24)	1.9% (1/53)	7.1% (4/56)	5% (1/20)
University level	00%	3.8% (2/53)	00%	10% (2/20)

Majority, 88.4 % (69/78) of the mothers/caretakers reported not cleaning the neonates' cord on every single day. Only 9% (7/78) reported cleaning the cord once each day and equal proportion (1.3%) reported cleaning the cord 2 times and more than two times each day. Participants with low levels of education (never attended school and primary) were more likely not to completely clean the cord each day represented by 36.2% and 37.7% $p<0.001$) respectively compared to participants with higher level of education (secondary, tertiary and university level) with 20.3%, 4.4% and 1.5% respectively as shown in table 9 below.

Table 9: Education and number times the cord is cleaned per day

	Number of times the cord is cleaned per day (Chi P<0.005)			
EDUCATION	None (n=69)	1 time a day (n=7)	2 times a day (n=1)	More than 2 times a day (n=1)
Never went to school	36.2% (25/69)	57.1% (4/7)	0%	100% (1/1)
Primary	37.7% (26/69)	14.3% (1/7)	0%	0%
Secondary	20.3% (14/69)	0%	0%	0%
Tertiary	4.4% (3/69)	28.6% (2/7)	0%	0%
University level	1.5% (1/69)	0%	100% (1/1)	0%

About seventy two percent of the mothers/caretakers of neonates were of parity 1 to 2, 22.7 % (17/75) were of parity 3 to 4 and the rest were of 5 or beyond. Majority (53.7%) of the participants with state of parity 1 to 2 had their neonates' weight between 1 to 2.5 kilograms. Whereas 29.6% of those with parity 1 to 2 had their neonates' weight between 2.6 to 3.5 kilograms, only 16.7% (9/54) had their neonates' weight above 3.6 kilograms. Over 45% (34/75) of the participants reported experiencing dysuria during pregnancy of which 58.8% reported their neonates' weight ranging between 1 to 2.5 kilograms. 26.5% of those who reported experiencing dysuria had their neonates' weight between 2.6 and 3.5 kilograms and only 14.7% reported had their neonates' weight over 3.6 kilograms. 56.8% (42/74) of the respondents a history of foul smell virginal discharge or amniotic fluid of whom 57.1% had their neonates' weight ranging between 1 to 2.5 kilograms compared to 28.6% of those whose neonates' weight ranged between 2.6 to 3.5 kilograms as well as those whose neonates' weight was 3.6 kilograms and above as shown in table 10 below.

Table 10: Neonates' weight and associated factors

	State of Parity			History of dysuria		History of foul-smelling vaginal discharge/amniotic fluid	
WEIGHT (Kgs)	1-2	3-4	>5	Yes	No	Yes	No
1-2.5	53.7% (29/54)	64.7% (11/17)	50% (2/4)	58.8% (20/34)	53.7% (22/41)	57.1% (24/42)	53.1% (17/32)
2.6-3.5	29.6% (16/54)	29.4% (5/17)	50% (2/4)	26.5% (9/34)	34.2% (14/41)	28.6% (12/42)	34.4% (11/32)
Above 3.6	16.7% (9/54)	5.9% (1/17)	00%	14.7% (5/34)	12.2% (5/41)	14.3% (6/42)	12.5% (4/32)

DISCUSSION

From the results of the study, it shows that 38.8% of the mothers never went to school and from the literature review it shows that mothers who are educated have greater knowledge of taking good care of their babies compared to the uneducated mothers. This explains why mothers who never went to school have the highest percentage however even some of those who went to school have their children have sepsis but this could be due to other reasons but not education level.

Table 3 shows that the mothers who did not receive antibiotics was high compared to those who received. Antibiotics are usually given as prophylaxis for the neonatal infection that's why the number of mothers who did not receive the antibiotics had the highest number of neonates with sepsis. The nature of the scissors used to cut the cord was also considered because it is one of the strongest risk factors for neonatal sepsis, however most have a sterile scissor used though there are also those on whom unsterile was used. Invasive procedures done before or during labor are risk factors however in the mothers it is clear that actually most the mothers never had the invasive procedures.

Figure 2 shows that the number of mothers who had this problem was high. Usually there is ascending infection from the maternal lower genital tract and this can cause infection to the unborn babies. that is why it is very important to give prophylactic antibiotics to mothers with infection prior to delivery to prevent spread of the infection to the unborn babies.

These are possible features of maternal infections like chorioamonitis and these can cause fetal infection. Figure 3 shows the results though the number of mothers who had this problem was less compared to those who had the problem. It is clear from the literature review that this is an important risk factor for the neonatal sepsis. And as such I would recommend that such mothers should get attention so that they can be given antibiotics and prevent neonatal infection.

From table 4 it is clearly shown that neonates of low birth weight had a high percentage and this is in agreement with the literatures review which showed low birth weight as a significant risk factor for neonatal sepsis. As well neonates with low birth weight had the highest percentage and as clearly stated in literature review there is strong relationship between neonatal sepsis and low birth weight.

From the literature review it was shown that mothers who delivered out of hospital had the highest risk for neonatal sepsis however according to the findings in my research shown in table 6 it does not agree with this. It shows that the neonates born in hospital actually have the highest percentage. May be the next research to be done should find out why the neonates born in hospital have sepsis yet it is expected to otherwise.

From Table 6 it shows that neonates whose mothers live in permanent houses have the highest percentage and the other types are shown. Some literature was showing that neonates born is poor houses had the highest risk however according to results of my research it's not in line, this could be researched further to find out the exact relationship.

Table 7 shows the results, it is clear that that the mothers who shared the basins with the neonates had the highest percentage, this is in line with literature. This is explained by the transfer of the infections from the mothers to their neonates. Mothers should be educated on the danger of this and this can reduce on the number of neonates getting infection. It also shows that the mothers who do not wash hands before holding their neonates had a higher number, this is possible because the un washed hands have germs which are responsible for causing the neonatal infection. Therefore, its important to wash the hands before holding or feeding the neonates.

CONCLUSION

Mothers should be educated on the danger of this and this can reduce on the number of neonates getting infection. It also shows that the mothers who do not wash hands

before holding their neonates had a higher number, this is possible because the un washed hands have germs which are responsible for causing the neonatal infection. Therefore, it's important to wash the hands before holding or feeding the neonates.

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