Introduction

Neonatal mortality has been an issue of public health concern in sub-Saharan Africa especially in Nigeria though over the recent years, there have been declines in neonatal mortality rates. Globally, neonatal mortality rate fell from 58% to 47% between 1990 and 2015 and infection accounted for 13% of the three million...
newborn deaths that occurred.\textsuperscript{2,3} Infections (36\%) have been reported to be the major cause of neonatal death and neonatal deaths account for 40\% of deaths under the age of 5 years worldwide.\textsuperscript{4} This is more so in northern Nigeria where neonatal mortality stands at 44/1000 live births.\textsuperscript{5} The three major causes of neonatal death (infections, complications of preterm birth, and intrapartum related neonatal deaths) account for almost 90\% of all neonatal deaths.\textsuperscript{6} To curb this trend in developing countries, the World Health Organization (WHO) in 2013 enlisted the use of antiseptic solution as means of clean cord care practices to reduce neonatal mortality and morbidity.\textsuperscript{7,8} Studies across the globe and particularly in sub-saharan Africa showed Chlorhexidine, when applied to the umbilical cord, is effective and efficient in reducing neonatal sepsis in high-risk settings, resulting in over 68\% reduction in severe infection and a 23\% reduction in all cause neonatal mortality.\textsuperscript{8,9}

In 2016, a community based randomized trial was conducted in Tanzania to compare the use of Chlorhexidine for cord care with dry cord care in babies between 1 – 48 hours old. The result showed that the neonatal mortality rate was not significantly lower in the Chlorhexidine group than in the dry cord care group.\textsuperscript{10} However, in another study in 2013 involving the distribution of Chlorhexidine in Sokoto State Nigeria, 99.97\% of newborns who received chlorhexidine cord care and were followed up survived past 28days.\textsuperscript{11} In 2015, another study conducted in Benin City, Edo State evaluated the content of health education on cord care given to mothers at various health facilities and found that health education on cord care was lacking in some of the health care centers; and even when available, the content may not be evidence-based.\textsuperscript{12}

The hygienic practice of cord care is mainly done to hasten the separation of the umbilical cord and prevent sepsis within the first few days of life. However, studies have revealed that normal cord separation time may extend for as long as 28 days in some cases.\textsuperscript{13} Chlorhexidine was first introduced in Nigeria through the USAID/TSHIP project in Sokoto and Bauchi States and it recorded a 17\% and 24\% reduction in neonatal morbidity and mortality rates.\textsuperscript{14} The Federal Government of Nigeria developed a framework for its scale up in 2016 with the support of National Primary Health Care Development Agency (NPHCDA) and Paediatrics Association of Nigeria (PAN). This is intended to guide programming, resource allocation and commitments to achieve the national objective of Chlorhexidine uptake of 52\% after the fifth year of national scale-up.\textsuperscript{15-18}

Neonatal sepsis and prematurity have emerged as principal challenges to reduction in neonatal mortality and morbidity.\textsuperscript{19} Poor hygienic umbilical cord care in the first week of life is a well-documented risk factor that increases the likelihood of neonatal infections.\textsuperscript{20-22} The knowledge of women of reproductive age on good cord care is vital. Their awareness and use of chlorhexidine for cord care is imperative not only to scale up its use but also to reduce the high neonatal mortality in this environment. The objective of this study was to determine the awareness of Chlorhexidine and its use for newborn cord care by women of reproductive age in Jos South LGA of Plateau State.

**Methods**

This was a community based descriptive study carried out among women of reproductive age in Lwellem villages of Tanchol ward, Gyel District, Jos South
Local Government Area, Plateau State, Nigeria. A structured questionnaire adapted from USAID/TSHIP project 2013 – 2015 was used to obtain data on age, place of antenatal care and birth, treatment applied to the cord stump and the socioeconomic status of the mothers. A total population sampling was done. The minimum sample size was calculated using Taro Yamane formula with 95% confidence interval shown below.  \[ n = N/1+N(e) = 3210/1+3210(0.0025) = 3210/9.025 = 355.7 \text{ or } 356 \]

The number of households in the study area was 703 according to Polio Supplemental Immunization Activities (PSIA) numbering with a total population of 3,210. Only 320 households after six visits were found to be open with women of child bearing age and entered by the researchers. Thus, 300 women of reproductive age with under-five children were reached from the households and had the questionnaire administered on them. The 300 questionnaires were entered into Microsoft Excel 2003-2007 and analyzed with Statistical package for Social Sciences (SPSS) version 20.

Ethical clearance and permission were obtained from the Bingham University Ethical Committee and relevant authorities at Lwellem settlement of Tanchol ward, Gyet district, Jos South Local Government Area of Plateau State, Nigeria.

Results

The socio-demographic distribution of mothers of under five children shows that the largest age group was between 25-29 years; 86 (28.7%) and the lowest age group 45 – 49 years; 9 (3.0%). The respondents with primary education or below were 167(55.6%) while 133 (44.3%) had secondary and above. Majority of the mothers were traders; 75 (25%) and farmers; 71 (23%). On the average, most (51.7%) women in the community had had at least 4 deliveries. Table 1.

Two hundred and eighty six (95.3%) mothers attended antenatal care but only 26.0% of them were aware of Chlorhexidine being used for cord care. Most; 168 (56.0%) mothers practiced cord care for the purpose of hastening falling off of the cord and only 85 (28.3%) of the mothers practiced cord care to prevent infection. Most of the women in the community applied some substances other than Chlorhexidine (29.9%) to clean the cord stump immediately after delivery. Table 2. Table 3 shows 29 (87.9%) of the 33 respondents who had in-depth knowledge of Chlorhexidine used it for new born cord care compared to 12(26.7%) of the 45 women who lacked in-depth knowledge of chlorhexidine but used it for cord care. This difference was statistically significant (p = 0.00001)
### Table 1: Socio-demographic characteristics of respondents

| Characteristics                                      | Frequency (n = 300) | Percentage |
|------------------------------------------------------|--------------------|------------|
| **Age group (years)**                                |                    |            |
| 15-24                                                | 71                 | 23.7       |
| 25-34                                                | 153                | 51.0       |
| 35-44                                                | 67                 | 22.3       |
| 45-49                                                | 9                  | 3.0        |
| **Educational level**                                |                    |            |
| None                                                 | 28                 | 9.3        |
| Primary                                              | 139                | 46.3       |
| Secondary                                            | 117                | 39.0       |
| Tertiary                                             | 10                 | 5.3        |
| **Occupation**                                       |                    |            |
| House wife                                           | 60                 | 20.0       |
| Civil servant                                        | 3                  | 1.0        |
| Trading                                              | 75                 | 25.0       |
| Farming                                              | 71                 | 23.7       |
| Artisan                                              | 41                 | 13.7       |
| Others                                               | 50                 | 16.7       |
| **Antenatal attendance**                             |                    |            |
| Yes                                                  | 286                | 95.3       |
| No                                                   | 14                 | 4.7        |
| **Parity**                                           |                    |            |
| 1-2                                                  | 102                | 34.0       |
| 3-4                                                  | 104                | 34.6       |
| 5 & above                                            | 94                 | 31.4       |

### Table 2: Awareness and practice of respondents to Chlorhexidine for Cord care

#### Awareness

| Awareness of Chlorhexidine   | Frequency (n=300) | Percent (%) |
|-----------------------------|-------------------|-------------|
| Heard of Chlorhexidine      |                   |             |
| Yes                         | 78                | 26.0        |
| No                          | 222               | 74.0        |
| Reason for Cord care        |                   |             |
| To prevent infection        | 85                | 28.3        |
| To facilitates falling off of the cord | 168 | 56.0 |
| To dry off the cord         | 40                | 13.3        |
| To prevent bad odour        | 7                 | 2.3         |

#### Practice of cord care

| No. of times substance is applied per day | Frequency (n=300) | Percent (%) |
|------------------------------------------|-------------------|-------------|
| Once a day                               | 5                 | 1.7         |
| < 3 times a day                          | 127               | 42.3        |
| > 3 times a day                          | 165               | 55.0        |
| Others                                   | 3                 | 1.0         |
The socio demographic data from women of Lwellem community showed the age group 25-29 years had the single highest number followed by the 30-34 years age group. However, mothers at the extremes of the reproductive age group (15-19yrs, 35-49yrs) make up thirty percent of mothers of under five children in the community. This is similar to findings from the National Demographic and Health Survey (NDHS) report of 2013, which showed that in Nigeria, the proportion of mothers of under five children in the extreme groups of reproductive age is smaller than the proportion in the age group of 25-29 years, which results in decline in fertility. 

Education plays a pivotal role in the knowledge and understanding of childcare. Our study showed that 55.6% of mothers of under-five children were of low educational level and is in keeping with studies conducted Nepal, Pakistan and Nigeria which showed that educational levels are low in women and this places them at a distinct disadvantage compared to men. Hence, this may in turn lead to a high neonatal mortality and morbidity. Occupation revealed that majority of respondents did not engage in any income generating activities. This agrees with the report of the NDHS 2013 which showed that only 45% of women in agricultural occupation were paid in cash/money while others were paid in kind or not paid at all.

Data analyzed on the parity of the mothers of under five children in the Lwellem community showed that the average number of children born to one woman is 4 which is lower than the total fertility rate (TFR) for Nigeria as recorded by NDHS 2013. Higher number of deliveries (>5 pregnancies) carry much obstetric complications, hence for the 31.3% grand multiparous women of reproductive age, this raises the concern of maternal mortality and morbidity in the community. Knowledge of mothers on neonatal and childcare is essential for their proper growth and development. Women are expected to have information and skills for newborn care and recognition of neonatal danger signs during the neonatal period. In this study, a large majority of the women in the Lwellem community attended ANC during their last pregnancy. This is not in agreement with findings from the 2008 NDHS reports, which showed that in north eastern region, only between 16 – 58% of pregnant women received antenatal care from skilled provider. It is recommended that Chlorhexidine be applied to the cord for all births irrespective of where childbirth takes place. However, in our study, three quarters of the respondents had not heard

| Table 3: The relationship between knowledge and practice of Chlorhexidine for cord care |
|--------------------------------|----------------|----------------|----------|
| In-depth knowledge of chlorhexidine | Practice of chlorhexidine cord care | X² | p-value |
|--------------------------------|----------------|----------|
| Yes (%) | Yes (%) | No (%) | Total | 28.6 | <0.001 |
| Yes (%) | 29 (87.9) | 4 (12.1) | 33 | |
| No (%) | 12 (26.7) | 33 (73.3) | 45 | |
| Total | 41 (52.7) | 37 (47.3) | 78 | |

Thus, the women have an economic base that is too weak to provide the required resources for holistic care of their neonates leading to increased neonatal morbidity and mortality. 

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about Chlorhexidine as only 26.0% of the mothers had ever heard about the use of Chlorhexidine for cord care. This correlates with findings from a study conducted by TSHIP Final Dissemination Meeting in 2015, which showed that in Nigeria, coverage for Chlorhexidine remains low with national coverage significantly under 5%. We can infer that knowledge of the goal standard of cord care (Chlorhexidine gel/ solution) is poor in this community. This could increase the risk of neonatal morbidity and mortality as various studies conducted in developing countries have shown that chlorhexidine antisepsis interventions may improve neonatal health. However, a study conducted in Benin City in 2015 on cord care education given at antenatal clinics showed that health education on cord care is lacking even among well-educated health care workers.

This study found that majority of the mothers applied substances such as salt-warm water, Shea butter, Savlon/gentian violet, vasline etc. to facilitate falling off of the cord implying that majority of the women were more concerned about the cord falling off than preventing infection of the cord. The belief is common in many cultures that the cord should not dry so the practice of applying substances to the cord stump aims to make it soft allowing it to separate and heal easily and quickly. There were similar findings seen in rural Uganda in 2008, Ghana in 2005 and Nigeria in 2010 where these substances are believed to help the cord to dry and separate faster within 3 days and save the neonate from “evil eye” which they believe causes neonatal deaths. Hence, from this study, the practice of women in the Lwellem settlement on cord care is poor. This may be the result of poor or inadequate knowledge on cord care practices immediately after delivery. Cord care plays a major role in causing neonatal morbidities and mortalities.

Chlorhexidine is poorly used for cord care in this community, meaning that many of the substances and methods used for cord care are based on traditional beliefs which are often interwoven with witchcraft, magic and taboo as reported in the LiST model, 2010. Here women were found to use charcoal or cow dung to dress the umbilical cord of neonates. A study conducted in Uganda showed that over 50% of the mothers applied various substances to the cord stump of their babies to quicken the healing. This agrees with our study which showed mothers practice cord care to facilitate drying off of cord. However, only a few of the mothers in this study practiced cord care to prevent infections.

**Conclusion**

This study found low awareness and poor utilization of Chlorhexidine for cord care in neonates among mothers of reproductive age in Lwellem Community. Women of reproductive age should be educated on the importance of the use of Chlorhexidine gel/solution for the cord care of their neonates.

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**Conflict of interest:** The authors declare that there is no conflict of interest of any form.
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