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## Research Article

# Maternal and Neonatal Tetanus Elimination in Nigeria: A Review of Delivery and Cord Care Practices among Women of Child Bearing Age

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## Abstract

**Introduction:** Maternal and Neonatal Tetanus (MNT) are important causes of maternal and neonatal deaths, and this led the World Health Assembly in 1999 to launch the maternal and neonatal tetanus elimination strategy with a target of 2020 after earlier targets of 2005, 2015 were missed. Tetanus claims tens of thousands of deaths annually with majority of the deaths occurring in Sub-Saharan Africa and Asia.

Safe delivery practice is one of the strategies for elimination of MNT and it can be achieved if delivery is handled by a skilled health worker that have adequate knowledge on the care of the umbilical cord.

**Methods:** This study which is a descriptive study that covered 62 high risk Local Government Areas (LGAs) is aimed at determining the delivery practices and cord care practice of Women of Child bearing Age. (WCBA) in sixty –two Local Government Areas in the six States of Ondo, Osun, Ekiti, Imo, Enugu and Ebonyi in Nigeria that were involved in the three rounds of tetanus toxoid vaccination campaign as part of the Nigeria's Maternal and Neonatal Tetanus Elimination program from 2014 to 2016.

**Results:** A total of 23,860 households were visited by enumerators in all the 1,860 selected clusters surveyed across the 62 high-risk LGAs of the 6 States. Eligible respondents were found in 13,020 of these households (54.6%). Most of the respondents were wives of the household heads, Christians (83.9%), educated with majority attending secondary school (53.8%), employed with majority doing petty trading 30.9% and located in predominantly rural LGAs (74.4%). Across the 62 LGAs, 84.8% of respondents had their delivery handled by doctors, nurses/midwives and CHEW while 76.7% had their delivery handled by doctors and nurses/midwives. On cord care practices the survey results showed that on the average, only 3.1% of women used chlorhexidine with Ebonyi state recording the highest while 79.0% of respondents used methylated spirit for cord care.

**Conclusion:** Sociocultural factors such as maternal education, financial preparedness, marital status, religion has been shown to be strong determinants of Skilled Birth Attendants (SBA) use. SBA usage has a direct effect on maternal and neonatal tetanus elimination as such government is encouraged to support the promotion of formal education for women and women empowerment and autonomy.

**Keywords:** Maternal and neonatal tetanus elimination strategies; Skilled birth attendant; Umbilical cord care

## Introduction

Maternal and Neonatal Tetanus (MNT) are important causes of maternal and neonatal deaths, and that was why the World Health Assembly relaunched the earlier initiative to eliminate neonatal tetanus to include maternal and neonatal tetanus elimination in 1999 with set target of 2020 for the 59 high risk countries after missing the initial target dates of 2005 and 2015 [1,2]. Tetanus claims tens of thousands of deaths annually with majority of the deaths occurring in Sub-Saharan Africa and Asia. As of 2015 there were an estimated 58,000 neonates and an unknown number of mothers dying every

year from tetanus [3,4].

Fewer than 5% of neonatal tetanus cases are reported and once contracted the newborn usually dies within seven days hence it is referred to as the seventh day death in the Old Testament [5]. Twelve countries of Afghanistan, Angola, Central African Republic, Guinea, Mali, Nigeria, Pakistan, Papua New Guinea, Somalia, South Sudan, Sudan, and Yemen are the remaining countries of the 59 high risk countries in 1989 yet to receive MNTE validation though some provinces in Pakistan and South East Region of Nigeria had been validated as at 2021 [6].

In many developing countries like Nigeria, maternal and neonatal tetanus persist as a public-health problem and the burden is a health equity issue affecting those who are the most disadvantaged, poor, and without access to adequate health services [7].

The disease is prevented by maternal immunization with tetanus toxoid vaccine, and aseptic obstetric and postnatal umbilical-cord care practice [8-10]. Tetanus is the only vaccine-preventable disease that is not contagious. It is characterized by generalized rigidity and convulsive spasms of skeletal muscles. The associated muscle stiffness usually involves the jaw (lockjaw) and neck and then becomes generalized. Neonatal Tetanus (NT) is a form of generalized tetanus that occurs in newborns and infants that are born without protective passive immunity because the mother is not immune [11,12]. Although symptoms of tetanus are triggered by the effects of the *Clostridium tetani* toxin, the diagnosis is entirely clinical and does not depend upon bacteriologic confirmation [13,14].

The causative bacteria are transmitted through contact with broken skin or dead tissues, such as the wound resulting when an infant's umbilical cord is cut [11]. Poor hygienic conditions, lack of access to sterilized childbirth delivery tools, unhygienic practices and limited access to health services amplify the risk for Maternal and Neonatal Tetanus (MNT) during childbirth [12,15].

Safe delivery practice is one of the strategies for elimination of MNT and it can be achieved if delivery is handled by a skilled health worker. The proportion of deliveries at home has remained very high and could be partly responsible for the high prevalence of MNT in the country.

The 2018 NDHS indicated that only 39% of births in Nigeria were delivered in a health facility while 59% are delivered at home. Sixty-one percent of urban births were delivered in a health facility, as compared with only 26% of rural births. North-West Geopolitical Zone (NWZ) had the highest proportion of deliveries at home with 84.4% while the lowest was recorded in South-East with 17.2%. Overall, 43.3% of deliveries were assisted by skilled provider, 20.4% by Traditional Birth Attendant (TBA), 22.3% by relatives or other persons and 11.2% were unassisted [16]. The TBA or relatives might recommend application of harmful traditional substances for cord care which increases the risk of contracting tetanus. Hygienic practices are expected during childbirth and early postnatal period. Clean birth and postnatal care practices in accordance with World Health Organization's (WHO) consists of "six cleans" - hand washing of birth attendant before birth, clean birth surface, clean perineum, cutting of the umbilical cord using a clean implement, clean cord tie, and a clean cloth for drying [17].

The commonest port of entry for the tetanus spores is the unhealed umbilical cord. In most cases of neonatal tetanus symptoms develop in the first 3–14 days of life with the majority presenting at 6–8 days [10]. Clean cord care seeks to ensure a care of the remnants of a newborn's umbilical cord until it falls off. It involves cleaning of the cord and following precautions to prevent infection. WHO recommended the use of chlorhexidine for clean cord care after delivery in high-risk areas [17]. Promoting clean delivery and cord care practices to prevent infection during and after delivery is one of the strategies for elimination of maternal and neonatal tetanus.

Other strategies include immunization of women during pregnancy with Tetanus Toxoid (TT) or TT & Tetanus Diphtheria (TD) vaccine, immunization of Women of Child Bearing Age (15-49 year) (WCBA) with TT or Td vaccine through three properly spaced rounds of Supplemental Immunization Activities (SIAs) in high-risk areas; and reporting Neonatal Tetanus (NT) for case detection, investigation and response [15,17,18].

This study aimed at determining the delivery practices and cord care practice of Women of Child bearing Age (WCBA) in sixty-two Local Government Area in Nigeria. This was a descriptive study that covered the 62 high-risk LGAs in the six States of Ondo, Osun, Ekiti, Imo, Enugu and Ebonyi in Nigeria that were involved in the three rounds of tetanus toxoid vaccination campaign as part of the Nigeria's Maternal and Neonatal Tetanus Elimination program from 2014 to 2016.

## Methods

### Study Design, Setting and Population

This descriptive study analyses the quantitative information in the 2016 post tetanus toxoid campaign coverage survey report, conducted for the 62 high-risk LGAs in the six states of Ondo, Osun, Ekiti, Imo, Enugu and Ebonyi in Nigeria that carried out three rounds of Maternal and Neonatal Tetanus Elimination (MNTE) campaigns between 2014 and 2016. The post campaign coverage survey was conducted from 4<sup>th</sup> to 8<sup>th</sup> October 2016. The sixty-two LGAs were selected following a risk assessment conducted by WHO, UNICEF, other Line Ministries (LMs) and Nigerian states to fast-track progress towards MNTE in 2013

### Inclusion Criteria

This survey involved women of childbearing age (15 to 49 years) who have had a live birth in the last two years preceding the survey and had lived in the Enumeration Area for a minimum of six months.

### Sampling Technique

The sample size to provide coverage estimates per LGA was determined using the WHO "30 X 7" cluster sampling technique for immunization coverage survey (2005) reference manual [19,20]. This amounted to seven respondents per cluster in the 30 selected clusters. For this household-based cluster survey, a two-stage sampling technique was used. A sampling frame of Primary Sampling Unit (PSU) was the cluster and the Secondary Sampling Unit (SSU) was the household in the cluster. Accordingly, 30 clusters coinciding with Enumeration Areas (EAs) based on the 2006 National population census in each LGA were randomly selected using the WHO cluster sampling methodology. Within a cluster, seven eligible women with one woman per household were randomly selected. The starting household was selected at random [19,20].

The list of EAs used for the cluster's selection in each of the LGAs in the six States was obtained from the National Population Commission. A total of 30 clusters were randomly selected from each LGA using a computer-generated table of random numbers. Community maps obtained from the Local Immunization Officers of the LGAs were used to confirm the existence of the selected EAs. The household lists were used to select the households to be included using simple random sampling. Only one eligible respondent was

selected from each household and where there was more than one eligible woman in a household, only one was selected randomly and interviewed.

Assuming a 95% confidence level and 5% error margin, a minimum sample size of 210 women aged per LGA and 13,020 in total were included in the study [19-21].

### Study Instrument

The survey questionnaire was an adaptation from the WHO reference manual of 2005 [20], and further reviewed with technical assistance from the survey steering committee made up of National Primary Health Care Development Agency, UNICEF, WHO, CDC and the survey firm. It consisted of the following 4 modules for collecting various data:

**TTCCS Form (M0):** household characteristics and social demographic data of the respondents.

**TTCCS Form (M1):** birth history, antenatal, safe delivery, clean cord care practices and coverage of the TT campaign.

**TTCCS Form (M2):** reasons why eligible children were not vaccinated during the campaigns and key communication channels used for the campaign.

**TTCCS Form (M3):** adverse event(s) of the TT vaccines on those immunized during the campaigns

The questionnaire was pre-tested and field piloted before it was finalized. Field manuals for enumerators, supervisors and State facilitators respectively were developed based on the questionnaires.

**Advocacy:** Before the survey, cooperation was sought from the necessary authorities (States Ministry of Health (SMOHs), States Primary Health Care Board, NPHCDA partner organizations and trade-religious institutions) of the selected EAs in order to seek their support for the survey and sensitize the community.

**Data Collection:** Electronic questionnaires were administered to eligible women randomly selected in 23,860 households in the 1,860 selected clusters across 62 LGAs of the six states. Information sought included household characteristics, delivery practices in particular whether the last delivery was in a health facility or not and the practices utilized in caring for the umbilical cord of the newborn. Results were presented using simple descriptive statistics.

**Ethical Consideration:** The National Health Research Ethics Committee of the Ministry of Health approved the study. Informed consent was obtained from each respondent and the household head prior to inclusion in the study. All information provided by the respondents were anonymized and kept secure.

## Results

### Distribution of Households

A total of 23,860 households were visited by enumerators in all the 1,860 selected clusters surveyed across the 62 high-risk LGAs of the 6 States. Eligible respondents were found in 13,020 of these households (54.6%). The result of the analysis shows that Osun State had the highest number of households visited with a total of 6,019 households followed by Imo State with 5,933 households, The 2 States also accounts for 33 (53.2%) of the 62 LGAs surveyed.

**Table 1:** Socidemographic characteristics of 13020 women selected from 860 clusters across 62 high-risk local government areas of six States surveyed for maternal and neonatal elimination strategies.

Characteristics	Frequency	%
<b>Marital status</b>		
Married	12,374	95
Single	472	3.6
Widowed	99	0.8
Others*	75	0.6
<b>Religion</b>		
Christianity		83.9
Islam		15.9
African traditional		0.2
<b>Education</b>		
Informal		0.5
Primary		33.2
Secondary		53.8
Tertiary		12.4
<b>Occupation</b>		
Trading		40.0
Skilled work		21.5
Farming		12.3
Public service		3.7
Casual work		1.2
Student		3.8
Unemployed		15.0
Others		1.2
<b>Location</b>		
Rural	46	74.4
Urban	16	25.6

**Table 2:** Distribution of Households Visited in the High-risk Local Government Areas of the 6 Survey States.

S/N	State	Number of High-risk LGAs	Number of Households Visited
1	Ebonyi	4	1,270
2	Ekiti	8	3,740
3	Enugu	7	2,967
4	Imo	17	5,933
5	Ondo	10	3,931
6	Osun	16	6,019
	Total	62	23,860

Understandably, Ebonyi and Enugu States had the lowest number of households visited with a total of 1,270 and 2,967 households respectively (Table 1).

### Characteristics of Study Participants

Thirteen thousand and twenty women aged 15 to 49 years were studied. Table 2 shows the characteristics of study participants. The majority of the respondents were wives of the household heads,

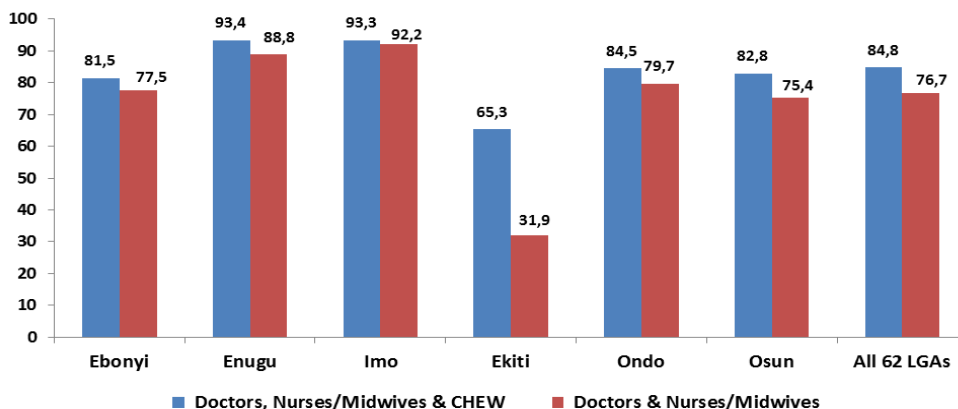


Figure 1: Proportion of Deliveries Handled by Skilled Health Workers in the 6 States (%) (n=13,020).

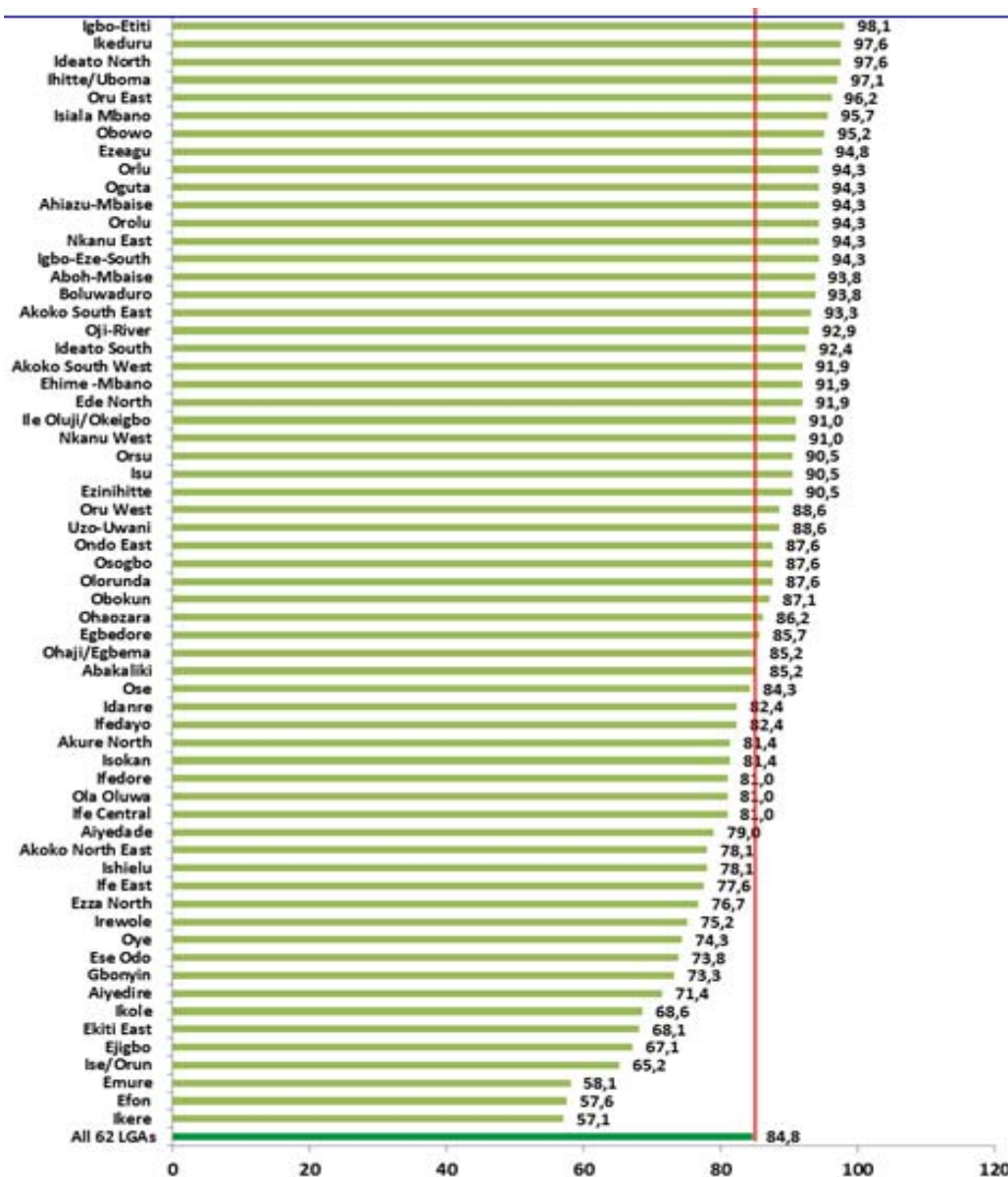


Figure 2: Proportion of Deliveries Handled by Doctors, Nurses/midwives and CHEWs Across 62 LGAs Surveyed (%) (n=13,020).

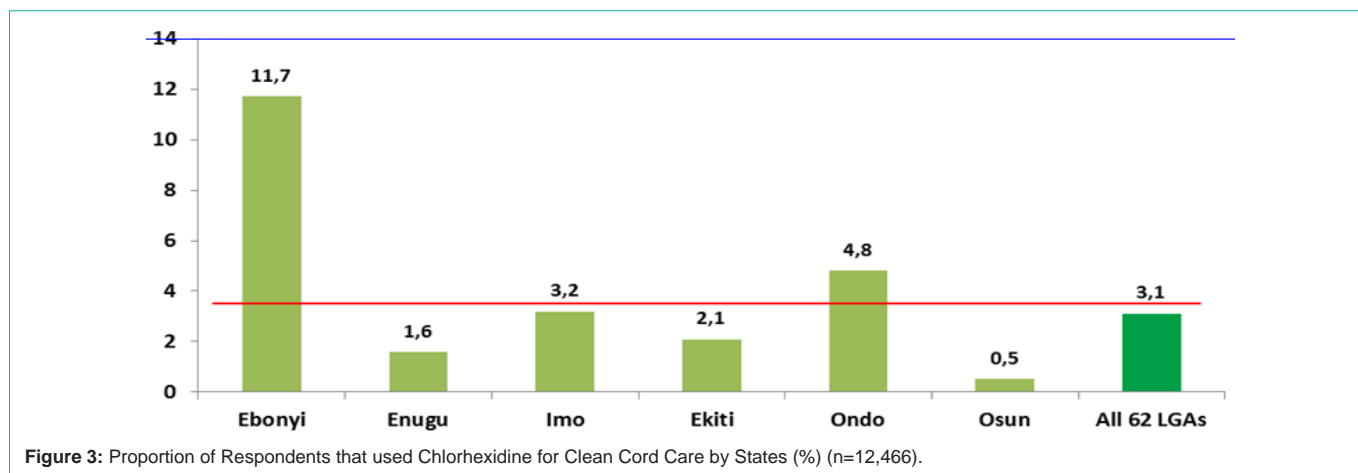


Figure 3: Proportion of Respondents that used Chlorhexidine for Clean Cord Care by States (%) (n=12,466).

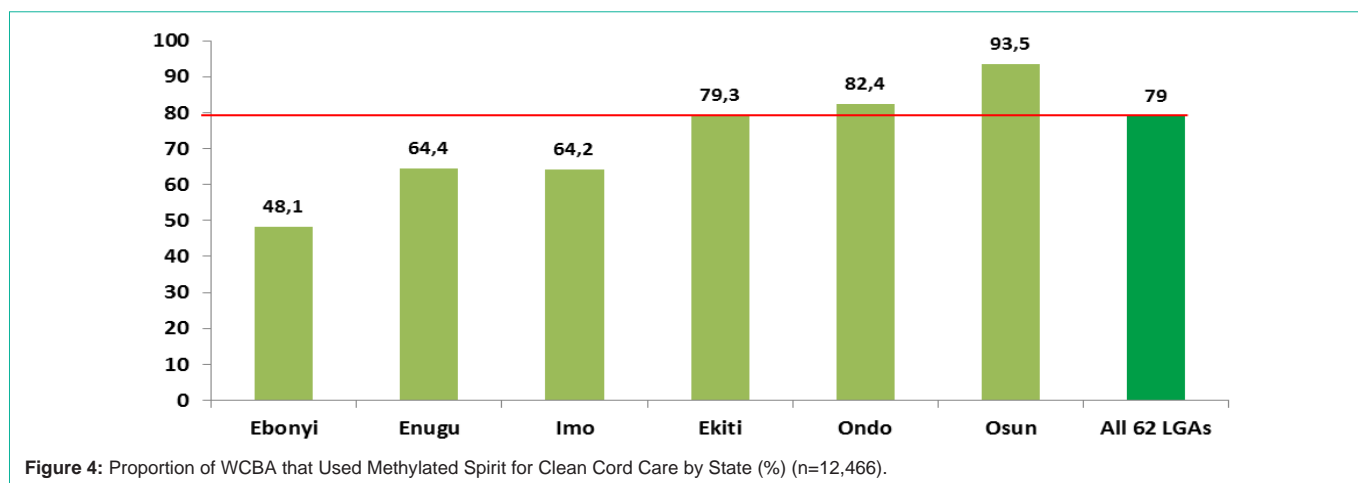


Figure 4: Proportion of WCBA that Used Methylated Spirit for Clean Cord Care by State (%) (n=12,466).

Christians (83.9%), educated with majority attending secondary school (53.8%), employed with majority doing petty trading 30.9% and located in predominantly rural LGAs (74.4%)

**Delivery Practices**

The percentage of respondents who had their last delivery handled by skilled health workers was recorded for each of the LGAs. The skilled health workers were categorized into two: (a) doctors, nurses/midwives & Community Health Extension Workers (CHEW); and (b) doctors, nurses/midwives.

Across the 62 LGAs, 84.8% of respondents had their delivery handled by doctors, nurses/midwives and CHEW while 76.7% had their delivery handled by doctors and nurses/midwives. Figure 1 shows the proportion of delivery handled by the two categories of health workers when compared by State.

When the States are compared, the LGAs in Imo State (93.3% & 92.2%) and Enugu State (93.4 & 88.8%) cumulatively had the highest proportion of deliveries handled by both categories of health workers while Ekiti State (65.3% & 31.9%) had the lowest. The difference between proportions of deliveries handled by the 2 categories of health workers was highest in Ekiti State.

The proportion of deliveries handled by doctors, nurses/midwives and CHEW across all the 62 high-risk LGAs is presented in (Figure

2). The average for the 62 LGAs is 84.8% Across 62 LGAs Surveyed the 5 LGAs with the highest proportion of deliveries handled by doctors, nurses/midwives and CHEW are: Oru-East, Ihitte/Uboma, Ideato-North & Ikeduru (Imo State) and Igbo-Etiti (Enugu State) with the range 96.2-98.1%. On the other hand, the 5 LGAs with the least proportions are: Ikere, Efon, Emure & Ise/Orun (Ekiti State) and Ejigbo (Osun State) with the range 57.1-67.1%.

**Cord Care Practice**

Clean cord care practice prevents contamination of umbilical cord of the newborn. (Figure 3) shows the proportion of respondents that used chlorhexidine in all the States where the survey was conducted. The survey results showed that on the average, only 3.1% of women used chlorhexidine. When States were compared, the highest proportion of respondents who used chlorhexidine was recorded in surveyed LGAs in Ebonyi State with 11.7% while the lowest (1.6%) was in Enugu State. Similarly, in terms of usage of methylated spirit to clean the umbilical cord, (Figure 4) shows the proportion of respondents that used methylated spirit in the States where the survey was conducted.

Across all the LGAs 79.0% of respondents used methylated spirit for cord care, which is higher than the proportion of women that used chlorhexidine. Also, there appears to be an inverse relationship between the proportion of women that used chlorhexidine and

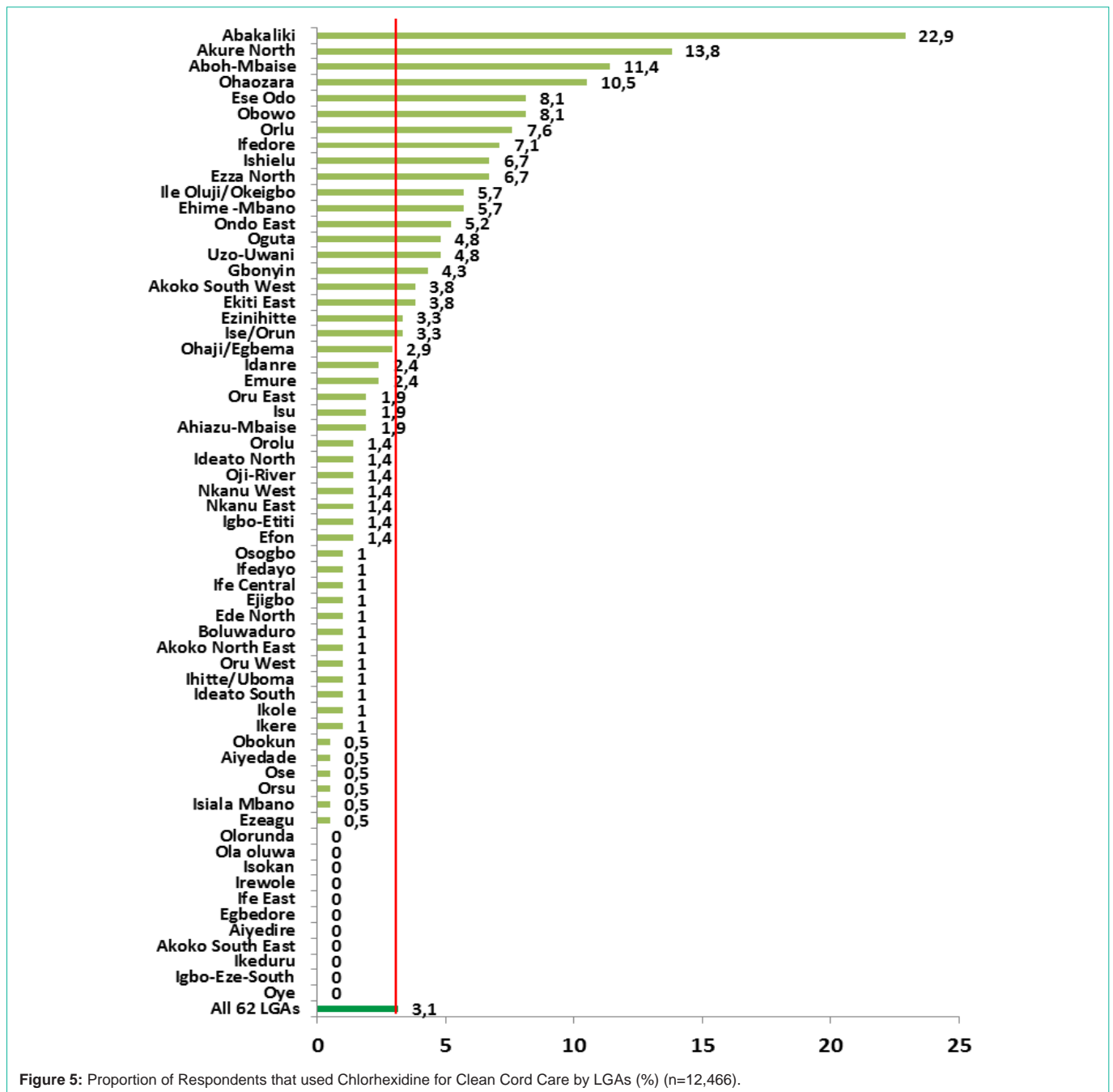


Figure 5: Proportion of Respondents that used Chlorhexidine for Clean Cord Care by LGAs (%) (n=12,466).

the proportion of women that used methylated spirit in the States except for Ondo State. The highest proportion of women that used methylated spirit (93.5%) was recorded in LGAs in Osun State while the lowest proportion (48.1%) was recorded in Ebonyi State. (Figure 5) shows the proportion of respondents that used chlorhexidine for cord care in all the surveyed LGAs.

The overall proportion of women that used chlorhexidine for cord care across all 62 LGAs surveyed is 3.1% although a wide variation in results was observed. The top 5 performing LGAs are: Ese-Odo (Ondo State), Ohaozara (Ebonyi State), Aboh-Mbaise (Imo State), Akure-North (Ondo State) and Abakaliki (Ebonyi State) (8.1-

22.9%). On the other hand, the 5 least performing LGAs are: Oye (Ekiti State), Igbo-Eze South (Enugu State), Ikeduru (Imo State), Akoko-East (Ondo State) and Aiyedire (Osun State) (all 0%). (Figure 6) shows the proportion of respondents that used methylated spirit for cord care in all the surveyed LGAs.

The overall proportion of women that used methylated spirit for cord care across all 62 LGAs surveyed is 79% although a wide variation in results was observed. The top 5 LGAs are: Oshogbo, Aiyedire, Irewole, Ife Central and Boluwaduro (all in Osun State) (96.2-98.1%). On the other hand, the 5 least LGAs are: Orsu (Imo State), Ezza-North & Ishielu (Ebonyi State) and Nkanu-East & Uzo-

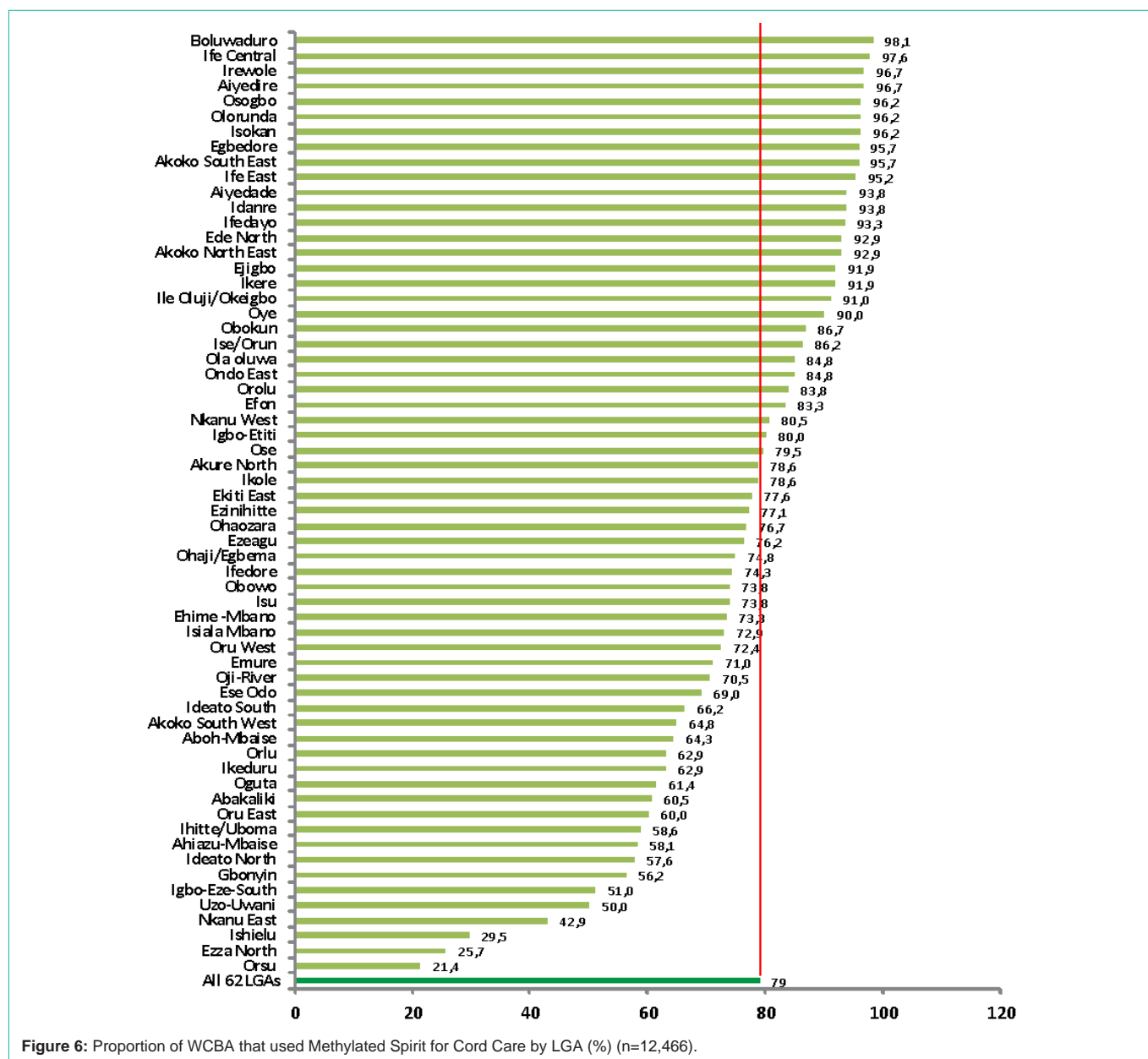


Figure 6: Proportion of WCBA that used Methylated Spirit for Cord Care by LGA (%) (n=12,466).

Uwani (Enugu State) (21.4-50%).

## Discussion

From our survey result, majority of the respondents were wives of the household heads, educated and employed and the high risk LGAs are predominantly rural. Despite residing in rural communities, four-fifth of WCBA had their delivery handled by doctors, nurses/midwives and CHEW. Safe delivery practice is one of the strategies for MNTE and it can be achieved if delivery is handled by skilled health workers i.e. doctors, nurses/midwives and CHEWs. This finding is a positive attribute among respondents and creates an opportunity for one-on-one health education for WCBA by the skilled birth attendants. This is in line with WHO requirements for Skilled Birth attendants for every delivery [7]. This may be attributed to the availability of functional health facilities with adequate health workers to cater for them in those

areas. Similarly, some of the characteristics of the respondents such as good education, Christianity, marital status favour access to skilled birth attendants as also reported by Kwamena and his colleagues in their assessment of skilled birth attendance in Northern Ghana and similar studies in Tanzania and Papua New Guinea [22-24]. However, in similar studies by Teferra et al, in Ethiopia and Al Kibria et al, in Bangladesh, only 12.1% and 35.9% of respondents assessed skilled birth but for those that assessed health facility deliveries, factors such as marital status, education and some form of income by the mothers had positive influence in their decision to access skill birth attendant [25,26]. In Nigeria, studies in the Northern states of Bauchi and Sokoto shows that over 75% and 80% of deliveries respectively took place at home [27].

The 62 LGAs of this study are from the Igbo and Yoruba states of South East and South West Nigeria respectively, in past NDHS and



studies by Fagbamigbe et al, these regions with more Christians have better access to skilled birth attendants which further corroborates the findings from this study [28-30].

Local government areas in the Enugu and Imo State had the highest proportion of deliveries handled by doctors, nurses/midwives and CHEW while local governments in Osun and Ekiti States, had the least proportions. This could be due to the presence of more recognized traditional birth attendants in the States with low level of births attended to by skilled birth attendants. There is need to improve access to skilled birth attendants in the areas with sub optimal skilled deliveries.

On cord care, which are steps applied in the handling of the umbilical cord after delivery, our finding shows that across all the LGAs, seventy nine percent of respondents used methylated spirit for cord care. This finding is close to studies conducted in Jos, Nigeria (73.2%), Abakaliki, Nigeria (82%), Benin, Nigeria (75%) where methylated spirit alone or in combination with other substances were used, Makurdi, Nigeria (70%) where also methylated spirit and methylated spirit plus were used as well as (95.7%) in Primary Health Centers in Ibadan, Nigeria [31-35]. In other studies, in Konduga LGA in Borno, Sokoto and Bauchi, Nigeria, use of methylated spirit was 8.5%, 2.6% and 6.3% respectively in the 2008, 2015 and 2015 respectively [27,36].

Our study shows that methylated spirit use is higher than the proportion of women that used chlorhexidine. The use of chlorhexidine for cord care is very low in all the high-risk LGAs as only about 1 out of 10 women interviewed used chlorhexidine. This is attributable to the fact that over the years, methylated spirit has been used for cleaning babies' umbilical cord after delivery and following systematic review of trials on the use of chlorhexidine on the umbilical cord, WHO in 2013 recommended its use and included it in the essential medicines list for umbilical cord care in neonates especially in settings with neonatal mortality rates of 30 deaths per 1000 live births or higher. It was also recommended in regions with low neonatal mortality where the application of harmful traditional substances to the umbilical cord exist. Its use has gained much acceptance and gradually it is replacing the use of methylated spirit in some settings [27,37,38].

From our study, there appears to be an inverse relationship between the proportion of women that used chlorhexidine and the proportion of women that used methylated spirit in the States. This is not unrelated to the fact that awareness of the use of Chlorhexidine is still low [39] and as of 2016 when the study was carried out, Nigeria was just introducing chlorhexidine into a national scale after its launch in two USAID supported states of Bauchi and Sokoto [27,40] and later Ebonyi and Kogi states in 2014 [27,40]. Of the six study states, Ebonyi state had the highest proportion of respondents using chlorhexidine for cord care (11.7%) and the closest state was Ondo with 4.8%. Earlier introduction of Ebonyi state by the USAID supported Maternal and Child Survival Program (MCSP) to chlorhexidine could have accounted for the high utilization when compared to the rest states. Competitive alternative may also have contributed to the poor use in the sixty-two high risk LGAs as some studies comparing the efficacy of use of methylated spirit and chlorhexidine shows no evidence that 96% methylated spirit is inferior to 4% chlorhexidine gel in preventing

neonatal omphalitis; hence, it may be considered a safe and effective alternative where chlorhexidine gel is unavailable [41].

## Conclusions and Recommendations

The majority of WCBA had their delivery handled by Skilled Birth Attendants (SBA) of doctors, nurses/midwives and CHEW. Sociocultural factors such as maternal education, financial preparedness, marital status, religion has been shown to be strong determinants of SBA use. SBA usage has a direct effect on maternal and neonatal tetanus elimination as such government is encouraged to support the promotion of formal education for women, women autonomy, in particular with reference to their involvement in decisions on their use of health care facility as well as financial preparations for delivery and make health facilities accessible to pregnant women without incurring financial hardship. An effective and efficient collaboration is necessary between the education sector and the government health apparatus so as to achieve optimal education needed to empower and enlighten women on the use of SBA.

## Declaration of Competing Interest

None to disclose.

## Acknowledgments

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## Authors' Contribution

NO, JA, SU, FS, AJO, KO, and EIA conceived the study idea and contributed to the study design and literature search. FD, AA-OM, RM, MA, CI, MMK and NO contributed to data collection, preparation of figures and tables, and performed the analysis. All authors contributed to interpretation and writing.

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