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Clean Delivery Kit Use and Maternal Health Outcome in Jigawa State, Nigeria

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Abstract
Background: The burden of maternal and neonatal mortality remains persistently high in Nigeria. Sepsis contributes significantly to both maternal and new-born mortality, and safe delivery kits have long been promoted as a cost-effective intervention to ensure hygienic delivery practices and reduce sepsis. However, there is limited evidence on the effectiveness of home clean delivery kit distribution by community health workers, and particularly the impact of this intervention on health outcomes. This paper examined a secondary analysis of data from a cluster randomized trial in rural northern Nigeria in which clean delivery kits were distributed by community health workers to pregnant women in their homes, analysing non-experimental variation in receipt and use of clean delivery kits. More specifically, associations between pregnant women’s baseline characteristics and receipt and use of clean delivery kits, and associations between clean delivery kit use, care utilization and maternal and new-born outcomes were assessed.

Methods and finding: Baseline, post-birth and end line data related to 3,317 births observed over a period of three years in 72 intervention communities in Jigawa state, Nigeria, were analysed using hierarchical logistic regression models. In total, 140 women received clean delivery kits, and 72 women used the kits. There were no associations between baseline demographic characteristics, health history, and knowledge and attitudes and receipt of a kit, suggesting that distribution of clean delivery kits by the community health workers lacks systematic targeting. However, women who used the kit reported reduction in odds of past pregnancy complications (OR = 0.44, 95% CI: 0.19-1.00) as well as significantly higher odds of feeling generally healthy at baseline (OR = 2.00, 95% CI: 1.06-3.76), of exposure to radio media (OR =1.97, 95% CI: 1.21-3.22), and of perceiving themselves as having a low-risk pregnancy (OR = 3.05, 95% CI: 1.39-6.68). While there were no significant associations between Clean delivery kit use and facility based delivery, skilled birth attendance or post-natal care, women who used a kit exhibited significantly lower odds of completing four or more ANC visits (adjusted OR = 0.39, 95% CI: 0.18-0.85) and significantly higher odds of reporting prolonged labour (adjusted OR = 4.75, 95% CI: 1.36-16.59), and post-partum bleeding (adjusted OR = 3.25, 95% CI: 1.11-9.52).

Conclusions: This evidence suggests that use of clean delivery kits is low in a rural population characterized by minimal baseline utilization of maternal and neonatal health services, and
the use of clean delivery kits was not associated with reductions in maternal or neonatal morbidity. While further research is required to understand how the effectiveness of clean delivery kits may be shaped by the mechanism through which women access and utilize the kits, our findings suggest that the provision of kits to women outside of the formal health system may be associated with increased risk of adverse outcomes.

**Keywords:** Clean Delivery Kit, Maternal Health, Outcome, Antenatal, Utilization

**Introduction**
Maternal mortality remained seriously high in Nigeria in spite of all effort and commitment by world policy makers to reduce the burden. Nigeria is one of the countries with high maternal and neonatal mortality (Bergström, 2016; Khan, Vandelaer, Yakubu, Raza, & Zulu, 2015; Organization, 2016b), contributing about 10% of the world total maternal deaths with ratio of maternal mortality reduction inconsistent and very slow. Maternal mortality ratio varies in Nigeria among and within the region with the figure showing concentration in north-west and north-eastern region and low concentration in southern region (Adedini, Odimegwu, Imasiku, Ononokpomo, & Ibisomi, 2015; Akinyemi, Bamgboye, & Ayeni, 2015; Gayawan & Turra, 2015; Jennings, Omoni, Akerele, Ibrahim, & Ekanem, 2015; Mbachu et al., 2017). The ratio in state of Jigawa is far above national estimate of 576, with the figure of maternal mortality ratio being 1,012 per given year per 100,000 live births (Jennings et al., 2015; Organization, 2016a). Delivery by skilled birth attendance is very low in the state (7.6%), and delivery at health facility is (6.7%) are partially among the reason behind the high burden of maternal death in the state (Ashimi & Amole, 2015; Kankara, Ibrahim, Mustafa, & Go, 2015; Sharma, Leight, AbdulAziz, Giroux, & Nyqvist, 2017). Maternal mortality is largely caused by sepsis (Acosta et al., 2016; Chebbo, Tan, Kassis, Tamura, & Carlson, 2016; Shields, Wiesner, Klein, Pelletreau, & Hedriana, 2016). About 10.7 percent of maternal mortality is caused by sepsis (infection during child delivery) as reported by World Health Organization (Morrison, Jacoby, Ghimire, & Oyloe, 2015). World health policy makers recommended and reemphasizes the used and adoption of six (6) clean in mothers infection during child delivery (Allegranzi et al., 2016; Rashid et al., 2016). The Six (6) cleans are:

1. Cleans Hand
2. Perineum clean
3. Delivery surface clean
4. Tying instrument and cord clean
5. Cloth for drying clean and
6. Clean Delivery Kit (CDK)

World health organization encourages the used of Clean Delivery Kit (CDK) especially in areas where the sterilization equipment is inadequate or none, with transportation problem among others (Morrison et al., 2015). The CDK normally enclosed of soap for cleaning, a blade, and guidelines on how to use the kit (Seward et al., 2015; Hussin & Mokhtar, 2018; Kasasbeh, 2018). Unfortunately no much literature assessed and studied the impact of CDK rigorously on maternal death infection especially in Jigawa State. A study conducted in Pakistan (rural Pakistan) evaluates the impact of CDK issuing on maternal mortality (Seward et al., 2015; Soofi et al., 2017). The study is a trial, randomizes cluster. The kits comprise gloves (sterilized) soap, blade, and gauze among others. A study in Nepal also revealed that the users of clean delivery kit recorded fewer infections as against non-users of the CDK (Morrison et al., 2015). The importance of clean delivery kits in reducing infection while child delivery cannot
be over emphasized as non-government and government organization has agreed as a best program and intervention to reduce infection during child delivery at low cost. Clean delivery kits use will improve the care standard in delivery at home and in health facilities where equipment (sterilized) are not available (Hartwell, Fryer, Collinson, & Phillips, 2015; Tamarkin, Eini, & Friedman, 2017; Tsai, 2013). The CDK composition varies within the region. Evidence from the literature has shown that, there were no much studies on the use of CDK intervention. Most of the studies were based on observation except that of rural Pakistan which randomized cluster trial, but the studies failed to study the clan delivery kit intervention separately (Colomar, Cafferata, Aleman, Tomasso, & Betran, 2017; Seward et al., 2015). A non-experimental study revealed that CDK users in Egypt significantly were likely less to experienced infection (sepsis) during child delivery (Gwida et al., 2015). Another study in Tanzania evaluated the impact of CDK distribution which and reported a significant reduction in maternal sepsis (Gwida et al., 2015). Base on the scientific literature, there are two factors which limit the clean delivery kit effectiveness: the first point is the rate of utilization of CDK may be very minimal especially outside the setting of formal health institutions, most of the literature only focuses on how the delivery kits are distributed to the health attendant or health institutions (Dupas, Hoffmann, Kremer, & Zwane, 2016; Elmusharaf, Byrne, & O’Donovan, 2015). However, about 52million women deliver at home each year without assistance from the skilled attendant (Eto, 2016). The second point accessibility to the CDK, where some women may consider it as substitute of going to health institution to receive other forms of care like antenatal or postal care (Organization & UNICEF, 2015). This paper examined the relationship between characteristics of women and CDK use, receipt, utilization and maternal outcome.

**Study Methods**

The study used documentary data from the Jigawa state ministry of Health recorded from the clean delivery kits trial program conducted in the state. The clean delivery kits were distributed to the women by the ministry of health in the state.

**Study Area**

The research covers the entire Jigawa state; the state is located in the northern part of Nigeria and lies between latitude 11°N and 13°N and longitude 8°E to 10°E. The total land area of the state is 22, 410km². It boarders with the Niger republic from the northern part, Katsina from the north west and Yobe from the east, Kano State from the south west and Bauchi State from the south eastern border with (Saka, Isiaka, Saka, Agbana, & Bako, 2012; Uzochukwu et al., 2015). Jigawa is shown along in Figure 1 with the other 35 states of the federal republic of Nigeria. The state was ranked 8th in term of population with about 4.5 million people. Utilization of maternal health care and , the outcomes of health baseline in the state is abysmally low. The hospital base delivery even in the country is low and in order to address the problem of low patronage of hospital delivery the Federal ministry of health introduced the Midwives Scheme program in the year 2019 (Adeniran et al., 2015).
Data Collection and Management
Documentary data was collected from the State Ministry of Health carryout on the clean delivery trial program in the state which consists of baseline, continuous and end line phases. Therefore, the Ministry employed and trained well-trained females who spoke the local language of the community (Hausa the baseline data). Data were collected using survey with the phones. The survey was conducted From December 2017 to May 2018 using random sample of 15% of women between the age of 15-49. During the survey, if number of women exceeded one, a single woman was selected using randomization on the field. The survey collected information on socio-economic variables of pregnant women, parity, utilization of maternal services, family planning, health status of the respondent, knowledge of health and attitudes toward health seeking.

Monitoring of pregnancy was continuous at second phase with simple short messages on phone. A member in the community was trained to monitor and report important information among respondent of baseline. The trained member of the community reports the information by text messages to the ministry of health; this information may include birth or mortality during pregnancy. The text messages sent will then be directed to the officer in charge in the ministry who will then subsequently trace the house and administer questionnaire. Verbal autopsies were used to record the maternal deaths. The survey (Questionnaire) includes information on antennal care, women health during pregnancy and delivery. However, the Ministry only produced a report from this without proper analysis that will bring out the actual outcome of the findings especially using appropriate statistical method of analysis.
Statistical Methods
The study used logistic regression (hierarchical) for the analysis of the relationship between characteristics and clean delivery kit (receipt, used and utilization of the kits) and pregnancy outcome. Individual was used for the analysis because the use, receipt and utilization of kit depend on individual level. The analysis takes into consideration only women who reported birth during the trial of the programme. Stata 14.2 software were used for the analysis.

Independent and Dependent Variables
Socio-characteristics variables of the respondent that were included in the research are respondent age, educational status, parity of the women, and wealth status. Wealth status of the household were computed using four variables, these variables are solid roof, solid floor, latrine accessibility and material used in construction of house. Parity of a woman is the number of birth by women. Miscarriage history of respondent, live births and complication resulting from pregnancy were also captured as a history of baseline of maternal services utilization, information on antenatal care, postnatal care, and delivery at the presence of skilled personnel, were also obtained. The perception of pregnancy risk by respondent were computed and measured by using: whether maternal death believes to be avoidable, not encounter complication during pregnancy or whether risk can be correctly recognized. Based on these variables knowledge of risk was categorized into high, medium and low. The study also considered and obtained information on household decision making, educational status, and occupation of the husband.

The outcome variables used in the study is maternal health. The variables of interest were explained in Table1. Outcome of pregnancy were used and selected based on the scientific literature review related to subject matter. Utilization care variables used in the research included are: use of antenatal care (including receiving folic acid, ANC at Primary Health care or Hospital, number of ANC received), place of deliver (Home or hospital), presence of skilled attendant during birth and utilization of postnatal service. Health practice variables were also captured in the study: husband presence at ANC, birth plan, and family planning.

Ethical Approval
Ethical clearance was obtained from the ethical Research Committee of the Ministry of Health in Jigawa state, Nigeria. The committees the institutional body that review all human subjects research to be conducted in the state. All respondents signed forms the consent forms.

Results
The statistics summary of clean delivery kits (CDK) were displayed in Table 2. The findings revealed that about one-tenth had received the clean delivery kit and CKD knowledge was found to be high. Out of the women who had collected the CDK, majority know how to operate the kit. Two-third (66.4%) of women who collected the clean delivery kit only correctly named one- equipment (object) in the kit distributed. However the percentage of use is low, only half use it. Most of the women revealed that, even though they are not using the clean delivery kit, it is in their custody. One of the women reported that, the kit was discarded while three women handed over the clean delivery kit to their neighbours.
| VARIABLES                                      | DESCRIPTIONS                                                                                                                                                                                                 |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Utilized antenatal care                       | Respondent attended at least 1 antenatal visit from skilled provider                                                                                                                                         |
| 4 ANC visits                                  | Respondent attended 4 or more antenatal visits from a skilled provider                                                                                                                                       |
| Received ANC in first trimester               | Respondent attended ANC in first trimester                                                                                                                                                                  |
| 50%ANC services                               | Respondent received more than 50% of available antenatal services; services included body weighing, height measurement, blood pressure check, blood test, urine test, stomach height measurement, listening to fetus heart, internal check, HIV test, advice about proper nutrition, information on indications of complication, advice on what to do in case of complication |
| Received ANC at PHC or hospital               | Respondent attended ANC at a higher-level facility (PHC, hospital)                                                                                                                                           |
| Tetanus vaccine                               | Respondent received tetanus vaccine during ANC                                                                                                                                                               |
| Received iron folic pills                     | Respondent received iron folic pills during ANC                                                                                                                                                              |
| Utilized care given complications             | Respondent used care from skilled provider if she experienced a pregnancy complication (Missing if no complication reported)                                                                                 |
| Facility birth                                | Respondent delivered in a health facility                                                                                                                                                                   |
| Delivered at home alone                       | Respondent delivered at home, with no other individual present                                                                                                                                              |
| Delivered at home accompanied                 | Respondent delivered at home, accompanied by another individual                                                                                                                                             |
| Skilled attendance at birth                   | Delivery was attended by a skilled provider                                                                                                                                                                  |
| Utilized postnatal care                       | Respondent received postnatal care within two months of delivery                                                                                                                                             |
| Developed birth plan                          | Respondent developed a birth plan prior to delivery                                                                                                                                                           |
| Husband present at ANC                        | Respondent reported husband attended 1 ANC visit                                                                                                                                                              |
| Husband present at delivery                   | Respondent reported husband present at delivery                                                                                                                                                              |
| Complementary feeding in first 3 days         | Respondent provided liquid or food to infant in first 3 days of life                                                                                                                                          |
| MATERNAL AND NEONATAL MORBIDITY                  |                                                                 |
|-----------------------------------------------|-----------------------------------------------------------------|
| Pregnancy—swelling; fatigue; high BP; other  | Respondent reported complication during most recent pregnancy    |
| Delivery—bleeding; prolonged labour;          | Respondent reported complication during most recent delivery    |
| headache/ blurred vision/ high BP             |                                                                  |
| Post-partum—bleeding; swelling; fever;        | Respondent reported complication during most recent post-partum |
| abdominal pain                                | period (60 days post-birth)                                     |
| Neonatal—rash, fever                          | Respondent reported infant experienced specified complication    |
|                                               | within first 60 days of life                                    |
Table: Statistics Summary of Clean Delivery kit use (CDK)

**Receipt of Clean Delivery kit and Baseline Variables**

Association between receipt of clean delivery kit and baseline variables were displayed in Table 3 and Table 4. The age of the women is averagely 26 (years), 15 years at marriage and mostly gave birth to three children. 30% of the women reported that they are living in a polygamous family, with the regards to the educational status of the women only 20% were attended school while only one in every ten read and write in Hausa language (The Major language in the study area). Only 40% of the women live in a solid roof home while 10% live in a solid floor home. The rate of antenatal coverage is relatively high; however only one-tenth of the respondent had their last delivery at health institutions.

In terms of comprising between women who received the clean delivery kit and those who did not received the kit, those with the kit (received) were significantly increased odds (OR 1.39, 95% CI: 1.01–1.91, \( p < 0.05 \)) of collecting about half of antenatal care in the last pregnancy. Breastfeeding and HIV awareness reporting (OR 1.55, 95% CI: 1.02–2.34, \( p < 0.01 \)), and husband educational status (OR 1.98, 95% CI: 1.20–3.28, \( p < 0.01 \)), relative to women without the clean delivery kit.

**Clean Delivery kit use and Baseline Variables**

Association between clean delivery kit use and baseline variables were displayed in Table 5 and Table, 6 out of 140 women who had received the clean delivery kit, reported that this is their first marriage (OR 2.82, 95% CI: 1.19–6.66, \( p < 0.05 \)) and they also reported that they are well doing (OR 2.00, 95% CI: 1.06–3.76, \( p < 0.05 \)), folic acid receipt by women and antenatal care services were OR 1.97, 95% CI: 1.21–3.22, \( p < 0.01 \), and OR 2.53, 95% CI: 1.27–5.04, \( p < .01 \) respectively. Clean delivery kits and exposure to radio association is very positive (OR 1.97, 95% CI: 1.21–3.22, \( p < 0.01 \)), knowledge of HIV and breastfeeding is very high (OR 2.16, CI: 1.12–4.19, \( p <0.05 \)) and family planning knowledge (OR 2.39, 95% CI: 1.18–4.85, \( p <0.05 \)). The respondents have confidence that they will not have challenges in future (OR 3.05, CI:  

| Birth kits (Exposure) | Number | Percentage |
|-----------------------|--------|------------|
| Received a kit: Birth kits arm |         |            |
| Yes                   | 113    | 9.9%       |
| No                    | 1027   | 90.1%      |
| Other intervention arms |       |            |
| Yes                   | 27     | 1.2%       |
| No                    | 2150   | 98.8%      |
| How to use kit        |         |            |
| Yes                   | 102    | 74.3%      |
| No                    | 38     | 25.7%      |
| Names at least one object in the kit | | |
| Yes                   | 93     | 66.4%      |
| No                    | 47     | 33.6%      |
| Use of kit            |         |            |
| Used                  | 72     | 51.4%      |
| Possession            | 61     | 43.6%      |
| Discarded             | 1      | 0.01%      |
| Gave it to friends    | 3      | 2.1%       |
| Unknown               | 3      | 2.1%       |
1.39–6.68, p < 0.01), knowledge of risk in pregnancy is medium (OR 7.03, 95% CI: 1.09–45.29, p <0.05).

**Table 3:** Relationship between baseline Variables and Clean Delivery Kit (CDK)

| Variables                          | Received Number | %     | Not Received Number | %     | Odd ratio | 95% Confidence Interval |
|------------------------------------|-----------------|-------|---------------------|-------|-----------|-------------------------|
| A: SOCIO-DEMOGRAPHIC VARIABLES     |                 |       |                     |       |           |                         |
| 16–19(yrs)                         | 737             | 23.2  | 31                  | 22.1  | 0.96      | (0.68–1.37)             |
| 29–29(yrs)                         | 1458            | 45.9  | 66                  | 47.1  | 1.09      | (0.75–1.57)             |
| 30 (yrs)+                          | 982             | 30.9  | 43                  | 30.7  | 0.94      | (0.64–1.37)             |
| Hausa                              | 2645            | 83.3  | 120                 | 85.7  | 1.17      | (0.61–2.24)             |
| First marriage                     | 2553            | 80.4  | 118                 | 84.3  | 1.20      | (0.68–2.12)             |
| Polygamous                         | 923             | 29.1  | 47                  | 33.6  | 1.19      | (0.83–1.70)             |
| Attended school                    | 615             | 19.4  | 28                  | 20.0  | 1.00      | (0.56–1.80)             |
| Literate in Hausa                  | 346             | 10.9  | 20                  | 14.3  | 1.31      | (0.69–2.48)             |
| Parity zero                        | 374             | 11.8  | 12                  | 8.6   | 0.75      | (0.42–1.36)             |
| Parity one                         | 477             | 15.0  | 24                  | 17.1  | 1.23      | (0.78–1.92)             |
| Parity 2+                          | 2326            | 73.2  | 104                 | 74.3  | 1.02      | (0.69–1.50)             |
| Age at marriage†                   | 15.3            | 1.9   | 15.1                | 1.5   | 0.93      | (0.82–1.06)             |
| Number of children†                | 2.8             | 2.2   | 3                   | 2.3   | 1.04      | (0.97–1.11)             |
| Wealth Status                      | 0               | 1.3   | 0                   | 1.3   | 1.05      | (0.90–1.23)             |
| B: HEALTH HISTORY                  |                 |       |                     |       |           |                         |
| Feels generally well               | 2055            | 64.7  | 85                  | 60.7  | 0.86      | (0.56–1.32)             |
| Any miscarriage                   | 344             | 10.8  | 12                  | 8.6   | 0.76      | (0.45–1.26)             |
| Any stillbirth                     | 434             | 13.7  | 19                  | 13.6  | 0.97      | (0.59–1.60)             |
| Any death of infant (under1)       | 1288            | 46.4  | 68                  | 54.0  | 1.23      | (0.87–1.73)             |
| Complication in last pregnancy     | 1468            | 56.3  | 69                  | 56.6  | 1.04      | (0.72–1.51)             |
| C: HEALTH UTILIZATION             |                 |       |                     |       |           |                         |
| Antenatal care                     | 1356            | 52.0  | 72                  | 59.0  | 1.33      | 90.91–1.93)             |
| 4 ANC visits                       | 831             | 31.9  | 48                  | 39.3  | 1.35      | (0.85–2.13)             |
| ANC in first trimester             | 278             | 10.7  | 16                  | 13.1  | 1.25      | (0.72–2.16)             |
| Received50%+ANC services           | 601             | 23.0  | 37                  | 30.3  | 1.39      | (1.01–1.91)             |
| ANC at PHC or hospital             | 1273            | 93.9  | 66                  | 91.7  | 0.92      | (0.31–2.80)             |
| Tetanus vaccine                    | 1174            | 45.0  | 58                  | 47.5  | 1.08      | (0.66–1.75)             |
| Iron folic pills                   | 1392            | 53.4  | 74                  | 60.7  | 1.34      | (0.89–2.00)             |
| Complications                      | 657             | 50.2  | 32                  | 49.2  | 0.90      | (0.56–1.43)             |
| Facility delivery                  | 179             | 9.6   | 10                  | 12.0  | 1.44      | (0.72–2.89)             |
| SBA                               | 204             | 11.0  | 10                  | 12.0  | 1.32      | (0.65–2.65)             |
| Postnatal care                     | 510             | 27.2  | 21                  | 25.3  | 0.87      | (0.57–1.33)             |
Table 4: Relationship between Variables and Clean Delivery Kit (CDK)

| Variables                          | Received | Not Received | Odd Ratio | 95% Confidence Interval |
|------------------------------------|----------|--------------|-----------|-------------------------|
|                                   | Number   | %            | Number    | %                       |                     |
| **A: HEALTH KNOWLEDGE**            |          |              |           |                         |                     |
| Listens to radio regularly         | 1302     | 41.0         | 67        | 47.9                    | 1.33 (0.92–1.91)    |
| TB Knowledge                       | 2126     | 66.9         | 99        | 70.7                    | 1.07 (0.76–1.50)    |
| HIV/AIDS                           | 2632     | 82.8         | 124       | 88.6                    | 1.37 (0.89–2.12)    |
| MTCT                               | 1233     | 46.8         | 67        | 54.0                    | 1.29 (0.91–1.83)    |
| HIV transmitted breastfeeding       | 1472     | 55.9         | 83        | 66.9                    | 1.55 (1.02–2.34)    |
| Birth control pill                 | 1054     | 33.2         | 51        | 36.4                    | 1.20 (0.82–1.78)    |
| Infant immediately breastfed       | 1397     | 44.0         | 72        | 51.4                    | 1.33 (0.89–1.97)    |
| Exclusive breastfeeding             | 238      | 7.5          | 12        | 8.6                     | 1.11 (0.65–1.89)    |
| **B: PREGNANCY COMPLICATION KNOWLEDGE** | | | | | |
| No of Labour complication          | 3.1      | 3.1          | 3.2       | 3.3                     | 1.01 (0.94–1.09)    |
| No of danger sign                  | 3.0      | 3.2          | 3.1       | 3.3                     | 1.01 (0.94–1.09)    |
| Postpartum complication             | 2.6      | 2.5          | 2.7       | 2.5                     | 1.01 (0.92–1.12)    |
| **C: PERCEPTION OF PREGNANCY AND DELIVERY RISK** | | | | | |
| Preventable Deaths                 | 357      | 11.2         | 19        | 13.6                    | 1.14 (0.62–2.100)   |
| No problem in delivery             | 1303     | 41.0         | 62        | 44.3                    | 1.10 (0.69–1.740)   |
| Risk low knowledge                 | 765      | 24.1         | 24        | 17.1                    | 0.71 (0.39–1.29)    |
| Medium                             | 238      | 7.5          | 8         | 5.7                     | 0.71 (0.33–1.53)    |
| High                               | 2174     | 68.4         | 108       | 77.1                    | 1.48 (0.82–2.67)    |
| **D: HOUSEHOLD DYNAMICS**          |          |              |           |                         |                     |
| Husband Education                  | 504      | 22.3         | 35        | 34.7                    | 1.98 (1.20–3.28)    |
| Husband occupation                 | 1550     | 48.8         | 76        | 54.3                    | 1.22 (0.79–1.90)    |
| Finance                            | 2700     | 85.0         | 112       | 80.0                    | 0.76 (0.47–1.22)    |
| Children                           | 2136     | 82.8         | 101       | 82.1                    | 0.97 (0.56–1.66)    |
| Antenatal                          | 2965     | 93.3         | 130       | 92.9                    | 0.88 (0.44–1.78)    |
| Husband assistant                  | 1025     | 54.8         | 46        | 55.4                    | 0.98 (0.59–1.62)    |
Table 5: Relationship between variable and Clean Delivery Kit use

| variable                                      | Used | %   | Not used | %   | Odd Ratio | 95% confidence interval |
|-----------------------------------------------|------|-----|----------|-----|-----------|-------------------------|
|                                               | Number |     | Number   |     |           |                         |
| **A: SOCIO-ECONOMICS VARIABLES**              |      |     |          |     |           |                         |
| 16–19(yrs)                                    | 16   | 23.5| 15       | 20.8| 0.80      | (0.37–1.73)             |
| 29–29(yrs)                                    | 28   | 41.2| 38       | 52.8| 1.66      | (0.86–3.19)             |
| 30 (+yrs)                                     | 24   | 35.3| 19       | 26.4| 0.66      | (0.43–1.03)             |
| Hausa                                         | 57   | 83.8| 63       | 87.5| 1.20      | (0.37–3.89)             |
| first marriage                                | 53   | 77.9| 65       | 90.3| 2.82      | (1.19–6.66)             |
| polygamous                                    | 22   | 32.4| 25       | 34.7| 1.06      | (0.50–2.25)             |
| Education                                     | 11   | 16.2| 17       | 23.6| 1.60      | (0.64–3.96)             |
| Literate in Hausa                             | 7    | 10.3| 13       | 18.1| 2.06      | (0.56–7.52)             |
| Parity zero                                   | 4    | 5.9 | 8        | 11.1| 1.75      | (0.41–7.42)             |
| Parity one                                    | 11   | 16.2| 13       | 18.1| 1.07      | (0.34–3.34)             |
| Parity 2+                                     | 53   | 77.9| 51       | 70.8| 0.74      | (0.32–1.69)             |
| Age at marriage                               | 14.9 | 1.6 | 15.2     | 1.5 | 1.13      | (0.88–1.45)             |
| Number of children                            | 3.1  | 2.2 | 2.9      | 2.3 | 0.97      | (0.85–1.11)             |
| Wealth Status                                 | 0.0  | 1.2 | 0.1      | 1.4 | 1.21      | (0.90–1.61)             |
| **B: HEALTH HISTORY**                         |      |     |          |     |           |                         |
| Generally well                                 | 36   | 52.9| 49       | 68.1| 2.00      | (1.06–3.76)             |
| Miscarriage                                   | 7    | 10.3| 5        | 6.9 | 0.76      | (0.25–2.29)             |
| Stillbirth                                    | 9    | 13.2| 10       | 13.9| 0.98      | (0.36–2.68)             |
| Death of infant (under1)                      | 38   | 60.3| 30       | 47.6| 0.57      | (0.32–1.03)             |
| last PG complication                          | 40   | 65.6| 29       | 47.5| 0.44      | (0.19–1.00)             |
| **C: HEALTH UTILIZATION**                     |      |     |          |     |           |                         |
| Antenatal care                                | 29   | 47.5| 43       | 70.5| 2.53      | (1.27–5.04)             |
| 4 ANC visits                                  | 20   | 32.8| 28       | 45.9| 1.66      | (0.86–3.22)             |
| ANC in first trimester                        | 6    | 9.8 | 10       | 16.4| 1.68      | (0.49–5.71)             |
| Received50%                                   | 16   | 26.2| 21       | 34.4| 1.43      | (0.78–2.60)             |
| PHC or hospital                               | 29   | 100.0| 37     | 86.0| Missing   |                         |
| Tetanus vaccine                               | 25   | 41.0| 33       | 54.1| 1.59      | (0.78–3.26)             |
| Iron folic pills                              | 30   | 49.2| 44       | 72.1| 2.58      | (1.22–5.47)             |
| Complications care                            | 19   | 51.4| 13       | 46.4| 0.77      | (0.38–1.54)             |
| Facility delivery                             | 4    | 9.1 | 6        | 15.4| 1.84      | (0.46–7.30)             |
| SBA                                           | 4    | 9.1 | 6        | 15.4| 1.84      | (0.46–7.30)             |
| Postnatal care                                | 11   | 25.0| 10       | 25.6| 1.03      | (0.33–3.23)             |
### Table 6: Relationship between variables and Clean Delivery Kit Use (CDK)

| Variables                                      | Used | %     | Number | Not Used | %     | Odd Ratio | 95% Confidence Interval |
|------------------------------------------------|------|-------|--------|----------|-------|-----------|-------------------------|
| **A: HEALTH KNOWLEDGE**                        |      |       |        |          |       |           |                         |
| Listens to radio                               | 27   | 39.7  | 40     | 55.6     | 1.97** | (1.21–3.22) |
| TB                                             | 45   | 66.2  | 54     | 75.0     | 1.47  | (0.78–2.78) |
| HIV/AIDS                                       | 59   | 86.8  | 65     | 90.3     | 1.43  | (0.46–4.48) |
| MTCT                                           | 31   | 52.5  | 36     | 55.4     | 1.21  | (0.57–2.55) |
| HIV through breastfeeding                      | 35   | 59.3  | 48     | 73.8     | 2.16* | (1.12–4.19) |
| Birth control pill                             | 19   | 27.9  | 32     | 44.4     | 2.39* | (1.18–4.85) |
| Immediately breastfed                          | 33   | 48.5  | 39     | 54.2     | 1.24  | (0.54–2.82) |
| exclusive breastfeeding                        | 6    | 8.8   | 6      | 8.3      | 1.13  | (0.35–3.62) |
| **B: KNOWLEDGE OF PREGNANCY–SPECIFIC COMPLICATIONS** |      |       |        |          |       |           |                         |
| Labour and delivery complications known†      | 3.0  | 3.2   | 3.4    | 3.4      | 1.03  | (0.94–1.11) |
| Danger signs known†                            | 2.9  | 3.2   | 3.2    | 3.5      | 1.02  | (0.94–1.11) |
| Postpartum complications†                      | 2.7  | 2.6   | 2.6    | 2.5      | 0.99  | (0.89–1.10) |
| **C: PERCEPTIONS OF RISK**                     |      |       |        |          |       |           |                         |
| Preventable Death                              | 9    | 13.2  | 10     | 13.9     | 1.24  | (0.55–2.80) |
| No problems in delivery                       | 22   | 32.4  | 40     | 55.6     | 3.05**| (1.39–6.68) |
| Relative risk: low knowledge                   | 15   | 22.1  | 9      | 12.5     | 0.49  | (0.21–1.13) |
| Medium knowledge                               | 1    | 1.5   | 7      | 9.7      | 7.03* | (1.09–45.29) |
| High knowledge                                 | 52   | 76.5  | 56     | 77.8     | 1.12  | (0.59–2.11) |
| **D: HOUSEHOLDDYNAMICS**                      |      |       |        |          |       |           |                         |
| Husband Education                              | 11   | 24.4  | 24     | 42.9     | 2.76  | (0.81–9.38) |
| Husband Occupation                             | 38   | 55.9  | 38     | 52.8     | 0.91  | (0.38–2.14) |
| Husband decides alone: finances                | 55   | 80.9  | 57     | 79.2     | 0.82  | (0.31–2.15) |
| Husband decides alone: children’s health       | 50   | 79.4  | 51     | 85.0     | 1.41  | (0.66–3.01) |
| Husband decides alone: antenatal care          | 65   | 95.6  | 65     | 90.3     | 0.42  | (0.09–1.90) |
| Husband assisted in most recent delivery       | 21   | 47.7  | 25     | 64.1     | 2.03  | (0.97–4.26) |
Outcomes of Pregnancy and Clean Delivery Kit

Crude odds ratios and adjusted of the clean delivery association and utilization of health care pattern were displayed in Table 7 (Panel A). Clean delivery kit. Clean delivery kit had a significant association with achieving antenatal care (four or more) with odd ratio decreased (aOR 0.39, 95% CI: 0.18–0.85, p <0.05), and utilization of anteninaal care at PHC or hospital odd ratios decreased (aOR 0.15, 95% CI: 0.06–0.42, p <0.001). Association between clean delivery kit and delivery at facility is negative (no association), postnatal care and or skilled birth delivery. Use of clean delivery kit is significantly associated with increased odd ratios that the women husband was at the hospital during the delivery (aOR 3.15, 95% CI: 1.07–9.25, p <0.05),

Maternal mortality complications in Table 8 revealed that clean delivery kit use was significantly associated with prolonged labour (increased odd ratios) (aOR 4.75, CI 1.36–16.59, p <.05) and aOR 4.10, CI 1.32–12.71, p <0.05 (postpartum bleeding). While the result revealed that there was negative association between not using clean delivery kit and complications.

Discussion

The findings of this study found low patronage of maternal care utilization in Jigawa State of Nigeria. Clean delivery kits distribution to the women is also very low, and evens the utilization of the clean delivery kits is significantly associated with maternal health outcome. The research found that nearly about 9.7% women who are pregnant women received the kits. When comparing the receipt and use of the clean delivery kit patterns is very challenging, this is because of the two main reasons: quantitative studies done previously examined the clean delivery kits assumed that clean delivery kit receipt and use are the same, and mostly data on those who received and used kits were not reported separately. This finding revealed that women who received and reported the used of the kits are 50% only. The second reason s is that, scientific literature focuses only on the intervention (programme) of the kit distribution to the health institutions, purchase stores or skilled birth attendant (Fagerli et al., 2017; Morrison et al., 2015). Only little is known about clean delivery kit uptake and recipients’ identity may vary (Cecilia Jevitt, Zalota, Lakehomuer, & Elizabeth Kitue; Seward et al., 2015).

Findings of this study are in consistent with early study conducted on the clean delivery kit distribution and use in India, Bangladesh and Nepal. In India only 18.4% reported using the kits, 18.4% and 5.7% for Bangladesh and Nepal respectively (Morrison et al., 2015; Seward et al., 2015). The clean delivery kits were normally distributed through the health institution. On the contrary higher figure were reported in Egypt and Tanzania, Egypt having 75% while Tanzania having 60% (Maheen & Hoban, 2017). Therefore this study contributed to the literature by examining the clean delivery kits distribution directly to the women at home. Many studies use qualitative method to examine the clean delivery kits and women experiences, acceptability of the kits, and reason for use and non-used by the women. These studies generally revealed that child giving birth and postnatal are patterned culturally and little were known about the perception and other constraining factors that hinder the use of the kit (Colomar et al., 2017; Fagerli et al., 2017). Another reason is that, most of the women have no confidence on the kit. Also members of the family always discourages the women from the using the kit (Morrison et al., 2015).
the study found that women have the knowledge of receiving the kits and reason behind the distributing the kits. The study also revealed no significant difference between outcomes of the maternal health between women who received and those women who did not have the kits. Women who received and used the kits were found by this research to be more patronising antenatal care, more aware of the health information, and have confident to face the maternal risk. In a study conducted in Egypt revealed that pregnant women who utilized antenatal care optimally also utilizes clean delivery kit used (Darmstadt et al., 2009; Holtz & Elsawy, 2016). The use of clean delivery kit in South Asia is negatively associated with women educational status while associated positively with women parity and antenatal visit (Pagel et al., 2014; Seward et al., 2012).

There is no significant association between wealth status of the household, parity and maternal education and clean deliver kit use. A positive relation between antenatal care utilization and clean delivery kit use, while there is evidence of negative association between maternal complication and use of clean delivery kit. In contrast with other studies, the analysis found a negative association between clean delivery kit and health care utilization. Clean delivery kit was found to be significantly associated with antenatal care receiving (four or more visit) and opposite association was observed between maternal health care utilization (hospital delivery, postnatal) and clean delivery kit. The association between clean delivery kit use and present of husband during delivery (this is significant statistically at 5% when confounders was adjusted. Mothers using clean delivery kit likely four or more time to attend and patronage antenatal care (Anastasi et al., 2015). The kits were normally distributed at antenatal visit therefore this will encourage women to attend the antenatal care. In Brazil hospital delivery was increased because during child delivery at hospital, diapers, blanket were distributed to women (do Carmo Leal et al., 2016). But receipt of the kit does not guarantee using the kit at home.

Many researchers are of the view that clean delivery kits provision potentially could encourage health services utilization, this will only be possible when the kits distribution is a attached with the care utilization. When distribution the kit also there is a need to understand and study the recipient demographic variables. This study found a positive relationship between prolonged labour and clean delivery kit. Clean delivery kit was also associated with the outcome of maternal health. In a study conducted in Nepal revealed, clean delivery kit distribution together with traditional birth attendant training significantly caused the reduction of sepsis and haemorrhage (Morrison et al., 2015). In fact many studies revealed the reduction of sepsis among the community who used clean delivery kit (Seward et al., 2015).

Given that the sample was drawn from one state in northern Nigeria, the evidence presented here may have limited external validity for a broader population. However, this evidence may be relevant for other similar populations (particularly rural areas characterized by extremely low baseline utilization rates of health services and poor health outcomes forewomen and children), as well as for other interventions in which community health workers characterized by low levels of training and/or supervision promote new health technologies or health inputs. Our findings have implications for health programming, policy and research. While further research is needed to understand how the effectiveness of clean delivery kits is shaped by the distribution mechanism and the characteristics of
recipients, this evidence suggests that the provision of kits to pregnant women outside of the formal health system may be undesirable. Use of clean delivery kits may encourage substitution away from the formal health system (at least for ANC), and appears to be associated with negative health outcomes. Distribution via skilled health workers or linking distribution to health service utilization may have more positive effects on beneficiaries; however, this choice also has implications for cost-effectiveness.

In light of the growing literature suggesting that safe clean delivery kits are effective in enhancing clean delivery practices and reducing maternal and neonatal health risks, it is important to highlight that the benefits of clean delivery kits may not be universal. Future interventions developed for settings where utilization of formal health care is particularly low should take into account the potential risk that clean delivery kits distribution may in fact reinforce a pre-existing preference to avoid utilizing care and contribute to poor health outcomes. Further evidence is needed to understand whether clean delivery kit distribution dis-incentivizes facility delivery in different contexts.

**Conclusion and Recommendation**

The finding suggests that intervention in rural northern Nigeria designed to distribute safe clean delivery kits widely to all pregnant women in targeted communities resulted in relatively low rates of penetration, and even lower rates of clean delivery kit use. In this setting, the use of clean delivery kits was not associated with reductions in maternal or neonatal morbidity, but rather seems to be associated with an increase in adverse health outcomes. Further research should explore the potential risks of clean delivery kit distribution in reinforcing low utilization rates of formal health care, particularly in contexts where resistance to formal health services is relatively high.

Our findings have implications for health programming, policy and research. While further research is needed to understand how the effectiveness of birth kits is shaped by the distribution mechanism and the characteristics of recipients, this evidence suggests that the provision of kits to pregnant women outside of the formal health system may be undesirable. Use of birth kits may encourage substitution away from the formal health system (at least for ANC), and appears to be associated with negative health outcomes. Distribution via skilled health workers or linking distribution to health service utilization may have more positive effects on beneficiaries; however, this choice also has implications for cost-effectiveness.

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