

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, Ononokpono, & 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 clean 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 52 million 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 borders 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).

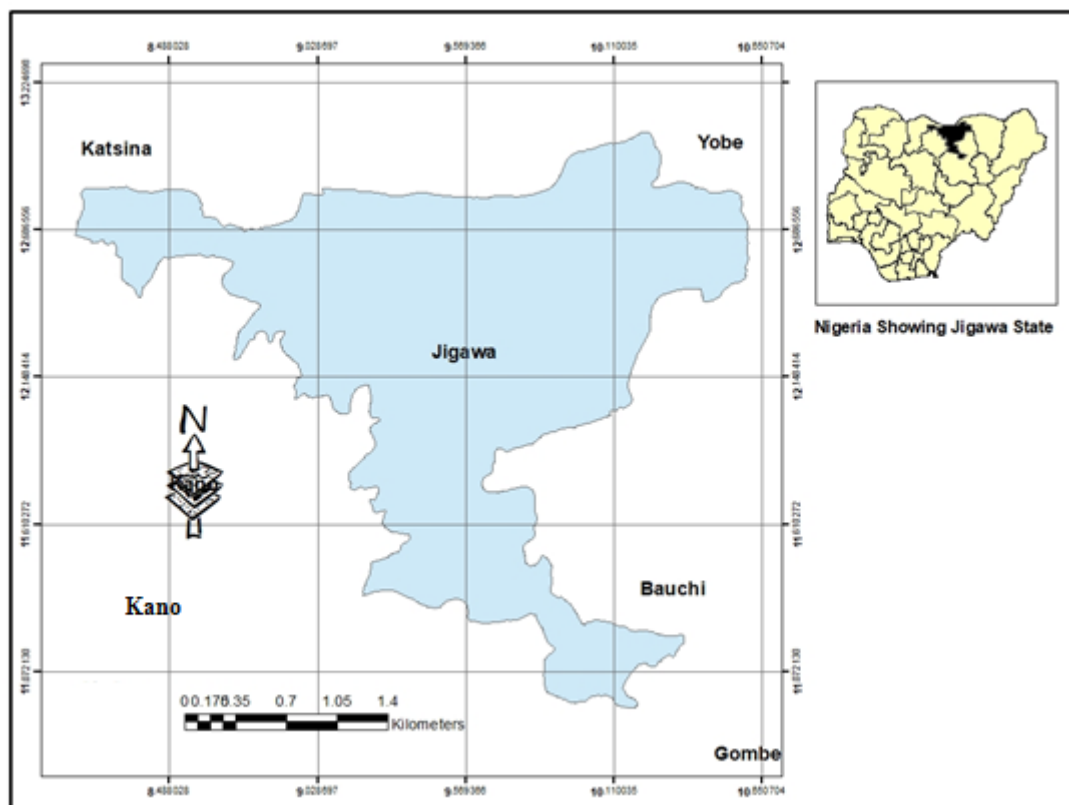


Figure 1: Jigawa State Nigeria

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 antenatal 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 Table 1. 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: used 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 committee is 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 CDK 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.

Table1: Pregnancy outcomes of interest.

VARIABLES	DESCRIPTIONS
CARE UTILIZATION	
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%ANCservices	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

HEALTH PRACTICES

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; headache/ blurred vision/ high BP	Respondent reported complication during most recent delivery
Post-partum—bleeding; swelling; fever; abdominal pain	Respondent reported complication during most recent post-partum 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

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%

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:

1.39–6.68, $p < 0.01$), knowledge of risk in pregnancy is medium (OR 7.03, 95% CI: 1.09–45.29, $p < 0.05$).

Table3: Relationship between baseline Variables and Clean Delivery Kit (CDK)

Variables	Received		Not Received		Odd ratio	95 Confidence Interval
	Number	%	Number	%		
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)
Received 50%+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 toradioregularly	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)
HIVtransmiviabreastfeeding	1472	55.9	83	66.9	1.55	(1.02–2.34)
birthcontrol pill	1054	33.2	51	36.4	1.20	(0.82–1.78)
Infantimmediately breastfed	1397	44.0	72	51.4	1.33	(0.89–1.97)
Exclusivebreastfeeding	238	7.5	12	8.6	1.11	(0.65–1.89)
B: PREGNANACY 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)
Postpartumcomplicatio	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)

Table5: 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: HELATH 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)

Table6: Relationship between variables and Clean Delivery Kit Use (CDK)

Variables	Used		Not Used		Odd Ratio	95% Confidence Interval
	Number	%	Number	%		
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)
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D:HOUSEHOLDDYNAMICS

Husband Education	11	24.4	24	42.9	2.76	(0.81–9.38)
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Husband Occupation	38	55.9	38	52.8	0.91	(0.38–2.14)
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Husband decides alone: finances	55	80.9	57	79.2	0.82	(0.31–2.15)
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Husband decides alone: children’s health	50	79.4	51	85.0	1.41	(0.66–3.01)
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Husband decides alone: antenatal care	65	95.6	65	90.3	0.42	(0.09–1.90)
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Husband assisted in most recent delivery	21	47.7	25	64.1	2.03	(0.97–4.26)
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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 antenatal 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, $p < 0.05$) 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 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, Lakehomer, & 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 (Colomaret *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 & Elsayy, 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 (Anastasiet *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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