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Antenatal care providers' attitudes and beliefs towards maternal vaccination in Kenya

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2011

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An abstract of
a thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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Abstract

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Background: Immunization provides critical protection against infectious diseases. Maternal immunization provides vital immunity against devastating infectious diseases that afflict many children under the age of five [1, 2]. Mothers in at-risk areas require significant antenatal care due to their vulnerability to infectious diseases. As antenatal care clinics (ANC) are primary care centers for new mothers, ANC providers are crucial for vaccine acceptance [3]. Although antenatal care data is available for high income countries, lack of data from middle to low income countries [4] demands research on attitudes and behaviors of ANC providers and receivers. Hence, we aimed to understand the beliefs and attitudes of ANC providers in Kenya.

Methods: We conducted a survey with questions to assess knowledge, attitudes and beliefs (KAB) of 150 antenatal care providers from clinics and hospitals across four different regions of Kenya.

Results: Antenatal care providers in this large sample from Kenya had positive attitudes towards maternal vaccination. 99% of the providers recommended maternal vaccinations. 80% of them reported flu as one of the main concerns in pregnant women. Majority of the providers reported that religious beliefs, ethnicity, cultural background and political leaders does not affect their attitude or beliefs towards vaccine acceptance or recommendation.

Conclusions: The results highlight an opportunity for the introduction of new maternal vaccines in Kenya and to implement maternal vaccine promotion campaigns in partnership with these providers.

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Chapter 1: Literature Review and Background

Immunization

Vaccination has proven to be one of the best strategies to protect humans from infectious diseases [5]. Globally, approximately 2-3 million deaths are prevented each year through immunization. Some of the most severe infectious diseases, such as smallpox, have been eliminated and polio is on the edge of eradication through immunization campaigns [6]. The key parameter that defines the success of immunization campaigns is herd immunity. This is an indirect protection from infectious diseases that occurs when large number of people are vaccinated. This interrupts the spread of infection and thus provide protection to non-immunized populace [7]. However, reduction in mortality rates in infants is less because they are too young to be vaccinated. In LMIC, the primary immunization is not complete until the infants are 6 months of age. This inability to vaccine infants leaves an immunity gap and results in high death rates in this age group [8].

Maternal immunization has the potential to address the immunity gap among infants too young to be vaccinated [9]. Gall et al studied maternal immunization and showed an association between mother's and newborn's antibody level. There were with higher odds of antibodies in newborns whose mothers were vaccinated [10]. Moreover, maternal influenza immunization has been shown reduce the influenza infection by 63% among their infants up to the age of 6 months [11].

Vaccine advancements

Over the decades, rapid development in conventional technology, microbiology and virology has helped to produce efficacious and safe vaccines [5]. For instance, conjugate vaccines play a key role in activating infant's immature immune system incapable of recognizing bacterial polysaccharide capsules [12]. Likewise, recombinant vector vaccines mimic the natural infection and provokes immune system [12]. There is also immense diagnostic techniques available to monitor vaccine consistency and stability at molecular level [13]. Thus, there is tremendous progress in terms of vaccine development and advancement.

Instead of proven advantages and advancements in vaccines, global vaccination coverage remains at 85% with minimal improvement from last few years [14]. In fact, in 2017, nearly 19.9 million infants did not obtain routine vaccine services such as DTP vaccine. Approximately, 60% of these children were from low and middle income countries (LMIC) [14]. Moreover, the global coverage of Hepatitis B, Rotavirus, Rubella and Yellow fever has been shown to be 43%, 28%, 52% and 43% respectively [14]. Hence, there is a need to review the challenges and barriers in achieving adequate vaccine coverage, especially in LMIC.

Limitations to vaccine administration and opportunities for adequate vaccine coverage

The Global Vaccine Action Plan (GVAP) 2011-2020 was developed by WHO and UNICEF to strengthen national immunization programs and increasing the vaccine availability equitably [15]. The African region has not been able to achieve the GVAP goal due to challenges in immunization programs. Some of the challenges included weak healthcare systems with logistical barriers and inappropriate funding from government sector [4]. Some of the suggested

opportunities to alleviate the challenges were to collaborate with political leaders, civil society organizations and key stake holders to come up with possible solutions [4].

Healthcare workers and Immunization

Healthcare provider play a vital role in successful delivery of vaccine and overcoming the challenges in developing and underdeveloped countries [16]. Healthcare providers include physicians, nurses, physiotherapists, dietitians, chaplains, cleaning, catering, pharmacists, laboratory technicians categorized in healthcare professional [17]. Studies have cited that general population support immunization due to healthcare professional advice. A review paper on European population showed that 65% of the people considered physicians as primary source of information and had the strongest influence of their advice [3]. It is also demonstrated that women who had detailed discussions about the vaccine benefits with the antenatal care providers were more likely to accept vaccine without hesitation [18]. Thus, the pivotal role of healthcare providers in vaccine administration is well recognized.

On the other hand, healthcare care providers can also face barriers when providing vaccines to their patients. Some of the providers were doubtful about vaccine delivery due to lack of enough knowledge and unable to provide timely vaccine due to inadequate reminder system for vaccine administration[3, 19]. These findings call for a need of knowledgeable caregiver, better communication and understanding the benefits of vaccination administration specifically in LMIC [16]. Current statistics have shown suboptimal immunization rate in regions of Africa [4]. Kenya has shown high neonatal mortality rate, especially in children below the age of 5 [20].

The goal of this study is to understand the attitudes and beliefs of antenatal care providers towards maternal immunization in Kenya. This study aims to identify barriers and opportunities that can be leveraged to increase the vaccine acceptance and administration in in Kenya.

**ANTENATAL CARE PROVIDERS' ATTITUDES AND BELIEFS TOWARDS
MATERNAL VACCINATION IN KENYA**

Introduction

Infectious diseases remain a major public health concern worldwide [21], affecting approximately 17 million children a year, including 4.5 million children under the age of 5[2]. The global introduction of vaccines has led to a remarkable decline in vaccine preventable diseases (VPD) , and to an increase in life expectancy [22]. Globally, it is estimated that vaccination prevents more than two million deaths each year [23]. However, despite these gains, infants and children still have the worst morbidity and mortality outcomes [24]. In particular, Infants remain one of the most vulnerable groups to infectious diseases [25] partially because vaccination is not feasible or effective for most diseases during the first months of life [25].

Maternal immunization has the potential to address this early vulnerability, since it yields protection for both the mother and their infant [1]. The transfer of maternal antibodies through placenta is one of the mechanisms of passive immunity in newborns [26]. Clinical studies have demonstrated protection of infants against pertussis and influenza infection through maternal immunization [27, 28]. Hence, it is important to promote maternal immunization, especially in settings where the risk of infection during pregnancy and early infancy is high.

Despite proven advantages and significant progress in vaccination programs, immunization still remains suboptimal in regions of Africa [4]. Some of the determinants of low vaccine uptake in this region include living in urban or peri-urban areas, living far away from

vaccination delivery centers, issues with funding and resources, lack of sufficient vaccines due to demand and supply resurgence, logistical barriers including improper laboratory infrastructures [4, 29, 30]. One of the studies analyzing barriers to vaccinations administration, considering healthcare providers, reported inadequate reminder system as one of the reasons of inability to provide timely vaccines to patients. Moreover, nurses rather than physicians were more likely to inform patients about their missing vaccinations and the consequences of not receiving these vaccines [19]. Thus, Healthcare providers play a key role promoting maternal immunization and are essential to overcome these barriers.

Pregnant women have also shown reliance and trust on healthcare providers (HCP) for immunization related information [1]. It has been shown in multiple studies that healthcare provider not only improve the vaccine acceptance in pregnant women but can also motivate their male- partners to accept the vaccines [31]. Maternal vaccine acceptance in low- and middle-income countries (LMIC) has also been linked to trust within the patient- provider relationship, which is particularly important in areas with low vaccination coverage [32]. It has also been shown that providers' attitudes and beliefs towards vaccination can influence their vaccine recommendations [32].

The most recent census of Kenya presented neonatal mortality rate of 21.8 per 1000 live births with almost 21,000 deaths occurring under the age of five [20]. The global health observatory also showed that only 57.6 % of the pregnant women obtain at least four antenatal care visits [33]. Despite high VPD morbidity and mortality in LMIC such as Kenya, most of the research assessing the knowledge, attitudes, and beliefs of health providers has been conducted

in high- income settings. The objective of the study was to assess attitudes, beliefs and characteristics of antenatal care providers towards maternal vaccination in Kenya.

Methods and Material

Study design

Data for this analysis are part of a larger study aimed at identifying determinants of maternal vaccine acceptance in Kenya. The study was conducted by Emory University, in collaboration with the Centers for Disease Control and Prevention (CDC) and the Kenya Medical Research Institute (KEMRI). Approval for the study was obtained from Emory University's and KEMRI's Institutional Review Boards. Written informed consent was obtained from participants before enrolling in the study.

Study Population

The study population included 150 antenatal care providers working in Antenatal care clinics and hospitals in four different areas in Kenya (Nairobi, Mombasa, Marsabit, and Siaya county).

Data Collection

The research staff visited the clinics and hospitals and distributed a quantitative KAB survey (Appendix 1) to the physicians. The KAB constructs included: vaccine-preventable diseases (including burden and perceived risk), vaccine effectiveness, vaccine safety, vaccination norms, prior experience with vaccination (either for themselves, their children, patients they care for, etc.), positive and negative motivations to vaccinate, and values around vaccination. The

survey questionnaire collected socio-demographic information (age, gender, marital status level of education, specialty). The survey was conducted in the language of preference of the provider and then translated to English for analysis.

Data analysis

Demographic variables were categorized as follows: age, education and marital status were dichotomized (less than equal to and more than 30 years; college or less than college and more than college, single and married/cohabitation) respectively. Religion was divided into four categories: Catholic, Protestant, Muslim and Traditional African Churches/Traditional Religion/others. Subcategories of the variable with missing data were removed.

The 5 Likert scale of the questions (See appendix 1) in the surveys were converted to 3 Likert scale as follows: “Strongly Agree”, “Agree”, “Neutral/Neither”, “Disagree” and “Strongly disagree” scale to “Agree”, “Neutral” and “Disagree”; “Always”, “Often”, “Sometimes”, “Rarely” and “Never” scales to “Always”, “Sometimes” and “Never”; “Very easy”, “Easy”, “Neutral”, “Difficult” and “Very difficult” scales were changed to “Easy”, “Neutral” and “Difficult”.

Descriptive statistics were summarized for all the categorical (gender, hospital site, native language spoken, marital status, education, religion, specialty and number of years worked in Antenatal Care Providers) variables and survey questions. The Chi-square test was used to examine the potential relationship between categorical variables and constructs of the KAB survey. All analyses were completed in SAS, version 9.4 (SAS Institute, Cary, NC).

RESULTS

A total of 150 participants were included in this study. Most of the participants were female (77.3%) nurses (89.3%) over 30 years of age (67.3%) with Luo as the primary language of communication (Table1).

A majority of ANC providers had positive attitudes towards maternal vaccines, agreeing that vaccines are the safest strategies to protect both mother and newborns from diseases even when suffering from debilitating diseases such as HIV. They also recognized (99%) that there is a need of greater number of recommended vaccines. Nearly 80% of the providers agreed that flu is a matter of concern in pregnant women. Approximately 97% of the providers were neutral to the statement if vaccines could cause more harm than good, but a similar proportion agreed that tetanus vaccine is effective and should be administered in pregnancy. Similarly, most participants (91%) disagreed that diet is more important than vaccines during pregnancy (table 2).

Providers responded that myths and misconceptions about vaccines in the society did not affect their decisions related to maternal vaccination. A large majority also expressed that it was difficult for the political leaders to influence provider's decision to accept. Similarly, most participants disagreed that ethnic/cultural background or religious beliefs influenced their attitudes or beliefs towards vaccination. Providers identified social support (family and friends) as having a positive effect on vaccine administration and said it makes it easier for participants to accept vaccines (Table 3).

Most providers agreed that the hospitals and clinics almost always had enough educational, logistical, and human resources to deliver vaccines to the pregnant women. However, 35% of the providers reported that they are not receiving up to date information about vaccines on a regular basis. About a third of providers (78%) believed that pregnant women take all the scheduled vaccines even when they migrate to new places. Besides, they also feel that their patients trusted their suggestions and information about vaccine recommendation (table 4).

Chapter 3: Discussion/Conclusion

Results from this study of ANC providers in Kenya in four different areas that influence vaccine acceptance, show in general a positive outlook to achieve good coverage in maternal vaccines that are currently recommended in the country (Td) and for the introduction of new vaccines during pregnancy. First, the providers had positive attitudes towards vaccine administration and demanded a greater number of recommended vaccines to protect both mother and the child from debilitating outcomes. Secondly, religion, myths or political opinions do not seem to influence provider's attitudes and recommendations around maternal vaccination. Thirdly, providers perceived that women consider them as a trustworthy source of information about vaccinations and suggested that women were very careful and willing to receive vaccines during pregnancy despite barriers such as migration. Finally, it was reported that healthcare centers were well equipped with all the required materials with uninterrupted supply from government sector to mediate adequate vaccine delivery.

This finding about providers perception of having adequate vaccine supplies was contradictory to a report of 2011 -2015, conducted by Kenya division of vaccines and immunization, that presented both demand and supply challenges in vaccine availability [34]. There have been incidences of vaccine stock outs in regions of Africa such as Kenya and Tanzania [35]. One of the reasons behind the divergent results might be that the study included mostly accessible clinics and hospitals located within or near urban areas with good infrastructure, but it is possible that harder to reach areas that are at high risk of insufficient

supplies were not included in the study. It is also possible that efforts to improve vaccines supplies based on previous assessments have been noticed by the providers.

Worldwide, various studies have reported positive attitudes of healthcare providers towards vaccination [36-38]. The studies in Canada and the United states showed positive HCP's attitude with almost 80% of the providers having up to date information about the vaccination. They also agreed that it is important to receive all the recommended vaccines to prevent various deleterious health outcomes [37, 38]. Our findings from a LMIC assessment agree with these results. However, in our study only 43% providers reported to have updated information about vaccines. This seems to be one of the opportunities to be leveraged, to increase HCP's confidence in providing vaccine information to pregnant women.

Influenza infection during pregnancy was reported as one of the most important concerns during pregnancy in Kenya. Similar results have been cited by previous studies conducted in the United States and showed intensification of flu due to muffed vaccine coverage, delay in vaccination and incomplete vaccination [27, 39, 40]. In one of the studies the hospitalization rate was significantly higher in pregnant women than non-pregnant women (55.3 compared to 7.7 per 100.000 population)[39]. A study conducted in Karachi, Pakistan to evaluate knowledge attitude and practices of mothers regarding immunization depicted positive attitude towards vaccination but inability to obtain the vaccines due to lack of knowledge. It was also described that the healthcare staff was their primary source of information [41]. It is seen that providing knowledge and empowerment to mothers towards vaccines would promote the acceptance of vaccine during pregnancy [41]. Since, ANC providers are regarded as main source of information, this is one of

the opportunities, in which healthcare providers can play a vital role by informing and motivating the pregnant women to receive influenza vaccines.

Globally, studies have shown influence of ethnicity and cultural background on acceptance of different kind of vaccines [42-44]. A positive finding from this study was that religion, politics and ethnic background did not seem to negatively impact providers attitudes and beliefs towards maternal vaccination. As the studies have shown that general population support vaccines because of their healthcare provider's advice and also take their suggestions earnestly [3], healthcare providers can play a crucial role in reaching the required immunization rate in countries like Kenya. Antenatal care providers in Kenya can be key partners to promote maternal vaccination and dispel misinformation or fears that women might have about maternal vaccination.

The study had several strengths and limitations. The data was collected from different regions across Kenya that provide definitive external validity to the results. Moreover, this study included only health care providers to report their beliefs about vaccine acceptance among pregnant women as well as administrative procedures. It is very important to consider the view of pregnant women about vaccine availability and accessibility. This would help to better predict the results without a confounding factor.

In conclusion, this study supports relying on ANC providers as partners to improve maternal vaccine acceptance in Kenya. Campaigns to improve vaccine acceptance in this setting should integrate providers and leverage their willingness to recommend maternal vaccines. It would also be interesting to look at the sources of training and information that have facilitated this

widespread acceptance of maternal immunization among providers in Kenya, and potentially try to replicate these approaches in similar settings.

Appendices and Tables

Table 1: Demographic Information of ANC provider and characteristics of the Pregnant women

<i>Characteristic</i>	n	%
<i>Sex</i>		
<i>Male</i>	34	22.7
<i>Female</i>	116	77.3
<i>Age</i>		
<i>18 to 29</i>	49	32.7
<i>Over 30</i>	101	67.3
<i>Level of Education</i>		
<i>College or less than College</i>	130	86.7
<i>More than College Education</i>	20	13.3
<i>Religion</i>		
<i>Catholic**</i>	53	35.3
<i>Protestant</i>	67	44.7
<i>Traditional African Churches/Traditional Religion/others</i>	7	4.7
<i>Muslims</i>	23	15.3
<i>Specialty</i>		
<i>Nursing</i>	134	89.3
<i>General / Internal Medicine</i>	7	4.7
<i>Pediatrics</i>	3	2.0
<i>Obstetrics / Gynecology</i>	1	0.7
<i>Surgery</i>	2	1.3
<i>Marital Status</i>		
<i>Single/Divorced/Separated/ Widow/Widower</i>	45	69.13
<i>Married/Cohabitation</i>	105	30.87
<i>Mother Tongue</i>		
<i>Luo</i>	49	32.7
<i>Kikyu</i>	18	12
<i>Luhya</i>	11	7.3
<i>Kamba</i>	14	9.3
<i>Swahili</i>	6	4.0
<i>Mijikenda</i>	3	2.0

<i>Taita</i>	5	3.3
<i>Borana\Rendile\Burji\Somali</i>	28	18.7
<i>Other</i>	16	10.7
<i>Location of the Hospitals/clinic</i>		
<i>Siaya county referral hospital</i>	8	5.3
<i>Tabitha clinic</i>	12	8.0
<i>Mbagathi district hospital</i>	09	6.0
<i>Coast general provincial hospital</i>	12	8.0
<i>Marsabit district hospital</i>	30	20.0
<i>Other*</i>	79	52.7

Table 2. ANC provider knowledge, attitudes and beliefs on vaccination

	n(%) <i>Agree</i>	n(%) <i>Neutral</i>	n(%) <i>Disagree</i>
<i>ANC provider attitude on vaccine for pregnant women.</i>			
<i>I am concerned that vaccine may weaken the immune system of Pregnant women?</i>	9(6)	2(1.3)	139(92.7)
<i>I am concerned that too many vaccines could bring complication to pregnant woman's immune system?</i>	39(26)	7(4.7)	104(69.3)
<i>Vaccines are one of the safest forms of disease prevention ever developed</i>	149(99.3)	0(0.0)	1(0.7)
<i>Vaccines are getting better and safer all of the times as a result of medical research</i>	147(98.0)	3(2.0)	0(0.0)
<i>Vaccines are necessary for pregnant women for protection of unborn children from diseases.</i>	150(100)	0(0.0)	0(0.0)
<i>Vaccines are necessary for pregnant women for their own protection from diseases.</i>	143(95.3)	6(4.0)	1(0.7)
<i>Vaccinating pregnant women can prevent disease in their newborn baby</i>	148(98.7)	2(1.3)	0.0
<i>Vaccinating pregnant women can cause infertility</i>	1(0.7)	1(0.7)	148(98.7)
<i>Vaccinating pregnant women can cause disability.</i>	5(3.3)	5(3.3)	140(93.3)
<i>Vaccines are safe for use in pregnancy.</i>	142(94.7)	3(3.0)	5(3.33)
<i>I would get a vaccine when pregnant to protect myself against a disease that would make me sick</i>	112(96.6)	1(0.9)	3(2.6)
<i>Vaccinations given in pregnancy do more harm than good.</i>	3(2.0)	146(97.3)	1(0.7)
<i>The Tetanus vaccine is effective when used in pregnancy</i>	146(97.3)	2(1.3)	2(1.3)
<i>The Tetanus vaccine should be given to pregnant women.</i>	137(91.3)	6(4)	7(4.7)
<i>I think there should be more recommended vaccines for pregnant women</i>	149(99.3)	1(0.7)	0(0.0)
<i>I recommend to all my pregnant patients that they should be vaccinated.</i>	149(99.33)	0(0.0)	1(0.7)
<i>I recommend to my patients that they should vaccinate their children</i>	148(98.7)	0(0.0)	2(1.3)
<i>I am confident that childhood vaccines are safe</i>	149(99.3)	0(0.0)	1(0.7)
<i>A good diet is more important than vaccinations in preventing infectious diseases.</i>	9(6.0)	5(3.3)	136(90.7)
<i>The flu is not a concern for pregnant women</i>	25(16.7)	5(3.3)	120(80)

<i>Despite migrations, pregnant women get all their scheduled vaccines.</i>	117(78)	12(8)	21(14)
<i>Does vaccinating pregnant women can weaken the immune system of their baby?</i>	1(0.7)	0(0)	149(99.3)
<i>Does pregnant women only be vaccinated against serious diseases</i>	64(42.7)	2(1.3)	84(56.0)
<i>Does vaccine cause miscarriage or still birth in pregnant women?</i>	4(2.7)	2(1.3)	144(96)
<i>Are vaccines safe for pregnant women living with HIV?</i>	142(94.7)	4(2.7)	4(2.7)
<i>Are vaccine safe for pregnant women with anemia?</i>	139(92.7)	7(4.7)	4(2.7)
<i>Do you think flu vaccine is risky while giving in pregnancy?</i>	14(9.3)	44(29.3)	92(61.3)
<i>Is it safe to vaccinate pregnant women during the first trimester of pregnancy?</i>	81(54)	2(1.3)	67(44.7)
<i>Is it safe to vaccinate pregnant women during the second trimester of pregnancy?</i>	147(98)	1(0.7)	2(1.3)
<i>Is it safe to vaccinate pregnant women during the third trimester of pregnancy?</i>	118(78.7)	6(4)	26(17.3)
	ORAL	INJECTABLE	
<i>What mode of vaccine administration do patients prefer in maternal vaccines?</i>	78(52)	72(58)	
	Less than 2	More than 2	
<i>What is the maximum number of vaccines you would feel comfortable giving to a pregnant woman over the course of her pregnancy*****</i>	8(5.3)	142(94.7)	
<i>What is the maximum number of vaccines you would feel comfortable giving to a pregnant woman during one clinic visit?</i>	115 (76.7)	35(23.3)	

Table 3 ANC Provider Religious Cultural and Political Belief on Vaccination

Religious Belief	Easy	Neutral	Difficult
<i>My religious affiliation makes it difficult for me to accept vaccines while pregnant/my wife is pregnant</i>	109(94)	6(5.2)	1(0.9)
<i>My religious affiliation makes it difficult for me to accept vaccines for my children</i>	102(95.3)	5(4.7)	0(0)
<i>Does maternal vaccines are easily accessible and available?</i>	137(91.3)	12(8.0)	1(0.7)
<i>Do you get regular training to get updated information for vaccine?</i>	64(42.7)	34(22.7)	52(34.7)
Ethnicity			
<i>My ethnicity makes it difficult for me to accept vaccine while pregnant/my is pregnant.</i>	131(97.8)	2(1.5)	1(0.7)
<i>My ethnicity makes it difficult for me to accept vaccine for my children.</i>	106(99.1)	1(0.9)	0(0)
Cultural practices			
<i>Some cultural practices prevent me from receiving (allowing my wife to receive) vaccine while pregnant.</i>	75(56)	2(1.5)	57(42.5)
<i>Despite vaccine refusal by my spouse/father to my child, I would still accept vaccines while pregnant</i>	92(97.9)	9(0.0)	2(2.1)
<i>Myths can influence me against vaccinations</i>	3(2.0)	1(0.7)	146(97.3)
<i>Misconceptions can influence me against vaccinations.</i>	4(2.7)	0(0.0)	146(97.3)
<i>Friends encourage me to take up vaccinations.</i>	126 (84)	9(6.0)	15(10)
<i>Family members encourage me to take up vaccinations</i>	121(80.7)	13(8.7)	16(10.7)
Political Influences			
<i>Do opinion leaders influence you against vaccinations?</i>	6(4)	3(2)	141 (94)
<i>Do political leaders influence you against vaccinations?</i>	12(8)	0(0)	138 (92)

Table 4 ANC Providers Belief about availability of supplies

	Always	Sometimes	Never
<i>I have enough vaccine related provider focused educational resources to use.</i>	96(64)	43(28.7)	11(7.3)
<i>I have enough vaccine educational resources to provide to pregnant mothers</i>	139(92.7)	6(4)	5(3.3)
<i>I have enough logistical resources to deliver vaccines to pregnant women</i>	99(66)	28(18.7)	23(15.3)
<i>We have enough human resources to deliver vaccines to pregnant women</i>	79(52.7)	53(35.3)	18(12)
<i>It is easy for health facilities to get vaccine supplies from the government</i>	131(87.3)	15(10)	4(2.7)
<i>Maternal vaccines are easily accessible and available</i>	137(91.3)	12(8)	1(0.7)
<i>I feel that I have enough information to confidently discuss vaccines with my pregnant patients</i>	138(92)	11(7.3)	1(0.7)
<i>I give pregnant women enough time to review the vaccination information I offer before they make a decision whether to refuse or accept.</i>	101(67.3)	23(15.3)	26(17.3)
<i>Women trust the vaccine related information that we give them</i>	121 (80.7)	29 (19.3)	0 (0)
<i>We are updated regularly on vaccination process/information through trainings</i>	64(42.7)	34(22.7)	52(34.7)
<i>Despite cultural affiliations, I am able to change my mind to receive vaccines while pregnant, when given the right information</i>	113(97.4)	1(0.9)	2(1.7)

Appendix 1

Knowledge Attitudes and Beliefs (KAB) Survey Antenatal Care Providers

SECTION A: DEMOGRAPHIC INFORMATION		
1.	Gender	1. <input type="checkbox"/> Male 2. <input type="checkbox"/> Female
2.	What is your age?	a. <input type="checkbox"/> 18-24 b. <input type="checkbox"/> 25-29 c. <input type="checkbox"/> 30-34 d. <input type="checkbox"/> 35-39 e. <input type="checkbox"/> 40-49 f. <input type="checkbox"/> 50-59 g. <input type="checkbox"/> 60+
3.	What is your highest level of education? (check only one)	a. <input type="checkbox"/> Primary school or less b. <input type="checkbox"/> Secondary school c. <input type="checkbox"/> Vocational training (e.g. technical school, etc.) d. <input type="checkbox"/> College or university degree e. <input type="checkbox"/> Master's degree f. <input type="checkbox"/> Doctorate g. <input type="checkbox"/> Other (specify)
4.	What is your religion?	1. <input type="checkbox"/> Catholic 2. <input type="checkbox"/> Protestant 3. <input type="checkbox"/> Traditional African Churches 4. <input type="checkbox"/> Muslims 5. <input type="checkbox"/> Hindu 6. <input type="checkbox"/> Traditional Religion
5.	What is your area of specialty?	a. <input type="checkbox"/> Nursing b. <input type="checkbox"/> General / Internal Medicine b. <input type="checkbox"/> Paediatrics c. <input type="checkbox"/> Neonatal Intensive Care Unit d. <input type="checkbox"/> Emergency Department e. <input type="checkbox"/> Obstetrics / Gynecology f. <input type="checkbox"/> Adult Intensive Care Unit g. <input type="checkbox"/> Radiology h. <input type="checkbox"/> Surgery i. <input type="checkbox"/> Laboratory ij <input type="checkbox"/> Nursing Assistant k. <input type="checkbox"/> Peer education l. <input type="checkbox"/> Other (specify)
6.	How many years have you worked in antenatal care? [Check only one]	a. <input type="checkbox"/> Less than 1 year b. <input type="checkbox"/> 1 to 4 years c. <input type="checkbox"/> 5 to 9 years d. <input type="checkbox"/> 10 to 14 years e. <input type="checkbox"/> 15 to 19 years f. <input type="checkbox"/> 20+ years

7.	Do you administer maternal vaccines?	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No. →10
8.	How long have you been administering maternal vaccines?	
9.	How long have you been administering vaccines in this clinic?	

SECTION B

10	Which maternal vaccines do you offer at the clinic?	Dropdown List of vaccines to be selected from
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SECTION C

For the following questions, for each question please indicate how much you agree with each statement (1 = ‘Strongly Agree,’ 5 = ‘Strongly Disagree’)

		1 Strongly Agree	2 Agree	3 Neutral/No option	4 Disagree	5 Strongly Disagree
11.	Pregnant women should only be vaccinated against serious diseases (i.e diseases that may cause life threatening conditions to the mother or/and baby).					
12.	I am concerned that vaccines may weaken the immune system of the pregnant woman.					
13.	I am concerned that too many vaccinations could bring complications to a pregnant woman’s immune system.					
14.	Vaccines are one of the safest forms of disease prevention ever developed.					
15.	Vaccines are getting better and safer all of the time as a result of medical research					
16.	Vaccines are necessary for pregnant women for protection of unborn children from diseases.					
17.	Vaccines are necessary for pregnant women for their own protection from diseases.					
18.	Vaccinating pregnant women can prevent disease in their newborn baby.					
19.	Vaccinating pregnant women can cause miscarriage or stillbirth.					
20.	Vaccinating pregnant women can weaken the immune system of their baby.					

21.	Vaccines are safe for use in pregnancy.					
22.	Vaccines are safe for pregnant women living with HIV.					
23.	Vaccines are safe for pregnant women with anemia.					
24.	New vaccines used in pregnancy are safer than old vaccines.					
25.	I would get a vaccine when pregnant/recommend vaccination to my pregnant wife to protect against a disease that would make me/her sick.					
26.	Vaccinations given in pregnancy do more harm than good.					
27.	The Tetanus vaccine is effective when used in pregnancy.					
28.	The Tetanus vaccine should be given to pregnant women.					
29.	I think there should be more recommended vaccines for pregnant women.					
30.	I recommend to all my pregnant patients that they should be vaccinated.					
31.	I recommend to my patients that they should vaccinate their children.					
32.	Without vaccinations, children may get a disease and cause other children or adults to also get the disease.					
33.	I am confident that childhood vaccines are safe.					
34.	A good diet is more important than vaccinations in preventing infectious diseases.					
35.	The flu is not a concern for pregnant women.					
36.	Getting a flu vaccine while pregnant is risky.					
37.	Despite migrations, pregnant women get all their scheduled vaccines.					

38.	It is safe to vaccinate pregnant women during the first trimester of pregnancy.					
39.	It is safe to vaccinate pregnant women during the second trimester of pregnancy.					
40.	It is safe to vaccinate pregnant women during the third trimester of pregnancy.					

For the following questions, for each question please indicate the frequency each statement (1 = 'Always,' 5 = 'Never ')

		Always	Often	Sometimes	Rarely	Never
41.	I have enough vaccine related provider focused educational resources to use.					
42.	I have enough vaccine educational resources to provide to pregnant mothers.					
43.	I feel that I have enough information to confidently discuss vaccines with my pregnant patients.					
44.	I have enough logistical resources to deliver vaccines to pregnant women.					
45.	I have enough human resources to deliver vaccines to pregnant women.					
46.	It is easy for health facilities to get vaccine supplies from the government. Yes					
47.	Maternal vaccines are easily accessible and available.					
48.	Women trust the vaccine related information that we give them.					
49.	I give pregnant women enough time to review the vaccination information I offer before they make a decision whether to refuse or accept.					
50.	We are updated regularly on vaccination process/information through trainings.					

For the following questions, for each question please indicate how the statement is (1 = 'Very Easy' 5 = 'Very difficult')						
		Very Easy	Easy	Neutral	Difficult	Very Difficult
51.	My religious affiliation makes it difficult for me to accept vaccines while pregnant/my wife is pregnant					
52.	My religious affiliation makes it difficult for me to accept vaccines for my children.					
53.	My ethnicity makes it difficult for me to accept vaccines while pregnant/my wife is pregnant.					
54.	My ethnicity makes it difficult for me to accept vaccines for my children.					
55.	Some cultural practices prevent me from receiving (allowing my wife to receive) vaccines while pregnant.					
56.	Some cultural practices prevent me from having my children vaccinated.					
57.	Despite vaccine refusal by my spouse/father to my child, I would still accept vaccines while pregnant.					
58.	Opinion leaders can influence me against vaccinations.					
59.	Political leaders can influence me against vaccinations.					
60.	Myths can influence me against vaccinations.					
61.	Misconceptions can influence me against vaccinations.					
62.	Friends encourage me to take up vaccinations.					
63.	Family members encourage me to take up vaccinations.					

For the following questions, for each question please indicate the frequency each statement (1 = 'Always,' 5 = 'Never ')						
		Always	Often	Sometimes	Rarely	Never
64.	Despite cultural affiliations, I am able to change my mind to receive vaccines while pregnant, when given the right information.					
65.	Despite cultural my affiliation, I am able to change my mind when given the right information and take my children to be vaccinated.					
66.	Despite my religious affiliations, I am able to change my mind to receive vaccines while pregnant, when given the right information.					
67.	Despite my religious affiliation, I am able to change my mind when given the right information and take my children to be vaccinated.					
68.	What mode of vaccine administration do patients prefer in maternal vaccines?	<input type="checkbox"/> Oral <input type="checkbox"/> Injectable				
69.	What mode of vaccine administration do patients prefer in infants vaccines?	<input type="checkbox"/> Oral <input type="checkbox"/> Injectable				
70.	What is the maximum number of vaccines you would feel comfortable giving to a pregnant woman over the course of her pregnancy?					
71.	What is the maximum number of vaccines you would feel comfortable giving to a pregnant woman during one clinic visit?					

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