Immunization service providers' knowledge, attitude and practice in primary health care units in pastoral and semi-pastoral areas of Ethiopia: CORE Group Polio Project

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Abstract

Background: Adequate knowledge is key for immunization service provision and related practices, such as providing the right vaccine at the right time, keeping vaccines potent, and to prevent vaccine failures. This study was conducted to assess the knowledge, attitude and practices of immunization service providers in primary health care units in pastoral and semi-pastoral areas of Ethiopia.

Methods: A facility-based cross-sectional study was conducted of 1,280 health workers drawn from health centers (233) and health posts (632) in five regions of Ethiopia: Somali, Gambella, Benishangul-Gumuz, Oromiya and SNNPR. Data were collected using a self-administered questionnaire prepared in English and translated into three local languages, and analyzed using STATA version 13.0. Descriptive statistics and binary logistic regression analysis were carried out to determine the magnitude of, and identify associated factors for, knowledge, attitude and practice. A p-value of less than 0.05 was used to declare statistical significance.

Results: Of all health center respondents, 389 (61.3%) had a good knowledge of the vaccination schedule; 403 (63.5%) had poor practices relating to vaccine placement in refrigerators; and 321(54%) had poor attitudes in relation to vaccines and vaccination. With respect to the vaccination schedule, midwives and Health officers/Medical Doctors were 0.28(95% CI: 0.08-0.95) times less knowledgeable than nurses; and health workers with more than five years' work experience were 2.78 (95% CI: 1.54-5.01) times more knowledgeable than health workers who had three years' work experience.

Conclusions and recommendations: In this study, gaps were observed in health service providers' knowledge, attitudes and practices in relation to immunization. Support to address these gaps – through training, supervision, monitoring and other mechanisms should focus on HEWs whose education is less than or equal to grade 12 at health post level, and on midwives and Health Officers (HOs)/MDs at the health center level. Similarly, attention should be given to enhance the vaccine and vaccination knowledge of semi-pastoral health facility service providers. The government, immunization working partners and other responsible bodies should give attention and take corrective measures to use maximum vaccine preventive potency.[*Ethiop.J. Health Dev.* 2019;33(Special issue):10-15]

Key words: Immunization, Knowledge, Attitude, Practice, Health Worker

Introduction

Immunization has proved to be one of the most cost-effective health interventions to reduce morbidity and mortality rates associated with vaccine-preventable diseases (VPDs) (1).Where immunization coverage is low, however, VPDs remain a serious concern (2).

All vaccines are sensitive biological substances that progressively lose their potency, and the loss of potency is much faster when the vaccine is exposed to temperatures outside the recommended storage range. Any loss of potency is permanent and irreversible. Thus, the storage of vaccines at the correct recommended temperature range is vitally important so that full vaccine potency is retained up to the point of administration(3).

The Ethiopian immunization program considers a child to be fully vaccinated if the child has received all basic vaccinations of one dose of Bacillus Calmette-Guérin(BCG)around birth and measles at nine months, three doses of polio, pentavalent and pneumococcal conjugate vaccine (PCV) given at the ages of 6, 10 and 14 weeks, and two doses of the rotavirus vaccine (given at the ages of 6 weeks and 10 weeks) (4,5).

Health workers (HWs) working in health posts (HPs), health centers (HCs) and hospitals are grassroot agents involved in the immunization of rural and urban populations. Hence, inadequate knowledge of vaccination and vaccine administration may reduce the potency of vaccines and lead to adverse effects. So, it is important to understand the knowledge level and practices of this huge workforce (4,5,6).

Adequate knowledge, and positive attitudes and practices in relation to vaccination and the cold chain system are important to maintain the potency of vaccines and effectiveness of immunization, and thereby have a significant impact on the burden of childhood VPDs. PCV and rota vaccines were introduced in Ethiopia in 2011, and new technologies were put in place to control the temperature of refrigerators that store them (7,8,9).

It is essential to ascertain the magnitude of knowledge, attitudes and practices of health care providers working at the grass roots level of vaccination and the cold chain system to take corrective measures at an early stage. In this study we assessed primary health care unit (PHCU) service providers' knowledge, attitudes

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and practices regarding immunization service delivery working in CORE Group Polio Project (CGPP)-targeted, pastoral and semi-pastoral areas of Ethiopia.

Methods

The study employed a cross-sectional survey in intervention areas in pastoral and semi-pastoral areas of Ethiopia that are under the CGPP. The study populations were HWs working in HCs and selected HPs in Somali, Gambella, Benishangul-Gumuz, Oromiya and SNNPR. The sampling units were health facilities (HCs and HPs) and the study units were HWs and health extension workers (HEWs) working in the respective health facilities. All HCs in CGPP regions (n=233) and three randomly selected HPs in a HC catchment (n=632) were included. From each HC, the head of the HC, the Extended Program on Immunization (EPI) coordinator, a midwife (or someone working in the delivery ward and involved in immunization services (n=648)) and one HEW (who was mainly involved in immunization activities in the health post (n=632)) were selected. A self-administered English language questionnaire – consisting of 31 knowledge questions, six attitude questions and six practice questions– was translated into Amharic, Oromifa and Somali for the purpose of collecting data at the facility level.

Data entry was done using EpiData 3.1, with double data entry verification. Data were then exported to STATA version 13.0 for description and analysis. Tables and graphs were used to organize and present results, and binary logistic regression analysis was used to identify factors of the different outcomes, with odds ratios (ORs) and 95% confidence intervals (CIs) used to determine magnitude and strength of associations.

Operational definitions

Good knowledge and poor knowledge: Respondents were asked 31 questions on the vaccination schedule. Those who answered more than 25 of the questions correctly were labeled as having 'good knowledge'; those who answered fewer than 25 questions correctly were considered to have 'poor knowledge'.

Good attitude and poor attitude: Respondents were asked six five-scaled questions designed to ascertain attitudes to vaccination and vaccine (with a total score range of six to 30). A total score of less than or equal to 26was labeled as 'poor attitude', and a score 27 and above was deemed 'good attitude'.

Good practice and poor practice: Six questions were posed on the practice of vaccine storage in vaccine refrigerators. Those who responded to all six questions correctly were considered as having 'good practice'; otherwise, their practice was labeled 'poor'.

To assess respondents' knowledge of the vaccination schedule in the provision of immunization services at both HCs and HPs, they were presented with three scenarios and asked to respond to them.

Scenario I (75-day-old child): "A mother brought her 75-day-old child, who has never been vaccinated. Which vaccines do you give to the child?" Here, correct responses were BCG, OPV 1, Penta 1, PCV 1 and rota 1.Giving any other vaccines was considered wrong.

Scenario II (10-month-old child): "For the first time today, a mother brought her 10-month-old child to the HP for vaccination. Which vaccines do you give?" Here a response was considered correct if BCG, measles, and first doses of OPV, penta, PCV and rota were mentioned.

Scenario III (Date of birth verification):"A father brought his child today for vaccination and gave you the vaccination card. As indicated on the card, the date of birth is 01/05/2016 and dates of vaccination are also shown. Please respond by choosing *'acceptable'*, *'not acceptable'* or *'don't know'* based on your practice about the recoding and timing of each vaccine." In this scenario, an OPV 0 given on 30 May 2016 and OPV 2 given on 30 June 2016 were considered to be unacceptable, whereas BCG on 30 May 2016, OPV 1 and penta 1 on 20 June 2016, and penta 2 on 25 July 2016, were considered acceptable.

The study team decided that those respondents who correctly answered more than 25 of the 31 vaccination schedule questions were labeled as having 'good knowledge'; otherwise, their knowledge was considered as 'poor'.

A total of six Likert-scale questions were developed for each question on attitude to vaccination and vaccine. Each question had a maximum mark of 5, and those who scored 4 or 5 were considered as having a 'high attitude'; scores of 3 were considered to reflect 'medium attitude'; and scores of 1 or 2 were considered as 'low attitude'. The scores of the six five-scaled attitude questions were added together (minimum score of six; maximum score of 30) and divided into two categories. A score of less than or equal to 26 was labeled as 'poor attitude', and a score greater than 26 as 'good attitude'.

A total of six practice questions focused on vaccine storage were developed. Each respondent was asked to indicate (mark) where each item/vaccine should be placed in a vertical refrigerator (freezer, top, middle or lower compartments). Those who responded to all six questions correctly were considered as having 'good practice'; otherwise, their practice was labeled as 'poor'.

Results

General information: The assessment sample of 1,280 HWs included 648 from HCs and 632 from HPs.

Of the sampled service providers at HPs, 71.8% were females, 84.3% were under 30 years of age, and 63.9% were married. With respect to educational level, 22.1% had completed grade 12 or below; 54.1%, had a TVET qualification; and 86.7% were trained as HEWs. A total of 62.2% had three or more years of work experience as an HEW. For the HC participants, 22.8% had a first degree; 69.7% had a diploma; and 7.6% had

no diploma or first degree. In addition, in the HCs, 57.2%, 28%, 12.4% and 2.3% were nurses, midwives, HOs/MDs, and others, respectively.

Health center service providers' knowledge of the vaccination schedule: The proportion of HC respondents who correctly responded to the different scenarios were 50.8% for scenario I, 38.0% for scenario II and 69.5% for scenario III. Good knowledge was seen in 62.2% of those who were school educated only, 69.5% for those who had a diploma, and 71.4% for those who had a first degree.

HEWs' (health post respondents') knowledge of the vaccination schedule: Of the HP respondents, 65.2% correctly answered all the questions asked about scenario I, while 46.2% correctly responded to all questions relating to scenario II. With respect to scenario III, 71.6% correctly identified the proper and improper recordings and validity related to date of vaccination. The distribution of HP respondents' knowledge based on region is shown in Figure 1.

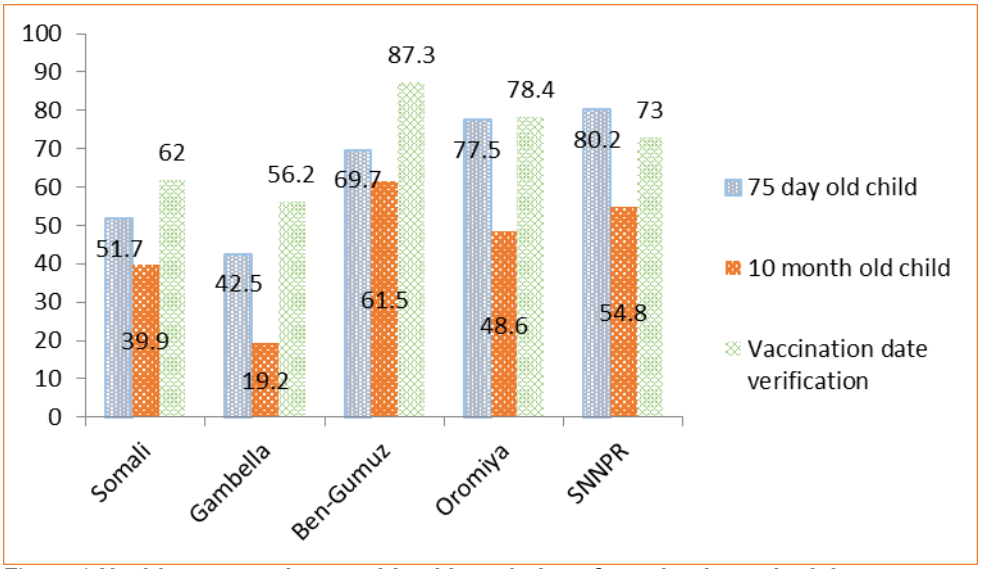

Figure 1:**Health post service providers' knowledge of vaccination schedules**

For HP service providers, those respondents whose educational status was at TVET level were 1.90 (AOR 95% CI: 1.17-3.08) times more knowledgeable about the vaccination schedule than those who were educated to grade 12 or below. Compared to this latter group, diploma holders were 2.34 (AOR 95% CI: 1.32-4.86) times more knowledgeable.

Those HP respondents who had more than five years' work experience were 1.71 (AOR 95% CI: 1.02-2.86) times more knowledgeable than HEWs who had two or fewer years' work experience. HC respondents who had more than five years' work experience were 2.78 (95% CI: 1.54-5.01) times more knowledgeable about the vaccination schedule than those who had up to two years' work experience.

HC midwives and HO/MD professionals were 0.28 (AOR 95% CI: 0.08-0.95) times less knowledgeable than nurses; and those who had more than five years' work experience were 2.78 (AOR 95% CI: 1.54-5.01) times more knowledgeable about the vaccination schedule compared to those who had less than three years' service (Table 1).

Table 1: **Factors associated with PHCU service providers' knowledge of vaccination schedule**

Variables	Health center			Health post		
	OR	95% CI		OR	95% CI	
Residence (Male)						
Female	1.08	0.77	1.53	0.75	0.50	1.13
Responsibility (HC=EPI coordinator, HP=HEW)						
Health center head	0.69	0.42	1.16			
Delivery ward	0.87	0.49	1.54			
Other	0.75	0.42	1.37	0.45	0.22	0.90
Age group						
25-29 years	1.20	0.81	1.78	1.07	0.69	1.66
30+ years	1.10	0.61	1.99	0.75	0.42	1.36
Sex (Male)	0.82	0.50	1.33			
Educational status (HC=diploma, HP=<grade 12)						
First degree	1.49	0.86	2.56			
Less than diploma	0.91	0.44	1.89			
TVET				1.90	1.17	3.08
Other				2.34	1.32	4.86
Profession (HC=Nurse, HP=HEW)						
Midwife	0.99	0.56	1.76			
HO/MD	1.38	0.68	2.77			
Other	0.28	0.08	0.95			
Years of work experience (≤ 2 years)						
3-5 years	1.34	0.91	1.98	1.24	0.80	1.92
> 5 years	2.78	1.54	5.01	1.71	1.02	2.86

Providers at HPs in pastoral areas were 3.32 (AOR 95% CI: 1.84-5.98) times more knowledgeable about vaccine and vaccination than those in semi-pastoral areas; those aged 25-29 years were 0.5 (AOR 95%CI: 0.27-0.92) times and those aged 30 or above were 0.37 (AOR 95% CI: 0.16-0.87) times less likely than those aged less than 25 (Table 2).

Table 2: **Factors on immunization service providers' knowledge of vaccine and vaccination at PHCUs**

Variables	Health center			Health post		
	OR	**95% CI**		**OR**	**95% CI**	
Residence (Semi-pastoral)						
Pastoral	1.29	0.88	1.91	3.32	1.84	5.98
Respondent (EPI coordinator, HEW)						
Health center head	0.91	0.51	1.59			
Delivery ward	0.71	0.38	1.35			
Other	0.92	0.47	1.79	0.43	0.16	1.15
Age group (< 25 years)						
25-29 years	1.14	0.73	1.77	0.50	0.27	0.92
30+ years	1.07	0.55	2.10	0.37	0.16	0.87
Sex (Male)						
Female	1.18	0.68	2.04	0.38	0.19	0.75
Educational status (Diploma, ≤ grade 12)						
First degree	0.99	0.54	1.80			
Less than diploma/TVET	0.59	0.23	1.51	1.96	0.96	4.04
Other				2.71	1.13	6.47
Profession (Nurse)						
Midwife	1.53	0.80	2.91			
HO/MD	1.03	0.48	2.19			
Other	0.53	0.11	2.47			
Years of work experience (≤ 2 years)						
3-5 years	0.77	0.49	1.19	1.18	0.67	2.09
>5 years	0.54	0.28	1.06	0.53	0.24	1.15

Attitude

Attitude of health center service providers to client handling and information sharing: A total of 273 (46%) respondents had a good attitude and the remainder had a poor attitude. In total, 370 respondents (62.9%) had high attitude and 158 respondents (26.9%) had low attitude to the benefit of shortening waiting times during immunization.

Regarding attitudes towards the benefit of vaccinating all children and caregivers who arrive on normal vaccination day, 464 HWs (78.6%) ranked high in the attitude scale, 46(7.8%) ranked medium, and 80(13.6%) ranked low.

Multivariate logistic regression analysis for HP service providers, age and sex showed significant association with attitude towards vaccine and vaccination. Specifically, those in the age group 25-29 years (AOR=1.52, 95% CI: 1.02-2.27)) and females

(AOR=1.74, 95% CI: 1.04-2.91) were more likely to have positive attitudes towards vaccine and vaccination compared to those younger than 25 years old and male HEWs (Table 3).

Table 3:**Factors associated with PHCU service providers' attitude towards vaccine and vaccination by facility**

Variables	Health center			Health post		
	OR	95% CI		OR	95% CI	
Residence (Semi-pastoral)						
Pastoral	0.78	0.55	1.11	0.94	0.65	1.38
Respondent (EPI coordinator/HEW)						
Health center head	0.72	0.43	1.20			
Delivery ward	0.78	0.44	1.39			
Other	0.78	0.43	1.43	1.26	0.65	2.42
Age group (< 25 years)						
25-29 years	1.29	0.86	1.93	1.52	1.02	2.27
30+ years	1.79	0.97	3.29	0.74	0.41	1.34
Sex (Male)						
Female	1.14	0.69	1.87	1.74	1.04	2.91
Educational status (Diploma)						
First degree	1.36	0.78	2.35			
TVET/Less than diploma	0.57	0.26	1.26	0.99	0.61	1.62
Other				1.37	0.75	2.50
Profession (Nurse)						
Midwife	1.36	0.76	2.43			
HO/MD	1.23	0.62	2.42			
Other	1.47	0.49	4.45			
Years of work experience (≤ 2years)						
3-5 years	0.77	0.51	1.15	0.78	0.52	1.19
> 5 years	0.81	0.46	1.41	0.83	0.52	1.33

Practice

Health center service providers' practice relating to vaccines and other items placed in refrigerators: Of the 635 HC respondents to the six questions on vaccine placement in refrigerators, 403 (63.5%) had poor practice and 232 (36.5%) had good practice. Of the 403 respondents whose practice was poor, 288 were male and 114 were female (Figure 2).

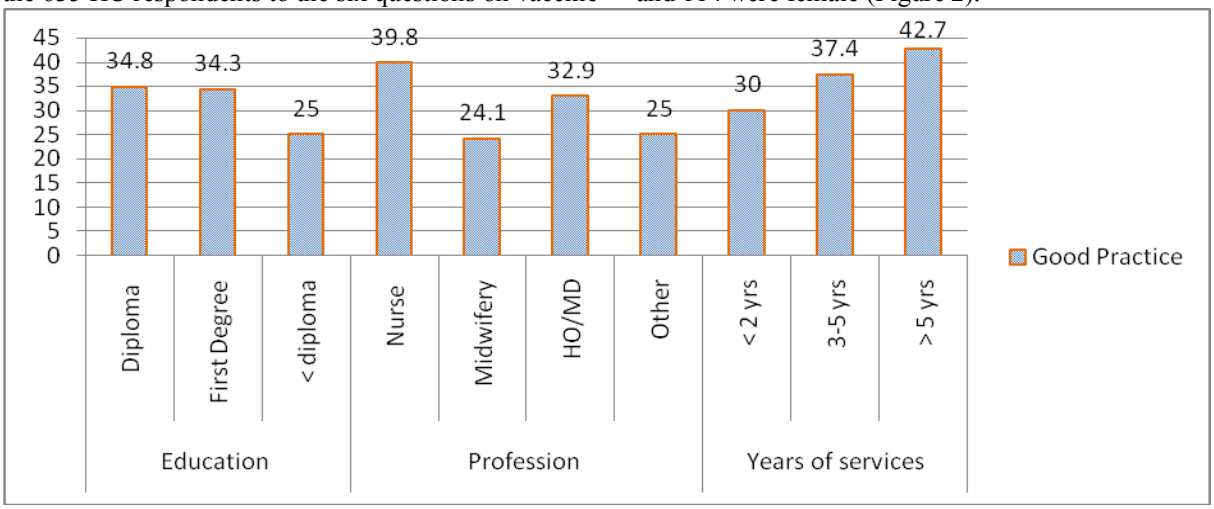

Figure 2: **Proper vaccine storage practice in vaccine refrigerator among HC respondents by education, profession and years of service, CGPP areas, Ethiopia, 2016**

HC heads' practices were 0.57 (AOR 95% CI: 0.34-0.96) times less accurate than EPI coordinators; HWs aged 30 or above had 2.12 (AOR 95% CI: 1.14-3.92) times stronger practice compared to HWs aged 25 or younger; HWs whose educational status was 'less than diploma' had practices that were 0.39 (AOR 95% CI: 0.16-0.95) times weaker than HWs with diplomas; and midwives showed 0.4 times weaker practice than nurse professionals.

Discussion

Among HP service provider respondents, TVET-level HEWs were 1.90 times (95% CI: 1.17-3.08) more knowledgeable about the vaccination schedule than HEWs who were educated up to grade 12 and below. Those with a diploma were 2.34 times (95% CI: 1.32-4.86) more knowledgeable. Similarly, those HEWs who were educated to TVET level were 2.71 times more knowledgeable about vaccine and vaccination

than those whose educational level was less than or equal to grade 12 (95% CI: 1.13-6.47)(Table 1).The reason for this knowledge variation may be due to the attainment of health science college education. This result is in line with a study done in India, which found increased knowledge with the advancement of qualifications (5).

Those HP respondents who had more than five years' work experience were 1.71 (95% CI: 1.02-2.86) times more knowledgeable than HEWs who had two or fewer years' work experience; and HC respondents who had more than five years' work experience were 2.78 (95% CI: 1.54-5.01) times more knowledgeable about the vaccination schedule than those who worked five or fewer years. A study in Kalasin, Thailand, showed that the knowledge of healthcare workers who have longer work experience in EPI was better than that of healthcare workers who have less work experience (8).

Providers at HPs in pastoral areas were 3.32 (AOR 95% CI: 1.84-5.98) times more knowledgeable about vaccine and vaccination than providers in semi-pastoral areas; those aged 25-29 years were 0.5 (AOR 95% CI: 0.27-0.92) and 30 or above years were 0.37 (AOR 95% CI: 0.16-0.87) times less likely than those younger than 25. This difference may be due to special support, especially training, that has been given to pastoral CHPs by NGOs and the government.

In terms of the findings in the HCs regarding vaccine placement and items that should not be in the refrigerators, we found that 262 (42.3%) of the respondents had good practices and the remainder (57.7%) had poor practices. Other studies show similar results. For example, in a study in Somali Region in Ethiopia, 11.1% of health facilities were found to store vaccines in the wrong position. Another study of childhood immunization knowledge and practices among primary health care providers in Riyadh, Saudi Arabia, found that in terms of handling and administering vaccines, no more than 40% of respondents complied with standard practice (9,11,12).

Conclusions and recommendations

In this study, gaps were observed in relation to health service providers' knowledge, attitude and practice in relation to immunization. Support through training, supervision, monitoring and other mechanisms should focus, at HP level, on HEWs whose educational status is less than or equal to grade 12, and at HC level, on midwives and HOs/MDs. Similarly, attention should paid to enhancing the vaccine and vaccination knowledge of semi-pastoral health facility service providers. Equally, government and immunization working partners and other responsible bodies should take corrective measures to use maximum vaccine preventive potency.

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