

Assessment of immunization session practices in primary health care centers in Al-Najaf province

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Abstract. Immunization has played a vital role in improving global health by reducing the transmission of infectious diseases. To ensure the successful implementation of immunization programs, it is crucial to thoroughly examine various elements within the Primary Health Care Centers, including immunization session management, cold-chain and logistics management, supervision, and reporting. The study aims to assess the immunization session practices in selected primary healthcare centers in Al-Najaf governorate. A descriptive cross-sectional study was conducted at 26 primary healthcare centers, selected using simple random sampling, across six districts in Najaf governorate. A total of 143 healthcare workers, comprising 122 vaccinators and 21 doctors, were included in the study. Questionnaires were utilized to assess immunization session practices. Data collection commenced on December 2, 2022, and concluded on March 2, 2023. Immunization session practices were evaluated as having poor vaccine and diluent management, fair cold chain management, communication with clients and caregivers, vaccine preparation and administration practices, and waste management practices. However, immunization session equipment availability, as well as card review and registration during immunization, received good evaluations. The overall assessment of immunization session practices was determined to be fair. In addition, the study identified significant associations between immunization practices and the number of non-vaccinators working in the immunization unit ($P=0.035$), and the average number of daily vaccine recipients in primary healthcare centers ($P=0.046$). The immunization session practices achieved a fair level of assessment, The increased number of daily visitors to the immunization unit and the number of

health workers who are non-vaccinator in the unit affected negatively the immunization session practices.

Introduction

Immunization is a method for eradicating and controlling infectious diseases that threaten life, affecting an estimated two to three million children deaths avoided each year. Routine vaccination is cost-effective and the most important public health measure for children (1).

The World Health Organization (WHO) has identified immunization as an essential health service that protects the health and well-being of populations, making it critical for the successful functioning of countries and economies. Immunization activities should be prioritized and protected to enable optimum continuity in the event of a substantial disruption in service supply or consumption (2,3).

Vaccinations have significantly enhanced world health by limiting the transmission of infectious diseases. Worldwide health organizations such as the World Health Organization (WHO), place a high value on developing and implementing effective immunization programs (4,5).

The 'Expanded Program of Immunization' (EPI) started in 1974 to gradually limit the transmission of infectious diseases, resulting in decreased child mortality and morbidity rates (6).

The goal of carrying out the 'Expanded Immunization Program' is to avoid infection with illnesses that can be prevented with vaccinations. Smallpox has been eradicated via the use of vaccinations, and the world is now on the verge of eradicating a second disease, viral polio (7).

The Primary Health Care Center (PHCC) is an important location for executing routine vaccination programs and storing vaccines. For the successful implementation of regular vaccination services, all of its elements-immunization session management, cold-chain and logistics management, reports, supervision, and so on-must be thoroughly examined. The Primary Health Care Center (PHCC) is an important location for executing routine vaccination programs and storing vaccines. For the successful implementation of regular vaccination services, all of its elements-immunization session management, cold-chain and logistics management, reports, supervision, and so on-must be thoroughly examined (8,9).

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Despite evidence that immunizations are among the most successful public health strategies for preventing mortality and morbidity from vaccine-preventable diseases in the world, vaccination rates in many countries remain low due to a lack of accurate information, incorrect beliefs, concerns about side effects, and vaccine hesitancy across the general public (10). The objective of this study is to assess the immunization session practices in the primary healthcare centers in Al-Najaf Governorate.

Materials and methods

Period of the study. Data collecting began on December 2, 2022, and continued until March 2, 2023. For each center, 3 days were provided for data collection, which took place on average 5 days per week.

Study design. A descriptive, cross-sectional study conducted at 26 randomly selected (simple sample) Primary Health Centers in Najaf governorate. There are 52 primary health care centers in Najaf, distributed in 6 primary health care sectors. Take 26 centers (52% of the total) randomly (using a simple sampling technique) from all sectors.

Population source. The source of this study was all healthcare workers in the immunization session at the selected primary healthcare centers in Al-Najaf governorate.

Inclusion criteria

Firstly. At the time of research, All healthcare workers who work in the immunization unit in the healthcare center in addition to the primary healthcare doctors who work in the healthcare center. Secondly, both genders are represented and all age ranges.

Exclusion criteria. Staff who refused to interview them and all healthcare workers who did not have an administrative order to work in the immunization unit.

Sample size and sampling techniques. Thompson's statistical equation was used to calculate the sample size considering the following assumptions: (11)

$$n = \frac{N \times P(1-P)}{[N-1 \times (e^2 + z^2)] + P(1-P)}$$

n=The minimum sample size, N=Community size 258449, Z=Standard degree=1.96, P=Rate of availability of property=0.50, d=Error ration=0.05.

The population includes all health workers (both gender) who work in immunization units, as well as primary healthcare physicians. The sample size for healthcare workers was (143) persons, including (122) vaccinators and (21) doctors. The sample size was selected Depending on the attached equation to choose the appropriate sample size.

The governorate of Najaf has 50 primary healthcare centers dispersed throughout six primary healthcare sectors. Twenty-six centers (52% of the total) were picked at random from all sectors using the simple random approach from each sector based on the sector aggregation map.

Data collection technique. Data were collected by a questionnaire which is responsible for information about the healthcare center and evaluating the practices of the immunization session in the healthcare center through direct observation. Using a questionnaire prepared based on the information from the Expanded Guide to Immunization Program of the Iraqi Ministry of Health and the World Health Organization as well as the opinion and approval of experts and modified WHO immunization session practices checklist (12) which consists of:

1. Primary healthcare center information which includes:- (Number of physicians in primary health care, Number of vaccinators working in the immunization unit, Number of non-vaccinator persons working in the immunization unit, Number of people receiving primary health care services according to population 2022 (or last available year), Monthly target for children under one year of age for the health care rate Primary health care, Number of people receiving vaccination in primary health care every day, Number of square meters (m²) occupied by the immunization unit, Number of kilometers (km) between primary health care centers and the administrative center of the health district, Number of supervisory visits made by district staff to primary health care during the past three months

2. WHO modified checklist for the assessment of the immunization session practices that include five domains:-

- A. Vaccine and diluent management.
- B. Cold chain management.
- C. Communication with clients and caregivers.
- D. Vaccine preparation and administration practices.
- E. Waste management practice.

Scoring system. The assessment of each domain in immunization session practices is calculated according to the quartile status (13).

Assessment of cold chain management practice. This section has 8 questions (1 score) is calculated for replying (no) and (2 score) is calculated for answering (yes), and it is computed based on the quartile status, which is classified as (good). If the score is higher than the (80%) (≥ 14 scores), it is classified as (Fair) if it is higher than the second quartile and lower than (80%) when (≥ 12 and < 14 scores), and it is considered (bad) if it is lower than the second quartile (< 12).

Assessment of communication with clients and caregivers practice. This section has 6 questions. (1score) is calculated for replying (no) and (2 score) is calculated for answering (yes), and it is computed based on the quartile status, which is classified as (good). If the score is higher than the (80%) (≥ 8 scores), it is classified as (Fair) if it is higher than the second quartile and lower than (80%) when (≥ 7 and < 8 scores), and it is considered (bad) if it is lower than the second quartile (< 7 scores).

Assessment of waste management practice. This section has 5 questions (1 score) is calculated for replying (no) and (2 score) is calculated for answering (yes), and it is computed based on the quartile status, which is classified as (good). If the score is higher than the (80%) (≥ 8 scores), it is classified as (Fair) if it

Table I. Cold chain management practice.

N	Cold chain management	Rating			
		No		Yes	
		F	%	F	%
1	Icepacks are not to be used until the sound of water can be heard on shaking (conditioned icepacks)	7	26.9	19	73.1
2	Vaccine carrier contain Conditioned icepacks in a required number (according to vaccine carrier type).	17	65.4	9	34.6
3	Vaccine vials in the middle of the vaccine carrier (not in contact with icepacks).	19	73.1	7	26.9
4	Put the opening date on the vaccine vial that is subject to the open-vial policy	21	80.8	5	19.2
5	Foam/sponge pad on top of vaccine carrier.	1	3.8	25	96.2
6	Unopened vaccine vials are placed in a plastic bag inside the vaccine holder.	19	73.1	7	26.9
7	The sponge at the top of the vaccine carrier is clean and tidy.	11	42.3	15	57.7
8	opening vials held in foam (or sponge) pad of vaccine carrier. (Multiple dose vaccines)	7	26.9	19	73.1
	Overall		12.07±1.49 (9-15)		

^aQuartile status [(≥14 good), (≥12 & <14 fair), (<12 poor) (N=8 items) (Total score=16)].

is higher than the second quartile and lower than (80%) when (≥7 and <8 scores), and it is considered (bad) if it is lower than the second quartile (<7 scores).

Assessment of vaccine preparation and administration practices.

This section has 16 questions (1 score) is calculated for replying (no) and (2 score) is calculated for answering (yes), and it is computed based on the quartile status, which is classified as (good). If the score is higher than the (80%) (≥29.6 scores), it is classified as (Fair) if it is higher than the second quartile and lower than (80%) when (≥28.5 and <29.6 scores), and it is considered (bad) if it is lower than the second quartile (<28.5 scores).

Assessment of vaccine and diluent management practices.

This section has 10 questions (1 score) is calculated for replying (no) and (2 score) is calculated for answering (yes), and it is computed based on the quartile status, which is classified as (good). If the score is higher than the (80%) (≥16 scores), it is classified as (Fair) if it is higher than the second quartile and lower than (80%) when (≥15 and <16 scores), and it is considered (bad) if it is lower than the second quartile (<15 scores).

Results and discussion

Table I presents an assessment of Cold Chain Management practices based on various criteria. The table includes different

practices related to the handling and storage of temperature-sensitive products, such as vaccines. The assessment categorizes each practice as either 'No' (indicating the practice is not followed) or 'Yes' (indicating the practice is followed). Icepacks are not to be used until the sound of water can be heard on shaking (conditioned icepacks): In this case, 73.1% of the PHCs that indicates that a significant number of PHCs understood the importance of conditioning icepacks and adhered to this practice. Followed the practice of using conditioned icepacks, while 26.9% did not. That could be due to lack of awareness or oversight regarding the correct usage of icepacks. Vaccine carrier contains Conditioned icepacks in a required number (according to vaccine carrier type): Here, 34.6% of the PHCs used the required number of conditioned icepacks in their vaccine carriers, while 65.4% did not. The lower percentage suggests a lack of compliance with the recommended guidelines for icepack usage. This could be attributed to factors such as inadequate training, resource limitations, or oversight during the supply chain process. Vaccine vials in the middle of the vaccine carrier (not in contact with icepacks): the table shows that 26.9% of the PHCs placed vaccine vials in the middle of the vaccine carrier as recommended, while 73.1% did not follow this practice. The higher percentage indicates a lack of adherence to the proper positioning of vaccine vials, potentially compromising the temperature stability of the products. Put the opening date on the vaccine vial that is subject to the open-vial policy: In this case, 80.8% of the PHCs correctly marked the opening date on vaccine vials subject to the open-vial policy, while 19.2% did not. The higher percentage reflects a satisfactory level of compliance with this important practice, ensuring the safety and efficacy of opened vaccine vials. Foam/sponge pad on top of vaccine

Table II. Communication with clients and caregivers practice

N	Communication with clients and caregivers	Rating			
		No		Yes	
		F	%	F	%
1	The client and caregiver greeted.	18	69.2	8	30.8
2	Contraindications checked	25	96.2	1	3.8
3	Key messages are given (Date of next visit)	16	61.5	10	38.5
4	Key messages are given (Common adverse event following immunization (AEFI))	20	76.9	6	23.1
5	key messages are given (What to do in case of AEFI).	18	69.2	8	30.8
6	key messages are given (Bring the vaccination card to the next visit)	21	80.8	5	19.2
	Overall		7.46±1.30	(6-10)	

^aQuartile status [(≥8.6 good), (≥7 & <8.6 fair), (<7 poor) (N=6 items) (Total score=12)].

carrier: The table shows that 96.2% of the PHCs used a foam or sponge pad on top of the vaccine carrier, while only 3.8% did not. This finding is consistent with a study conducted in the Southern part of Ethiopia (14). The higher percentage indicates a widespread adoption of this practice, which helps provide additional insulation and maintain temperature stability within the carrier. Unopened vaccine vials are placed in a plastic bag inside the vaccine holder: Here, 26.9% of the PHCs followed the practice of placing unopened vaccine vials in a plastic bag inside the vaccine holder, and 73.1% did not, while in India's Bijapur district, 95.7% of immunization locations successfully practiced this issue, with vaccine vials maintained in zipper bags within vaccine carriers (15). A higher percentage indicates non-compliance with this practice, which poses a risk to vaccine safety. The sponge at the top of the vaccine carrier is clean and tidy: The table shows that 57.7% of the PHCs maintained a clean and tidy sponge at the top of the vaccine carrier, while 42.3% did not. The higher percentage suggests that a majority of the PHCs were conscious of the importance of cleanliness in Cold Chain Management. The lower percentage might be due to insufficient attention or oversight in maintaining the cleanliness of the carrier's sponge. Opening vials held in foam (or sponge) pad of vaccine carrier (Multiple dose vaccines): In this case, 73.1% of the PHCs held opening vials in the foam or sponge pad of the vaccine. An evaluation of cold chain management in vaccine distribution reveals a fair level of performance with room for improvement. The assessment considers different aspects, such as the use of conditioned icepacks, proper placement of vaccine vials, labeling practices, foam/sponge pad utilization, and the use of plastic bags for unopened vials. Reference to the study by Johnson *et al* (2022) demonstrates that while some aspects of cold chain management received positive evaluations, certain areas fell short of optimal performance (16)

Table II shows important point related to communication with clients and caregivers that include 6 items regarding Client and caregiver greeted, Contraindications and the four key message. Overall assessment of this domain was fair (7.46±1.30). Regarding (Client and caregiver greeted) our result show the 69.2% of selected PHCs do not greet parents properly. It is suggested that the reason is the societal customs

in the holy city of Najaf, especially when mothers bring their children to the immunization unit and dealing with a male vaccinator. In relation to Contraindications checking practices, our result showed that (96.2%) of selected PHCs do not verify or ask parents about Contraindications to vaccination. Where the health workers were completely dependent on the doctor in the health center in determining vaccine contraindications and considered that this issue is greater than their responsibilities and capabilities. Similarly, in the study conducted in Wasit province, Iraq By Amily, Ali, and F. Lami (2016) that found problem in greeting of clients and caregivers Some difficulties may be observed in welcoming clients and carers, particularly when a male vaccinator is dealing with a female client or caregiver and due to overcrowding and the result show only (7%) of selected PHC did check Contraindications to vaccinations are health workers at the vaccination session, because the vaccinators believed that this bigger duty should be carried out by doctors themselves, and this choice, if made, may add another responsibility for them that they should not attempt to undertake (17). The delivery of four critical messages following immunization proved ineffective, as (61.5%) of selected PHCs do not give key messages about the day of the next visit, (76.9%) do not told about (Common adverse event following immunization (AEFI), (69.2%) do not told parents about (What to do in case of AEFI) and (80.8%) do not give key messages about (Bring the vaccination card to the next visit). This may be happens as a result of the health worker's lack of knowledge of the importance of these matters, as well as due to the overcrowding of the health center. these findings on the way with study conducted in Bahir Dar city, Northwest Ethiopia by Swarnkar, Madhusudan *et al* (2016) found that only 35% of workers delivered all four message, 42% delivered three messages 47% delivered two message, and 75% delivered at least one message (18) Another study conducted by Singh *et al* (2015) in Ahmedabad District, India, found that Four key messages by Healthcare worker were given in only 38.3% of session site (19).

Table III shows the Assessment of Waste Management Practice in the 26 selected primary healthcare centers which consist of 5 items. This domain has a fair assessment score.

Table III. Waste management practice.

N	Waste management practice	Rating			
		No		Yes	
		F	%	F	%
1	Used AD syringes disposed of into a safety box Immediately after injection.	7	26.9	19	73.1
2	Do not dispose of the following items in the safe box: (Cotton, bandages, gloves, and any other plastic materials)	2	7.7	24	92.3
3	The safety box is disposed of when it is 75% full	22	84.6	4	15.4
4	Safety boxes used and handled according to national waste management guidelines (Placed within reach of staff administering injections, Closed ,Kept in a dry place out of reach of children and others)	25	96.2	1	3.8
5	Reconstituted needles and auto syringes were disposed of immediately into a safety box.	12	46.2	14	53.8
	Overall		7.38±0.94 (6-10)		

^aQuartile status [(≥8 good), (≥7 & <8 fair), (<7 poor) (N=5 items) (Total score=10)].

Our result shows that (Used AD syringes disposed of into a safety box Immediately after injection) was 73.1% of PHC where applicable. These findings agree with a study conducted in Wassit province, Iraq by Amily and Lami (2018) that found sharps were immediately disposed into these boxes in 86% of these PHCs (20). Regarding (the safety box is disposed of when it is 75% full) the result show that 84.6% of selected PHCs dispose safety box when it is filled with more than 75%. Where it is suggested that the reason for this is the lack of attention due to the overcrowding. This finding dose not consistent with previous study conducted by Jahangiri *et al* (2016) in Iran that have shown Discharging the safety box when it is filled at ¾ of its capacity in 71% of selected sample (21).

Table IV shows the practices assessment regarding vaccine preparation and administration, which include hand washing, safe preparation of vaccines, using correct type of diluent, using new disposable syringe for each injection and new syringe for each dissolve process, Rubber membrane or opening as well as needle not touched and alcohol do not used, Fill syringes just before administration, do not re-cap syringe after use and the right process for administration of routine vaccines. This domain has an assessment score of fair (28.53±0.989). Regarding (Health care worker/vaccinator washed hands with soap) and (Vaccines prepared safely on clean table) our result showed that (69.2%) of selected PHCs vaccinators did not wash their hand before the injection of vaccines and (50%) of selected PHCs did not use clean table for vaccine preparation. It is likely that the reason is due to the health worker's lack of awareness of the importance of washing hands before the vaccine injection process and their failure to use a clean table for preparing the vaccine, as they prepare the vaccine on the vaccine-giving table. These results consist with that found in a study conducted in 40 healthcare facilities of two districts of Kashmir valley, India by Allaqband *et al* for assessment of injection practices in various healthcare settings that found 95.6% of HCWs in selected PHCs used unsafe methods, such

as preparing injections on dirty surfaces or tables, and 99.8% did not wash their hands before preparing injections. A nother study Tripoli, Libya (2015) about Cold chain status and vaccination activities at vaccination centers by El-Hamadi *et al* shows that only 66% of HCWs in selected PHCs washed their hands before vaccination due to absence of this habit in HCWs practice (22). Our result disagree with a study conduct in Darjeeling District, West Bengal (2016) about Safe injection practices in primary health care settings that found (100%) of vaccinator in selected PHCs wash their hands once before starting the vaccination session (23) The current assessment discovered that all selected PHCs received a complete assessment score (100%) for (each vaccine provided using the proper route of administration practices, each vaccine prepared using the appropriate vaccine diluents, needle and rubber not touched, do not re-cap the syringe after use, alcohol is not used to disinfect the skin and Fill syringes just before administration). These results agreed with the previous study findings done in Al-Diwanyia Governorate, Iraq for evaluation of vaccination session that found All PHCCs received a complete assessment score (100%) for (each vaccine delivered using the proper method of immunization, and each vaccine prepared using the appropriate vaccine diluents). While 93.6% of the investigated sample was good in terms of (vaccinator did not touch or recap the needle) (13). Also our result agreed with another study in rural areas of Ahmedabad district that found all session sites (100%) practice a correct site and route of vaccination (19)

Table V shows the Assessment of Vaccine and Diluent Management Practices in the 26 selected primary healthcare centers which consist of 10 items. The assessment categorizes each practice as either 'No' (indicating the practice is not followed) or 'Yes' (indicating the practice is followed). our result about this domain has a poor assessment score of (14.88±1.24). Regarding (vaccines and vaccination supplies are requested through the approved application form

Table IV. Vaccine preparation and administration practices.

N	Vaccine preparation and administration practices	Rating			
		No		Yes	
		F	%	F	%
1	Health care worker/vaccinator washed hands with soap.	18	69.2	8	30.8
2	Vaccines are prepared safely on a clean table.	13	50	13	50
3	vaccine dissolves with the correct quantity and type of diluent.	0	0	26	100.0
4	New disposable needles were used.	0	0	26	100.0
5	use a new syringe for each dissolving process	0	0	26	100.0
6	Rubber membrane or opening not touched.	3	11.5	23	88.5
7	Fill syringes just before administration .	0	0	26	100
8	Never leave the needle on top of the vaccine vial.	4	15.4	22	84.6
9	Alcohol is not used to disinfect the skin.	0	0	26	100
10	Needle not touched.	0	0	26	100
11	Oral Polio vaccine and rotavirus vaccine are given orally	0	0	26	100
12	Pentavalent and triple vaccines are given in the muscle of the left thigh at an angle of 90 degrees	0	0	26	100
13	The injectable polio and pneumococcal vaccines are given in the muscle of the right thigh at an angle of 90 degrees.	0	0	26	100
14	BCG vaccine is given in the In the dermis of the left arm at an angle of 15 degrees.	0	0	26	100
15	MMR and measles vaccines are given in the muscle of left arm at an angle of 45 degrees	0	0	26	100
16	Do not re-cap the syringe after use.	0	0	26	100
	Overall		28.53±0.989	(27-30)	

^aQuartile status [(≥29.6 good), (≥28.5 & <29.6 fair), (<28.5 poor) (N=16 items) (Total score=32)].

described in the vaccinators' guide) and (Vaccine vials taken out of the refrigerator in Required quantities) found that (96.2 and 88.5% respectively) of selected PHCs do not use the form for requesting vaccines from the cold chain, which is approved in the immunization guide and they do not take out the vaccines from the refrigerator according to the required quantity Where the health worker takes the vaccine out of the refrigerator as needed. this is similar to the finding of a study conducted in Amhara region that found a gap in using requisition forms for reporting and ordering vaccines (24) 92.3% of selected PHCs do not check the freeze indicator (or digital thermometer) when the vaccine was taken out of the storage refrigerator. This suggested that the health worker's have lack of knowledge about the importance of the freeze indicator for sensitive vaccines. This finding is likely to a study conduct by Zalyer *et al* in Wassit Governorate, Iraq for the evaluation of the application of effective vaccine Management that found only 22% of sample reported use of freeze indicators (25) This differs from study conducted in 2018 in Oman that showed good performance about vaccine management (26). This domain also contains important points related to examining the safety of the vaccine, which includes checking the label, expiry date and vaccine vial monitor (VVM). our result found that 73.1% of PHCs did not check the label on the vaccine vial

, 80.8% did not check the expiry date and 50% did not check (VVM).This finding disagrees with a study conducted in India by Parmar, Snehal, *et al* (2020) that found most of healthcare worker (96%) had checked VVM status, expiry dates of vaccine vials and vaccine label before vaccination (27) Finally Unopened vaccine vials were returned to the refrigerator in 100% of selected PHCs and opened vaccine vials that should no longer be used are discarded in 96.2% of selected PHCs. this finding agree with study conducted in Wasit Governorate, Iraq by Amily, *et al* (2019) that found unopened vaccine vials returned to the refrigerator in 100% of PHCs and 90% of opened vaccine vial that should no longer be used are discarded (20).

Table VI show the assessment of overall immunization session practices which divided into seven domains in 26 primary healthcare centers that included in the study. Regarding Vaccine and Diluent Management only 8 (30.8%) of primary healthcare centers had a correct application of these practices while 18 (69.2%) of PHCs had poor practices. The second domain include cold chain management practices which had good application in only 9 (34.6%) of PHCs with poor application of these practices in 9 (65.4%) of PHCs. Third domain which include the availability of immunization session equipment we found that all PHCs (100%) had a fully

Table V. Vaccine and diluent management practice.

N	Vaccine and diluent management	Rating			
		No		Yes	
		F	%	F	%
1	Vaccines and vaccination supplies are requested through the approved application form described in the vaccinators' guide.	25	96.2	1	3.8
2	Checked freeze indicator (or digital thermometer). when the vaccine was taken out of the storage refrigerator.	24	92.3	2	7.7
3	Vaccine vials taken out of refrigerator in Required quantities.	23	88.5	3	11.5
4	Vaccine vials taken out of refrigerator in Specific order.	6	23.1	20	76.9
5	Diluents taken out of the refrigerator are matched with the appropriate vaccine in quantity and type.	1	3.8	25	96.2
6	Checked if the vaccine is safe to use by checking label.	19	73.1	7	26.9
7	Checked if the vaccine is safe to use by checking the Expiry date.	21	80.8	5	19.2
8	Checked if the vaccine is safe to use by checking the Vaccine vial monitor.	13	50.0	13	50.0
9	Unopened vaccine vials were returned to the Refrigerator.	0	0	26	100.0
10	Opened vaccine vials that should no longer be used are discarded.	1	3.8	25	96.2
	Total score		14.88±1.24 (12-18)		

*Quartile status [(≥16 good), (≥15 & <16 fair), (<15 poor) (N=10 items) (Total score=20)].

Table VI. Overall domains practices.

N	Domains	Rating			
		No		Yes	
		F	%	F	%
1	Vaccine and diluent management	18	69.2	8	30.8
2	Cold chain management	17	65.4	9	34.6
3	Availability of immunization session equipment	0	0	26	100
4	Communication with clients and caregivers	23	88.5	3	11.5
5	Card review and registration during immunization	0	0	26	100
6	Vaccine preparation and administration practices	0	0	26	100
7	Waste management practice	15	57.7	11	42.3
	Overall	0	0	26	100
	Total score		96.34±3.35 (89-103)		

assessment degree. Fourth domain which include communication with clients and caregivers practices, as the results show, this domain received the lowest assessment score in relation to the other domain with only 3 (11.5%) PHCs had adequate practices with inadequate practices in 23 (88.5%) of PHCs. Full assessment degree regarded fifth domain which include Card review and registration practices during immunization and sixth domain which include vaccine preparation and administration practices. The last domain include waste management practices, as the result we found 11 (42.3%) of PHCs were applied correctly with incorrect application in 15 (57.7%) of PHCs. The overall assessment of immunization

session practices was fair (96.34±3.35) according to quartile status. Our findings consist with another study conducted in Northwest Ethiopia by Amarem *et al* (2021) for vaccine safety practices and its implementation barriers that found vaccination safety practices, including the cold chain system, vaccination administration, and waste disposal and management, were suboptimal (28).

Conclusions

Poor vaccine and diluent management especially in requesting the vaccine from the cold chain, as well as not checking the

freezing indicator when taking out the vaccines from the refrigerator. Immunization session practices varied among the selected healthcare centers with the highest evaluating percentage (100%) for the availability of immunization session equipment and card review and registration during immunization. Healthcare workers who are not vaccinators and working in immunization units have an effect on immunization session practices since they do not have any information about vaccination practices. The number of people who visit the immunization unit in the health care center has an impact on the practices of the immunization session, especially on the days of Sunday and Wednesday of each week, due to the opening of the BCG vaccine on these days.

Recommendations. Continuous training of the primary health care worker on information about vaccines through the comprehensive guide to the Expanded Program on Immunization. On-job training on the correct practices of the immunization session, especially on the vaccine and diluent management. Immediate, accurate, and for long-term planning to solve the problem of overcrowding in immunization units during certain days of the week. Increasing supervisory visits to follow up the work of immunization units, evaluate their performance and support their development.

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Conflict of interest

The authors declare no potential conflict of interest.

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