



Assessment of Expanded Program of Immunization Provided for Children less than Five Years in Family Health Centers at Cairo Governorate

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Abstract

Background: Assessment of expanded program on immunization (EPI) is an important tool as it improves its general status, give solutions to the weak points as well as it enables immunization stakeholders with the evidence needed to manage programs more effectively and efficiently.

Objectives: To characterize the degree of development of the program to detect children with improper vaccination status, to assess knowledge, attitude and practices of health care providers (HCPs) and to assess community satisfaction towards EPI.

Subjects and Methods: To characterize the degree of development of the program to detect children with improper vaccination status, to assess knowledge, attitude and practices of health care providers (HCPs) and to assess community satisfaction towards EPI.

About 45 of HCPs and 144 of immunization beneficiaries were included in this study. Data was collected using two pre-designed standardized questionnaire and observation checklist.

Results: Knowledge of HCPs towards EPI was accepted with presence of some weakness areas, especially vaccine type and its contraindication; about 71% recorded an average level of knowledge. The knowledge score was significantly higher among nurses, trained workers and who have experience. About 13% of HCPs scored negative attitude especially for shortage of vaccines and the incentives they receive. Their practice was highly accepted and about 92% scored a high level. Process of cold chain was being made perfect. Concerning satisfaction of immunization beneficiaries, 63% of them were satisfied, with less satisfaction for patient rights.

Conclusion: Knowledge, attitude and practice of HCPs towards EPI were good with presence of some weakness areas that needed to be upgraded. Satisfaction of immunization beneficiaries was accepted.

Keywords: Immunization; Expanded Program on Immunization; Immunization Assessment

Introduction

Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine [1].

Vaccines are a proven tool for controlling and eliminating life-threatening infectious diseases and are estimated to prevent between 2 and 3 million deaths each year. It is one of the most cost-effective health investments, with proven strategies that make it accessible to even the most hard-to-reach and vulnerable populations [2].

The importance of immunization is so great that the American Centers for Disease Control and Prevention has named it one of the "Ten Great Public Health Achievements in the 20th Century [3].

Vaccination programs are an important component of public health initiatives and preventative medicine. This is particularly true in an urban environment where such factors as density, sanitation and pollution increase exposure to a variety of communicable diseases [4].

In Egypt, the immunization program is achieved through the Expanded Program of immunization (EPI) which has achieved several successes in controlling vaccine preventable

diseases, including strong national vaccination coverage of over 90%, through an increase of vaccine coverage and continuous surveillance leading to reduced illness, disability and death from diseases such as diphtheria, tetanus, whooping cough, measles and polio [5]. With high coverage rates for routine immunization, vaccine-preventable diseases have shown a remarkable decline in past decades. However, several factors indicate that there are still challenges, with measles outbreaks occurring in 2013 and 2014, and an increasing need for funding for new vaccine introduction [5].

Assessment of immunization program is an important tool as it improves the general status of the immunization program, give solutions to the weakness points as well as it enables immunization awardees with the evidence needed to manage programs more effectively and efficiently, assess and improve existing activities, plan and implement new activities, demonstrate value and ensure accountability [6].

WHO declared the purpose of the evaluation is to examine the EPI in the context of the health system and its broader surroundings. The evaluation looks at the program's strengths and weaknesses, the efficiency and effectiveness of its activities and its impact. It also assesses the program's capacity to adapt to new demands, both those generated from health sector reform and decentralization, as well as those arising in response to the population's need for access to new vaccines and technologies [7].

The Rationale of the Study

In view of the importance of the EPI assessment tool, as explained in advance, which reflects positively on the health of today's children, young people of tomorrow and future men, and also because of the high population density in Cairo Governorate, and the fewer studies in this regard in this area; hence this study was in our hands to determine the status of immunization program and to identify the weaknesses and strengths of the program in a Governorate such as Cairo, which is overcrowded and can contribute to better results that can be circulated to the rest of the Governorates successively.

Subjects and Methods

Administrative Design

Ethical consideration

The study was approved by the Ethical Committee of the Faculty of Medicine, Al-Azhar University at October 2016; an official permission letter was obtained and directed to the administrators in primary health care facilities at Cairo Governorate. In addition to that, there was informed oral consent was obtained from all participants.

Communication with local authorities

This communication aims to orient the health authorities and health unit officials about the objectives and procedures of the study to get an official permission for conduction of the study.

Technical design

Type of study

This study is a descriptive one based on cross-sectional approach.

Time of study

The study was conducted in the time frame from the first of October 2016 to the end of September 2018.

Study sitting

This study was conducted in the family health centers in Cairo Governorate, Egypt.

The Target Population

The target populations of the study are:

1. Immunization services at family health centers in Cairo Governorate,
2. Health care providers working in family health centers under study, and
3. Parents of children who come usually to these health care centers.

Sample design

A multi-stage stratified random sample is selected as follows:

1. Stage one: Cairo Governorate was selected by all its four classification areas
2. Stage two: One district was selected from each area of Cairo randomly.
3. Stage three: Two family health centers were selected from each district randomly. So about eight family health centers had been involved in the study

Sample size

1. All HCPs (about 45 providers) deal with immunization in the studied centers, were chosen without exception.
2. A sample of mothers (144 beneficiaries) coming for immunizing their children was chosen, using Cochran equation for calculation.

The inclusion criteria

1. HCPs related to the immunization services, including doctors, nurses who work on sites of study.
2. The immunization beneficiaries represented in parents of children or their relatives who coming to health centers under study.

Exclusion criteria

HCPs who are not involved in the immunization services. (e.g., dentists, laboratory technician....) or who not works in sites of study.

Data collection

Data are collected using the following tools:

1. A standardized Questionnaire to assess knowledge, attitude, and practices of HCPs towards the immunization system.
2. A standardized Interview Questionnaire to elicit quantitative information on user satisfaction with immunization services.
3. Observation checklist for assessing the immunization process.
4. Review of existing technical and legal documents and logbooks.

The operational design

Preparatory phase

This phase lasted from the first of October 2016 till the first of the end of March 2017, it was devoted to:

1. The literature reviews
2. Getting the approval of the local authority to carry out the study
3. Designing of questionnaires
4. Designing of the checklist.
5. Taking permission from the supervisors on the questionnaire to start working.
6. Performing of Pilot study and fieldwork.

Phase of data collection

1. The fieldwork for this study extended through 4 months from the first of April 2017 until the end of July 2017.
2. About 2 - 4 visits for each family health center were performed for the matter of assessment.

Analysis and reporting phase

This phase included:

1. Statistical analysis of the collected data.
2. Writing up the thesis.
3. Submission of the thesis for evaluation.

Statistical design

Two types of statistics were done:

1. Descriptive statistics [e.g. percentage (%), mean (x) and standard deviation (SD)],
2. Analytic statistics: which include the following tests:
 1. Chi-square test (χ^2): was used to study the association between two qualitative variables.
 2. T-test; is a test of significance used for comparison between two groups normally distributed having quantitative variables.
 3. One way ANOVA: is a test of significance used to determine whether there are any statistically significant differences between the means of two or more independent (unrelated) groups.
 4. Correlation analysis: is used to test relationships between quantitative variables or categorical variables. In other words, it's a measure of how things are related. P-value of <0.05 was considered statistically significant.

Scoring system

Concerning knowledge

Total Score Percentage	Level of Practice
More or equal to 75%	High level of practice
From 50% to less than 75%	Average level of practice
Less than 50%	Low level of practice

Table 1

Concerning practice

Total Score Percentage	Level of knowledge
More or equal to 75%	High level of knowledge
From 50% to less than 75%	Average level of knowledge
Less than 50%	Low level of knowledge

Table 2

Study Time Table (Gantt chart)

1. Preparatory phase 10/2016 – 1/2017
2. Pilot study 2 – 3/2017
3. Data collection 4 – 7/2017
4. Data entry 6 – 9/2017

5. Analysis of data 8/2017 – 2/2018
6. Interpretation of data 1 – 5/2018
7. Final phase 6 – 9/2018

Results

First: Knowledge, Attitude and Practice of Health Care Providers towards EPI

Table 3 shows the socio-demographic criteria of the studied HCPs; the majority of health care personnel were in their twenties with a percentage of 37.8% and the thirties age group by percentage of 33.3%. Most of the participants were females with a percentage of 89.9%, while the males represented 11.1%. On the other hand, the participants are classified into 77.8% nurses and 22.2% doctors. Most of the nurses were qualified by diploma of nursing secondary school (three years after basic education) by percentage of 66.7%

Socio-Demographic Criteria	The Health Care Providers (N=45)	
	Frequency	%
Age: (year)		
20 –	17	37.8
30 –	15	33.3
40 +	13	28.9
Mean ± SD	33.8 ± 7.7	
Range	23 – 52	
Sex:		
Male	5	11.1
Female	40	89.9
Qualifications		
Diploma of Nursing Secondary School	30	66.7
Specialized Nursing Diploma	5	11.1
Bachelor of Medicine	10	22.2

Table 3: Socio-demographic criteria of the studied health care providers.

Table 4 shows the experience and training of the studied HCPs; their experience ranged from one to 25 years with an average of 10.9 years. In addition, 82.2% of the studied HCPs had training courses with an average of four courses, while 17.8% of them had

not. The mean duration since the last training course was 5.6 years with a range from one to 18 years.

Training Item	The Health Care Providers (N=45)	
	Frequency	%
Experience_Years_		
Mean ± SD	10.9 ± 7.9	
Range	1 – 25	
Taking Training Courses		
Yes	37	82.2
No	8	17.8
Number of Training Courses		
Mean ± SD	3.5 ± 3.1	
Range	1 – 12	
Duration Since Last Course: (Year)		
Mean ± SD	5.6 ± 5.1	
Range	1 – 18	
Period of The Last Training Courses: (Day)		
Mean ± SD	5.0 ± 3.1	
Range	1 – 15	

Table 4: Experience and training of the studied health care providers.

Table 5 shows that the highest level of knowledge was for transferring vaccines in a safe/proper way by percentage of 88.9 %, while the lowest level of knowledge was for the contraindications for vaccinations by percentage of (35.3 %). Concerning knowledge score, it ranged from two to seven with an average of 4.6 right answers. About 20 % of HCPs scored a high-level of knowledge.

Figure 1 shows a summary of the total knowledge percentage, 71.1% of the HCPs scored an average level of knowledge, while 26.7 % scored a high-level. The lowest percentage was for the low-level of knowledge by percentage of 2.2%.

Table 6 shows that the total knowledge score was significantly higher among nurses who have a diploma of nursing secondary school compared to doctors who have a Bachelor of Medicine. The total knowledge score was significant higher in HCPs who had training courses compared to who did not.

Knowledge About Vaccinations (7 Variables)	The Correct Answer	
	N = 45	%
Method of Safe/Proper Transfer of Vaccines	40	88.9
Method of Getting Rid of Remaining Vaccines	35	77.8
The Diseases Covered by EPI Vaccines	30	66.7
The Time in Which the Vaccine Is Considered Unfit for Use	30	66.7
The Routine Tests Performed for The Child Before the Vaccination Session	29	64.4
The Common Side Effects of Vaccinations	26	57.8
Contraindications for Vaccinations	16	35.6
Knowledge Score (Out of 7)		
Mean ± SD	4.6 ± 1.2	
Range	2 - 7	
Knowledge Percentage		
High level of knowledge	20 %	
Average level of knowledge	55.6 %	
Low level of knowledge	24.4 %	

Table 5: Knowledge of the studied health care providers about vaccinations.

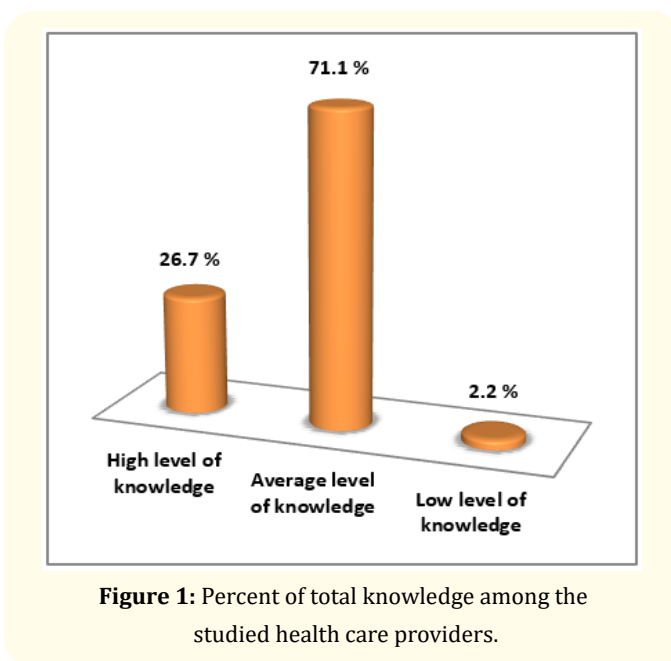


Figure 1: Percent of total knowledge among the studied health care providers.

Demographic Characters	Total knowledge score	Test	P value
	Mean ± SD		
Qualifications			
Diploma of Nursing Secondary School	53.4 ± 4.8	F= 3.3	0.04*
Specialized Nursing Diploma	53 ± 2.9		
Bachelor of Medicine	48.7 ± 6.6		
Type of Health Providers			
Physicians	48.7 ± 6.6	T = -2.5	0.01*
Nurses	53.4 ± 4.5		
Sex			
Male	50.6 ± 4.8	T = -0.7	0.4
Female	52.5 ± 5.4		
Having Training			
Yes	53.5 ± 4.6	T = 3.9	0.001*
No	46.8 ± 5.1		

Table 6: Relationship between total knowledge score with qualifications, sex and training.

Table 7 shows the correlations between the total knowledge score with the duration since last course and the experience years. There was a significant positive correlation between total knowledge score with duration of experience years while there is no correlation with the duration since last course.

	Total Knowledge Score	
	R	P value
Duration of Experience	0.4	0.0*
Duration Since Last Course	0.3	0.1

Table 7: Correlation between total knowledge score with both the duration since last course and experience years.

Figure 2 shows that 75.4% of HCPs had a positive attitude, 11.6% was indifferent, while about 12.9% had a negative attitude.

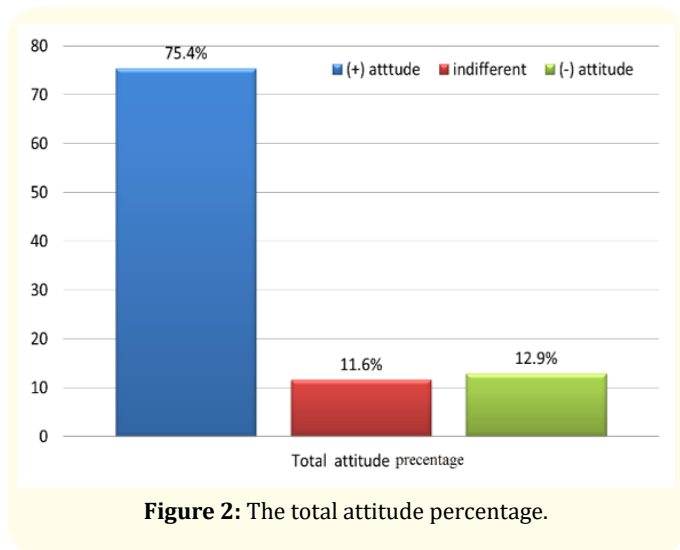


Figure 2: The total attitude percentage.

Second: Satisfaction of The Immunization Beneficiaries

Table 8 shows that the majority of the sample was in their twenties with a percentage of 85.3% and the thirties age group by a percentage of 29.9%. Their age ranged from 20 to 55 years with an average of 30 years. Most of the participants were educated with percentage of 83.3.

Socio-Demographic Characteristics	Immunization Beneficiaries (N=144)	
	Frequency	%
Age: (year)		
20 -	84	85.3
30 -	43	29.9
40 -	7	4.9
50 +	10	6.9
Mean ± SD	30.3 ± 8.3	
Range	20 - 55	
Education		
Educated	120	83.3
Illiterate	24	16.7

Table 8: Socio-demographic characteristics of immunization beneficiaries.

Table 9 shows that the highest level of satisfaction was for the place and time of service by the percentage of (80.8%), followed by satisfaction with the service by the percentage of (77.8%). On the other hand, the lowest level of satisfaction was for patient rights by percentage of (32.8%).

	Attitude of Immunization Beneficiaries (N=144)					
	Satisfied		Neutral		Unsatisfied	
	N	%	N	%	N	%
Place and Time of Service	113	80.8	25	17.7	6	4
Satisfaction with The Service	112	77.8	32	22.2	0	0
Effectiveness of Health Care	109	75.7	28	19.1	7	5.2
Environment of The Unit	102	70.6	24	16.4	18	13
Reception Services	97	67.4	37	26.1	10	6.6
Health Care Performance	93	64.5	35	24.2	16	11.9
Continuity of Health Care	78	54.4	26	17.9	40	27.9
Vaccinations	68	46.9	26	17.9	50	35.2
Patient Rights	47	32.8	35	24.6	62	42.7
Total Satisfaction Score	91	63.3	30	20.5	23	16.2

Table 9: Level of satisfaction in relation to different domains among beneficiaries.

Concerning the total satisfaction percentage: 63.3% was satisfied, while about 16.2% was not satisfied.

Third: Assessment of EPI practice (Observation chick-list)

Table 10 shows that the major percent of correct practice was for verifying beneficiaries' record and age and also for checking that the beneficiary is due for vaccination today (100%), while the minor percent was for explaining to beneficiaries about the vaccine (17.5%). Concerning average practice score of the pre-vaccination measures, it ranged from two to six with an average 4.7 correct practice. About 37.5 % of studied HCPs recorded a high-level of practice compared to 7.5 % of them recorded a low level of practice.

Table 11 shows that the major correct practice was for proper disposal of all medical sharps waste (85%), while the least percent of correct practice was for washing hands before reconstituting vaccine (47.5%). Concerning average score of general vaccination measures, it ranged from one to four with an average 2.5 correct practice. The high-level of practice represented 50%, followed by the average level of practice by percentage of 40%.

Pre-Vaccination Measures (6 Variables)	Correct Practice	
	No. (40)	
	N.	%
Verify beneficiaries' record and age	40	100
Check that the beneficiary is due for vaccination today	40	100
Contraindications to vaccines are asked about before immunization	30	75
Welcome the beneficiaries	29	72.5
Immunization services providers check the labels for expiry date and VVM of the vaccine vials before use	21	52.5
Immunization service providers explain to beneficiaries what vaccine(s) will be given and the disease it prevents	7	17.5
Average practice score of pre- vaccination measures (Out Of 6)	4.7 ± 1.1	
X ± SD	2 - 6	
Range		
High level of practice	37.5 %	
Average level of practice	55 %	
Low level of practice	7.5 %	

Table 10: Practice of different studied units/center regarding pre-vaccination measures.

General vaccine measures (4 variables)	Correct practice	
	No. (40)	
	No.	%
Proper disposal of all medical sharps waste	34	85
Immunization providers write the time of reconstitution on the vial (BCG, Measles)	27	67.5
No massage of the injection site	20	50
Immunization services providers wash their hands before session	19	47.5
Average score of general vaccination measures (Out of 4)	2.5 ± 0.9	
X ± SD	1 - 4	
Range		
High level of practice	50 %	
Average level of practice	40 %	
Low level of practice	10 %	

Table 11: Practice of different studied units/centers regarding general vaccine measures.

Table 12 shows that all practices were doing perfectly for all vaccines (OPV, PENTA, MMR and BCG) by percentage of 100%, except proper position of the child in OPV vaccination by percentage of 67.5% in all observations. Concerning average practice score; it ranged from 14 to 15 with an average 14.6 correct practice. The major percent of practice was a high-level of practice by percentage of 100%.

Specific Measures Regard Each Vaccine (15 variables)	Correct Practice	
	N: (40)	
	No	%
(OPV) Proper position of the child	27	67.5
(OPV) Proper site and route: oral	40	100
(OPV) Proper dose: two drops	40	100
(PENTA vaccine) Proper position of the child	40	100
(PENTA vaccine) Proper site: antero-lateral side of mid-thigh	40	100
(PENTA vaccine) Proper dose: 0.5 ml DPT vaccine, 0.5 ml HB vaccine and 0.5 ml Hib vaccine	40	100
(PENTA vaccine) Angle of insertion of needle: 90 degree	40	100
(MMR) Proper position of the child	40	100
(MMR) Proper site: right upper arm	40	100
(MMR) Proper dose: 0.5 ml	40	100
(MMR) Angle of insertion of needle: 45 degree	40	100
(BCG) Proper position of the child	40	100
(BCG) Proper site: left upper arm	40	100
(BCG) Proper dose: 0.1 ml BCG vaccine	40	100
(BCG) Angle of insertion of needle: 15	40	100
Average score (out of 15)	14.6 ± 0.47	
X ± SD	14 - 15	
Range		
High level of practice	100 %	
Average level of practice	0 %	
Low level of practice	0 %	

Table 12: Practice of different studied units/centers regarding specific measures for each vaccine.

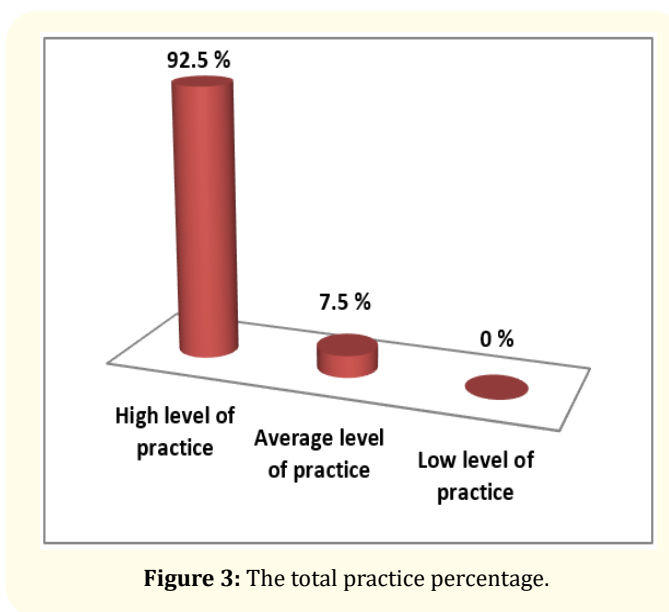
Table 13 shows that the major percent of correct practice was for reminding of parents about the next visit (82.5%), while the least percent was for telling the parent to return to the health center if a side effect seems serious (45%). Concerning average score of post vaccination measures; it ranged from one to four with an average 2.5 correct practice. The high-level of practice represented 52.5%, followed by the average level by percentage of 30%.

Post vaccination measures (4 variables)	Correct practice	
	No. of observations (40)	
	No.	%
Immunization services providers remind parents about the next visit	33	82.5
Immunization providers remind parents to bring the immunization card on next visit	26	65.5
Immunization services providers explain potential minor side effects/problems that may occur due to the vaccine and how to deal with them	23	57.5
Immunization services providers tell the parent to return to the health center if a side effect seems serious	18	45
Average score (out of 4)	2.5 ± 0.96	
X ± SD		
Range		
High level of practice	52.5 %	
Average level of practice	30 %	
Low level of practice	17.5 %	

Table 13: Practice of different studied units/centers regarding post-vaccination measures.

Figure 3 shows the total practice percentage, the major percent was the highest level of practice by percentage of 92.5%, followed by the average level by percentage of 7.5 %. On the other hand, there is not any practice recorded low-level.

Table 14 shows that the highest percent of the coverage was recorded at El-Darrasa and El-Makassi health centers (98%) and the lowest percentage was at El Matarya-Tani health center (95%), with an average of 96.6%. On the other hand, the average percent of non-coverage of vaccinations was 3.1%.



Name of Center	Coverage Percent	X ± Sd Range	The Non-Coverage Percent	X ± Sd Range
El Matarya-Tani	95	96.6 ± 1 95 - 98	5	3.4 ± 1 2 - 5
El Matarya-Awal	96		4	
El-Darrasa	98		2	
El-Darb El Ahmar	97		3	
Amr Ibn El-Aas	96		4	
Ain El-Sira	96		4	
El-Makassi	98		2	
Shobra-Tani	97		3	

Table 14: Vaccination coverage among the studied centers depending on the medical records.

Discussion

Regarding knowledge of the studied HCPs, our results revealed that the general knowledge towards different vaccines was accepted and the majority of HCPs recorded an average level of knowledge by percentage of 71%, followed by the high level of knowledge by percentage of 27%. This result was expected due to the fact that the average of experience years in this field among HCPs was about 10 years, so they should be aware of all its elements. This finding is considered worse if compared with the results of study done by

Swarnkar, *et al* [8]. who reported that 75% of health care workers under study have a high level of knowledge about immunization.

The present study revealed that there was a significant positive correlation between total knowledge score with duration of experience years. This result goes in the same line with Rogie, *et al.* [9] who found that health workers who reported to have worked more than two years in the immunization program were about four times more likely to have satisfactory knowledge on cold chain management compared to those with less than two years of experience. On the other hand, this result contradicted with Esa, *et al.* [10] who reached to the opposite result in which there is no correlation between knowledge and experience years. This dissimilarity may be due to lack of availability of regular training courses among the studied sample in the previous study.

Our results revealed that receiving training courses has a significant positive effect on the total knowledge of HCPs about vaccination with (p value < 0.05). These results agree with Widsanugorn, *et al.* [11] who mentioned that trained healthcare workers had better knowledge than untrained health care workers, and to ensure optimal immunization effectiveness. Also, Al-Ayed [12]. Mentioned that insufficient knowledge and inadequate training about immunizations by health professionals have negative impact on the quality of immunization services for children. This highlights the need for more efficient training and continuous education of primary HCPs in this field.

Regarding attitude of the studied HCPs, our results revealed that, about 75.4% of them had positive attitude towards the EPI. This result was expected due to the success that achieved by the program in Egypt, and also because the program is very structured and orderly. This finding is consistent with Taddei, *et al.* [13]. study who reported that the attitude of health providers was generally positive towards immunization program and their ability to prevent some infectious diseases.

Our results revealed that there is a highly negative attitude towards the adequacy of vaccines in the program from the healthcare providers; about 60% of them declared that the program needs other vaccines. Ahun M [14] declared that in his immunization guide that before deciding to incorporate new vaccines into the immunization program, managers should assess the disease burden and competing public health priorities. They

should estimate the cost of introducing and sustaining the new vaccine, identify funding sources, and analyze the impact on the health system as a whole.

Our results were unfortunately shameful towards the HCPs' knowledge about the contraindications for vaccination, about 64.4% recorded false knowledge. Al-Ayed, *et al.* [15] reported better results than our finding and documented that the correct response for vaccine contraindications was given by more than 60% of the respondents which is fairly good. This issue may pose a risk to children who going to be immunized and It can lead to deaths.

Concerning the knowledge of HCPs about structural types of different vaccine, our results revealed that about only (13.3%, 8.9%, 26.7%, and 6.7%) of HCPs provided right response to the following vaccines, respectively (DPT, HBV, MMR, and Hib), which is a very low knowledge and may cause problems for children who will be immunized. A little knowledge in this regard may make a health provider give a live attenuated vaccine to an immune-suppressed, which in turn may threaten his life [7] declared that different types or formulations of vaccines affect how they are used, how they are stored, and how they are administered. If they are to be safe and effective, it is vital to be familiar with the different types and to know how to handle them.

Our results revealed that about 82.2% of HCPs don't perform the required examination for children before the process of vaccination. Hutchins, *et al.* [16] reported that routine physical examinations and procedures are not prerequisites for vaccinating persons who appear to be healthy. The provider should ask the parent or guardian if the child is ill. If the child has a moderate or severe illness, the vaccination should be postponed.

Our results revealed that; about 71% of HCPs don't follow up children health after the process of vaccination. This does not match with guidelines in this regard, and the cause of this matter may be attributed to the overcrowding and the frequent number of children that does not allow a proper time for every child. CDC [17] reported that prior to immunization with any vaccine, the HCPs should ascertain if the child is unwell on that day, has a fever over 38°C, has ever had a severe reaction to any vaccine, has any severe allergies to vaccine components, has undiagnosed or evolving neurological condition [18].

Insufficient knowledge, inadequate training and less enthusiasm about immunizations by health professionals have negative impact on the quality of immunization services for children. Health professionals' perceptions of immunization against vaccine-preventable diseases must inevitably be transmitted to parents, and parents can be perplexed by the confusing and contradictory messages they may receive from health professionals [19].

Regarding Satisfaction of immunization beneficiaries, our results revealed that about 63% of beneficiaries were satisfied, 20.5% was neutral, while about 16.2% was not satisfied. These results agree with the study done by [20] on maternal satisfaction about childhood immunization in primary health care center, Egypt, who found that 57% of mothers evaluated childhood immunization services as good compared to 40.6% of mothers who evaluated it as fair, while 2.1% evaluated it as inappropriate. These differences may only be based on differences in personal opinions and views of the beneficiaries or that the difference arises from the quality of work in the places under study.

Concerning maternal satisfaction in relation to different domains of immunization, our results revealed that the highest level of satisfaction was for the place and time of service by the percentage of (81%) and followed by satisfaction with the service by the percentage of (78%), then effectiveness of health care by percentage of (76%). These results are better than [20] results who documented that satisfaction of mothers about waiting place was 63%, satisfying about waiting time 62%.

On the other hand, the lowest level of satisfaction in our results was for patient rights by percentage of 33%, which it is lower than [20] results who documented that satisfaction about information giving was 61%. This may be due to our study was done at Cairo governorate which characterized by overcrowding in health centers compared to El Gammal study, which was done in the Suez governorate at which no crowding at health centers.

Regarding the previous two studies related to patient rights and other similar studies, it seems that the patient's rights are not well considered and that it is necessary to sensitize officials and providers of health services to the importance of the patient's access to all his rights and the importance of the good relationship between the health service providers and service beneficiaries.

Regarding the observation checklist, our results revealed that the temperature inside refrigerators was in the range of 2–8°C in all observations by percentage of 100%. A total of 100% of these centers kept OPV on the freezer shelf, and kept DPT, HBV, BCG, Hib and MMR vaccines on the normal shelf. Also, 100% of the studied centers had a temperature chart and recorded the temperature inside the refrigerator 2 times daily and 88 % of them had a flow chart about what to do in case of a power outage.

These results were some sort better than Widsanugorn., et al. [11] who found that in 87% of primary care units, the temperature inside refrigerators was in the range of 2 - 8°C. A total of 96% of PCUs that kept OPV on the freezer shelf, and 100% of PCUs kept DPT, DT and hepatitis B vaccine on the normal shelf and only 61% of PCUs had a temperature chart and recorded the temperature inside the refrigerator 2 times daily. Only 63% of PCUs had a flow chart about what to do in case of a power outage.

Regarding taking the number of vaccine vials needed for the entire immunization session, our result revealed that; about 75% of HCPs were taking only the needed vials. This finding was lower than Al-Ayed [12] who found that 87% of HCPs were taking the vaccine vials out of the refrigerator at the arrival of the first child for that immunization.

Regarding hand washing, our results revealed that about 48% of the studied HCPs washed their hands before reconstituting vaccine and conducting the session, which is better than Esa., et al. [10] who recorded that none of their participants washing their hands. According to WHO [21] hand washing is essential procedure before any dealing with a patient, especially health activities related to blood.

Our results revealed that about 66% of HCPs remind parents to bring the immunization card on next visit. In another study by Swarnkar., et al. [8] who assessed the knowledge and practices of about 144 HCPs and documented that 75% of HCPs were reminding beneficiaries to take care of immunization card and carry this card on further visits. Regarding the previous two studies, the percentages are considered unsatisfactory, especially in our study because of the importance of data recording in the immunization card.

Concerning site and route of vaccines, our results revealed that these practices were made perfect for all vaccines and it matches with the international guidelines [22].

Our results show that about 58% of immunization services providers explained potential minor, side effects/ problems that may occur due to the vaccine and how to deal with them. However, this finding is considered unsatisfactory, but it is better than study of Swarnkar, *et al* [8]. In which about only 35% of HCPs learned beneficiaries about the minor adverse effects after vaccination and how to handle them.

Limitations of the Study

1. Refusal of some patients to participate in the study.
2. Difficulty in obtaining MOH approval for completing the practical part of the study.
3. The length of the questionnaire filling period.
4. Presence of illiteracy rate among studied population.
5. Difficulty in obtaining the documented information that related to immunization.

Strengths of the Study

1. The large sample size of the study.
2. The items of the questionnaire covered all aspects of the expanded program of immunization.
3. The items of the studied domains of satisfaction have relatively high internal consistency.
4. The questionnaire was filled by the researcher during an interview with each participant.

Generalization of the results

As we took a representative sample of the population, according to Cochran equation, so the sample group is as truly representative of the whole population which is the whole family health centers that located in Cairo Governorate.

Based on the above, and depending on the performed correct statistics through SPSS, we can generalize our results to the whole family health centers concerned with immunization in Cairo Governorate.

Conclusion

Concerning knowledge, attitude of Health Care Providers towards the EPI; the majority recorded an average level of knowledge towards different vaccines and the knowledge score was significantly higher in nurses and who received training courses. Also, the majority scored positive attitude especially for the importance of EPI for children's health and their confidence in its various vaccines. The negative attitude was mainly for un-adequacy of vaccines in the program with needing addition.

Concerning practice there was an accepted level of practice, however many essential practices weren't done regularly as asking children to wait in the center about 15-20 minutes after vaccinations.

Concerning satisfaction of immunization beneficiaries towards the EPI; the majority of them were satisfied in most of EPI domains with low satisfaction for patient rights.

Recommendations

Based on the conclusions of the study, it is recommended that:

1. Continuous training of HCPs is highly essential to improve their knowledge and practice and also quality of immunization services.
2. Strict adherence of HCPs to rules of doctor-patient relationship and giving all rights to health service takers.
3. Allocate adequate government financial resources to address the increasing demands of the immunization programs as introducing other recommended vaccines as pneumococcal and rotavirus vaccines.

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