



## ORIGINAL ARTICLE

# Knowledge and Practice of Immunization Among Primary Health Care Nurses in Bahrain

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### Abstract

**Background & Objectives:** Nurses play an important role in delivering and advocating for vaccines in the healthcare system. Our goal was to assess the nurses' knowledge of vaccine administration, their immunization practice, knowledge of precautions and contraindications to vaccines, and practices towards them in primary health centers in Bahrain.

**Methods:** We conducted an observational cross-sectional study using a self-administered questionnaire. All nurses practicing in the primary health centers in Bahrain were invited to participate in the study. The questionnaire contained several statements regarding general knowledge and practice of vaccines administration and contraindications. Written consent obtained from all participants prior to study.

**Results:** Overall knowledge of vaccine administration, practice of immunization and practice towards precautions and contraindications to vaccines were satisfactory. Although, certain areas of gaps exist. The least satisfactory result was observed in the knowledge of vaccine precautions and contraindications.

**Conclusion:** Our study showed good immunization practice in Bahrain. However, there is a need for improvement in the area of knowledge regarding precautions and contraindications of vaccines.

**Keywords:** Bahrain, Knowledge, Immunization, Primary health care, Nurses

### Introduction

Immunization is the most cost-effective health care intervention to reduce the incidence of vaccine-preventable diseases in the world. No other health care modality, not even antibiotics, has played such a major role in reducing mortality worldwide.<sup>1,2</sup> It has contributed to increased life expectancy, and improved quality of life among people.<sup>3</sup> According to the World health organization (WHO), vaccines

prevented at least 10 million deaths between the years 2010-2015.<sup>4</sup>

Despite vaccines major roles in mortality reduction, not all children across the globe are receiving the required vaccines. In 2017, the number of infants who did not receive diphtheria and tetanus toxoids and pertussis (DTP3) vaccine, which is the main indicator of immunization program performance, was 19.9 million.<sup>5</sup>

In the Kingdom of Bahrain, immunization has always been among the top priorities of the health care system. It has had a steady progression since the introduction of the first vaccine in 1956, and the expanded immunization program (EPI) in 1981.<sup>6</sup> Since then, the Ministry of Health (MOH) has incorporated many rules and regulations in order to control infectious diseases, and ensure high vaccine coverage. Bahrain was declared polio-free since 1993.<sup>7</sup> In addition, measles incidence declined significantly after the introduction of the first dose of measles vaccine in 1974, and measles, mumps, rubella (MMR) vaccine in 1985 as a second dose booster. Furthermore, in 1996 a plan was implemented to eliminate measles, through which significant progress was made. As a result, the average annual number of cases has declined by more than 99% since the 1970s.<sup>6</sup> Immunization coverage for the last decade in Bahrain is maintained above 90% according to the latest 2020 statistics.<sup>8</sup>

At the present, vaccines are provided free of charge to everyone residing in the country irrespective of their nationalities. The vaccination program is implemented mainly through the primary health care system, beside the private sectors, and it covers the entire life span. It includes children, adults, the elderly, and special risk groups such as immunocompromised patients, sickle cell disease, and certain chronic illnesses.<sup>9</sup> The childhood vaccination schedule starts from birth up to the age of five; it includes hepatitis A and B, diphtheria, tetanus and pertussis (DTP), hemophilus influenzae type B (HiB), inactivated and oral polio, pneumococcal conjugate (PCV), rota virus, measles, mumps, rubella (MMR), varicella, and meningococcal conjugate vaccines.<sup>9</sup>

Maintaining high immunization coverage is essential for ensuring a healthier society. Health care providers play a crucial role in maintaining high vaccination coverage. Health care professionals, such as nurses, are the main source of education, and the main advocate of vaccination for the public.<sup>10,11</sup> A strong association was found between the nurse's knowledge about immunization, and the vaccination uptake in the communities across several countries in Europe.<sup>10</sup>

Several studies evaluated the nurses knowledge of vaccination and found significant gaps in their understanding of vaccines, and insufficient knowledge to address all the parental concerns regarding vaccines.<sup>12,13,14</sup> Other studies found significant misconceptions among nurses about vaccines and reported gaps in the principle of vaccine administration.<sup>15,16</sup> A study showed that up to 33.5 % of the nurses believed that at least one vaccine in the childhood immunization schedule contains thiomersal, and 28% did not know whether the amount of thiomersal in the vaccines could cause neurotoxicity.<sup>16</sup> In addition, a study done in Saudi Arabia concluded that despite nurses having overall good knowledge regarding childhood immunization, still significant gaps exist.<sup>13,14</sup> For example, more than 50% of nurses believed that a child with controlled epilepsy should not receive the DTP vaccine.<sup>14</sup> In the same study only 11.8% of nurses answered correctly when asked about the relation between egg allergy and MMR vaccine.<sup>15 and 3</sup>

The aim of this study is to assess the nurses' knowledge and practice regarding immunization services in primary health centers in Bahrain by evaluating knowledge of vaccine administration, immunization practice, knowledge of precautions and contraindications to vaccines, and practice of precautions and contraindications to vaccines.

## Materials & methods

### Setting

In Bahrain, vaccination is provided through primary healthcare system as well as private sectors. In the primary health centers, vaccination is provided through two channels, including the mother and child health services (MCH) for childhood vaccination, and the general nursing area, which provides vaccination for adults, travelers and special risk groups. The study involved all the nurses working in the primary health center in Bahrain. All nurses practicing in the health centers, including morning and evening shifts, during the data collection period were invited to participate in the study.

### Study design

Observational cross-sectional study.

**Study subject**

Primary health care nurses practicing in primary health centers in Bahrain.

**Sample size**

All nurses practicing in primary health centers in Bahrain were invited to participate in the study. According to latest Bahrain statistics, seven hundred and sixteen (716) nurses are employed in primary health centers.

**Tools**

The study was conducted using a self-administered questionnaire including 42 statements regarding immunization. It contains several statements regarding general knowledge and practice of storage, handling, administration, and contraindications of vaccines. The questionnaire is adapted from a similar study conducted in Saudi Arabia.<sup>13, 14</sup> Permission from the authors was obtained for using the questionnaire in this study.

**Data collection method**

The questionnaires were distributed by the researchers to the nursing director at each health center, who then distributed them to the nurses in that health center, and after completion returned them to the researcher. Data was collected in September 2019.

**Ethical consideration**

Ethical approval was obtained from Health Research Committee (HRC) before conducting our research. Written consent was collected from all nurses willing to participate in our study.

**Data analysis**

The Statistical Package for the Social Sciences (SPSS) program version 23 was used for data entry and analysis. Frequencies and percentages were computed for all the categorical variables. In our study, the missing data were not included in data analysis

**Results****Socio-demographical characteristics of nurses**

Out of 716 nurses, a total of 374 nurses respond to our questionnaire, which represents 52.2 % of all

staff nurses working in primary care health centers in Bahrain.

The mean age of the nurses was  $34.3 \pm 7.8$  years, with 249 (67.5%) of them having a bachelors degree or higher, 348 (93.3%) were females, and 237(64.9%) of Bahraini nationality (Table 1).

Our result showed, 294 (79.3%) of respondents were working in the treatment room unit in the health centers, 114 (31.1%) had 5-10 years of work experience, while 146 (39.8%) had over 10 years of work experience. In addition, 138 (37.7%) nurses had 5-10 years of experience working specifically with vaccines, while 89 (24.3%) had more than 10 years of experience. Furthermore, 124 (33.2%) had attended vaccine related lectures, 76 (20.4%) vaccine related workshops, and 47(12.6%) had specific courses on vaccination (Table 1).

**Table 1: Socio-demographical characteristics of nurses participating in the study, N=374, values are numbers (%)**

Characteristics	n (%)	
Age N= 328	<30	113 (34.5)
	30 – 39	125 (38.1)
	≥40	90 (27.4)
Sex N= 373	Male	25 (6.7)
	Female	348 (93.3)
Nationality N= 365	Bahraini	237 (64.9)
	Non-Bahraini	128 (35.1)
Educational level N= 369	Diploma	120 (32.5)
	Bachelor or higher	249 (67.5)
Area of work N= 370	MCH	61 (16.5)
	Treatment room	294 (79.5)
	Others	15 (4.1)
Years of experience as a nurse N= 367	<5	107 (29.2)
	5 – 10	114 (31.1)
	>10	146 (39.8)
Years of experience in dealing with vaccination N= 366	<5	139 (38)
	5 - 10	138 (37.7)
	>10	89 (24.3)
Attend vaccination training during the past 2 years	Courses	47 (12.6)
	Workshops	76 (20.4)
	Lectures	124 (33.2)

**Knowledge of vaccine administration**

Table 2 included ten statements regarding knowledge of vaccine administration. The highest score was in the statement number ten with 329 (88.4 %) respondents stating the use of distinct injection sites for giving more than one injectable vaccine simultaneously. The next high score was about the proper site of giving injectable vaccines, which 325 (87.6%) gave the correct answer.

In comparison, the incorrect statement of reducing DTP dose if a child had suffered from inconsolable cry for more than 3 hours, had the lowest score in which only 208 (56%) respondents gave the correct answer. In addition, only 244 (65.9%) respondent answered correctly when asked about the timing for the first dose of DPT vaccine (Table 2).

**Table 2: Knowledge of vaccine administration, N=374, values are numbers (%)**

Statement	Correct response n (%)
1. According to the local national immunization schedule, the first dose of DTP should be given at 3 months of age. N=370	244 (65.9)
2. MMR, DTP and OPV can be safely given simultaneously to the same child. N=366	247 (67.5)
3. Children who suffered inconsolable crying for more than 3 hours after previous full DTP dose should be given half of the usual DTP dose. N= 371	208 (56.1)
4. If a child misses the 2 <sup>nd</sup> dose of DTP and OPV for more than 2 months, vaccination schedule should be restarted again from 1 <sup>st</sup> dose. N= 372	266 (71.5)
5. Preterm babies should receive half the dose of vaccine given to term babies. N=370	273 (73.8)
6. According to the national immunization schedule, the MMR vaccine is given at 12 months of age. N=368	297 (80.7)
7. BCG must be given intradermal in the upper third of the left arm for the eligible children. N= 371	271 (73)
8. Five drops of OPV are given to children whose weight is above 20 kg. N=368	246 (66.8)
9. Injectable vaccines should be given preferably in the anterolateral aspect of the thigh or in the deltoid muscle. N= 371	325 (87.6)
10. Separate injection sites should be used to administer more than one injectable vaccine at the same time. N= 372	329 (88.4)

**Immunization practice**

Table 3 included nine statements regarding immunization practice. Our result showed, 365(98.1%) respondents record vaccine batch number in patient's immunization records, and 339 (91.1%) register the immunization details in patient's electronic record.

According to our findings, after vaccine administration, only 171(46.6%) respondents keep the child for 15-20 minuet observation period, which attained the lowest correct response. When asked if the mothers should not breastfeed their children for 20 minutes after administration of oral poliovirus vaccine, only 185(50.3%) respondents chose the correct answer.

**Table 3: Immunization practice, N=374, values are numbers (%)**

Statement	Correct response n (%)
1. I read the vaccine summary (manufacturer's instructions or electronically provided vaccine information) before giving any vaccine. N= 372	339 (91.1)
2. I advise parents to give regular antipyretics e.g. Adol after DTP vaccine to children. N=370	288 (77.8)
3. I ask children/patients to wait for 15-20 minutes in the center after vaccination. N=367	171 (46.6)
4. I record the date, name of the patient, type of vaccine for every patient in the immunization record book/ electronic record of the patient. N=370	362 (97.8)
5. I check/record the Batch no. of the vaccine used, in the immunization record (booklet or electronic record) of the patient. N=372	365 (98.1)
6. I check immunization record (or electronic immunization records) of every preschooler who attends the center. N=369	322 (87.3)
7. I call dropout children for completion of missed vaccination. N=365	246 (67.4)
8. Mothers should not breastfeed their children for 20 minutes after administration of oral poliovirus vaccine. N= 368	185 (50.3)
9. Vaccination of preterm baby should be delayed to compensate for their prematurity. N= 366	267 (73)

#### ***Practice towards Precautions and Contraindications to Vaccination***

The participants were asked four questions regarding practice towards possible precautions and contraindications to vaccines. Before vaccination, 344(92.7%) respondents reported they always

inquire about previous vaccine reactions, 304(81.9%) always ask about use of immunosuppressive medications, and 297(80.1%) always check for presence of an immunocompromised household member (Table 4).

**Table 4: Practice towards precautions & contraindications to vaccination, N=374, values are numbers (%)**

	Always n (%)	Sometimes n (%)	Never n (%)
1. Before vaccination, I ask the parents of children/patients about previous vaccine or reactions. N= 371	344 (92.7)	23 (6.2)	4 (1.1)
2. Before vaccination, I ask the parents of children/patients about presence of an immunocompromised individual in the household. N= 371	297 (80.1)	53 (14.3)	21 (5.7)
3. Before vaccination, I ask the parents of children/patients about history of blood transfusion or administration of blood products in the last few weeks. N= 371	272 (73.3)	55 (14.8)	44 (11.9)
4. Before vaccination, I ask the parents of children/patients about their current use of immunosuppressive medications. N=371	304 (81.9)	40 (10.8)	27 (7.3)

### ***Knowledge of precautions and contraindications to vaccination***

The participants were asked twelve statements regarding knowledge of precautions and contraindications to vaccines. Results showed 299(80.8%) respondents agree that severe anaphylactic reaction to a vaccine contraindicates further doses of that vaccine. In addition,

260(70.8%) respondents answered correctly when asked about MMR vaccine in contacts of measles cases. In comparison, only 19(5.1%) respondents answered correctly when asked about vaccinating a child with oral temperature of 38°C, and 161(43.5%) in common cold cases. Furthermore, when asked about vaccinating children with acute diarrhea only 168(45.7%) answered correctly (Table 5).

**Table 5: Knowledge of precautions and contraindications to vaccination, N=374, values are numbers (%)**

Statement	Correct response n (%)
1. Injectable vaccines should not be administered to children/patients with acute diarrhea. N= 368	168 (45.7)
2. Family history of convulsions is a contraindication to DTP vaccinations. N= 369	185 (50.1)
3. Necessary precautions should be taken before giving MMR vaccine to children/patients with severe allergy to eggs. N= 370	213 (57.6)
4. Vaccination of children/patients having colds and cough should be deferred until full recovery. N=370	161 (43.5)
5. Children/patients with oral temperature of 38°C should not be vaccinated. N=370	19 (5.1)
6. OPV & MMR should not be given to children/patients with primary immune deficiency disease. N= 368	193 (52.4)
7. Children who suffered inconsolable crying for more than 3 hours after previous full DTP dose should be given half of the usual DTP dose. N=367	226 (61.6)
8. Vaccinated is contraindicated in children/patients who suffer longstanding respiratory, cardiovascular or liver diseases. N= 369	244 (66.1)
9. Children/patients who come in contact with a patient who got measles should not receive MMR vaccination. N= 367	260 (70.8)
10. Children/patients with controlled epilepsy should not receive the DTP vaccination. N= 365	174 (47.7)
11. Soreness, redness or swelling following an injectable vaccine contraindicates the further doses of that vaccine. N=369	241 (65.3)
12. Severe anaphylactic reaction to a vaccine contraindicates further doses of that vaccine. N= 370	299 (80.8)

### **Discussion**

Our results showed that the majority of nurses were well aware of proper vaccine administration; for example, 88.4% knew separate injection site should be used when giving more than one injectable vaccine simultaneously. In addition, 87.6 % of the nurses knew the correct administration site of injectable vaccines. On the other hand, we observed

some less than satisfactory areas of knowledge; when asked if inconsolable cry post DTP vaccine mandates giving half the dose of DTP in the next vaccine dose, only 56.1 % answered correctly (Table 2).

In relation to immunization practice, 98.1% reported they check and record vaccine's batch number, 97.8 % stated they record the vaccines details in

patient's electronic records, and 91.1 % stated they read vaccine's manufacturer-provided information before giving any vaccine (Table 3). This means that the nurses in primary health care are generally safe and competent in the practice of administering childhood immunization in the Kingdom of Bahrain, which is similar to a study done in Saudi Arabia.<sup>13</sup> Although, one aspect of immunization practice to consider was waiting fifteen to twenty minutes in the health center post-vaccination, which only 46% of respondents answered correctly (Table 3). Despite rate of anaphylaxis being quite rare post childhood vaccination, with an incidence of 1.31 cases per million vaccine doses, this practice could be dangerous.<sup>17</sup> If an anaphylaxis reaction post vaccination occurred, delay in appropriate management of such cases might have disastrous consequences.

Regarding practice towards precautions and contraindications of vaccines, our study showed 92.7 % of nurses check for previous vaccine reactions, 81.9% inquire about immunosuppressant use, and 80.1% ask about presence of immunocompromised households before administering the vaccine. (Table 4). This indicated nurses in primary care centers exercise very good practice towards vaccine's precautions and contraindications.

In assessing knowledge of vaccine precautions and contraindications, our study showed significant areas of gaps in nurses' knowledge. For example, when asked about common minor illnesses, such as common cold and acute diarrhea, unfortunately most respondents agreed with the incorrect statement of delaying vaccine (Table 5). This was in contrast to a study done in Saudi Arabia where majority of nurses answered correctly when asked about such conditions.<sup>15</sup> Insufficient and incorrect knowledge regarding vaccine's true contraindication results in caregiver's hesitancy and confusion about receiving vaccines. Deferring vaccination for common minor illnesses in turn leads to missed opportunities in providing childhood vaccination.<sup>18</sup>

Another common misconception was about epilepsy and vaccination. In our study, 52.3% of nurses believe that a child with controlled epilepsy should not receive the DTP vaccine, and around

50% of them believed even having a family history of epilepsy is a contraindication to DTP vaccine (Table 5). This was similar to a study done in Saudi Arabia in which over 60% of respondents had the same misconception about epilepsy and the DTP vaccine.<sup>14</sup>

### **Limitation**

A Potential limitation of this study is about 40% non-response rate. In addition, any missing data among the participants were not included in the analysis. Another limitation of this study could be the use of self-reported questionnaire for assessing knowledge and practice of childhood vaccination.

### **Conclusion and Recommendations**

In conclusion, our study showed overall good immunization practice in Bahrain, however, there is a need for improvement in the area of knowledge regarding precautions and contraindications of vaccines. We suggest regular vaccination seminars as a strategy to improve nurses' knowledge about vaccinations. Furthermore, studies assessing knowledge and practice of primary healthcare providers towards immunization in Bahrain are scarce. Therefore, this study could be a starting milestone in the assessment of immunization practice among primary care workers in Bahrain.

### **Conflict of interest**

The authors declare no conflicts of interest.

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