ASSESSING NURSE'S ATTITUDES AND PRACTICE AFTER PARTICIPATING IN A VACCINATION TRAINING PROGRAM: A QUANTITATIVE STUDY

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Abstract

Background: Primary healthcare nurses are pivotal to the successful uptake of immunization worldwide. Central to this, is the attitude and practice nurses may have toward vaccines during administration. It is postulated that altering knowledge towards immunization may impact both attitude and practice towards successful immunization uptake. The aim of this research was to assess nurses' knowledge, attitude and practice after the delivery of a three-day continuing professional development program regarding administration, safe handling and delivery of vaccines.

Method: This research consisted of a quantitative cross-sectional study, utilizing a self-administered survey. The survey contained questions related to immunization knowledge, attitude, and practice. Before and after attendance of an immunization program for continuing professional development, the survey was administered to nurses working in well-baby clinics, communicable diseases clinics, travel clinics and school nurses. Speciýc areas identiýed gaps in knowledge, attitude, and practice among participating nurses.

Results: Results from our study suggest that attitudes and practices of participants identiýed a signiýcant difference after receiving an immunization educational program that focused on administration and delivery of immunization skills.

Conclusion: Continuous professional development activities such as this have shown a marked increase in the attitude and practices of nurses making it tantamount to the success of vaccine uptake.

Implications for Practice: Nurses are poised to be frontline advocates for the uptake of immunization; therefore education and training needs to be provided in order for them to understand and further affect change.

Keywords: Vaccine, Immunization, Knowledge, Attitude, Practice

Introduction

It is widely known that vaccines are the most cost-effective method of controlling communicable diseases worldwide (Squeri et al., 2017; World Health Organization [WHO], 2017). Primary healthcare nurses play a vital role in both educating and protecting the public from communicable diseases. These nurses are ubiquitous to and inextricably linked to providing knowledge to parents and adults requiring immunization. According to Lee et al. (2019), there has been a shift towards parents refusing to vaccinate their children, which has led to the re-emergence of communicable diseases. There has been a dearth of evidence to suggest nurses may be linked to the non-compliance amongst parents in the vaccination of their children (Pulcini et al., 2014; Walsh et al., 2015). This in part may be due to lack of knowledge, which affects attitude and practice skills related to immunization.

Primary healthcare nurses are the gatekeepers to protecting the public from the re-emergence of communicable diseases and as such, education within curricula falls short when it comes to lectures on public health and vaccination hesitancy and compliance. Nursing students receive as little as one hour or as much as 52 hours in total on vaccination training within their respective programs (Pelly et al., 2010). Also concerning is the growing public movement in questioning the risks and beneýts, side effects, and contraindications for immunization, resulting in more and more adults hesitant to vaccinate themselves or their children (Pelly et al., 2010). A study in Canada found that nurses did not feel equipped to answer immunization concerns of parents and therefore believed further education be provided to help them answer childhood immunization questions (Mossey et al, 2020). Consequently, receiving little immunization education would appear to make it difýcult for PHCC nurses to fully support the usefulness of vaccines and safely handle vaccine delivery and services, positioning them at a disadvantage from their perceived knowledge deýcits, varied vaccine practices, and potential differing attitudes. In Qatar, the goal was to educate nurses in the realm of immunization as a continuing professional development program. In a concerted effort between Qatar University-School of Pharmacy, Weill Cornel School of Medicine and University of Calgary in Qatar-School of Nursing, this program was developed. This provided an opportunity to assess the knowledge, attitude and practices of nurses before and after the continuing professional development program.

Methods

1. Design: The authors conducted a quantitative cross-sectional study between October and December, 2018 using a self-administered questionnaire. Potential candidates were selected based on the inclusion criteria created by the Primary Health Care Corporation (PHCC) Workforce Training Department. The inclusion criteria included: 1) ability to read and write in English, 2) completed education with a diploma in nursing or Bachelor of Science in nursing, 3) designated work in Well-Baby Clinics (WBCs), Communicable Diseases Clinics (CDCs), Travel Clinics or Schools, 4) employed for a minimum of 3 years within PHCC, 5) licensed by Qatar Council Health Professionals, and 6) recommended by their manager. This resulted in 340 candidates meeting the inclusion criteria. As a method to calculate sufýcient sample size, an online tool (http://www.nss.gov.au cited on May, 23rd, 2019) determined 120 participants demonstrated an adequate sample. With this recommendation, two cohorts of 64 and 56 participants were formed, respectively.

2. Questionnaire: A 32-question survey was developed from three pre-existing, validated and tested surveys related to the knowledge, attitude and practice (Lee et al, 2020; Pelly et al., 2010; Ritvo et al., 2003). A team of three health care providers compiled select items based on the diverse representation of nurses and cultural context of Qatar. After review and approval by an expert committee of health care providers, the ýnal survey consisted of three sections: 1) demographic, 2) knowledge, and 3) attitude and practice. Each section amounted to 13, 9, and 20 items respectively.

3. Data Collection: To collect responses of this survey, the Qualtrics online program was used. Emails distributed the survey to participants of cohort 1 and cohort 2 one week prior to the vaccine education program. In this email, the authors asked for informed consent prior to participation and a 7-day turnaround to complete. Within this week, a follow-up email reminded participants about completing the online survey. After receiving vaccine education, practicing and demonstrating their skills, the same vaccine questionnaire was sent to each participant.

4. Data Analysis: The SPSS software version 25 (IBM SPSS statistics, Armonk, NY) and Microsoft Excel performed the data analysis for this study. Application of descriptive statistics calculated the mean and percentages of demographic data and attitude of nurses. The inferential statistic compared the attitude of each participant pre- and post-immunization educational training. The Wilcoxon Signed-rank test computed the effect of immunization training on immunization practices and attitude of nurses. We have recently assessed the immunization knowledge of nurses (Abdullah E et al. 2020). To understand the relationship between knowledge and attitude of nurses, the measure of correlation analysis was carried out to reveal speciýc items and their association to nurses' knowledge about immunization.

5. Ethical Considerations: Authors of this study obtained ethics approval from PHCC review ethics board.

Results

1. Demographics of Participants

A total of 120 participants (64 cohort 1, 56 cohort 2) submitted the complete surveys which were included in the data analysis. Responses to demographic characteristics are shown in Table 1. Of the participants, 90.9% cohort 1 and 92.9% cohort 2 identiýed as female between the age of 25-33 years (60.6% cohort 1, 49.1% cohort 2). Most participants identiýed as staff nurses (87.9% and 96.5%, cohort 1 and cohort 2 respectively) and over half the sample responded to work less than 5 years at PHCC (63% cohort 1 and 56.1% cohort 2). Of the nurses, many completed education at the bachelor's level (81.8% cohort 1, 82.45% cohort 2), while some graduated from nursing school less than 10 years ago (47% cohort 1, 42% cohort 2). More than 70% of participants studied entry level nursing in the Philippines or India. Nurses who graduated from nursing school in the Philippines represented 26 and 29 participants of cohort 1 and cohort 2 respectively. Likewise, participants who graduated from nursing school in India represented 24 and 15 nurses of cohort 1 and 2, respectively. The majority of participants worked in well-baby clinics and described vaccine administration as part of their job description (90% and 98.2%, cohort 1 and 2, respectively). Thirty-two participants of cohort 1 had less than 5 years of vaccination experience whereas 27 participants of group 2 had 6-10 years of vaccination experience. More than 30% of each cohort administered 51-100 doses of vaccines per month and the majority of participants provided immunization services to infants and young children (89.4% cohort 1, 93% cohort 2).

2. Attitude of Participants

Towards Immunization Practices: The majority of nurses strongly disagreed with the general statements: (1) 'It is not necessary to immunize breastfed infants at 2 months of age' (63% cohort 1, 78.6% cohort 2), (2) 'Vaccines may cause chronic diseases and learning disorders because they contain small amounts of mercury' (43.5% cohort 1, 82.1% cohort 2), (3) 'It is no longer necessary to immunize against polio as it is now a rare disease' (65.1% cohort 1, 85.7% cohort 2). Interestingly, variation in responses to particular statements was observed between cohorts. Participants of cohort 2, 85.7 % strongly agreed to the statement ◊Getting my annual inþuenza vaccine is important' whereas only 59.7% of participants of cohort 1 responded to this same statement. Similarly, the statement, 'The vaccines available are very carefully and consistently tested for safety', 80.4% nurses strongly agreed, whereas only 51.6% nurses of cohort 1 strongly agreed. About 23-30% of participants responded neutral to the following three statements: 'The idea of taking a newly developed vaccine, even if it is carefully safety tested, makes me anxious', 'An increasing number of people become anti-vaccine oriented as more information about vaccines and how they are developed is delivered over the Internet', 'Those people who are against taking vaccines are highly prejudiced and ill-informed, scientiýcally◊.

After completion of the continuous professional development program, a signiýcant difference resulted from speciýc responses on attitudes toward practice of immunization. These differences are shown in Table 2. In both cohorts, signiýcant differences in attitudes were observed from the following statements: 3, 4, 5, 6, 12, 16, and 17. Responses to statements 1, 2 and 18 resulted in signiýcant differences for only cohort 1, whereas only cohort 2 demonstrated a signiýcant difference for statement 7, 13, and 20. (Table 1)

Correlation between the Attitude of Nurses and Immunization Knowledge

We have previously reported that participants of cohort 1 scored high on mean knowledge outcomes compared to cohort 2 (Abdullah et al. 2020). Our results demonstrated that those participants with high mean knowledge scores showed positive attitudes towards three vaccine safety related questions: 'A vaccine can give you a serious case of the very same disease you are trying to avoid', 'An increasing number of people are becoming anti-vaccine oriented as more information about vaccines and how they are developed is (delivered) over the Internet' and 'The idea of taking a newly developed vaccine, even if it is carefully safety tested, makes me anxious' (Table 3). Among cohort 1, 9 of the total 20 attitude questions and the total mean knowledge score of the participants resulted in a signiýcant correlation. However, cohort 2 demonstrated signiýcant correlation between one of the attitudes questions about vaccines (i.e., 'A vaccine can give you a serious case of the very same disease you are trying to avoid') and the total mean knowledge score of the participants. (Table 2)

Table 1: Demographic characteristics of the participants

	Cohort One		Cohort Two	
	N	%	*N*	%
Gender				
Male	4	6.1	3	5.26
Female	60	90.9	53	92.9
Missing	2	3	1	1.8
Age				
25-33 Years	40	60.6	28	49.1
34-44 Years	21	31.8	22	38.59
45-54 Years	3	4.5	6	10.5
Missing	2	3	1	1.8
Duration of Work at PHCC				
Less Than One Year	1	1.5	1	1.75
1-5 Years	42	63.6	32	56.1
6-10 Years	7	10.6	11	19.29
11-15 Years	12	18.2	9	15.78
16- 20 Years	2	3	4	7.0
Missing	2	3		
Professional Classification				
Staff Nurse	58	87.9	55	96.5
School Nurse	4	6.1	2	3.5
Home Healthcare	2	3		
Missing	2	3		
Highest Level of Education				
Diploma Level	5	7.6	4	7.0
Bachelors Level	54	81.8	47	82.45
Masters Level	4	6.1	4	7.0
Fundamental License	1	1.5	1	1.75
Missing	2	3		
Years Since Graduated From Nursing School				
Less Than 5 Years	4	6.1	3	5.26
5-10 Years	31	47	24	42.105
11-15 Years	16	24.2	17	29.8
16-20 Years	9	13.6	6	10.5
Over 20 Years	4	6.1	6	10.5
Missing	2	3		
Years Worked as Practicing Nurse				
1-5 Years	1	1.5	1	1.75
6-10 Years	37	56.1	27	47.36
11-15 Years	14	21.2	16	28.07
16- 20 Years	8	12.1	7	12.28
Over 21 Years	4	6.1	6	10.5
Missing	2	3		
Country of Origin of First Education as a Nurse				
Egypt	5	7.6	2	3.5
India	24	36.4	15	26.3
Philippines	26	39.4	29	50.87

Table 1: Demographic characteristics of the participants (continued)

Qatar	4	6.1	2	3.5
Jordan	3	4.5	5	3.5
Tunis	2	3	4	1.75
Missing	2	3		
Locality of Work Place				
School Health	4	6.1	6	10.5
CDC Travel Clinic	1	1.5	3	5.26
Well-Baby Clinic	26	39.4	26	45.6
Home Health Clinic	3	4.5		
Rotating	15	22.7		
General	3	4.5		
PHC	1	1.5		
Family Medicine	2	3		
Staff Nurse	1	1.5		
Vaccination Room	2	3		
Treatment Room	2	3		
Vaccination Unit / CDC Travel Clinic	1	1.5		
Walk in Area	1	1.5		
Well Baby Clinic and Other Areas	1	1.5		
Missing	2	3		
Other			22	38.5
Giving Vaccination is Part of Job Description				
Yes	60	90.9	56	98.2
No	1	1.5	1	1.8
Not Sure	2	3		
Missing	3	4.5		
Years of Vaccination Experience				
Less Than One Year	3	4.5		
1-5 Years	32	48.5		
6-10 Years	16	24.2	27	47.368
11-15 Years	11	16.7	16	28.07
16-20 Years	1	1.5	7	12.28
Over 21 Years			6	10.5
Missing	3	4.5		
Vaccine Doses per Month				
None	3	4.5	3	5.26
Less Than 25 Doses	9	13.6	4	7.017
26-50 Doses	15	22.7	13	22.8
51-100 Doses	20	30.3	19	33.3
More Than 101 Doses	15	22.7	18	31.57
Missing	4	6.1		
Age Group Vaccinated				
Infant and Young Children (0-5 Years)	59	89.4	53	93
Children and Teenagers (6-17 Years)	22	33.3	36	63.15
Adults (18 Years and Older)	26	39.4	34	59.6

Table 2: Comparison of the attitude of nurses towards immunization before and after training

		SA				A				N				DA				SDA					
		Pre		Post		Pre		Post		Pre		Post		Pre		Post		Pre		Post			
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	Z	p-value
Q1	G1	3	4.8	0	0	3	4.8	0	0	0	0	1	1.5	17	27	61	92.4	40	63	4	6.1	-2.748[b]	0.006
	G2	8	14.3	3	5.4	1	1.8	6	10.7	0	0	1	1.8	3	5.4	10	17.9	44	78.6	35	62.5	-.171[b]	0.864
Q2	G1	7	11.1	3	7.1	11	17.5	2	4.8	3	4.8	0	0	30	47.6	7	16.7	12	19	30	71.4	-2.886[c]	0.004
	G2	10	17.9	5	8.9	4	7.1	9	16.1	3	5.4	3	5.4	10	17.9	27	48.2	29	51.8	12	21.4	-.706[b]	0.480
Q3	G1	1	1.6	7	17.1	1	1.6	8	19.5	3	4.8	0	0	28	40.6	9	22	30	43.5	17	41.5	-2.253[b]	0.024
	G2	0	0	1	1.8	0	0	2	3.6	0	0	11	19.6	10	17.9	23	41.1	46	82.1	18	32.1	-4.826[b]	0.000
Q4	G1	0	0	1	2.4	1	1.6	0	0	0	0	0	0	21	33.3	7	10.1	41	65.1	33	80.5	-1.856[c]	0.063
	G2	0	0	0	0	1	1.8	1	1.8	0	0	1	1.8	7	12.5	20	35.7	48	85.7	33	58.9	-2.499[b]	0.012
Q5	G1	36	57.1	1	2.4	21	33.3	0	0	5	7.9	0	0	1	1.6	8	19.5	0	0	32	78	-5.437[c]	0.000
	G2	48	85.7	33	58.9	6	10.7	21	37.5	0	0	1	1.8	0	0	0	0	1	1.8	1	1.8	-2.702[c]	0.007
Q6	G1	21	30.4	23	54.8	33	52.4	14	33.3	4	6.3	3	7.1	4	6.3	2	4.5	1	1.5	0	0	-2.945[b]	0.003
	G2	39	69.6	19	33.9	14	25	26	46.4	0	0	5	8.9	0	0	6	10.7	3	5.4	0	0	-3.046[c]	0.002
Q7	G1	37	59.7	30	73.2	21	33.9	9	22	1	1.6	1	2.4	3	4.8	0	0	0	0	1	2.4	-.096[b]	0.924
	G2	44	78.6	28	50	8	14.3	20	35.7	0	0	2	3.6	0	0	2	3.6	4	7.1	4	7.1	-2.032[c]	0.042
Q8	G1	38	61.3	23	54.8	21	33.9	14	33.3	2	3.2	3	7.1	0	0	2	2.9	1	1.6	0	0	-1.013[b]	0.311
	G2	46	82.1	35	62.5	7	12.5	18	32.1	0	0	0	0	0	0	0	0	3	5.4	2	3.6	-1.227[c]	0.220
Q9	G1	23	36.5	34	81	35	56.6	8	19	3	4.8	0	0	0	0	0	0	2	3.2	0	0	-4.216[b]	0.000
	G2	34	60.7	27	48.2	17	30.4	25	44.6	2	3.6	3	5.4	1	1.8	1	1.8	1	1.8	0	0	-.745[c]	0.456
Q10	G1	11	17.5	24	60	30	11.1	14	35	7	6.3	1	2.5	4	47.6	1	2.5	11	17.5	0	0	-3.631[b]	0.000
	G2	18	32.1	8	14.3	14	25	25	44.6	7	12.5	8	14.3	7	12.5	13	23.2	10	17.9	2	3.6	-.149[b]	0.882
Q11	G1	6	9.7	8	19.5	16	25.8	13	31.7	12	19.4	5	12.2	18	29	6	14.6	10	16.1	9	22	-1.392[b]	0.164
	G2	17	30.4	5	8.9	13	23.2	23	41.1	6	10.7	11	19.6	9	16.1	12	21.4	11	19.6	5	8.9	-.354[c]	0.724

Q12	G1	15	23.8	7	17.5	32	50.8	8	20	11	17.5	5	12.5	3	4.8	13	32.5	2	3.2	7	17.5	-2.315[c]	0.021
	G2	30	53.6	17	30.4	18	32.1	26	46.4	4	7.1	8	14.3	1	1.8	5	8.9	2	3.6	0	0	-2.110[c]	0.035
Q13	G1	19	30.2	18	45	34	54	18	45	8	12.7	2	5	0	0	2	5	2	3.2	0	0	-1.791[b]	0.073
	G2	40	71.4	19	33.9	13	23.2	28	50	1	1.8	7	12.5	0	0	2	3.6	2	3.6	0	0	-3.124[c]	0.002
Q16	G1	0	0	11	27.5	7	11.1	12	30	11	17.5	2	5	19	30.2	9	22.5	26	41.3	6	15	-3.776[b]	0.000
	G2	1	1.8	3	5.4	3	5.4	16	28.6	3	5.4	5	8.9	17	30.4	18	32.1	32	57.1	14	25	-4.173[b]	0.000
Q17	G1	2	3.2	2	5	16	25.8	4	10	17	27.4	2	5	19	30.6	12	30	8	12.9	20	50	-2.704[c]	0.007
	G2	1	1.8	4	7.1	7	12.5	16	28.6	16	28.6	16	28.6	14	25	16	28.6	18	32.1	4	7.1	-3.029[b]	0.002
Q18	G1	4	6.8	2	5	28	47.5	6	15	14	23.7	5	12.5	10	16.9	19	47.5	3	5.1	8	20	-2.934[c]	0.003
	G2	9	16.1	5	8.9	16	28.6	21	37.5	15	26.8	21	37.5	9	16.1	7	12.5	7	12.5	2	3.6	-.759[b]	0.448
Q19	G1	13	18.8	9	22.5	19	27.5	18	45	19	27.5	7	17.5	11	15.9	3	7.5	1	1.4	3	7.5	-1.330[b]	0.184
	G2	18	32.1	9	16.1	23	41.1	24	42.9	9	16.1	14	25	2	3.6	6	10.7	4	7.1	3	5.4	-1.811[c]	0.070
Q20	G1	27	39.1	12	30.8	22	31.9	12	30.8	10	14.5	11	28.2	2	2.9	3	7.7	2	2.9	1	2.6	-.968[c]	0.333
	G2	34	60.7	21	37.5	13	23.2	21	37.5	4	7.1	3	5.4	2	3.6	9	16.1	3	5.4	1	1.8	-1.962[c]	0.050

Table 2: Comparison of the attitude of nurses towards immunization before and after training (continued)

Table 3: Correlation between the mean knowledge score and attitude of nurses towards immunization

	Group 1			Group 2		
	mean	Pearson correlation	p value	mean	Pearson correlation	p value
It is not necessary to immunize breastfed infants at 2 months of age						
Strongly agree	4.3	-0.104079	0.4208	1.33	-0.207	0.129
Agree	5.34			3		
Neutral	0			3		
Disagree	5.06			2.5		
Strongly disagree	5.4			3.142		
It is necessary to restart a series of vaccines if a dose is missed or delayed						
Strongly agree	4.7148	-0.124045	0.3367	2.8	0.118	0.388
Agree	4.727			3.667		
Neutral	3.33			2.66		
Disagree	6.103			2.74		
Strongly disagree	4.5			2.883		
Vaccines may cause chronic diseases and learning disorders because they contain small amounts of mercury						
Strongly agree	5	-0.201334	0.1166	0	0.079	0.565
Agree	3			5		
Neutral	5			3.27		
Disagree	4.892			2.78		
Strongly disagree	5.7			2.77		
It is no longer necessary to immunize against polio as it is now a rare disease						
Strongly agree	0	-0.0977660	0.4496	0	0.074	0.592
Agree	3			2		
Neutral	0			4		
Disagree	5.25			3.15		
Strongly disagree	5.317			2.7897		
Getting my annual influenza vaccine is important						
Strongly agree	5.25	.261*	0.0401	0	-0.193	0.154
Agree	4.38			2.845		
Neutral	5.25			2.857		
Disagree	4			3		
Strongly disagree	0			6		
Getting tetanus/diphtheria toxoid (Td) vaccine (every 10 years) is important						
Strongly agree	6.38	.313*	0.0133	2.84	-0.075	0.581
Agree	4.78			2.88		
Neutral	3.25			0		
Disagree	5.7			2.8		
Strongly disagree	3			3.33		
Children should be offered varicella vaccine (chicken pox) at 12 months of age						
Strongly agree	5.38	.338**	0.0076	3	0.062	0.649
Agree	4.6			2.7		
Neutral	4			5		
Disagree	3.66			3		
Strongly disagree	0			2.25		

Table 3: Correlation between the mean knowledge score and attitude of nurses towards immunization (continued)

It is important to encourage all healthcare workers to be immunized annually with influenza vaccine						
Strongly agree	5.65	.267*	0.0372	2.88	-0.159	0.245
Agree	4.76			2.83		
Neutral	4			0		
Disagree	0			0		
Strongly disagree	3			4.5		
It is important to ensure that your adult patients have received all their required adult vaccines						
Strongly agree	5.86	.263*	0.0386	3	0.053	0.699
Agree	4.9			2.7		
Neutral	5.66			4		
Disagree	0			1		
Strongly disagree	3			0		
Routine immunization should be delayed in individuals with moderate to severe illness with or without fever						
Strongly agree	4.36	-.424**	0.0005	2.875	-0.075	0.584
Agree	4.86			2.68		
Neutral	5			3.5		
Disagree	5.85			3.07		
Strongly disagree	6.9			2.5		
Parental stress can be reduced by spreading necessary vaccines over several visits						
Strongly agree	6.83	-0.1504640	0.2470	3	0.073	0.591
Agree	4.66			3.13		
Neutral	3.66			2.27		
Disagree	5.72			2.4		
Strongly disagree	6.5			3.4		
I received adequate teaching about vaccines during my nursing training						
Strongly agree	6.2	.414**	0.0008	3	-0.68	0.619
Agree	5.31			2.69		
Neutral	4.9			3.12		
disagree	3			3.4		
Strongly disagree	2.5			0		
I am comfortable responding to questions parents/patients have about vaccine side effects						
Strongly agree	6.684	.498**	3.8	3.057	0.105	0.444
Agree	4.85			2.92		
Neutral	4.14			2.57		
Disagree	0			2.5		
Strongly disagree	2.5			0		
The vaccines available are very carefully and consistently tested for safety						
Strongly agree	5.53	0.2408741	0.0614	2.97	0.024	0.862
Agree	5.23			2.75		
Neutral	3			4		
Disagree	0			0		
Strongly disagree	3			0		

Table 3: Correlation between the mean knowledge score and attitude of nurses towards immunization (continued)

A vaccine is a medical treatment in which dangerous viruses and bacteria are killed or modified and then put in your body						
Strongly agree	5.4	-0.1011243	0.4341	3	0.163	0.229
Agree	5.03			2.96		
Neutral	0			3.86		
Disagree	5.33			2.33		
Strongly disagree	6.5			2		
A vaccine can give you a serious case of the very same disease you are trying to avoid						
Strongly agree	4.85	-.347**	0.0057	3.66	0.438**	0.001
Agree	3.9			3.875		
Neutral	3.9			3.2		
Disagree	4.84			2.277		
Strongly disagree	6.19			2.357		
The idea of taking a newly developed vaccine, even if it is carefully safety tested, makes me anxious						
Strongly agree	3.5	-.388**	0.0020	4.5	0.157	0.248
Agree	4.37			2.75		
Neutral	5.37			2.812		
Disagree	5.26			2.875		
Strongly disagree	7.12			2.5		
An increasing number of people are become anti-vaccine oriented as more information about vaccines and how they are developed is over the Internet						
Strongly agree	9	-0.0722900	0.5897	3.6	0.101	0.941
Agree	4.67			2.619		
Neutral	4.38			3.142		
Disagree	6.5			2.285		
Strongly disagree	6.66			4		
Those people who are against taking vaccines are highly prejudiced and ill-informed, scientifically.						
Strongly agree	6.615	0.18929452	0.1406	3.333	0.019	0.889
Agree	5.105			2.703		
Neutral	0			2.92		
Disagree	4.16			3		
Strongly disagree	8			3		
If it were available, I would readily take a vaccine to prevent HIV-AIDS						
Strongly agree	5.62	0.097	0.451	2.66	-0.111	0.42
Agree	5.04			3.047		
Neutral	4.44			3		
Disagree	5.5			3		
Strongly disagree	6			4		

Discussion

To our knowledge, this is the ýrst survey in Qatar to evaluate knowledge, attitude, and practice of registered nurses participating before and after a CPD immunization program in the primary care setting. In this study, a very high participation rate (99.17%) was achieved, demonstrating a representative sample. Demographic data also supports a representative sample, as many participants reported administration of vaccine as part of their job description at PHCC- the main provider for all immunization services in Qatar. In addition, the majority of participants worked in well-baby clinics, in an area known for routine practice of early childhood immunization.

In the present study, the majority of nurses strongly disagreed in response to questions about common attitudes related to vaccine safety and efýcacy before the CPD vaccine education program. The most common false understandings found were the following: (1) 'It is not necessary to immunize breastfed infants at 2 months of age', (2) 'It is no longer necessary to immunize against polio as it is now a rare disease' and (3) 'Vaccines may cause chronic diseases and learning disorders because they contain small amounts of mercury'. These results demonstrate a lack of education and a need for practice and knowledge to change personal attitudes about immunization. This is important for program development, as nurses have a central role in communicating about evidence-based reasons for immunization, and any misconceptions and beliefs may contribute to parental decisions to accept or reject immunization (Mergler et al., 2013). In addition, studies clearly document that positive attitudes of health professionals signiýcantly correlate with the higher vaccination coverage rates (Forster et al 2016). Ritvo et al., 2003;). Hence, our program development focused on including role play with familiar and diverse scenarios to represent lived experiences of participants communicating with parents and children in the practice setting.

Furthermore, many studies have shown that many health care providers fail to make signiýcant recommendations about the beneýts and risks of vaccines for their clients because of knowledge gaps and lack of consistency in immunization education (Dybsand et al., 2019, Pelly et al., 2010; Kernéis S, et al 2017). In our study, allowing for behavior, communication and attitude practice through guided scenarios, participants could demonstrate proactive behaviors by answering common questions or concerns to better guide parental decision making. According to Shibli et al. (2017) attitudes of pediatric healthcare providers and their recommendations are associated with parents' decisions to vaccinate their children. In a study conducted by Best et al. (2018), knowledge and attitude of school nurses inþuence parental decision making about immunizing their children. More recently, a multimodal study conducted by Wilson et al. (2019), identiýed nurses' misbeliefs and misconceptions were the strongest barriers to vaccine uptake. Therefore, nurses at the frontline administering vaccines need to be aware of their own misbeliefs to change their own attitudes and be proactive. They need to be adequately trained and educated to communicate safety and be aware of vaccine efýcacy.

Our results post training and education suggest that participant knowledge, attitudes, and practice related to immunization were signiýcantly different. In other words, the specially designed program had an impact. Wilson et al. (2019) found the underlying cause of these misbeliefs and misconceptions among nurses were from lack of training and conýdence in ofýcial sources related to information about vaccines. Furthermore, research has shown substantial variation in the knowledge about immunization exists among the health care providers because of the lack of standardization of immunization training within nursing curricula (Berry et al., 2017; Nicol, E.et al 2019). Findings further suggest that inadequate education regarding vaccination is the main cause of discomfort experienced by health care professionals in discussing side effects of immunizations with their patients (Dysband et al. 2019). Moreover, it is indicated that worrisome attitudes and knowledge gaps are a continual challenge for future health care professionals (Berry et al., 2017 & Nicol, et al. 2019).

Public and providers' concerns about potential side effects and their conýdence about vaccine efýcacy are the contributing factors of non-compliance and lower immunization coverage in adults and children. This suggests that providers should be aware of the misconceptions and be able to communicate with parents and patients to educate them about the beneýts and risks of vaccines (Matta et al., 2020 & Jaca, et al., 2018).

Our ýndings indicate that despite the demographics of all nurses, their background or undergraduate nursing educational programs, there is still continued misunderstanding and confusion about the safety and efýcacy of routine childhood vaccines in the health care settings (Picchio et al 2019). Therefore, nurses need extra education and training as it is not offered fully in programs. Participating in this program allowed nurses the opportunity to gain knowledge in theory to be practiced in role play. In this vein we were able to add to nurse's knowledge, dispel myths and further empower them in the realm of vaccine administration. Therefore, there is a need for the development and evaluation of immunization educational programs speciýcally designed to overcome knowledge gaps and negative attitude of nurses which can be incorporated into formal education curricula of health care professionals to increase the conýdence and competency of health care professionals (Pelly et al., 2010). The current education program has proven successful thus far. It is postulated that having carefully designed education programs are an important step in ensuring nurses are kept abreast of new evidence-based immunization knowledge in order to enhance and advance practice and to discuss attitudes they may have toward immunization.

Limitation: There some limitations to note for this study. One limitation is the fact that the combined survey was not psychometrically tested. Also, the focus of this paper is on PHC nurses' attitude and practice, hence it is not enough to assess their knowledge level post this vaccine training and education in comparison to the other studies. Another limitation is distribution of post surveys occurred six weeks after the delivery of the program, which may not account for knowledge retention after many months. It would be reasonable to expect higher scores immediately after program compared to 6 months or longer. Lastly, this paper does not include the qualitative data, which was collected and analyzed by the researchers to round out the ýndings of this whole study.

Conclusion

The results of this study indicate a strong correlation between the mean scores of attitude and practice responses both before and after the CPD. Thus, this demonstrates the need to provide training programs like these to nurses who work in areas where immunization is a primary part of their practice. A successful uptake of immunization worldwide is inherent on nurses' attitudes and how they practice within this realm; hence it is necessary to provide continuing education. Offering well designed educational programs with the latest evidence to nurses enhances their ability to perform better teaching and administration of immunization to parents / adults.

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