

## Improving utilization of rotavirus vaccination among children in Kuwait: an intervention study

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### ABSTRACT

Vaccination against rotavirus is an effective strategy to overcome the consequences of rotavirus infection. This study aims to raise the knowledge, attitude, and practice (KAP) of both parents or caregivers and healthcare providers towards the rotavirus vaccination. The design of the study was an interventional pre-test and post-test. The type of intervention used in this study is an educational intervention. The intervention consisted of a health education message delivered to the participants including both parents or caregivers and healthcare providers. It included three phases, the first one was carried out to assess the KAP of mothers and caregivers before the intervention, the second phase involved the evaluation of participants' post-intervention, and the third phase involved the assessment of healthcare providers. The study used a survey to assess the demographics, KAP of the participants. The collected data was analyzed using the SPSS program. The overall KAP among mothers were high (11.6%). After the intervention, the level of KAP of mothers toward the rotavirus vaccine was improved significantly ( $p=0.0001$ ). Also, after the health education message, the level of KAP of the healthcare providers was significantly improved ( $p=0.0001$ ). The levels of KAP of mothers and healthcare providers were improved after the educational intervention and the health educational message, reflecting the important role of educational intervention in raising the awareness of both mothers and healthcare providers.

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## 1. INTRODUCTION

At the global level, rotavirus was the most important cause of severe gastroenteritis among children less than five years of age [1]. Rotavirus causes almost 37% of all diarrhea-associated hospitalization and 215,000 deaths [2]; it is more severe than other common causes of childhood diarrhea [3]. Childhood immunization is a strategy to reduce mortality and prevent vaccine-preventable diseases [4]. Currently, two oral live attenuated retrovirus vaccines have been licensed for global utilization since 2006. One is a monovalent vaccine including a single human rotavirus strain, and the other is a pentavalent vaccine comprising 5-bovine-human reassortant rotavirus strains. In 2016, more than 80 countries added rotavirus vaccines to their immunization programs [5]–[7]. The effectiveness of rotavirus vaccines against gastroenteritis was stated as a support for the World Health Organization (WHO) recommendation that all countries should introduce vaccination against rotavirus into their national immunization program [8].

The extent of knowledge of mothers and caregivers on childhood immunization is essential to determine their attitude toward the uptake and acceptance of the vaccine [9]. Knowledge and practice of parents regarding vaccination are contributors to the vaccination decision of parents [10]. Inadequate knowledge about the vaccine, its contraindications, and adverse effects often leads to many errors. The knowledge, attitude, and practice (KAP) pattern of caregivers and parents toward vaccination determine the early prevention of many communicable diseases [11]. Poor awareness of the rotavirus vaccine among mothers was reported regarding rotavirus vaccine [12]. Also, inadequate knowledge and low practice were reported in other studies [13].

The uptake of vaccination services depends not only on the provision of these services but also on the knowledge and practice of healthcare providers. Therefore, increasing the knowledge of healthcare providers regarding childhood through expanded program immunization (EPI) launched by WHO could increase vaccination coverage and increases the efficiency of childhood immunization [14]. The issue of vaccination among healthcare providers is important for the protection of the whole community and the protection of the healthcare providers themselves [15]. Healthcare providers have a role in vaccine utilization as they can recommend the vaccine to the parents and inform them about its benefits [16].

In a previous study conducted on Pakistani mothers showed that there was inadequate awareness of the rotavirus vaccine [12]. Another study from Italy showed that more than one-half of parents (59.2%) were aware of the rotavirus vaccine. Additionally, the knowledge of parents was affected by the age of children and the source of information regarding rotavirus vaccine [13]. The predictors of knowledge and attitude among parents are various regarding childhood immunization; it was found that the level education of parents and family income influenced the level of parents' knowledge and attitude [4]. Regarding healthcare providers, Egyptian study revealed that the majority of healthcare providers had adequate knowledge about vaccine with significant impact of place of work, qualification, and training courses on their level of knowledge [14]. A study enrolled on healthcare providers from Indonesia showed that the majority had some level of knowledge about the rotavirus, and there were mixed feelings toward the need for the vaccine with no definite attitude reported [16].

However, there no previous similar study reported from Kuwait; therefore, determining the KAP of the rotavirus vaccine among parents and healthcare providers is necessary to determine the utilization of the vaccine among children. Also, the identification of KAP levels helps to find the gaps and increase the level of KAP in case of an inadequate level of KAP. Additionally, there was no previous study from Kuwait conducted on this subject; Therefore, we conducted this study to raise the knowledge, attitude, and practice (KAP) of both parents or caregivers and healthcare providers towards rotavirus vaccination.

## **2. RESEARCH METHOD**

### **2.1. Study design, settings, and subjects**

The study used an interventional pre-test and post-test design. The type of intervention used in this study is an educational intervention. The intervention consisted of a health education message delivered to the participants including both parents or caregivers and healthcare providers. It was carried out at six primary healthcare centers in Kuwait. The study was conducted on mothers, caregivers, and healthcare providers, including physicians and nurses. The inclusion criteria for mothers and caregivers were adults, conscious, Arabic, and/or English speakers. The inclusion criteria for healthcare providers were training doctors, physicians, and nurses working in the selected primary healthcare centers. The candidates who didn't fulfill the previous inclusion criteria were excluded. Also, healthcare providers who had never dealt in vaccination fields and mothers/caregivers with urgent referral cases were excluded. Approval was obtained from the study supervisors in the Public Health and Community Medicine Department. All human subjects were treated as stated by the Helsinki Declaration of biomedical ethics, and informed consent was obtained from all participants to ensure their voluntary participation.

### **2.2. Sample size calculation**

All healthcare providers involved in immunization services in the targeted facilities were included in the study. A random sample of Mothers/caregivers was selected. Sample size calculation was conducted in the 2 phases of the study by using the Epi info software, version 7. Sample size for the baseline assessment (Phase 1): Based on the most recent estimates of rotavirus vaccination coverage in Kuwait in 2018 (69%), with a precision of  $\pm 5\%$  and a 90% confidence level, the minimum sample size required was determined to be 231 mothers. Additionally, 20% was added to account for possible non-response, resulting in a final estimated sample size of 277 participants. On the other hand, sample size for the Pre/Post intervention (Phase 2): For the Pre/Post intervention phase, the main outcome was to measure the effect of the intervention on vaccine utilization before and after the intervention. Since there were no similar studies specifically on rotavirus vaccine uptake, studies on vaccination uptake in general were considered. These studies showed that educational

interventions can increase vaccine uptake by 4% to 16%. To account for the potential increase in vaccine utilization of 16%, a larger sample size was favored. Employing a precision of  $\pm 5\%$ , a 90% confidence level, and assuming a 16% increase in vaccine utilization, the minimum sample size required was calculated to be 206 mothers. An additional 20% was added to compensate for possible non-response, resulting in a final estimated sample size of 247 participants.

### 2.3. Data collection and tools

The study was conducted through three phases; the first phase involved mothers and caregivers who have children aged six months and above to assess their utilization of rotavirus vaccination. A survey was used for this phase, and it included questions on socio-demographics, reasons for visiting the center, types-timing of vaccines, and vaccine complications. The second phase assessed the KAP of mothers and caregivers regarding the utilization of the rotavirus vaccine and other vaccines before and test intervention and after the intervention. In this phase, the European catalog of interventions [17] and other available tools with minimum changes to address vaccine utilization was used. The third phase included the assessment of the KAP of healthcare providers in terms of the utilization of the rotavirus vaccine and other vaccines before and after the intervention. Previously used questionnaires were used in this phase [18], [19]. Overall, the questionnaire used in this study demonstrated good validity and reliability. In this study, steps were taken to establish content validity of the used questionnaires by including relevant items and questions that accurately assessed the KAP of mothers/caregivers and healthcare providers towards the rotavirus vaccination. The questionnaires were developed based on existing literature and guidelines related to rotavirus vaccination and KAP assessment [18], [19]. Additionally, the questionnaires were reviewed by experts in the field to ensure the inclusion of appropriate and relevant items. To assess reliability, the questionnaires were piloted on a small sample of participants to identify any potential issues or areas for improvement. Internal consistency reliability was assessed using Cronbach's alpha to ensure that the items within each section of the questionnaires were measuring the same construct consistently.

### 2.4. Scoring and statistical analysis

All questions of the KAP questionnaire were coded; the correct or positive answer was coded with higher or positive codes, whereas the incorrect or negative answer was coded with lower or zero codes, then the overall scores were transmitted into percent scores (percentiles). Those who achieved the 75th percentile and more were included in one group, and those who achieved less than the 75th percentile were included in another group regarding knowledge, attitude, practice, and the overall KAP. The collected data was coded, recorded, and analyzed using SPSS version 25. Quantitative variables were displayed as mean and standard deviation (SD), whereas qualitative data were demonstrated as frequencies and proportions.  $p$ -values  $\leq 0.05$  was the cutoff point for statistical significance. Chi-square tests or Fisher's exact tests, were utilized to examine associations between categorical variables. Univariate and multivariate analyses were used in the analysis of the data in Pre/Post intervention phase. Ethical approval: the study was approved the ministry of health in Kuwait City. Approval no. [3835-21714] with the date of 13/7/2021.

## 3. RESULTS AND DISCUSSION

Rotavirus was the main cause of severe gastroenteritis among children [20], less than five years before the availability of vaccines against rotavirus [1]. Rotavirus was estimated to be responsible for almost 37% of deaths under the age of five [21], and responsible for 10-20% of severe diarrhea [22]. Additionally, the global effect of rotavirus vaccination is obvious, where a 40% reduction in rotavirus prevalence was noted after the introduction of vaccines [23]. Furthermore, rotavirus vaccination reduced the hospital stay and mortality rates, significantly [24].

Rotavirus vaccine effectiveness was described in a systematic review; the different types of vaccines showed median effectiveness of vaccines ranged between 45-90% based on the type of the vaccine and the mortality rate of the countries [8]. In this study, we assessed the KAP of mothers and healthcare providers through three phases in order to raise their level of KAP. The first phase of the study included 277 mothers; more than one-half of the mothers belonged to the age group 26-35 years old. The large majority of mothers (91%) were married, and 60.6% and 61% had a university education and worked in government, respectively. More than one-half also reported an income of fewer than 750 Dinars. Table 1 shows the demographics of mothers. A previous study conducted on parents showed that the majority of parents were married, and a few proportions (28.2%) had a college education or higher [13]. A study conducted on Sudanese mothers showed that the largest proportion of mothers belonged to the age group 30-34 years (39.1), followed by those 25-29 years (30.4%); this indicates that mothers 25-34 years represented the largest proportion of the participants [25], similar to our study.

Table 1. Description of demographic characteristics of the baseline mothers

Variable	N (%)
Age	
15-25	38 (13.7)
26-35	148 (53.4)
36-45	78 (28.2)
>45	13 (4.7)
Marital status	
Married	252 (91)
Not married	25 (9)
Education	
Less than higher education	109 (39.4)
University	168 (60.6)
Occupation	
Private	63 (22.7)
Governmental	169 (61)
Housewife	45 (16.2)
Income	
<750 Dinar	149 (53.8)
750 Dinar or more	128 (46.2)

The level of KAP among our participants is shown in Table 2. The large majority of our participants showed a low level of knowledge (6.9%), a higher attitude (78.3%), and low practice (37.5%). The overall level of KAP was high among only 11.6%. A study from Pakistan conducted on mothers showed that there was poor awareness of the rotavirus vaccine; however, the acceptance of mothers was excellent [12]. This was in agreement with our findings as the large majority of mothers in this study had a low level of knowledge, whereas the level of attitude toward the vaccine was much higher. A study enrolled Sudanese mothers reported that more than one-half (57%) had knowledge about the rotavirus vaccine [25]. However, the previous percentage was much higher compared to ours. A study from Italy showed that 59.2% of parents were aware of the rotavirus vaccine [13].

The description of participants involved in the second phase is presented in Table 3. The most dominant age group in this phase includes participants of age 26-35 years (56.3%). The large majority were married, and more than one-half (67.2%) had a university education. Also, more than one-half reported working for the government and reported an income of fewer than 750 Dinars. A previous study that evaluated mothers' knowledge and practice of pre-and post-health education showed that one-half of mothers were 20 to less than 30 years, and more than one-half were married; these were close to our findings. In contrast to our findings, only 14.3% had a university education [26], whereas more than one-half of our participants had a university education.

Table 2. Description of baseline mothers and caregivers' overall KAP level

Variables	N (%)
Mother knowledge level	
75th percentile or higher	19 (6.9)
<75th percentile	258 (93.1)
Mother attitude level	
75th percentile or higher	217 (78.3)
<75th percentile	60 (21.7)
Mother practices level	
75th percentile or higher	104 (37.5)
<75th percentile	173 (62.5)
Mother KAP level	
75th percentile or higher	32 (11.6)
<75th percentile	245 (88.4%)

The KAP of mothers before and after the intervention is summarized in Table 4. There were significant differences in the levels of KAP and the overall KAP between pre and post-intervention. There were significant increases in the level of KAP as well as the overall KAP after the intervention compared to before the intervention. A study conducted on mothers from rural areas investigated the impact of health education on the knowledge and practice of mothers toward the immunization of their children under five years. The level of mothers' knowledge after intervention significantly increased compared to pre-intervention ( $p < 0.001$ ). There was only 28.6% had good knowledge pre-intervention, whereas post-intervention, the percentage increased to 75.7% having good knowledge. Also, the practice of the mothers

was improved post-education (79.6%) compared to the pre-educational phase (69.8%) [26]. The previous findings were in agreement with ours; however, the previous study didn't assess the attitude of mothers [26].

Univariate and multivariate analyses of the factors affecting the overall KAP level are shown in Table 5. Univariate analysis showed that marital status was a determinant factor for the level of KAP ( $p=0.049$ ) with an odds ratio (OR) of 6.7; however, the multivariate analysis failed to show any factor affecting the level of KAP. Similar to our study, one study conducted on mothers revealed that the education level of mothers didn't affect their level of knowledge ( $p=0.08$ ) [25]. A previous study conducted on parents showed that the age of children and the source of information affected the knowledge of parents about the rotavirus vaccine [13]. In the current study, we didn't assess the impact of children's age or the source of information on the KAP of our participants.

Another study investigated the predictors of knowledge and attitude among parents regarding childhood immunization; it was reported that the education of parents and income affected the level of knowledge and attitude [4]. However, only educational level was a predictor of inadequate knowledge, but both educational level and income were predictors for a negative attitude. Neither education nor income showed a significant association or effect on the knowledge and attitude in our study. A study that was enrolled on mothers revealed that the levels of knowledge and practice were significantly affected by age, marital status, education of the mother, and her job [26]. In our study, only marital status affected the level of mothers' KAP. In a systematic review including 15 studies, it was reported that family income, education of parents, and employment status positively affected the decision of parents regarding using rotavirus [27].

Table 3. Description of the demographic characteristics of the studied population (mothers) and caregivers

Variable	N (%)
Age	
15-25	37 (15)
26-35	139 (56.3)
36-45	63 (25.5)
>45	8 (3.2)
Marital status	
Married	229 (92.7)
Not married	18 (7.3)
Education	
Less than university	81 (32.8)
University	166 (67.2)
Occupation	
Private	63 (25.5)
Governmental	136 (55.1)
Housewife	48 (19.4)
Income	
<750 Dinar	144 (58.3)
750 Dinar or more	103 (41.7)

Table 4. Comparison of the mothers' KAP levels before and after the health education message

Variables	Pre-N (%)	Post N (%)	p-value	OR (95% CI)
Mother knowledge level				
75th percentile or higher	11 (4.5)	27 (10.9)	0.007*	2.633 (1.276-5.435)
<75th percentile	236 (95.5)	220 (89.1)		
Mother attitude level				
75th percentile or higher	203 (82.2)	244 (98.8)	0.000*	17.629 (5.394-57.617)
<75th percentile	44 (17.8)	3 (1.2)		
Mother practices level				
75th percentile or higher	90 (36.4)	152 (61.5)	0.000*	2.791 (1.939-4.019)
<75th percentile	157 (63.6)	95 (38.5)		
Mother KAP level				
75th percentile or higher	26 (10.5)	66 (26.7)	0.000*	3.099 (1.890-5.082)
<75th percentile	221 (89.5)	181 (73.3)		

\*Chi-square test, #Fisher exact test, OR=odds ratio, CI=confidence interval

The third phase of the current study included a total of 25 healthcare providers; the comparison between the KAP levels and the overall KAP among doctors is shown in Table 6. The health education message showed a significant impact on the levels of knowledge, practice, and the overall KAP level, whereas no significant impact was found regarding attitude ( $p=0.3$ ). Significant proportions reported higher levels of knowledge, practice, and the overall KAP after education compared to pre-education.

A qualitative study conducted on healthcare providers from Indonesia showed that the majority had some level of knowledge about the rotavirus, but not all healthcare providers knew about the availability of the vaccine. Regarding attitude, there were mixed feelings toward the need for the vaccine, and there was no definite attitude reported [16]. The previous findings support the importance of our educational message to healthcare providers. Healthcare providers require education to increase their KAP toward the rotavirus vaccine; we especially found the efficacy of such education in our sample.

A high proportion of medical students in one study from Pakistan showed knowledge about both rotavirus and the vaccine against it. Additionally, the level of knowledge and attitude increased significantly with increasing the year of study, and this reflects the importance of education in increasing the knowledge and attitude toward the rotavirus vaccine [28]. A previous study on parents regarding children's immunization revealed that previous educational intervention was a predictor for the level of knowledge. This also ensures the role of educational intervention on the level of knowledge of parents. One study assessed the influence of the educational intervention on the practice of immunization among healthcare professionals in India. The study found that continuous education resulted in positive changes in the behavior of healthcare professionals [29]. However, the study didn't report the improvement in KAP individually.

A study from India was conducted on the frontline health workers who received training regarding the vaccine of rotavirus. The study revealed that there was an increase in the knowledge level at the end of the first month. However, at 12 months, there was a decline in the knowledge of the healthcare personnel. Therefore, it was suggested to perform regular monitoring and training to enhance knowledge retention [30].

Table 5. Univariate and multivariate analysis for factors affecting overall mother KAP level

Variables	Mother KAP level		Univariate analysis		Multivariate analysis
	>75th percentile	<75th percentile	p-value	OR (95% CI)	p-value
Age			0.288#		
15-25	8 (12.1)	29 (16)		Reference	
26-35	39 (59.1)	100 (55.2)		1.414 (0.595-3.360)	
36-45	19 (28.8)	44 (24.3)		1.565 (0.606-4.047)	
>45	0 (0)	8 (4.4)		0.204 (0.011-3.910)	
Marital status			0.049#	6.738	0.066
Married	65 (98.5)	164 (90.6)		(0.879-51.670)	
Not married	1 (1.5)	17 (9.4)			
Education			0.155*	0.634	
Less than higher education	17 (25.8)	64 (35.4)		(0.338-1.191)	
University	49 (74.2)	117 (64.6)			
Occupation			0.713*		
Governmental	39 (59.1)	97 (53.6)		Reference	
Private	16 (24.2)	47 (26)		0.847 (0.430-1.668)	
Housewife	11 (16.7)	37 (20.4)		0.739 (0.343-1.595)	
Income			0.310*		
<750 Dinar	35 (53)	109 (60.2)		0.746 (0.423-1.316)	
750 Dinar or more	31 (47)	72 (39.8)			

\*Chi square test, \$Fisher exact test, #Logistic regression model, OR=odds ratio, CI=confidence interval

Table 6. Comparison of the KAP levels and the overall doctors' KAP level before and after the health education message

Variables	Pre-N (%)	Post N (%)	p-value	OR (95% CI)
Doctor knowledge level				
75th percentile or higher	11 (44)	22 (88)	0.001*	9.333 (2.207-39.464)
<75th percentile	14 (56)	3 (12)		
Doctor attitude level				
75th percentile or higher	18 (72)	21 (84)	0.306*	2.042 (0.513-8.119)
<75th percentile	7 (28)	4 (16)		
Doctor practices level				
75th percentile or higher	16 (64)	25 (100)	0.002#	29.364 (1.599-539.296)
<75th percentile	9 (36)	0 (0)		
Doctor KAP level				
75th percentile or higher	5 (20)	18 (72)	0.000*	10.286 (2.768-38.216)
<75th percentile	20 (80)	7 (28)		

\*Chi-square test, #Fisher Exact test, OR= odds ratio, CI= confidence interval

#### 4. CONCLUSION

There was an overall low level of KAP among mothers regarding the rotavirus vaccine. However, after the intervention, mothers showed a significant increase in the level of KAP, reflecting the effectiveness of intervention in increasing the KAP of mothers and caregivers. Regarding the healthcare providers, also

health education messages significantly increased the KAP of the healthcare providers. Therefore, increasing the KAP of mothers, caregivers, and healthcare providers can be performed through educational interventions





## REFERENCES

- [1] U. D. Parashar, E. G. Hummelman, J. S. Bresee, M. A. Miller, and R. I. Glass, "Global illness and deaths caused by rotavirus disease in children," *Emerging Infectious Diseases*, vol. 9, no. 5, pp. 565–572, May 2003, doi: 10.3201/eid0905.020562.
- [2] J. E. Tate, A. H. Burton, C. Boschi-Pinto, and U. D. Parashar, "Global, regional, and national estimates of rotavirus mortality in children <5 years of age, 2000–2013," *Clinical Infectious Diseases*, vol. 62, no. 2, pp. 96–105, May 2016, doi: 10.1093/cid/civ1013.
- [3] N. A. Cunliffe *et al.*, "Efficacy of human rotavirus vaccine against severe gastroenteritis in Malawian children in the first two years of life: a randomized, double-blind, placebo controlled trial," *Vaccine*, vol. 30, pp. 36–43, Apr. 2012, doi: 10.1016/j.vaccine.2011.09.120.
- [4] A. C. Abdullah, N. A. Mohd Zulkefli, and A. M. Rosliza, "Predictors for inadequate knowledge and negative attitude towards childhood immunization among parents in Hulu Langat, Selangor, Malaysia," *Malaysian Journal of Public Health Medicine*, vol. 18, no. 1, pp. 102–112, 2018.
- [5] A. Loharikar, L. Dumolard, S. Chu, T. Hyde, T. Goodman, and C. Mantel, "Status of new vaccine introduction – worldwide, September 2016," *MMWR. Morbidity and Mortality Weekly Report*, vol. 65, no. 41, pp. 1136–1140, Oct. 2016, doi: 10.15585/mmwr.mm6541a3.
- [6] E. Burnett, U. Parashar, and J. Tate, "Rotavirus vaccines: effectiveness, safety, and future directions," *Pediatric Drugs*, vol. 20, no. 3, pp. 223–233, Jun. 2018, doi: 10.1007/s40272-018-0283-3.
- [7] World Health Organization, "Health topics: rotavirus infections," *who.int*, 2016. [http://www.who.int/topics/rotavirus\\_infections/en](http://www.who.int/topics/rotavirus_infections/en) (accessed on 20th June 2022).
- [8] C. L. Jonesteller, E. Burnett, C. Yen, J. E. Tate, and U. D. Parashar, "Effectiveness of rotavirus vaccination: a systematic review of the first decade of global postlicensure data, 2006–2016," *Clinical Infectious Diseases*, vol. 65, no. 5, pp. 840–850, Sep. 2017, doi: 10.1093/cid/cix369.
- [9] F. E. Andre *et al.*, "Vaccination greatly reduces disease, disability, death and inequity worldwide," *Bulletin of the World Health Organization*, vol. 86, no. 2, pp. 140–146, Feb. 2008, doi: 10.2471/BLT.07.040089.
- [10] B. G. Gellin, E. W. Maibach, and E. K. Marcuse, "Do parents understand immunizations? A national telephone survey," *Pediatrics*, vol. 106, no. 5, pp. 1097–1102, Nov. 2000, doi: 10.1542/peds.106.5.1097.
- [11] T. M. Alshammari *et al.*, "Assessment of knowledge, attitude and practice of parents about immunization in Hail City, 2018," *The Egyptian Journal of Hospital Medicine*, vol. 73, no. 3, pp. 6377–6381, Oct. 2018, doi: 10.21608/ejhm.2018.14358.
- [12] Saffiullah, F. R. Malik, S. H. Qureshi, and A. Ullah, "Awareness and acceptance of rotavirus vaccine among mothers of neonates attending Kuwait teaching hospital, Peshawar-Pakistan," *Khyber Medical University Journal*, vol. 11, no. 3, pp. 170–175, Sep. 2019, doi: 10.35845/kmu.2019.19326.
- [13] F. Napolitano, A. A. Adou, A. Vastola, and I. F. Angelillo, "Rotavirus infection and vaccination: Knowledge, beliefs, and behaviors among parents in Italy," *International Journal of Environmental Research and Public Health*, vol. 16, no. 10, pp. 1–11, May 2019, doi: 10.3390/ijerph16101807.
- [14] H. I. G. Alsemari, N. S. Shihab, H. S. AlMahdy, and H. A. M. Zayed, "Knowledge and practices of primary health care providers regarding childhood immunization," *Journal of Advances in Medicine and Medical Research*, vol. 34, no. 2, pp. 20–30, Feb. 2022, doi: 10.9734/jamr/2022/v34i231257.
- [15] C. Tomboloni *et al.*, "Knowledge, attitude and disinformation regarding vaccination and immunization practices among healthcare workers of a third-level paediatric hospital," *Italian Journal of Pediatrics*, vol. 45, no. 1, pp. 1–7, Dec. 2019, doi: 10.1186/s13052-019-0684-0.
- [16] H. Seale *et al.*, "Knowledge and attitudes towards rotavirus diarrhea and the vaccine amongst healthcare providers in Yogyakarta Indonesia," *BMC Health Services Research*, vol. 15, no. 1, pp. 1–6, Jun. 2015, doi: 10.1186/s12913-015-1187-3.
- [17] S. A. A. Elkhider, "Assessment of knowledge, attitude and practice of mothers of under five children regarding vaccination in Al Rhmaa health center Khartoum State, Sudan," Ph.D. dissertation, Univ. of Gezira, Wad Madani, Sudan, 2018.
- [18] H. M. El Shazly, N. A. Khalil, R. A. Ibrahim, and S. A. A. Wahed, "Knowledge and practice of healthcare providers as regards routine children vaccination in primary healthcare facilities of Queswina District, Menoufia Governorate," *Menoufia Medical Journal*, vol. 29, no. 4, pp. 1018–1024, 2016, doi: 10.4103/1110-2098.202507.
- [19] S. Cotter, F. Ryan, H. Hegarty, T. J. McCabe, and E. Keane, "Immunisation: the views of parents and health professionals in Ireland," *Eurosurveillance*, vol. 8, no. 6, pp. 145–150, Jun. 2003, doi: 10.2807/esm.08.06.00416-en.
- [20] D. C. Payne *et al.*, "Norovirus and medically attended gastroenteritis in US children," *New England Journal of Medicine*, vol. 368, no. 12, pp. 1121–1130, Mar. 2013, doi: 10.1056/NEJMsal206589.
- [21] P. C. Ecevit, B. K. Tetik, A. Ertürk, F. İ. Arkan, and Y. D. Bilge, "Knowledge, attitudes, behaviors of families on rotavirus vaccine," *Turkish Journal of Family Medicine and Primary Care*, vol. 13, no. 3, pp. 273–278, Sep. 2019, doi: 10.21763/tjfm.610635.
- [22] Z. Gundogdu and O. Y. Sezer, "Changing parental attitudes towards rotavirus vaccine," *Cureus*, vol. 15, no. 2, pp. 1–9, Feb. 2023, doi: 10.7759/cureus.35348.
- [23] N. Aliabadi *et al.*, "Global impact of rotavirus vaccine introduction on rotavirus hospitalisations among children under 5 years of age, 2008–16: findings from the global rotavirus surveillance network," *The Lancet Global Health*, vol. 7, no. 7, pp. 893–903, Jul. 2019, doi: 10.1016/S2214-109X(19)30207-4.
- [24] M. M. Patel, R. Glass, R. Desai, J. E. Tate, and U. D. Parashar, "Fulfilling the promise of rotavirus vaccines: how far have we come since licensure?," *The Lancet Infectious Diseases*, vol. 12, no. 7, pp. 561–570, Jul. 2012, doi: 10.1016/S1473-3099(12)70029-4.
- [25] R. G. A. Mohammed, "Assessing mother's knowledge regarding the importance of rotavirus vaccine for their children," *International Journal of Novel Research in Healthcare and Nursing*, vol. 4, no. 1, pp. 204–212, 2017.
- [26] H. H. S. Khalil, W. H. Alseraty, and N. A. El-adham, "Effect of health education on mothers' knowledge and practices of children under-five-year regarding immunization in rural area," *Egyptian Journal of Health Care*, vol. 13, no. 2, pp. 1180–1201, Jun. 2022, doi: 10.21608/ejhc.2022.239364.
- [27] A. Apte, S. Roy, A. Bavdekar, S. Juvekar, and S. Hirve, "Facilitators and barriers for use of rotavirus vaccine amongst various stakeholders and its implications for Indian context—a systematic review," *Human Vaccines & Immunotherapeutics*, vol. 14, no. 11, pp. 2760–2767, Jun. 2018, doi: 10.1080/21645515.2018.1489190.





- [28] T. H. Zaidi *et al.*, "Knowledge and attitude regarding rotavirus and its vaccination among medical students in Karachi, Pakistan," *Public Health in Practice*, vol. 2, pp. 1–4, Nov. 2021, doi: 10.1016/j.puhip.2021.100171.
- [29] J. Sebastian, G. Parthasarathi, and M. D. Ravi, "Impact of educational intervention on the best immunization practices among practicing health care professionals in a south Indian city," *Therapeutic Advances in Vaccines and Immunotherapy*, vol. 9, pp. 1–11, Jan. 2021, doi: 10.1177/25151355211032590.
- [30] S. F. Quadri *et al.*, "Assessment of knowledge retention of healthcare staff through telephonic interview after training for rotavirus vaccine introduction in India," *Systematic Review Pharmacy*, vol. 12, no. 12, pp. 3853–3857, 2021.

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