

## Effectiveness of Rota vaccine in prevention of Rotavirus gastroenteritis

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### Abstract

**Background:** Rotavirus gastroenteritis is the most common cause of acute gastroenteritis in children especially during infancy. Rota vaccine plays an important role in prevention of Rotavirus gastroenteritis.

**Purpose:** To determine the role of Rotavirus vaccine in prevention or decrease the prevalence of Rota virus gastroenteritis.

**Method:** The study involved 200 patients who admitted to hospital with acute gastroenteritis and not vaccinated with Rotavirus vaccine and reared as control. Second group include 100 patients presented with gastroenteritis and vaccinated with Rotavirus vaccine (Rotarix type) and reared as cases.

**Main results:** The rotavirus vaccine decreases the incidence of rotavirus gastroenteritis from 36% in control group (not vaccinated) into 22% in vaccinated group (cases).

**Conclusion:** The Rotavirus vaccine plays an important role in prevention the Rotavirus gastroenteritis especially in infancy.

**Key Words:** Rota virus, vaccine, RNA virus, diarrhea, cross sectional and gastroenteritis.

### Introduction

Rotaviruses are part of a large family of viruses that cause diarrhea in a variety of mammals and birds. Rotavirus was first detected in Australia in 1973 in duodenal biopsy specimens from children who had acute diarrhea. These biopsy specimens showed wheel-shaped viruses in the epithelial cells lining the intestine; the name rotavirus is derived from the Latin word "Rota" meaning wheel (Dennehy, 2006). The virus is a wheel-like, double-shelled icosahedron containing 11 segments of double-stranded RNA. The diameter of the particles by electron microscopy is approximately 80 nm. Rota viruses are classified by group (A, B, C, D and E), subgroup (I or II). Group A, which has no antigenic relationship to the other groups, includes the common human pathogens as well as a variety of animal viruses. Group B rotavirus is reported as a cause of severe disease in infants and adults in China but not elsewhere. Occasional human outbreaks of group C rotavirus are reported. The other groups are limited to animal strains (Bass, 2004). Most rotavirus infections in infants are symptomatic. After a 2 day incubation period, symptoms begin with fever and vomiting followed shortly by diarrhea. The whole illness lasts about 3 or 4 days, but loose stools can persist for weeks (Musher & Musher, 2004; Coffin, et al., 2006). Early on, vomiting may be rate limiting in terms of

attempts at oral rehydration. Most children have experienced at least 1 rotavirus infection by their second birthday and almost all are infected in the first 5 years of life. The virus is highly infectious and spreads by the feco-oral route. The amount of rotavirus excreted by infected children is very high, more than  $10^{10}$  to  $10^{11}$  viral particles per gram of feces. Thus, combined with the fact that children begin shedding before they are symptomatic and for up to 2 weeks after onset of symptoms and that infant do not have good stool hygiene, helps to explain why rotavirus spreads so quickly through daycare centers, families and communities. The peak incidence of disease is between 6 months and 2 years of age; neonates may be relatively protected by maternal antibody (Gary, 2009).

Two different rotavirus vaccines are currently licensed for infants in the United States. The vaccines are RotaTeq® (RV5) and Rotarix® (RV1). Before being licensed, both vaccines were tested in clinical trials and shown to be safe and effective. In these studies, during approximately the first year of an infant's life, rotavirus vaccine was found to prevent almost all (85% to 98%) rotavirus illness episodes that were severe and to prevent 74% to 87% of all rotavirus illness episodes (Cortese & Parashar, 2009). A marked and sustained decline in rotavirus activity was seen

nationally in all seven rotavirus reporting years from 2007 to 2014 following the implementation of routine rotavirus vaccination of U.S. children (Aliabadi, et al., 2015). Both rotavirus vaccines were over 85% effective against rotavirus hospitalization among young children. The high effectiveness shown argues in favor of their inclusion in the official schedule (Perez-Vilar, et al., 2015). In July 1999 in US centers for disease control and prevention reported a clustering of cases of intussusception in the weeks after vaccination with tetravalent rhesus rotavirus vaccine, representing an additional risk of 1 in 10000 for this complication (Charles, 2000).

**Materials and Methods**

Bi-center, hospital based and observational cross sectional study was done in two main hospitals in Amarah city and include 200 children below 2 years as a control, hospitalized for gastroenteritis and other group (100 children) as cases that receive Rota vaccine (Rotarix, Glaxo-Smith Kline, England) the study done during May 2011 to march 2015. A questionnaire was circulated to solicit information about demographics (age, sex and residences), type of feeding, vaccine receiving, gastroenteritis symptoms and signs (according to WHO definition, three loose stools and /two or more vomiting episodes within 24 hour period, with onset of symptoms ≤14 days before admission). A stool samples was collected from all enrolled children and tested for presence of rotavirus by special Rota virus kit (ABON one step rotavirus test device).

**Results**

The result of study shows that positive cases for rotavirus gastroenteritis in control patients (without vaccine) was more compared with vaccinated group, 72 out of 200 (36%) and 22 out of 100 (22%) respectively, significantly decrease at the level of p value ≥ 0.013 as showing in table (1).

Table.1: Prevalence of gastroenteritis (positive or negative rotavirus) compared with non-vaccinated (control).

Gastroenteritis		Vaccinated	%	Control	%
Cases	+ve	22	22	72	36
	-ve	78	78	128	64
	Total	100		200	
p≥0.013					

According to the genders, male had highest prevalence than female in control group (118:82) while in vaccinated group male also, had high prevalence of rotavirus gastroenteritis, table (2).

Table.2: Prevalence of gastroenteritis unvaccinated and non-vaccinated group according to the gender.

Gender	Vaccinated	%	Non-vaccinated (control)	%
Male	57	57	118	59
Female	43	43	82	41
Total	100		200	
p≥0.74				

Regarding residency; non-vaccinated group was significantly increased in rural area (108:92) compared with vaccinated, the percentage nearly equal, 49 live in urban while 51 live in rural (50%), with no statistical significant (p value =0.62) as showing in table (3).

Table.3: Prevalence of gastroenteritis in vaccinated and control group according to the residency.

Residency	vaccinated	%	Non-vaccinated	%
Urban	49	49	92	46
Rural	51	51	108	54
Total	100		200	
p≥0.62				

Regarding the type of feeding, the results was revealed that the artificial feeding was high in both vaccinated and control groups. In control patients, 98 artificial, 50 breast feeding and 52 mixing. While in cases the result was 40 (artificial), 27 (breast) and 33(mixing) with no statistical significant (p value ≥ 0.29) as showing in table (4).

Table.4: Prevalence of gastroenteritis in vaccinated and control according to the type of feeding.

Feeding	Vaccinated	%	Control	%
Artificial feeding	40	40	98	49
Breast feeding	27	27	50	25
Mixing	33	33	52	26
Total	100		200	
p≥0.29				

The result of study was appeared that the age group (4-10 months) was the highest prevalence of gastroenteritis (positive or negative rotavirus) in both vaccinated and non-vaccinated (control) groups, there was significant increased compared with age group of more than 10 months (p value ≥ 0.006) as showing in table (5).

Table.5: Age distribution in both vaccinated and non-vaccinated (control).

Age(months)	Vaccination			
	Cases	%	Control	%
4-10	82	82	132	66
More than 10	18	18	68	34
Total	100		200	
p≥0.006				

## Discussion

The result of study shows that rotavirus vaccine play an important role in prevention of rotavirus gastroenteritis, furthermore the vaccine decrease the cases from 36% to 22%, this result was agreed with a lot of studies, as done in Morocco that showed Rotavirus vaccines have reduced greatly the number of children hospitalized due to rotavirus infection (Aliabadi, et al., 2015). Also study done by Leshem E (Perez-Vilar, et al., 2015), in United States which showed the rates of rotavirus gastroenteritis were reduced by 75% in 2007-2008, 60% in 2008-2009, 94% in 2009-2010, and 80% in 2010-2011. Another study done in Colombia showed that rotavirus vaccine provided significant protection against rotavirus hospitalization among children under 1 year of age in the Colombian setting (Charles, 2000; Benhafid, et al., 2015).

Regarding sex, our result shows male more than female in rotavirus gastroenteritis in both vaccinated and non-vaccinated (control) groups, this result agrees with other study done in Nigeria by **Junaid, et al., 2011:** (Males excreted rotavirus at a significant higher rate than females).

The prevalence of rotavirus gastroenteritis occurs most commonly in the younger age group, where the study shows that age group (4-10 months) was predominate. In both vaccinated and non-vaccinated children, 82 out of 100 (82%) in cases and 132 out of 200 (66) in control patients. These results agree with many studies done in worldwide as research done in Africa by Cunliffe, et al. 1998:

38% of the hospitalized patients with rotavirus were < 6 months and 81% were < 1 year of age, also study done by **Junaid, et al., 2011:** (highest prevalence in children 7-12 months of age).

Regarding type of feeding, artificial feeding consider risk factor in all cases of diarrheal disease in children. Our study shows that the prevalence of gastroenteritis in both control (49%) and cases (40%) in those children receive artificial feeding, the rest percentage either receive breast or mixing feeding, and this result was disagreed with study done by Duffy, et al., 1986: showed the percentage equal between artificial and breast feeding, but clinical course was mild in most cases whom received breast feeding. Another study done by Schoub, et al., 1987: that concluded that colostrum and mature milk had important role in prevention of rotavirus gastroenteritis.

Residency was equal in both urban and rural areas in cases whom received rotavirus vaccine, where 49 out of 100 live in urban area (50%) while in control group slightly more in rural area 82 out of 200 (59%). Study done in Kenya showed that the incidence of rotavirus gastroenteritis was very high in rural area (Breiman, et al., 2014; Leshem, et al., 2014; Cotes-Cantillo, et al., 2014).

## Conclusion

The Rota vaccine play an important role in prevention of rotavirus gastroenteritis, so every infant should receive this vaccine in vaccination schedule.

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