

## Rotavirus gastroenteritis among hospitalized children under 5 years of age in the Middle Eastern and North African Region: a review

Mohamed Nasr Fathi Shaheen <sup>1</sup>

<sup>1</sup>Department of Water Pollution Research, Environmental Research Division, National Research Centre, Cairo, Egypt. (Correspondence to: Mohamed Shaheen: m\_nrc2007@yahoo.com).

### Abstract

**Background:** Rotavirus (RV) is one of the primary causes globally of acute diarrhoea in children below 5 years of age.

**Aims:** This literature research aims to evaluate the rotavirus diarrhoea among hospitalized children < 5 years of age in the Middle Eastern and North African region from 2010 to 2016. Data from each country were extracted and compared.

**Methods:** An extensive literature search was carried out using the following databases: PubMed, Google Scholar and Science Direct, with the keyword “Rotavirus”. The search was limited to articles published from January 2010 to December 2016.

**Results:** The search identified 28 studies. Rotavirus gastroenteritis (RVGE) was identified in 19%–78.2% of all tested diarrhoeal specimens, primarily in children ≤ 1 year of age. RV occurred throughout the year, with peak incidence during autumn and winter seasons. G1P[8] was the predominant circulating genotype combination followed by G9P[8] and G2P[4]. Out of 28 studies, only one examined the economic burden which ranged from US\$ 245 to \$345 per hospitalized child due to RV diarrhoea. Moreover, three days were the minimum duration of hospitalization. No available data on the mortality rates due to RVGE among the selected studies.

**Conclusions:** This research documents that RV diarrhoea is one of the most significant pathogens that cause morbidity and mortality in the paediatric population in Middle Eastern and North African countries. The data from this literature research may help public healthcare workers in decreasing mortality and morbidity resulting from RVGE in the region.

**Keywords:** Rotavirus, gastroenteritis, diarrhoea, mortality, vaccine, children

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## **Introduction**

Human rotavirus group A (human RV-A) is one of the global environmental risks that causes acute diarrhoea in children aged under five years, and accounts for 527 000 deaths per year, of which 82% occur among the paediatric population in the poorest countries (1,2). Morbidity and death caused by rotavirus occur mainly in low- and middle-income countries, particularly those with poor healthcare systems (3).

Rotavirus is a non-enveloped virus within the family of Reoviridae. The genome of this virus consist of 11 double-stranded RNA segments and based on the 2 surface capsid segments VP4 and VP7; RV is classified into P and G serotypes, respectively (4). To date, 27-G and 37-P genotypes have been described in humans (5). Several epidemiological studies reported that the G1P[8], G2P[4], G3P[8], G4P[8], G9P[8], and G12P[8] combinations are the major causes of rotavirus gastroenteritis in humans (6,7). Currently, two live-attenuated oral rotavirus vaccines (Rotarix and RotaTeq) were licensed for infants < 6 months old. Rotarix (GlaxoSmithKline, Rixensart, Belgium) contains human G1P[8] serotype while RotaTeq (Vaccines, Whitehouse Station, NJ, USA) contains a mixture of five human serotypes G1–G4 and P[8].

Both vaccines appear to protect against diarrhoeal diseases caused by RV infection (8). This study was designed to update the knowledge of circulating human RV-A G and P genotypes in the Middle East and North Africa (MENA) region, through conducting a comprehensive literature review that assessed the distribution of rotavirus among children younger than 5 years of age with diarrhoea. The data would be beneficial before, during, and after the rotavirus vaccine introduction in populations.

## **Methods**

In order to identify the impact of RV gastroenteritis on the paediatric population under five years of age in the MENA region (Algeria, Bahrain, Egypt, Islamic Republic of Iran, Iraq, Jordan, Kuwait, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen) as well as Turkey for its regional proximity, an extensive literature search was carried out using the following databases: PubMed, Google Scholar and Science Direct, with the keyword "Rotavirus". The search was limited to articles published in the last seven years (January 2010 to December 2016) that met the following criteria: 1) hospitalized children  $\leq$  5 years of age with acute diarrhoea; 2) period of sample collection  $\geq$  12 months; 3) number of tested samples for rotavirus  $\geq$  100; and 4) detection of RV was performed using a sensitive methods such as an enzyme immunoassay (EIA), latex agglutination (LAT), polyacrylamide gel electrophoresis (PAGE), or reverse-transcriptase polymerase chain reaction (PCR).

The proportion of RV infection was extracted from all selected studies and calculated by study and country. In case a single country had several published studies, a pooled average of the proportion of RV diarrhoea among cases of acute diarrhoea was calculated and reported. Also, the percentage of rotaviral genotype combinations among children suffering from RV gastroenteritis was calculated by study. Overall, the mean proportion of RV infection and genotype combinations among hospitalized children under 5 years of age in the MENA region was calculated from a combination of all extracted data. Moreover, age and gender distributions, seasonal variation, genotypes of RV, intravenous rehydration, duration of hospital stay, and medical costs were extracted from the selected studies and compared. Disease severity was measured by using 20-point Vesikari scores, based on the duration of diarrhoea, vomiting, intensity of diarrhoea, fever, and dehydration. A severe disease occurs when a Vesikari score is more than 11 (9).

## **Results**

### *Studies selected for review*

We reviewed 145 articles/abstracts to select a total of 28 that met the inclusion criteria of the current review (Figure 1). The selected studies covered Bahrain (10), Egypt (11,12), Islamic Republic of Iran (13–21), Iraq (22,23), Jordan (24,25), Libya (26), Morocco (27–29), Saudi Arabia (30–32), Tunisia (33), Turkey (34,35), United Arab Emirates (UAE) (36), and Yemen (37). All studies from Algeria, Jordan, Lebanon, Oman, Palestine, and Qatar were excluded because these did not meet our inclusion criteria whereas no studies were available from Kuwait and the Syrian Arab Republic. The included studies in the current review contained the following topics: proportion of RV gastroenteritis (n = 28), seasonal variation (n = 21), age distribution (n = 23), gender distribution (n = 19), genotype distribution (n = 15), and disease severity (n = 13 articles).

### *Proportion of RV gastroenteritis among hospitalized children*

Twenty-eight studies from 12 countries contained data on the proportion of RV gastroenteritis among hospitalized children under five years of age in the MENA region. These studies contained 17 233 diarrhoeal samples and tested for RV gastroenteritis. Of these, 7366 (42.7%) children had RV infection. By country, the mean percentage of cases caused by rotavirus infection ranged from 316 (22.5%) to 1885 (63%). Egypt, Tunisia, and Islamic Republic of Iran reported the lowest proportion with 316 (22.5%), 65 (23.3%), and 537 (27.4%), respectively. The highest proportion was observed in Turkey 1885 (63%), UAE 381 (50.3%), and Saudi Arabia 1226 (48.7%). The other countries reported a percentage of between 93 (35.8%) and 358 (45.2%) (Figure 2).

### *Variation in the proportion of RV gastroenteritis over time*

Among hospitalized children with acute diarrhoea, the proportion of RV gastroenteritis have fallen in Morocco from 741 (40%) to 89 (26.6%) between 2006 and 2011 (27,29), and in Saudi Arabia from 660 (65.5%) to 171 (31.6%) between 2008 and 2012 (30,32). The proportion of RV

gastroenteritis appears to have increased over time in Islamic Republic of Iran from 131 (19%) to 10 (25%) between 2004 to 2014 (14,21), and in Turkey from 241 (28%) to 1644 (78.2%) between 2006 and 2014 (34,35) (Table 1).

#### *Seasonal distribution of RV gastroenteritis*

Twenty-one studies from 12 countries including Bahrain (10), Egypt (12), Islamic Republic of Iran (13,15–19,21), Iraq (22), Jordan (25), Libya (26), Morocco (26–28), Saudi Arabia (31,32), Tunisia (33), Turkey (34), UAE (36) and Yemen (37), reported seasonality distribution (Table 2). Most RV infection was found in winter and autumn. In contrast, three studies from Islamic Republic of Iran, Iraq and Yemen concluded that the peak incidence of rotaviral infection was found in summer (16,22,37) (Table 1).

#### *Gender distribution of children with RV gastroenteritis*

Nineteen studies from nine countries including Bahrain (10), Islamic Republic of Iran (13,15–21), Iraq (22), Jordan (25), Morocco (29), Saudi Arabia (30–32), Tunisia (33), Turkey (34,35), and Yemen (37) contained data on gender distribution. All studies found that the frequency of diarrhoea for Rotavirus was higher in males (Table 1).

#### *Age distribution of children with RV gastroenteritis*

Data on age distribution (Table 2) were available in 23 studies from the following countries: Bahrain (10), Egypt (12), Islamic Republic of Iran (13,15–18,21), Iraq (22,23), Jordan (24,25), Libya (26), Morocco (27–29), Saudi Arabia (30–32), Tunisia (33), Turkey (34), UAE (36), and Yemen (37). Children aged 6-12 months had the highest rate of positive samples for RV (15,18,22–24,26–29,31). A limited number of studies stated that the peak distribution of RV infections was observed in age group ranged from 6–23 months (10,17,25,33), whereas the majority of RV infection occurred in children aged < 12 months in three studies from Egypt and Saudi Arabia (12,30,32). A number of studies reported that most RV infections occurred in the age group from 12–24 months (13,16,21,34,36). Only one study reported that most RV gastroenteritis occurred among children aged 1–6 months (37).

#### *Distribution of human RV G and P combination in children with gastroenteritis*

Out of 28 studies, 15 studies from 11 countries – Bahrain (10), Egypt (11), Islamic Republic of Iran (14), Iraq (23), Jordan (24,25), Morocco (28,29), Saudi Arabia (31,32), Tunisia (33), Turkey (34,35), UAE (36) and Yemen (37) – studied the human RV G-P combinations in 4070 hospitalized children with RV gastroenteritis. Overall, G1P[8] combination represented the predominant genotype followed by G9P[8] and G2P[4] in the MENA region, in 1535 (37.7%), 916 (22.5%), and 331 (8.1%) of all RV positive samples, respectively. G1P[8] combination was detected in 14 studies from 10 countries (10,11,14,23–25,28,29,31,32,34–37). G1P[8] was the most prevalent in 11 of those studies, accounting for between 6 (6%) and 171 (69%) of genotyped RV gastroenteritis samples in those countries. G9P[8] was present in seven countries (Bahrain, Egypt, Jordan, Morocco, Saudi Arabia, Turkey and UAE) where it was the

most prevalent genotype in Morocco during 2006–2009 (28), and Turkey during 2006–2014 (34,35). In addition, G2P[4] was detected in all countries except Islamic Republic of Iran, Tunisia, and UAE. G2P[4] was the highest circulating genotype from November 2006 to February 2008 in Yemen (37) (Figure 3).

Uncommon RV genotype combinations in the MENA region (Figure 3 and Figure 4) were detected in multiple countries and accounted for 5% or less of the total genotypes during 2010–2016, including G1P[4] in Egypt (11), Islamic Republic of Iran (12), Iraq (23), Jordan (24,25), Morocco (28), Saudi Arabia (32), Turkey (34,35), UAE (36); G1P[6] in Egypt (11), Iraq (23), Morocco (28,29), UAE (36); G2P[8] in Bahrain (10), Egypt (11), Iraq (23), Morocco (28,29), Saudi Arabia (31,32), Turkey (34,35); G3P[8] in Jordan (24,25), Morocco (28), Saudi Arabia (32), Tunisia (33), Turkey (34,35), UAE (36); G4P[8] in 13 of 15 studies (11,14,23–25,28,29,31–36); and G9P[6] in Egypt (11), Iraq (23), Jordan (24,25), Morocco (28) and Turkey (34,35).

Rare RV genotype combinations such as G1P[9], G2P[6], G3P[4], G3P[6], G4P[4], G4P[6], G4P[9], G5P[4], G5P[8], G8P[4], G8P[6], G8P[8], G9P[4], G9P[9], G9P[10], G10P[8], G12P[6], G12P[8], G12P[11], were detected in three countries or less as follows: G1P[9] in Turkey (34); G2P[6] in Iraq (23), Morocco (28) and Turkey (35); G3P[4] in Egypt (11), Morocco (28) and Turkey (34); G3P[6] in Iraq (23) and Morocco (28); G4P[4] in Jordan (24) and Turkey (34); G4P[6] in Iraq (23); G4P[9] in Turkey (34); G5P[4] in UAE (36); G5P[8] in UAE (36); G8P[4] in Turkey (34); G8P[6] in Iraq (23); G8P[8] in Turkey (34) and UAE (36); G9P[4] in Jordan (24), Turkey (34), and UAE (36); G9P[9], G9P[10], and G10P[8] in Turkey (34); G12P[6] and G12P[8] in Iraq (23), Saudi Arabia (31), Turkey (34); and G12P[11] in Turkey (34). The results are summarized in Table 2.

Mixed genotypes, partially or non-typeable RV genotypes were pooled in the “Other” category in Figure 4. Mixed RV genotypes were identified in nine studies / eight countries (11,14,23,24,28,29,31,34,36), with a mean proportion of 191 (4.7%) of the total rotavirus positive samples during 2010–2016. Non-typeable and partially typed RV genotypes were detected in seven studies / seven countries (10,11,25,29,31,35,36) and 12 studies / 10 countries (11,14,23–25,28,31,33,34–37), respectively. They accounted for 161 (4%) to 68 (1.7%) of all genotypes in the MENA region during 2010–2016, respectively.

#### *Clinical features and disease severity*

Thirteen studies from the MENA region provided data on clinical manifestations caused by RV gastroenteritis in the following countries: Bahrain (10), Egypt (12), Islamic Republic of Iran (15,16), Iraq (22), Libya (26), Morocco (27,29), Saudi Arabia (31,32), Tunisia (33), UAE (36) and Yemen (37). In most cases, RV-positive children suffered from vomiting (10,12,15,16,22,26,27,29,31–33,36,37), dehydration (10,26,27,29,31–33,36,37), and fever (12,15,16,22,31,33,36,37). Convulsion was reported in two studies from Islamic Republic of Iran 3 (6.25%) (15) and Iraq 7 (4%) (22). Disease severity was measured by the Vesikari scale in

two studies from Morocco with a mean score of 86.4 (11.66%,  $P = 0.13$ ) vs. 126.6 (11.51%) of non-RV gastroenteritis (27) and 11.5 (14.74%,  $P < 0.0001$ ) vs. 23.6 (12.3%) of non-RV gastroenteritis (29), which increased to 16.5 (17.8%,  $P = 0.001$ ) vs. 26.2 (15.7%) of RV gastroenteritis and 102 (25%,  $P = 0.0005$ ) vs. 133 (23.4%) of non-RV gastroenteritis in Libya (26) and Saudi Arabia (31) during hospitalization, respectively. The higher severity score was identified in a study from UAE with 161 (42.3%,  $P = 0.0031$ ) vs. 117 (31%) of non-RV gastroenteritis (36). No deaths were reported in all included studies.

#### *Intravenous rehydration*

Seven studies from Bahrain (10), Libya (26), Morocco (27), Saudi Arabia (31), Tunisia (33), UAE (36) and Yemen (37) reported that 106 (99.6%), 93 (100%), 627 (84.5%), 387 (98%), 28 (77.7%), 337 (99%) and 421 (53.0%) of all hospitalized children with RV diarrhoea received Intravenous rehydration therapy, respectively.

#### *Duration of hospital stay*

The mean ( $\pm$  SD) duration of hospitalized children with RV diarrhoea was 4.1 ( $\pm$  2.41), 3, and 4.0 ( $\pm$  1.8) days in three studies from Bahrain (10), Morocco (27), and Saudi Arabia (31), respectively. Health-care utilization and economic burden resulted from RV gastroenteritis. One study from Tunisia contained data on healthcare resource use with a mean cost ranging from US\$ 245 to \$345 per hospitalized child with RV diarrhoea (33).

## **Discussion**

Rotavirus is a major cause of gastroenteritis in humans in both low- and middle-income countries as well as high-income countries. A continuous survey to identify the most common RV strains responsible for severe gastroenteritis is an important tool for vaccine selection and production to prevent rotavirus infection in the MENA region. Based on collected data from 28 studies in MENA countries, our analysis revealed that RV is a major cause of diarrhoeal disease in children under 5 years of age in all included countries.

The detection rates of RV were different between these countries and can be explained by the differing conditions of these studies, such as geographical area, number of collected samples, RV antigen concentration in the collected samples, season of sample collection, and the sampling methods. In the MENA region (2010–2016), RV infections were responsible for 42.7% of all diarrhoeal cases in children  $< 5$  years of age. This finding is close to studies published by Centers for Disease Control and Prevention (CDC), where 40% was the median RV detection rate in the Eastern Mediterranean Region during 2001–2008 (38). Forster et al. (39) reported that RV gastroenteritis accounted for 43.4% of diarrhoeal cases in European children  $< 5$  years of age from February 2005 to August 2006.

According to our survey, the majority of RV gastroenteritis was detected in children aged 6–23 months, which is in agreement with previous reports on the epidemiological profile of RV infection (40–42). This may be explained by the protection that was given by maternal antibodies in the first six months of the child's life rather than the immunity acquired after two years of age due to repeated exposure (43). Based on this explanation, preventive strategies should occur during infancy. Moreover, RV infection was detected in all seasons but primarily during cooler months, as reported by McNulty (44) who found RV tends to be more common in winter than summer. It has been suggested that the low humidity of these seasons and combination of rainfall with drying soils might lead to an increase in the aerial transportation of dried and faecal contaminated materials (45,46). Moreover, the prevalence of acute gastroenteritis due to RV infection was higher in males than in females. This finding is similar to other studies conducted in Lebanon, Japan, and Nepal (41,47,48).

In this survey, G1P[8] genotype combination was the most common in MENA countries during 2010–2016. G9P[8] was second in frequency; however, it was the predominant genotype in Turkey during 2012–2014 (34). In spite of the presence of G2P[4] at low levels (median 8.1% of all genotyped specimens), it was detected in all studies (10,11,23–25,28,29,31,32,34,35,37) except three studies from Islamic Republic of Iran (14), Tunisia (33), and UAE (36). In comparison with other studies, G1P[8] and G2P[4] genotype combinations were the most common in MENA, central and Eastern European countries during 1999–2009 (49) based on studies from 2005/2006 and 2007/2008 (50). In spite of G4P[8] genotype detected at low levels (median 2.9% of all genotyped specimens), it was detected in all studies (11,14,23–25,28,29,31–36), except two studies from Bahrain (10) and Yemen (37).

In contrast, G2P[6] genotype combination was detected only in three studies (23,28,35); however, it was the predominant genotype during 2008 in Iraq (23). Moreover, other genotype combinations such as G1P[4], G2P[8], G3P[8] and G9P[4] were detected in different countries but at a level  $\leq 5\%$  of all genotypes. Iturriza-Gomara et al. (51) reported that these genotypes belong to the most characterized RV strains that can cause diarrhoeal diseases in humans. Collectively, these findings imply that the current Rotarix vaccine, containing G1P[8], is still the most predominant circulating strain in MENA countries.

In our analysis we find differences in the percentage of non-typeable (median 1.7; range, 0.4–10.8% of all genotypes samples) and partially types (median 4; range, 0.4–29.7% of all genotype samples), which may be attributed to occurrence of novel strains that were not determined in these studies or occurrence of differences and sensitivity of the used protocols in RV characterization from country to country. Therefore, using a uniform protocol for RV surveillance in all countries would provide an accurate picture of the burden of RV diseases among countries. Three studies provided us with data on the duration stay of hospitalized children with a minimum duration of three days. This finding is similar to another review

conducted on data collected during 1999–2009 from the MENA region (49). Globally, this duration was decreased to 2.5 days in a study from Sweden (52).

The current review showed that the criteria of resource utilization used for patients infected with RV were similar in all countries. Also, the hospital admission and disease severity due to RV gastroenteritis were higher than those of non-RV gastroenteritis, which is similar to data reported in the region during 1999–2009 (49) and western Europe (53).

Finally, only one study from Tunisia conducted in 2015 contained data on healthcare utilization, where the medical cost of hospitalized children due to RV infection ranged from US\$ 245 to \$345 (33). This cost was lower than those costs reported during 1999–2009 in the MENA region (ranging from US\$ 467 to \$1117) (49) and in western Europe (ranging from 2008 US\$ 1949 to \$2398 (54). Moreover, no data was available on the rotavirus fatalities in all our selected studies. From a previous review, annual deaths rates due to RV gastroenteritis ranged from 0 to 112 per 10 000 children below 5 years of age in the MENA region during 1999–2009 (49).

### **Conclusion**

Data on mortality and medical costs is limited to the MENA countries. However, the available data showed that RV diarrhoea is a common disease in the MENA region, affecting the paediatric population health. Currently, two or three genotype combinations, including G1P[8], G9P[8] and G2P[4] are predominant in the region. Thus, the current Rotarix vaccine might be suitable to reduce the rates of morbidity and mortality caused by RV infection. However, new vaccines rather than Rotarix are desired to contain the other predominant genotypes of RV such as G9P[8] and G2P[4] in the region.

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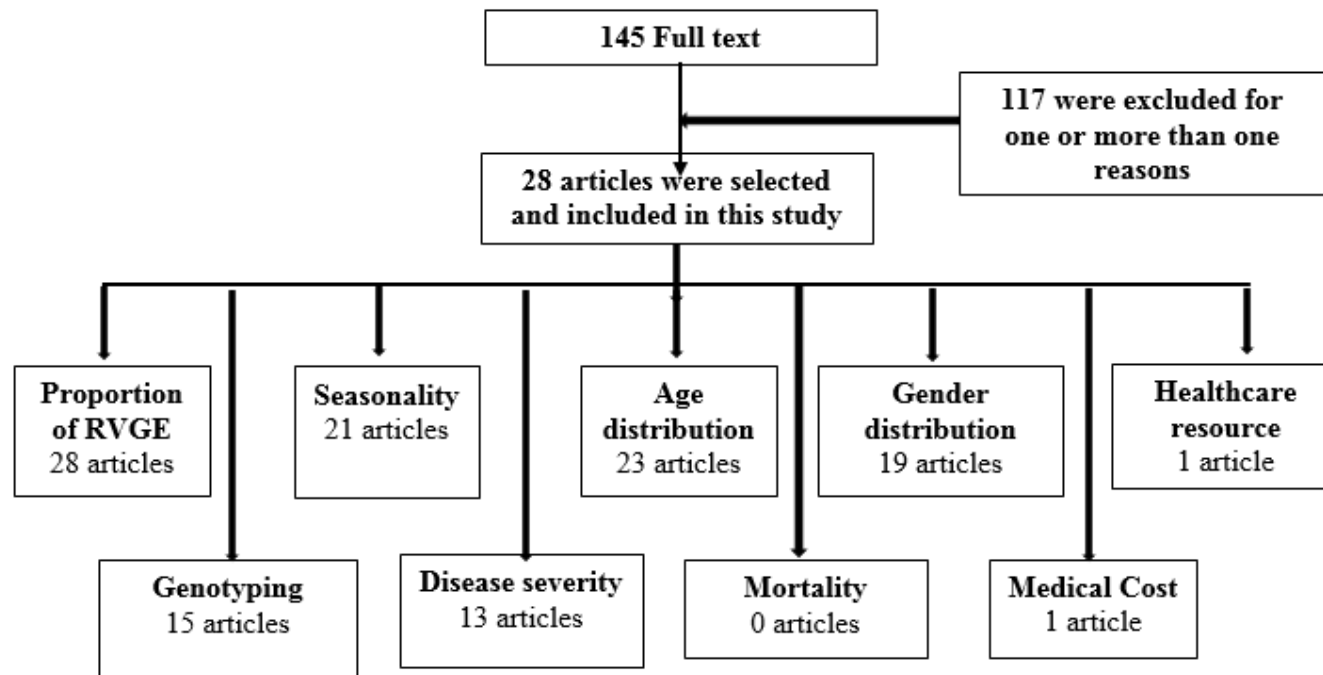
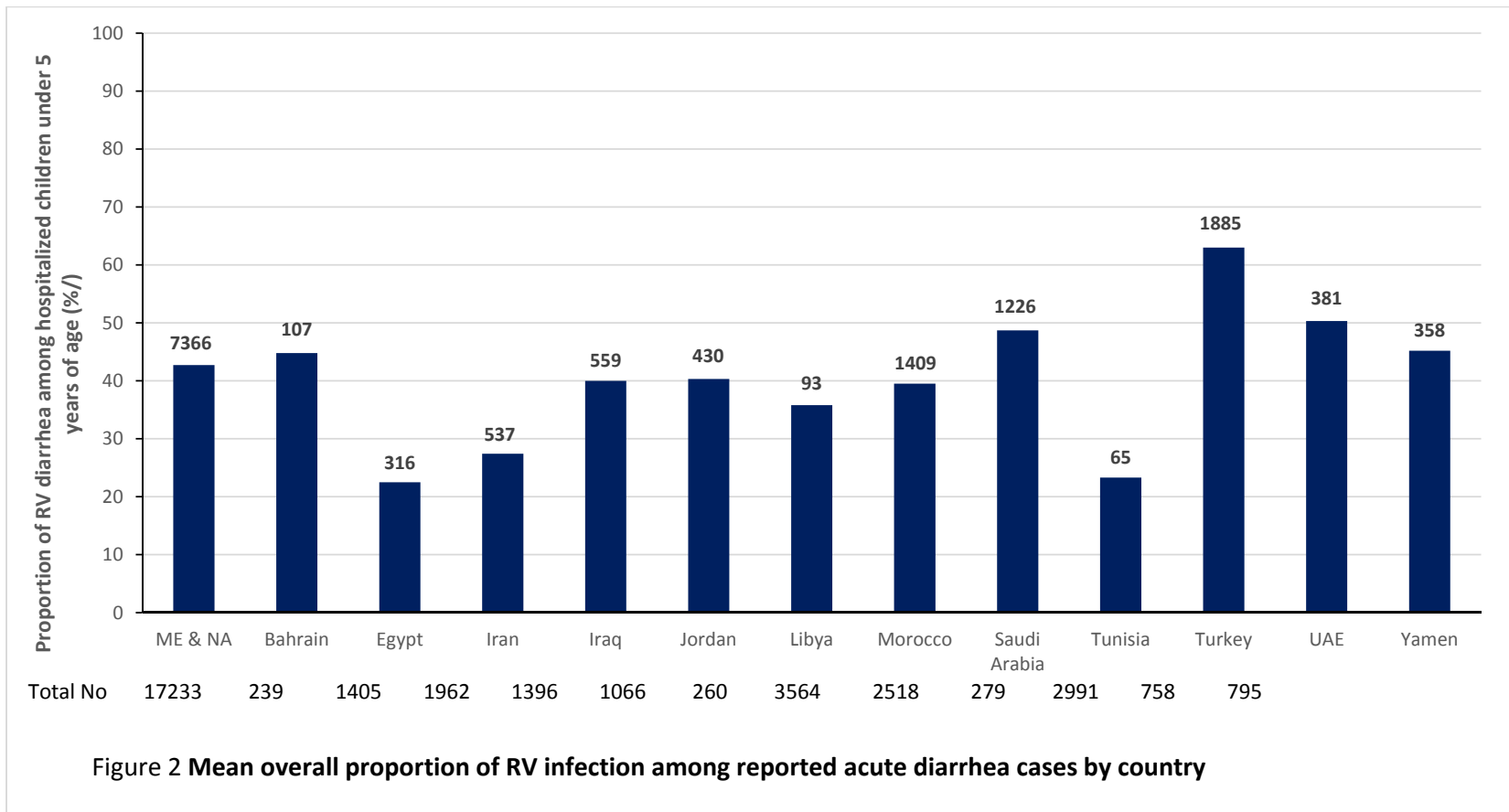
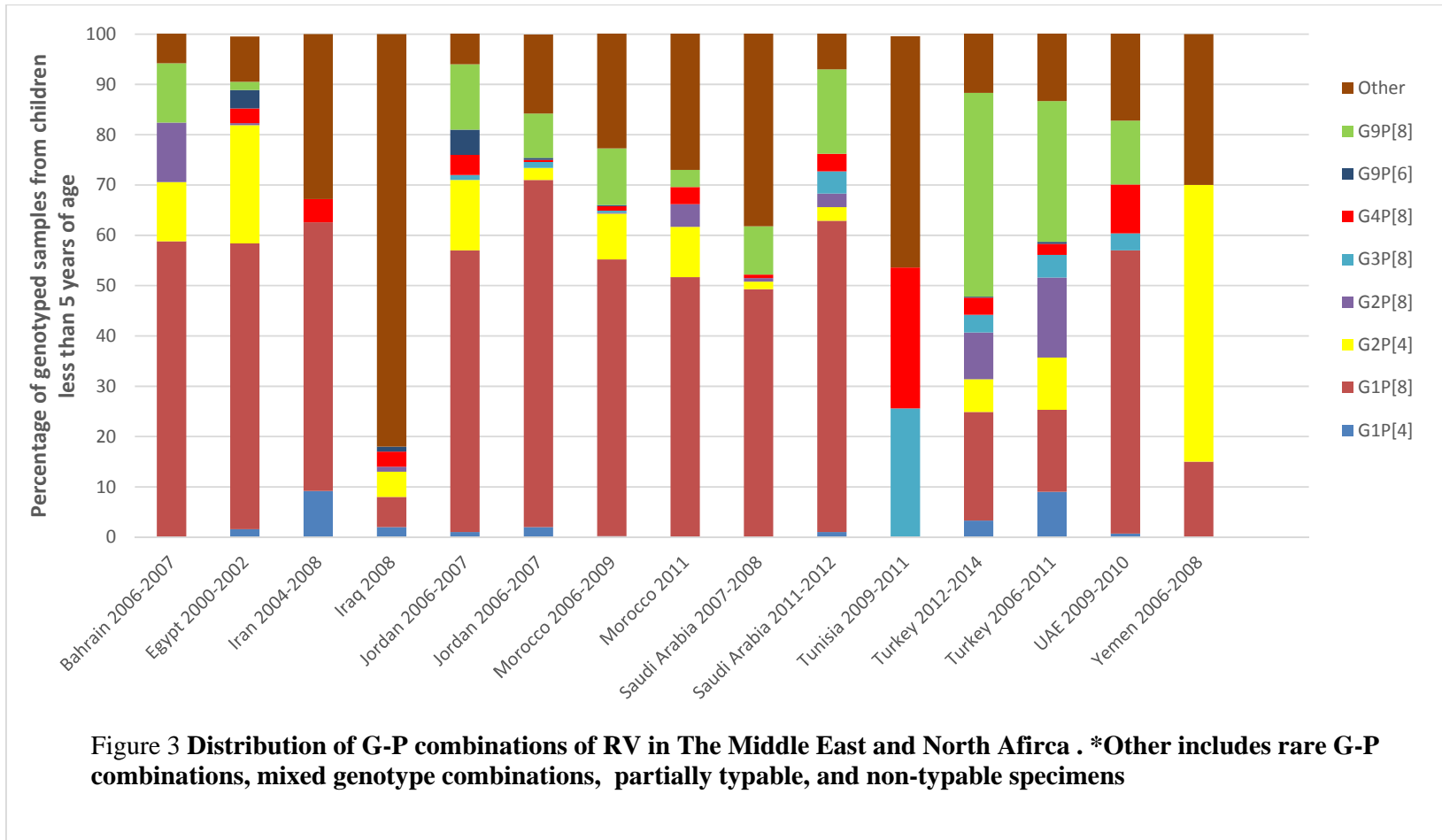
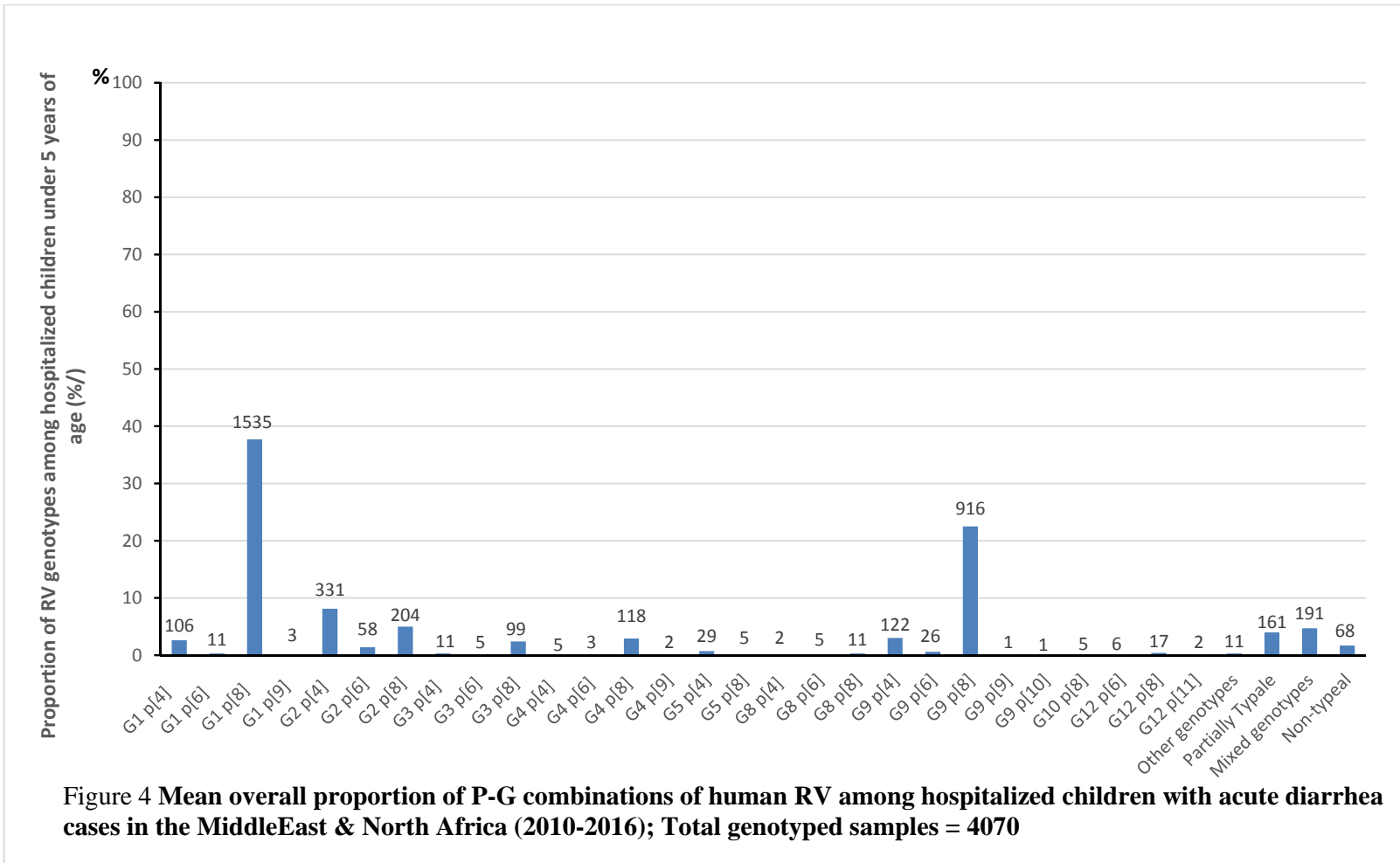


Figure 1 Flow chart indicating the selected of relevant studies









**Table 1 Proportion of RV gastroenteritis among hospitalized children under 5 years of age according to study**

Country	Ref.	Study characterization			No of samples	nRGE (%)	Peak Season	Peak Age, month	Peak gender Male/female
		Year(s) of Sample collection	Duration of sample collection per month	Method					
Bahrain	10	2006- 2007	12	ELISA	239	107 (44.8)	April	6–23	Male
Egypt	11	2000-2002	12	ELISA	1275	259 (25.2)	-	-	-
	12	2011-2012	24	ELISA	130	57 (43.9)	Winter	1-12	-
Islamic Republic of Iran	13	2009 – 2010	36	ELISA	316	88 (27.85)	Autumn	12-17	Male
	14	2004- 2008	36	dsRNA-PAGE	700	131(19)	-	-	-
	15	2007- 2008	12	ELISA	138	48 (34.7%)	autumn	9-11	Male
	16	2007- 2008	24	ELISA	141	40 (28.37)	summer	12-17	Male
	17	2009 – 2010	12	ELISA	163	75 (46 )	winter	6–23	Male
	18	2009- 2010	12	ELISA	180	63 (35)	Autumn	7-12	Male
	19	2010- 2011	12	ELISA	184	52(28.26)	autumn	-	Male
	20	2010- 2011	12	RT-PCR	100	30 (30)	-	-	Male
	21	2013-2014	12	RT-PCR	40	10 (25)	Winter	13-24	Male

Iraq	22	2009 - 2010	12	ICA	420	165 (39.26)	Summer	7-12	Male
	23	2008	12	ELISA	976	394 (40)	-	6-11	-
Jordan	24	2006 -2007	24	ELISA	368	182 (49.2)	-	6-12	-
	25	2006 - 2007	12	ICA	698	248 (35.5)	winter	6-17	Male
Libya	26	2007- 2008	12	ELISA	260	93 (35.8)	Nov.- June	6-11	-
Morocco	27	2006 -2010	48	ELISA	1841	741 (40)	Oct. – Dec.	6-11	-
	28	2006 - 2009	36	EIA	1388	579(42)	Oct	6-11	-
	29	2011	12	ELISA	335	89(26.6)	January	6-12	Male
Saudi Arabia	30	2008 -2010	34	ELISA	1007	660 (65.5)	-	<12	Male
	31	2007- 2008	14	ELISA	970	395 (40.7)	July - Aug	6-11	Male
	32	2011-2012,	12	RT-PCR	541	171 (31.6)	Octo. – Nov.	<12	Male
Tunisia	33	2009 -2011	12	ELISA	279	65 (23.3)	winter	6–23	Male
Turkey	34	2012 -2014	24	ELISA	2102	1644 (78.2)	Jan. - March	13-24	Male
	35	2006-2011	68	ELISA	889	241 (28)	-	-	Male
United Arab Emirates	36	2009–2010	12	ELISA	758	381 (50.3)	February	12-23	-

Yemen	37	2006 -2008.	16	ELISA	795	358 (45.2)	summer	1–6	Male
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Ref: reference; nRGE: number of rotavirus gastroenteritis; dsRNA-PAGE: dsRNA electrophoresis in polyacrylamide gel; LAT: latex agglutination; EIA: Enzyme immunoassay; ICA: immunochromatographic assay;

**Table 2 Rare genotype combinations from the Middle East and North Africa by study**

Country	Bahrain	Egypt	Iran	Iraq	Jordan		Morocco		Saudi Arabia		Tunisia	Turkey		UAE	Yemen	No of countries
Ref.	[10]	[11]	[14]	[23]	[24]	[25]	[28]	[29]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	
Genotype Year	2006-2007	2000-2002	2004-2008	2008	2006-2007	2006-2007	2006-2009	2011	2007-2008	2011-2012	2009-2011	2012-2014	2006-2011	2009-2010	2006-2008	
G2 p[6] n(%)	-	-	-	30(30.6)	-	-	24(4.3)	-	-	-	-	-	4(1.6)	-	-	3
G3 p[4] n(%)	-	1(0.4)	-	-	-	-	1(0.2)	-	-	-	-	9(0.54)	-	-	-	3
G9 p[4] n(%)	-	-	-	-	1(0.5)	-	-	-	-	-	-	118(7.2)	-	3(1.1)	-	3
G12 p[6] n(%)	-	-	-	3(3)	-	-	-	-	-	1(0.9)	-	2(0.12)	-	-	-	3
G12 p[8] n(%)	-	-	-	3(3)	-	-	-	-	-	7(6.2)	-	7(0.42)	-	-	-	3
G3 p[6] n(%)	-	-	-	3(3)	-	-	2(0.4)	-	-	-	-	-	-	-	-	2
G4 p[4] n(%)	-	-	-	-	1(0.5)	-	-	-	-	-	-	4(0.24)	-	-	-	2

G8 p[8] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	10(0.60)	-	1(0.4)	-	2
G1 p[9] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	3(0.18)	-	-	-	1
G4 p[6] n(%)	-	-	-	3(3)	-	-	-	-	-	-	-	-	-	-	-	-	1
G4 p[9] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	2(0.12)	-	-	-	1
G5 p[4] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29(10.8)	-	1
G5 p[8] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5(1.9)	-	1
G8 p[4] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	2(0.12)	-	-	-	1
G8 p[6] n(%)	-	-	-	5(5)	-	-	-	-	-	-	-	-	-	-	-	-	1
G9 p[9] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	1(0.06)	-	-	-	1
G9 p[10] n(%)	-	-	-	-	-	-	-	-	-	-	-	-	1(0.06)	-	-	-	1
G10 p[8] n (%)	-	-	-	-	-	-	-	-	-	-	-	-	5(0.30)	-	-	-	1
G12 p[11] n (%)	-	-	-	-	-	-	-	-	-	-	-	-	2(0.12)	-	-	-	1