Title

Seroprevalence of *erythrovirus* B19 IgG antibody in Makkah and Jeddah cities of Saudi Arabia

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Seroprevalence of *erythrovirus* B19 IgG antibody in Makkah and Jeddah cities of Saudi Arabia

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Abstract

Objective: The seroprevalence of B19V in 364 Saudi individuals was measured.

Methods: IgG seroprevalence was measured in serum samples of 165 males and 199 females aged 1 week to 57 years (mean 25.6, median 26 and standard deviation 9.7 years) by a commercial enzyme-linked immunosorbent assay (ELISA) using a highly specific recombinant B19V antigen.

Results: A total of 174 out of 364 (47.8%) sera were found positive, including 82 (47.1%) males and 92 (52.9%) females. The prevalence of antibody calculated as NovaTec unit was not statistically significant difference between gender ($p = 0.46$). Our results have shown that, as reported for other countries, anti-B19V IgG increases in an age-dependent manner, the prevalence increased significantly from 13.9% at $\leq$ 16 year to 51.5% in those > 16 year (p-value = 0.0001 and 95% confidence interval = 0.1 to 0.6).

Conclusion: This seroprevalence study indicated that almost half of the adult population in Saudi Arabia showed prior exposure to B19V. No gender differences in B19 seroprevalence were observed. The exposure as indicated by IgG positivity was seen to increase with age. The IgG negative individuals may be considered at risk of developing infection due to B19V.

KEYWORDS

Seroprevalence, B19 virus, Saudi Arabia.

Introduction

The B19 virus (B19V) (formerly Parvovirus B19) is a member of the genus erythrovirus within the *Parvoviridae* family. It was discovered by chance in 1974 by Yvonne Cossart in England during routine screening for hepatitis B of asymptomatic blood donors[1].

The B19 virion has a simple structure composed of two proteins and a linear, single-strand DNA molecule[2]. The non-enveloped icosahedral viral particles are 24 nm in diameter with a molecular weight of 5.6 X 10^6 Da. The genome of B19V contains approximately 5600 bases, encoding one major non-structural protein (NS1), two capsid proteins (VP1 and VP2), and several small peptides of unknown function[3;4] Approximately 95% of the capsid is composed of VP2[5].

The most common clinical presentation of B19V infection is erythema infectiosum (also called Fifth disease and slapped cheek syndrome), which is characterized by a facial rash that spreads to the trunk and limbs, usually preceded by a non-specific flu-like illness[6;7] B19V is also associated with arthropathy[8], aplastic crisis[9] and fetal infection[10]. Less commonly, B19V may be associated with myocarditis[11], various vasculitic syndromes[12], hepatitis[13;14] and more recently has been implicated as a cause of neurological disorders[15;16].

B19V is an ubiquitous virus that tends to produce spring epidemics in children 4-10 years of age in temperate climates[17]. The infection is transmitted primarily through respiratory secretions[10]. It can also be transmitted through infected serum via blood transfusions, transplantation or vertically from mother to foetus[18].

Seroprevalence in developed countries is 2-10% in children less than 5 years, 40-60% in adults over than 20 years, 60% in blood donors, and 85% or more in those over 70 years[19]. Infection with B19V is thought to confer lifelong immunity.

Little is known about the seroprevalence of B19V in Arabic countries including Saudi Arabia. This information will be important to determine the contribution this virus makes to childhood illness in these areas, and of its role in serious sequelae of infection especially in pregnancy.

The most common method for detection of B19V specific antibodies is ELISA[20]. In this assay B19V antigen is used to detect the presence of B19V IgG and IgM antibodies in serum[21]. IgM is considered to be the first serological marker for B19V infection, detected 6 to 10 days after initial infection. IgG antibodies are produced approximately 12 days after infection and persist for life. The presence of IgG antibodies specific for B19V is indicative of past infection[22].

METHODS

Specimen collection and preparation

Local permission was obtained to collect anonyms samples.

Blood (serum) samples were collected from healthy volunteer blood donors, pregnant women and paediatric patients in Saudi Arabia (Jeddah and Makkah region). After collection by venepuncture, blood was allowed to clot at room temperature (20-25°C) followed by centrifugation at 1500 x g for 10 minutes. The serum was then frozen at –20°C.

Specimen testing

Sera were tested for the presence of IgG antibody to B19V using a commercial enzyme immuno sorbent assay (ELISA) (NovaTEC) (Immundiagnostica GmbH, Germany, Distributor: DiaSorin, Italy).

Before assaying, all samples were diluted 1/100 with IgG sample diluent (PBS buffer containing stabiliser and 0. 1% Kathone). Then 100 µl controls (positive, negative and cut-off) and diluted samples were dispensed into their respective wells, while well A1 was kept for the substrate blank. Wells were then covered with foil and incubated for 1 hour at 37°C. After incubation, the plate was washed three times with 300 µl washing solution (Tris buffered saline with 0.25% Tween 20 and 0.1% Kathone) followed by the addition of 100 µl B19V anti-IgG Conjugate (anti-human IgG Horse Radish Peroxidase conjugate in a stabilizing buffer with 0. 2% Bronidox

L into all wells except for the blank well. The plate was then incubated again at room temperature for 30 min. Three washing steps were performed before the addition of 100 µl tetramethylbenzidine (TMB) substrate solution into all wells. The plate was then incubated for 15 min at room temperature in the dark before stopping the reaction by the addition of 100 µl stop solution (0.2 M sulphuric acid) to all wells. Absorbance was measured using an ELISA microwell plate reader (Titertek Multiskan, Labsystems, Basingstoke, UK) at 450/620 nm. The cut-off was the mean absorbance value of the cut-off control determinations. Samples were considered positive if the absorbance was higher than 10% over the cut-off. Samples with an absorbance value of 10% above or below the cut off were not considered as clearly positive or negative. To convert the absorbance values to a NovaTec-Units (NTU) the following equation was used:

$$\frac{\text{Patients (mean) absorbance value} \times 10}{\text{Cut-off}} = \text{(NTU)}.$$

Where Cut-off = 10 NTU, Grey zone = 9-11 NTU, Negative = < 9 NTU, Positive = > 11 NTU.

Data analysis

The seroprevalence results of B19V in Saudi Arabia was statistically analysed by calculating the mean, median, standard deviation, range and p value, and distributed according to age and gender differences using a Fisher test. P values less than 0.5 were considered significant.

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Results

Blood (serum) samples

A total of 364 blood (serum) samples were collected from blood donors (total of 146), pregnant women (total of 182) and paediatric patients (total of 36) in Saudi Arabia (Jeddah and Makkah cities) from a variety of different hospitals and laboratories. The majority of samples were collected from King Abdulaziz Medical City hospital (KAMC), which is located in Jeddah city. While the rest of samples were collected from other hospitals, polyclinics and private laboratories located in the city of Makkah (Figure 1).

Total B19V seroprevalence in Saudi Arabia

The seroprevalence of B19V in 364 Saudi individuals was measured.

Antibodies of the immunoglobulin G (IgG) class were investigated in serum samples of 165 males and 199 females aged 1 week to 57 years (mean 25.6 years, median 26 years and standard deviation 9.7 years) by a commercial enzyme-linked immunosorbent assay (ELISA) using a highly specific recombinant B19V antigen.

A total of 174 out of 364 (47.8%) sera were found to be positive, comprising 82 (47.1%) males and 92 (52.9%) females.

Out of 146 blood donors serum samples tested, 78 were positive for B19V IgG (53.4%). However, out of 182 serum samples tested from pregnant women, 91 were positive for B19V IgG (50%). Whilst, out of 36 Saudi paediatric patients serum samples tested, 5 were positive for B19V IgG (13.9%) (Table 1). In addition, the

likelihood of maternal transmission of B19V in light of the immunity status and the gestational age of women was determined. Women at risk of infection with B19V were at different gestational age (Table 2). A total of 169 pregnant women were in their first trimester of pregnancy, out of these 83 (49.1%) were found to be at risk of infection with B19V. A further, 13 women were in their second trimester, out of these 7 (53.8%) were found to be at risk of infection with B19V.

B19V seroprevalence with regard to age distribution

B19V seroprevalence in Saudi Arabia was distributed according to age. B19V seroprevalence increased from 11% at 0-5 years to 16.7% at 6-11 years.

By the age of 21- to 30 years, half of the people in this sample were immune to B19V infection. Seroconversion continued to occur up to the age of 45 years when the level of immunity appeared to plateau at approximately 66% - to - 80%.

These results show that anti-B19V IgG positivity increases in an age-dependent manner, the prevalence increased significantly from 13.9% at $\leq$ 16 year to 51.5% in those > 16 year (p-value = 0.0001 and 95% confidence interval = 0.1 to 0.6).

Furthermore, the prevalence of immunity was almost similar in the 26- to 30-year-old blood donors and pregnant women of the same age (50% versus 50.8%, p = 0.85) and amongst the 31- to 35-year-old blood donors and pregnant women (63% versus 64%, p-value = 0.9). (Table 3).

B19V seroprevalence in Saudi Arabia with regard to gender distribution

Out of 174 patients positive for B19V IgG, 82 (47.1%) were males and 92 (52.9%) were females (Table 4).

However, the rate of antibody positivity calculated as NovaTec unit showed no statistically significant difference between gender (p-value = 0.46 and 95% confidence interval = 0.9 to 1.3).

Discussion

B19V usually causes mild disease[23], however, recent reports described an association between B19V and severe illness such as neurological[15;16] and cardiac[11] manifestations. Hence, because of the epidemic nature of B19V circulation and the potential that it may be an unrecognised cause of serious disease, there has been raised interest in B19V seroprevalence worldwide.

B19V seroprevalence was measured in several countries around the world. In Australia the seroprevalence ranged from 38% (0-19 years) to 76% (40+ years) [24]. In Northern America the seroprevalence rates were 58% and 70% in USA[25] and in Canada[26] respectively. In Europe however, the seroprevalence was ranging from 38% to 81%[27-37]. In southern America the seroprevalence were 43% in Brazil[38], 10% in Chile[39] and 46.6% in Venezuela[40]. In African countries the seroprevalence were 58% in Malawi[41], (56-91%) in Eritrea[42] and 25% in South Africa[43]. In Asia the seroprevalence was ranging from 20% to 66.5%[44-51]. While in Arabic countries the seroprevalence was 65% in Tunisia[29] and 17% (<16 years) in Kuwait[52]. Differences of B19V seroprevalence between countries are unlikely to be explained by collection during epidemic or inter-epidemic years, but may be due to the sensitivity of the assays used[24], as well as differences in the ages of those sampled.

Data about seroprevalence of B19V in Saudi Arabia is limited. The only study about B19V seroprevalence in Saudi Arabia was done by Al-Frayh *et al*[53] in 1993. In his study Al-Frayh *et al*[53] screened 517 healthy people aged 2-40 years for the presence of B19V -specific IgG. He concluded that the prevalence of antibodies to B19V (anti- B19V IgG) in Saudi Arabia is low (overall prevalence 19.0%) and he also indicated that Saudis begin to be exposed to B19V early in life and that prevalence of exposure increases with age in both sexes.

In our study a total of 364 blood (serum) samples were collected from healthy volunteer blood donors, pregnant women and paediatric patients in Makkah and Jeddah cities of Saudi Arabia from different hospitals and laboratories. Sera were tested for the presence of IgG antibody to B19V using a commercial enzyme immuno sorbent assay (ELISA) NovaTEC.

The recombinant NovaTEC B19V IgG-ELISA is intended for the qualitative determination of IgG class antibodies against B19V in human serum. It offers increased diagnostic specificity and sensitivity by employing the highly purified antigens VP-1S, VP-C, and VP-N.

During acute infection with B19V, specific antibodies to VP1, VP2 and NS1 are produced. These antibodies recognise both linear and conformational epitopes of the capsid proteins. However, several reports[22;54;55;56] indicated that B19V specific IgG antibodies recognising linear epitopes disappear about 6 months after infection, leaving only circulating antibodies that recognise conformational epitopes. Soderlund *et al*[54]reported that antibodies towards the linear epitopes of VP2 disappear rapidly during late convalescence while those towards conformational VP2 epitopes persist.

Consequently, the nature of the viral antigens used in the B19V serological assay is a significant variable to consider in evaluating analytical test performance.

Capture enzyme immunoassay using native or recombinant antigens are good choices for measuring B19V immunoglobulin[54;55] Systems employing either *Escherichia coli*-expressed or baculovirus-expressed B19V antigens or both in mixture have been described[57]. The baculovirus-based expression vectors always produces conformational antigens. While not all expressed *E.coli* antigens produce linear epitopes, the one expressing B19V -specific antigens does[58]. Capture Enzyme Immunoassays using native or baculovirus recombinant antigens are the best methods[22.]

In the present study the overall seroprevalence of B19V in this region of Saudi Arabia was found to be 48%. This was significantly higher than the Al-Frayh *et al*[53] finding of 19.0% (p value = 0.0001). This might be explained by the notable increase in the Saudi population in the last 12 years (Saudi Arabian population increased from 12 million in 1993 to 26 million in 2007). In addition, there were some variables between our study and the Al-Frayh *et al*[53] study; in our study we screened 364 individuals aged 1 day-57 years from various patient groups (blood donors, paediatric patients and pregnant women) from the western region of Saudi Arabia (Makkah and Jeddah cites) using a commercial enzyme immunoassay (EIA) NovaTEC (Immundiagnostica GmbH, Germany, Distributor: DiaSorin). While Al-Al-Frayh *et al*[53] screened 517 healthy individuals aged 2-40 years using indirect enzyme-linked immunosorbent assay (ELISA) (Parvoscan-B19, Ferring Diagnostica, Sweden) from the middle region of Saudi Arabia (Riyadh city).

However, our finding indicated that B19V is not commonly circulating in the Saudi community in comparison to some other countries around the world such as USA[25] (60%), Canada[26] (70%), Spain[34] (65%), Tunisia[29] (65%), Sweden[30] (81%) and Malawi[41] (58%).

B19V causes a childhood illness known as Erythema Infectiosum (Fifth disease) [6;7], children are exposed to B19V infection early in life 4-10 years of age[17]. Out of the 36 children included in this study for B19V specific IgG, only 5 were positive (13.9%). This is in accordance with a study from neighbouring Kuwait Alsaeid *et al*[52] where the B19V seroprevalence in 218 children (<16 years) was found to be 17%. In our study also, the B19V seroprevalence increased gradually from 11% at 0-5 years to 13.9% at 6-16 years. This suggests that infection principally occurs during the school years in Saudi Arabia.This interpretation is supported by a study by Valeur-Jensen *et al* from Denmark[28] which concluded that the highest risk of B19V infection is associated with having school-aged children in the house and that the susceptibility to B19V infection increases with the number of children.

B19V is recognised as a major contaminant of blood and blood products[59]. In addition, because the virus is resistant to different inactivation methods, most final blood products that contain B19V DNA are potentially infectious[60]. Seroconversion was observed in volunteers receiving SD-treated pooled plasma containing high titres of B19V DNA[61]. The Food and Drug Association (FDA) recommend testing plasma pools by PCR and discarding those with a B19 viral load of >104 genome equivalent /ml[62]. One aim of this study was to measure the seroprevalence of B19V in blood donors in Saudi Arabia, out of 146 blood donors' serum samples tested in our study,

78 were positive for B19V IgG (53.4%). However, this prevalence was slightly lower than the B19 seroprevalence in blood donors in Western countries such as Belgium (74%)[29], Italy (79.1%)[32] and Spain (65%)[34], while it was in accordance with the B19V seroprevalence in blood donors in Asian countries such as India (50%)[50] and Japan (45% in 26-40 years)[44]. Our study indicated that almost half of donors in Saudi Arabia have had contact with B19V and have recovered; such individuals are probably immune.

B19V infection in pregnant women can, but usually does not, lead to fetal infection[10]. Prospective studies have estimated that foetal transmission occurs in approximately 33% of pregnant women infected with B19V [63]. Foetal infection sometimes causes severe anaemia, leading to congestive heart failure, generalised oedema (foetal hydrops), and death[64]. The risk of foetal death attributable to acute B19V infection during pregnancy is estimated to be less than 10%, ranging from 3 to 38% in different studies[65]. Several studies had looked for the B19V seroprevalence in pregnant women, in a study done by Valeur-Jensen *et al* in Denmark[28] he found that 65% of 30,946 pregnant women tested were immune for B19V. These findings were similar to those of another study by Ziyaeyan *et al*[51], carried out in Iran where the prevalence of B19V in 184 pregnant women tested was 69%. However, in Russia[66] the B19V seroprevalence in 182 pregnant women tested was slightly higher (75.3%).
In our study, Out of 182 serum samples from pregnant women tested, 91 were positive for B19V IgG (50%). Again this figure is lower than other reports from Iran[51], Denmark[28] and Russia[66] where the B19V seroprevalence in pregnant women found to be 69%, 65% and 75.3% respectively. This may be explained by low sample size, but indicates at least half of Saudi women of childbearing age are

immune to B19V. The risk of B19V infection during pregnancy is likely to depend on country of residence[24].

Although the seroconversion during pregnancy was not tested in the present study, the outcome of maternal infection with B19V depends on gestational age at which the maternal infection occurs. A total of 49.1% (83/169) and 53.8% (7/13) of B19V seronegative women in this study are at the first and second trimester of gestation respectively. Therefore, those B19V seronegative women are at a potential risk of fetal loss or hydrops fetalis as it was found that a significant B19V-associated risk of hydrops fetalis and/or fetal death is mainly restricted to maternal B19V infection between 9 and 20 weeks of gestation. In light of the potential adverse outcomes associated with B19V infection in seronegative Saudi pregnant women, control of the possible perinatal transmission of this virus should be considered. This could perhaps be achieved by screening all Saudi pregnant women for B19V using prenatal serological tests and applying preventive measures such as the passive immunisation of susceptible pregnant women after exposure to B19V with the commercially available intravenous parvovirus IgG antibodies. However, a full cost benefit analysis would be required.

Furthermore, where subjects sampled from different sources were compared by age group, there were no significant differences in the prevalence of immunity to B19V. For instance, the prevalence of immunity was similar in the 26- to 30-year-old blood donors and pregnant women of the same age (50% versus 50.8%, $p = 0.85$) and amongst the 31- to 35-year-old blood donors and pregnant women (63% versus 64%, $p = 0.9$). There was no difference in the prevalence of immunity by sex in any age

group. By the age of 21- to 30 years, half of the people in this sample were immune to B19V infection. Seroconversion continued to occur up to the age of 45 years when the level of immunity appeared to plateau at approximately 66% - to - 80%.

In conclusion, the total B19V seroprevalence in Saudi Arabia was 48% distributed as follows: 11% in children < 5 years, 13.9% in paediatrics ≤ 16 years, 51.5% in adults > 16 years, 53.4% in blood donors and 50% in pregnant women. The amount of anti-B19V IgG was not statistically significantly different between gender ($p = 0.9$). However, our results have shown that, as reported for other countries[45;47;49;50], anti-B19V IgG increases in an age-dependent manner, the prevalence increased significantly from 11% at 0-5 years to 51.5% in those > 16 year ($p = 0.0002$). In addition, the prevalence increased significantly from 13.9% at ≤ 16 year to 51.5% in those > 16 year ($p = 0.0001$), which indicated that the exposure to the B19V increases with age.

This seroprevalence study indicated that almost half the population in Saudi Arabia showed exposure to B19V. The exposure as indicated by IgG positivity is seen to increase with age. The IgG negative individuals may be considered at risk of developing infection due to B19V.

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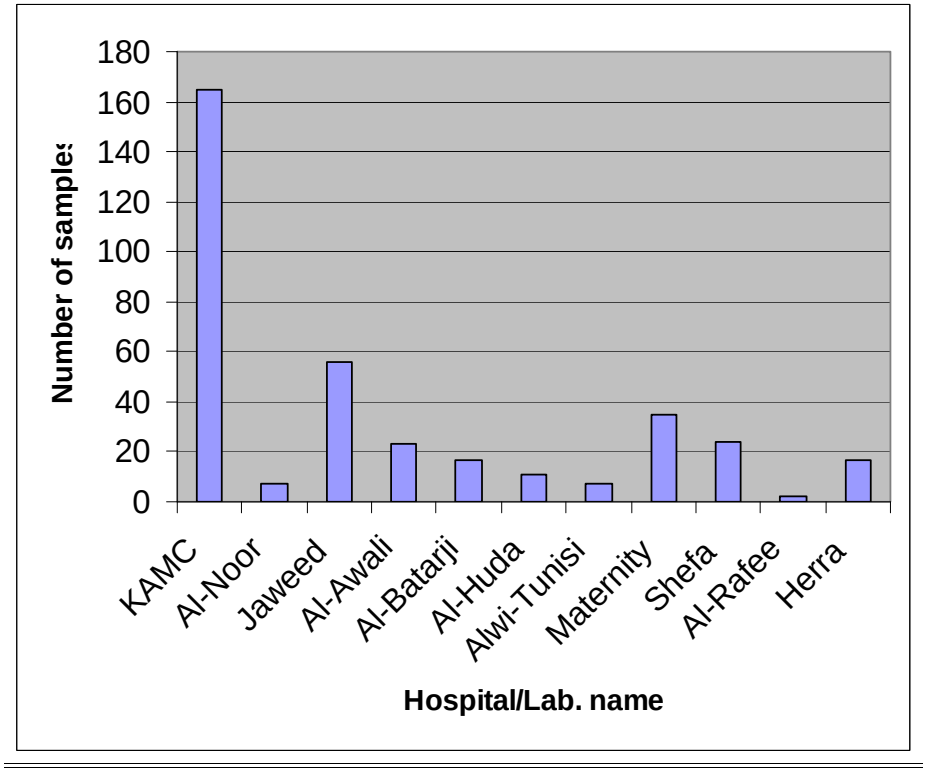

Figure **1** Distribution of numbers of blood samples according to hospitals and laboratories. This figure shows the distribution of numbers of blood samples collected from different hospitals and laboratories in Makkah and Jeddah cities of Saudi Arabia.

Table 1 B19V seroprevalence in Saudi Arabia

Category	+ Ve (%)	- Ve (%)	*E (%)	Total (%)
Blood donors	78 (53.4%)	65 (44.5%)	3 (2.1%)	146 (100%)
Pregnant women	91 (50%)	90 (49%)	1 (1%)	182 (100%)
Paediatric patients	5 (13.9%)	28 (77.8%)	3 (8.3%)	36 (100%)
Total	174 (47.8%)	183 (50.3%)	7 (1.9%)	364(100%)

*E= Equivocal

Table 2 The gestational age of women at risk of infection with B19V during pregnancy

Gestational age (trimester)	+ Ve (%)	- Ve (%)	E (%)	Total
First (1-12 weeks)	85 (50.3%)	83 (49.1%)	1 (0.6%)	169 (92.9%)
Second (13-27 weeks)	6 (46.2%)	7 (53.8%)	0 (0%)	13 (7.1%)
Third (28 weeks - delivery)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	91 (50%)	90 (49.5%)	1 (0.5%)	182 (100%)

Table 3 Age distribution among blood donors, pregnant women and paediatric patients

	Blood donors				Pregnant women				Paediatric patients			
Age (Year)	+ Ve (%)	- Ve (%)	E (%)	Total (%)	+ Ve (%)	- Ve (%)	E (%)	Total (%)	+ Ve (%)	- Ve (%)	E (%)	Total (%)
0-5	-	-	-	-	-	-	-	-	3 (11%)	21 (77.8%)	3 (11.2%)	27 (75%)
6-11	-	-	-	-	-	-	-	-	1 (16.7%)	5 (83.3%)	0 (0%)	6 (16.7%)
12-16	-	-	-	-	-	-	-	-	1 (33.3%)	2 (66.7%)	0 (0%)	3 (8.3%)
17-20	3 (25%)	9 (75%)	-	12 (8.2%)	12 (34.3%)	23 (65.7%)	-	35 (19.2)	-	-	-	-
21-25	22 (55%)	17 (42.5%)	1 (2.5%)	40 (27.4%)	21 (47.7%)	23 (52.3%)	-	44 (24.2)	-	-	-	-
26-30	20 (50%)	20 (50%)	-	40 (27.4%)	30 (50.8%)	28 (47.5%)	1 (1.7%)	59 (32.4)	-	-	-	-
31-35	17 (63%)	10 (27%)	-	27 (18.5%)	16 (64%)	9 (36%)	-	25 (13.7)	-	-	-	-
36-40	10 (71.4%)	3 (21.5%)	1 (7.1%)	14 (9.6%)	10 (62.5%)	6 (37.5%)	-	16 (8.8)	-	-	-	-
41-45	4 (80%)	1 (20%)	-	5 (3.4%)	2 (66.7%)	1 (33.3%)	-	3 (1.7)	-	-	-	-
46-50	1 (20%)	3 (40%)	1 (20%)	5 (3.4%)	-	-	-	-	-	-	-	-
51-55	1 (50%)	1 (50%)	-	2 (1.4%)	-	-	-	-	-	-	-	-
56-60	-	1 (100%)	-	1 (0.7%)	-	-	-	-	-	-	-	-
Total	78 (53.4%)	65 (44.5%)	3 (2.1%)	146 (100%)	91 (50%)	90 (49 %)	1 (1%)	182 (100%)	5 (13.9%)	28 (77.8%)	3 (8.3%)	36 (100%)

Table 4. B19V gender distribution among Saudi individuals

Gender	+ Ve (%)	- Ve (%)	E (%)	Total (%)
Male	82 (47.1%)	79 (43.2%)	4 (57.1%)	165 (45.3%)
Female	92 (52.9%)	104 (56.8%)	3 (42.9)	199 (54.7%)
Total	174 (47.8%)	183(50.3%)	7 (1.9%)	364 (100%)


بسم الله الرحمن الرحيم

Seroprevalence of *erythrovirus* B19 IgG antibody in Makkah and Jeddah cities of Saudi Arabia

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Faculty of Medicine, Umm Al-Qura University, Makkah (Saudi Arabia)

OUTLINE

- Background
- Aims, hypothesis and objectives of the project
- Methodology
- Results
- Summary and Conclusion
- Novel Findings
- Future work and Recommendation

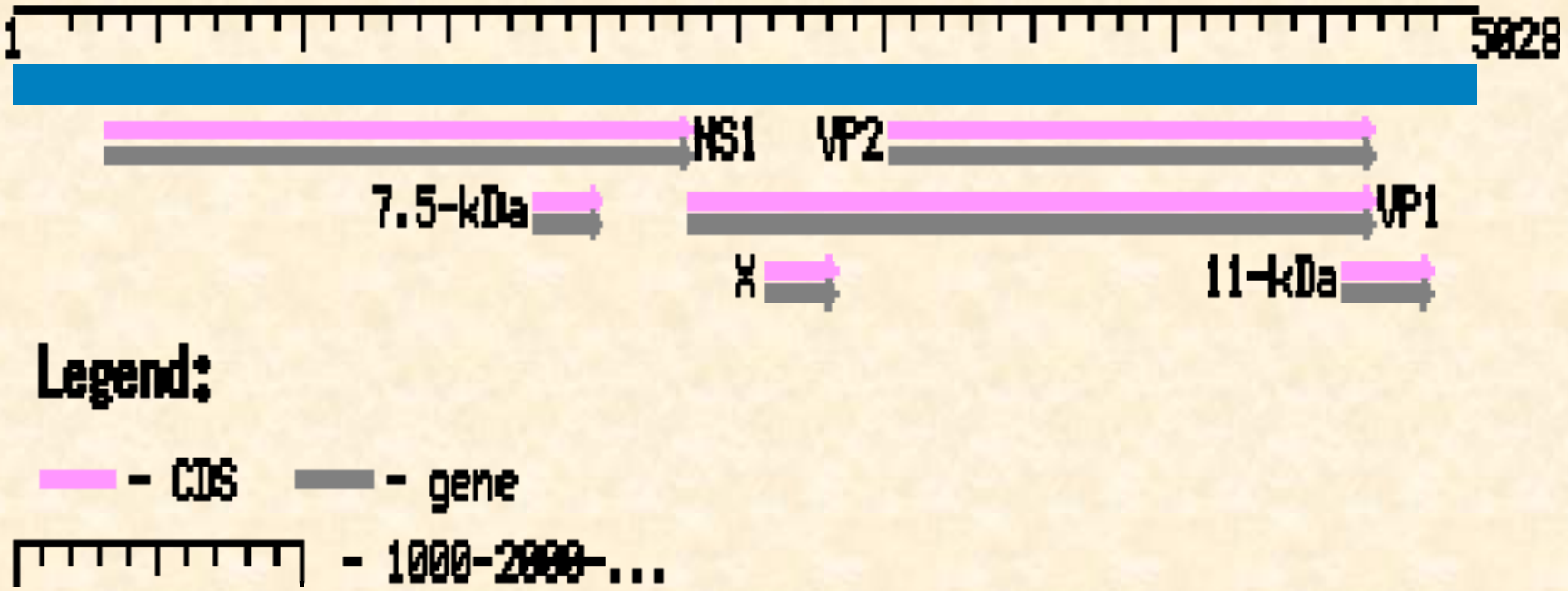
Background

The Virus

• *Erythrovirus* B19 (formerly Parvovirus B19) was discovered in 1974 by Yvonne Cossart.

• B19V is a member of the family *Parvoviridae*.

• Non-enveloped, icosahedral, ssDNA, 24 nm in diameter.



Epidemiology and Transmission

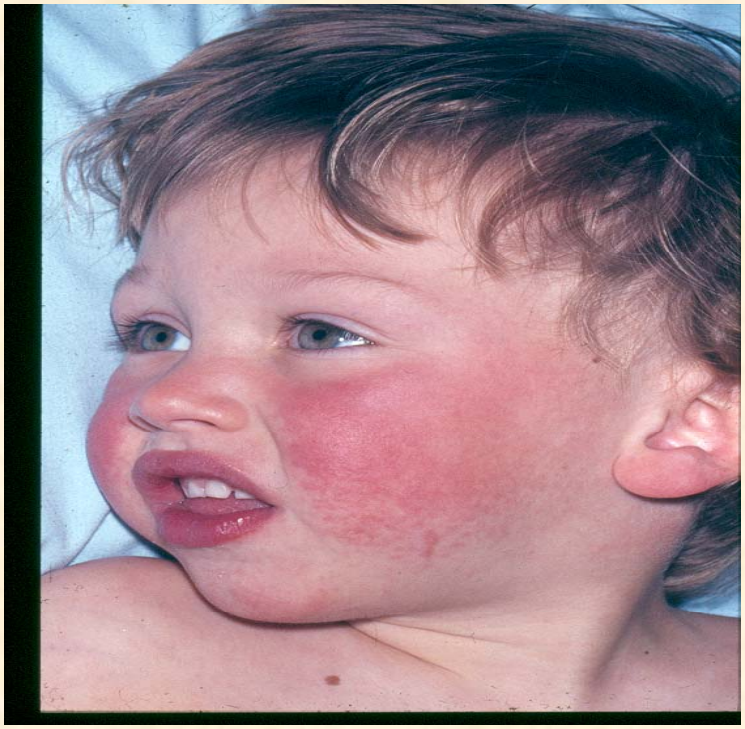
• IgM response 10-14 days after infection and lasts for several months after exposure.

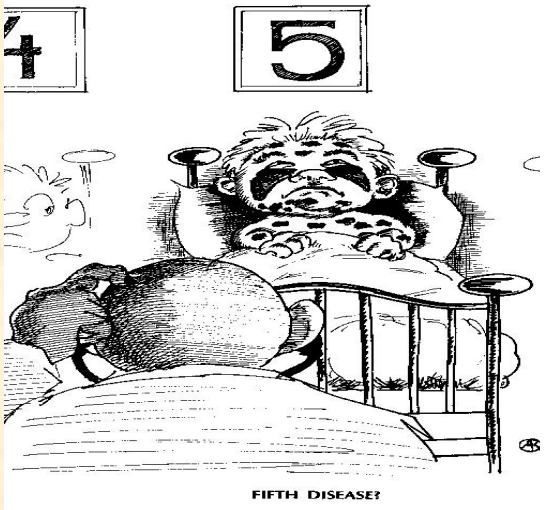
•IgG appears two weeks after infection and lasts for life.

• Transmission of B19V infection :

1) Respiratory secretions (close contact).
2) Parenterally by some blood products.
3) Vertically from mother to fetus.
4) Transplantation.

Clinical Syndromes Associated with B19V Infection





• **Commonly associated** and **less commonly associated**

1) Commonly associated:

- Erythema infectiosum (EI)
- Arthropathy
- Aplastic crisis
- B19V infection in pregnancy
- B19V infection in the immunosuppressed

2) Less commonly associated:

- Myocarditis, Hepatitis, Vasculitis and Glomerulonephritis

• Neurological Disease Associated with B19V Infection:

- Encephalitis, Meningitis and Neuropathy

B19V seroprevalence worldwide

• **Seroprevalence of B19V in developed countries is:**

- 2-10% in children < 5 years

- 40-60% in adults < 20 years

- 60% in blood donors

- 85% or more in > 70 years

• **B19V seroprevalence was measured in several countries around the world:**

-In Australia ranged from 38% (0-19 years) to 76% (40+ years).

-In North America: 60% USA and 70% in Canada.

-In Europe range from 38% to 81%.

-In Southern America 43% in Brazil, 10% in Chile and 46.6% in Venezuela.

-In Africa 58% in Malawi, 56-91% in Eritrea and 25% in South Africa.

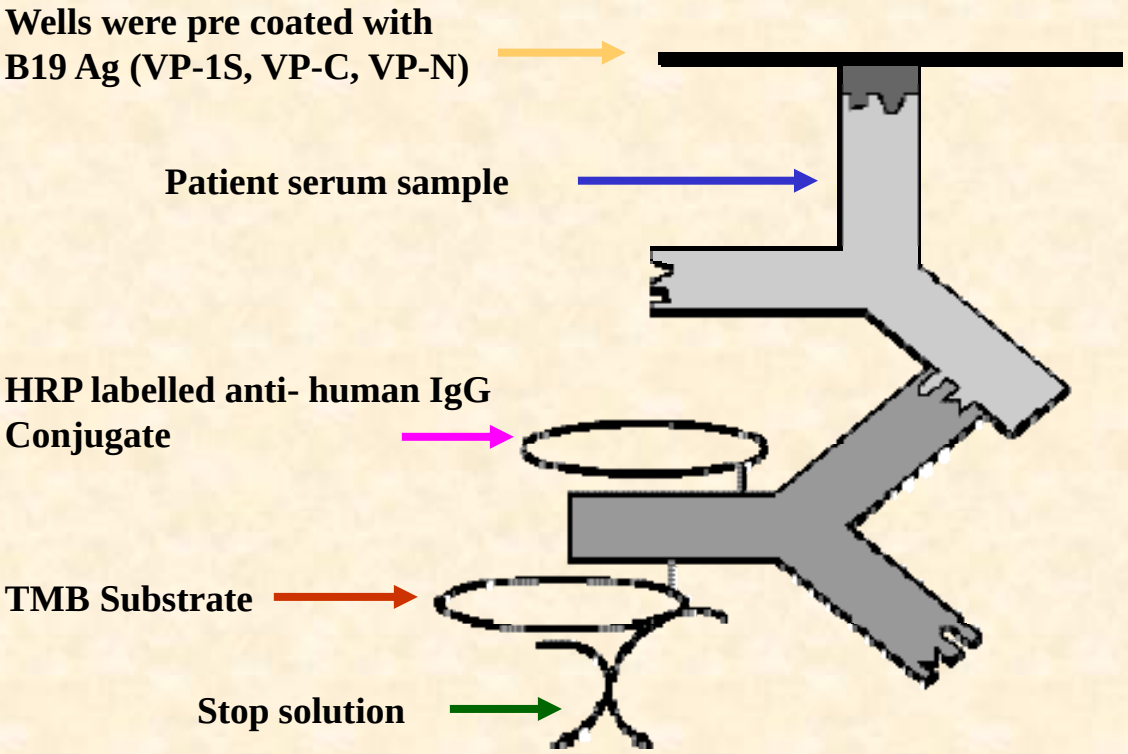
-In Asia the ranged from 20% to 66.5%

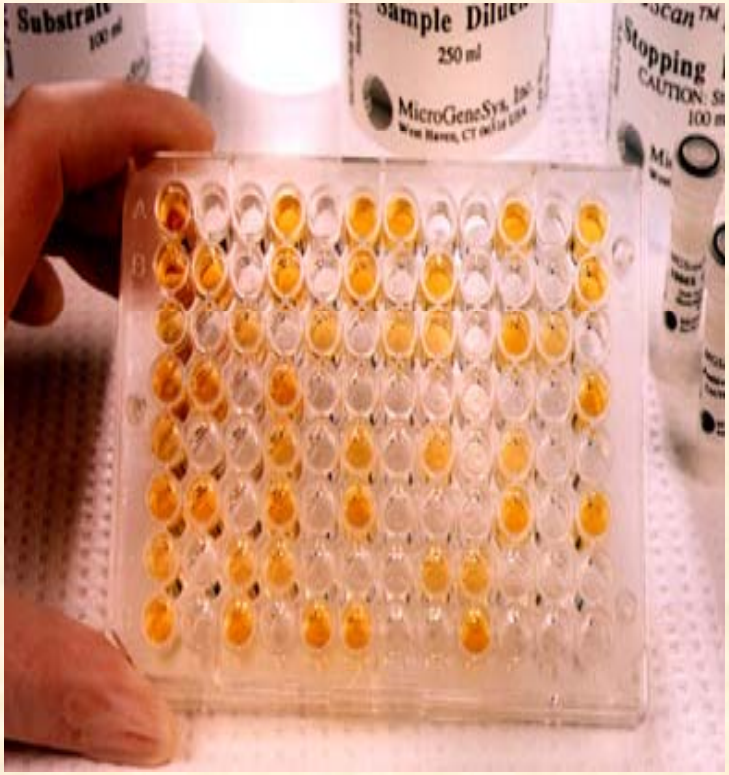
-In Arabic countries 65% in Tunisia, 17% (<16 years) in Kuwait, 48.7% in Jordan

• **In Saudi Arabia** Al-Frayh *et al* in 1993 (Al-Frayh AR, Bahakim H, Kidess E, Ramia S. *J Infect.* 1993 Jul;27(1):51-5) , 517 healthy people (2-40 y) (19.0%)

ELISA

• The most common method used to detect B19V specific antibodies responses is ELISA. This assay contain B19V antigen, which is used to detect the presence of B19V IgG and IgM antibodies in serum.





Aims, hypothesis and objectives of the project

Aims, hypothesis and objectives of the project

• Data on B19V prevalence is limited in Saudi Arabia. Only one study has been carried out to date (Al Frayh et al. 1993) (19.0%).

Hypothesis

-That B19V is commonly circulating in Saudi community in a similar way to that found in most non-temperate countries.

Aims

Principal aim

-Investigate the observed finding of Al Frayh et al. of B19V seroprevalence in Saudi Arabia and to determine whether the B19V seroprevalence in Saudi Arabia is low in comparison to other countries.

Investigative aims

-To carry out immunological analysis of serum samples from blood donors, pregnant women and pediatric patients for B19V specific IgG Ab.

- To determine if the B19V seroprevalence in Saudi Arabia is affected by age and gender.

-To compare B19V seroprevalence in Saudi Arabia with other countries worldwide.

Objectives

1) Collect Blood (serum) samples from blood donors, pregnant women and pediatric patients from Makkah and Jeddah cities of Saudi Arabia.

2) Test for the presence of B19V specific IgG Ab in blood (serum) samples using a sensitive ELISA kit.

3) Statistical analysis of B19V seroprevalence results from Saudi Arabia.

4) Review literatures about B19V seroprevalence worldwide and compare our findings with them

Methodology

Cohorts of the Study

(1)

Healthy volunteer blood donors

(146)

(2)

Pregnant women

(182)

(3)

Paediatric patients

(36)

Methods

Specimen

- Blood (serum)

ELISA

- Sera tested for B19V-IgG (NovaTEC)

Data Analysis

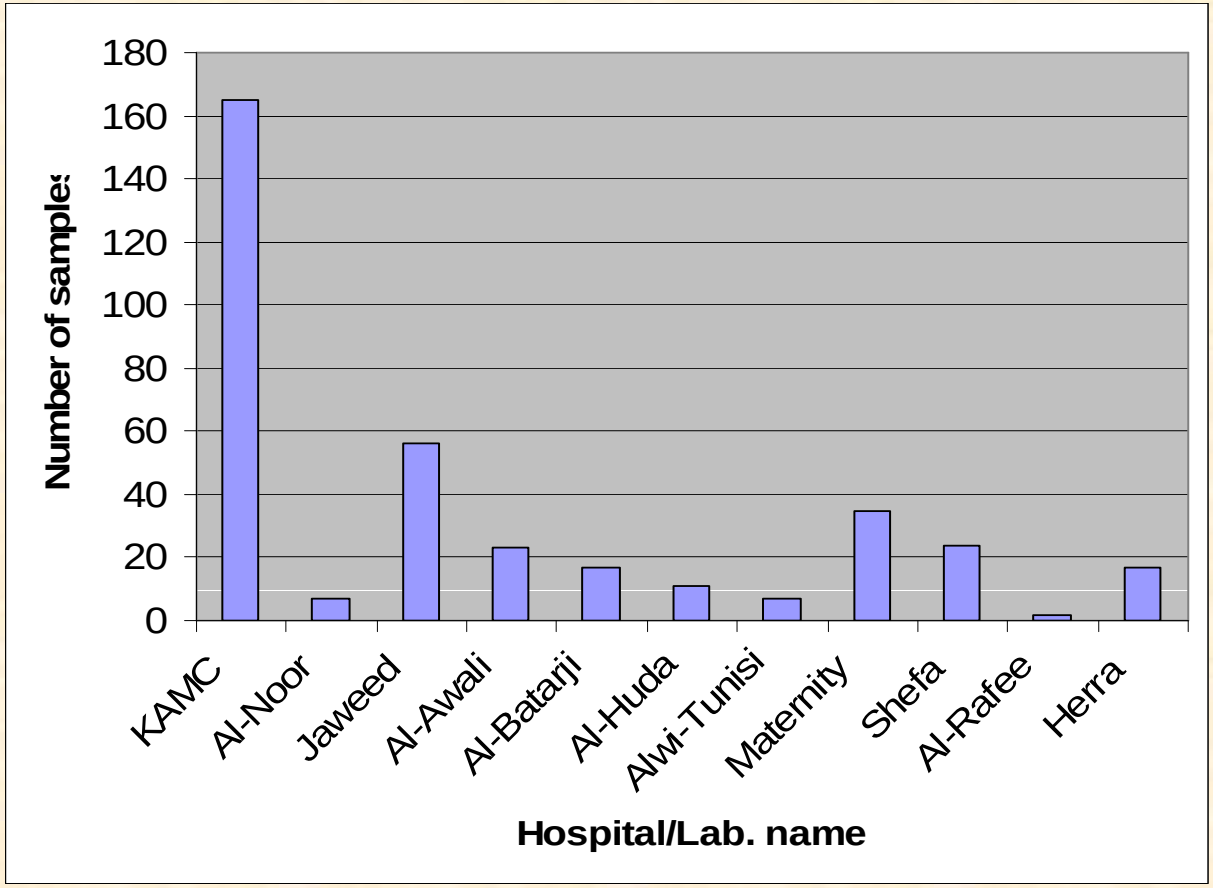
- Seroprevalence results of B19V in SA was statistically analysed (mean, median, Sd, range and p value, and distributed according to age and gender differences)

RESULTS

Results

Samples description

• **364** samples (mean= 25.6 y, median= 26 y, Sd = 9.7 y, age range= 1 week-57 year) were collected from **BD** (**146**) age 17- 57 year, **pregnant women** (**182**) age 18-43 year **paediatric patients** (**36**) age 1 week-16 years from different hospitals and laboratories



Total B19V seroprevalence in Saudi Arabia

Results

B19V seroprevalence in Saudi Arabia

Category	+ve (%)	-ve (%)	E (%)	Total (%)
Blood donors	78 (53.4%)	65 (44.5%)	3 (2.1%)	146 (100%)
Pregnant women	91 (50%)	90 (49%)	1 (1%)	182 (100%)
Pediatric patients	5 (13.9%)	28 (77.8%)	3 (8.3%)	36 (100%)
Total (%)	174 (47.8%)	183 (50.3%)	7 (1.9%)	364 (100%)

E= Equivocal

Results

The gestational age of women at risk of infection with B19V during pregnancy

Gestational age (trimester)	+ve (%)	-ve (%)	E (%)	Total (%)
First (1-12 weeks)	85 (50.3%)	83 (49.1%)	1 (0.6%)	169 (92.9%)
Second (13-27 weeks)	6 (46.2%)	7 (53.8%)	0 (0%)	13 (7.1%)
Third (28-delivery)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	91 (50%)	90 (49.5%)	1 (0.5%)	182 (100%)

B19V seroprevalence with regard to age distribution

Results

Age distribution among blood donors

Age (Y)	+ve (%)	-ve (%)	E (%)	Total (%)
17-20	3 (25%)	9(75%)	0 (0%)	12 (8.2%)
21-25	22 (55%)	17(47.5%)	1 (2.5%)	40 (27.4%)
26-30	20 (50%)	20(50%)	0 (0%)	40 (27.4%)
31-35	17 (63%)	10 (27%)	0 (0%)	27 (18.5%)
36-40	10 (71.4%)	3 (21.5%)	1 (7.1%)	14 (9.6%)
41-45	4 (80%)	1 (20%)	0 (0%)	5 (34%)
46-50	1 (20%)	3 (40%)	1 (20%)	5 (3.4%)
51-55	1 (50%)	1(50%)	0 (0%)	2 (1.4%)
56-60	0 (0%)	1(100%)	0 (0%)	1 (0.74%)
Total (%)	78 (53.4%)	65 (44.5%)	3 (2.1%)	146 (100%)

Results

Age distribution among Saudi pregnant women

Age (Y)	+ve (%)	-ve (%)	E (%)	Total (%)
17-20	12 (34.3%)	23(65.7%)	0 (0%)	35 (19.2%)
21-25	21(47.7%)	23(52.3%)	0 (0%)	44 (24.2%)
26-30	30 (50.8%)	28(47.5%)	1(1.7%)	59 (32.4%)
31-35	16(64%)	9(36%)	0 (0%)	25 (13.7%)
36-40	10 (62.5%)	6 (37.5%)	0 (0%)	16 (8.8%)
41-45	2 (66.7%)	1 (33.3%)	0 (0%)	3 (1.7%)
Total (%)	91 (50%)	90 (49%)	1(1%)	182 (100%)

Results

Age distribution among Saudi pediatric patients

Age	+ve (%)	-ve (%)	E (%)	Total (%)
0-5	3 (11%)	21 (77.8%)	3 (11.2%)	27 (75%)
6-11	1 (16.7%)	5 (83.3%)	0 (0%)	6 (16.7%)
12-16	1 (33.3%)	2 (66.7%)	0 (0%)	3 (8.3%)
Total	5 (13.9%)	28 (77.8%)	3 (8.3%)	36 (100%)

B19V seroprevalence in Saudi Arabia with regard to gender distribution

Results

B19V gender distribution among Saudi individuals

Gender	+ve (%)	-ve (%)	E (%)	Total
M	82 (47.1%)	79 (43.2%)	4 (57.1%)	165 (45.3%)
F	92 (52.9%)	104 (56.8%)	3 (42.9%)	199 (54.7%)
Total	174 (47.8%)	183 (50.3%)	7 (1.9%)	364 (100%)

- The amount of antibody calculated as NovaTec unit between gender (p-value = 0.46)

SUMMARY AND CONCLUSION

SUMMARY

• 364 serum samples from 3 SA cohorts tested for B19Vspecific IgG.

• 174 out of 364 (47.8%)sera were found positive, including 82 (47.1%) males and 92 (52.9%) females.

• The amount of antibody calculated as NovaTec unit was not statistically significant difference between gender (p-value = 0.46).

• B19V specific IgG Ab increases in an age-dependent manner, the prevalence increased significantly from 13.9% at $\leq$ 16 year to 51.5% in those > 16 year (p-value = 0.0001).

CONCLUSION

- This seroprevalence study indicated that almost half of the population in Saudi Arabia showed exposure to B19V.

- No gender differences in B19V seroprevalence were observed.

- The exposure as indicated by IgG positivity was seen to increase with age.

- The IgG negative individuals may be considered at risk of developing infection due to B19V.

NOVEL FINDINGS

NOVEL FINDINGS

This study was the first to:

- Describe that B19V is commonly circulating in Saudi community (Makkah and Jeddah) in a similar way to that found in most non-temperate countries.

FUTURE WORK AND RECOMMENDATIONS

FUTURE WORK AND RECOMMENDATIONS

- Seroprevalence study in different cities and regions around Saudi Arabia is required to confirm that this virus is commonly circulating in the whale Saudi community.

QUESTIONS

IS THERE A BETTER WAY?