# The Decline of Hepatitis B Virus Infection in the Kingdom of Saudi Arabia

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# Agenda….

- Summary of the epidemiology of HBV in Saudi Arabia
- Hepatitis B vaccination: Integration into EPI and initial evaluation
- Assessment of the impact on the prevalence of HBV markers in children
- Changing epidemiology of HBV in unvaccinated adult population
- Ultimate goal: Reduction of HBV –related liver diseases
- Conclusions

# Saudi Arabia .....

**Middle Eastern Country:**
Arabian Peninsula;
on the Red sea

**Population:**
1991 – 10 million
**2001 – 16 million**
> 50% younger than 40y

Homogeneous **culture /religion**

Free health care within a national system

**Economic** status: High GNP

Rapid **Education and Social development**

# Epidemiology of HBV in Saudi Arabia

- HBV is endemic in Saudi Arabia
  - In apparently healthy adults, **7 - 8% are HBsAg "carriers";** At least one marker is positive in **60 -70% of the population**
  - In children: HBsAg **6.7%;** any marker **20%**
- Characteristics
  - Horizontal transmission; Acquisition during early life
  - Regional variations in prevalence of HBsAg in asymptomatic persons
- Chronic HBV infection : a major cause of acute hepatitis, liver cirrhosis and hepatocellular carcinoma [HCC]

# Regional variation in the prevalence of HBV in Saudi Arabia [pooled data from surveys up to 1988]

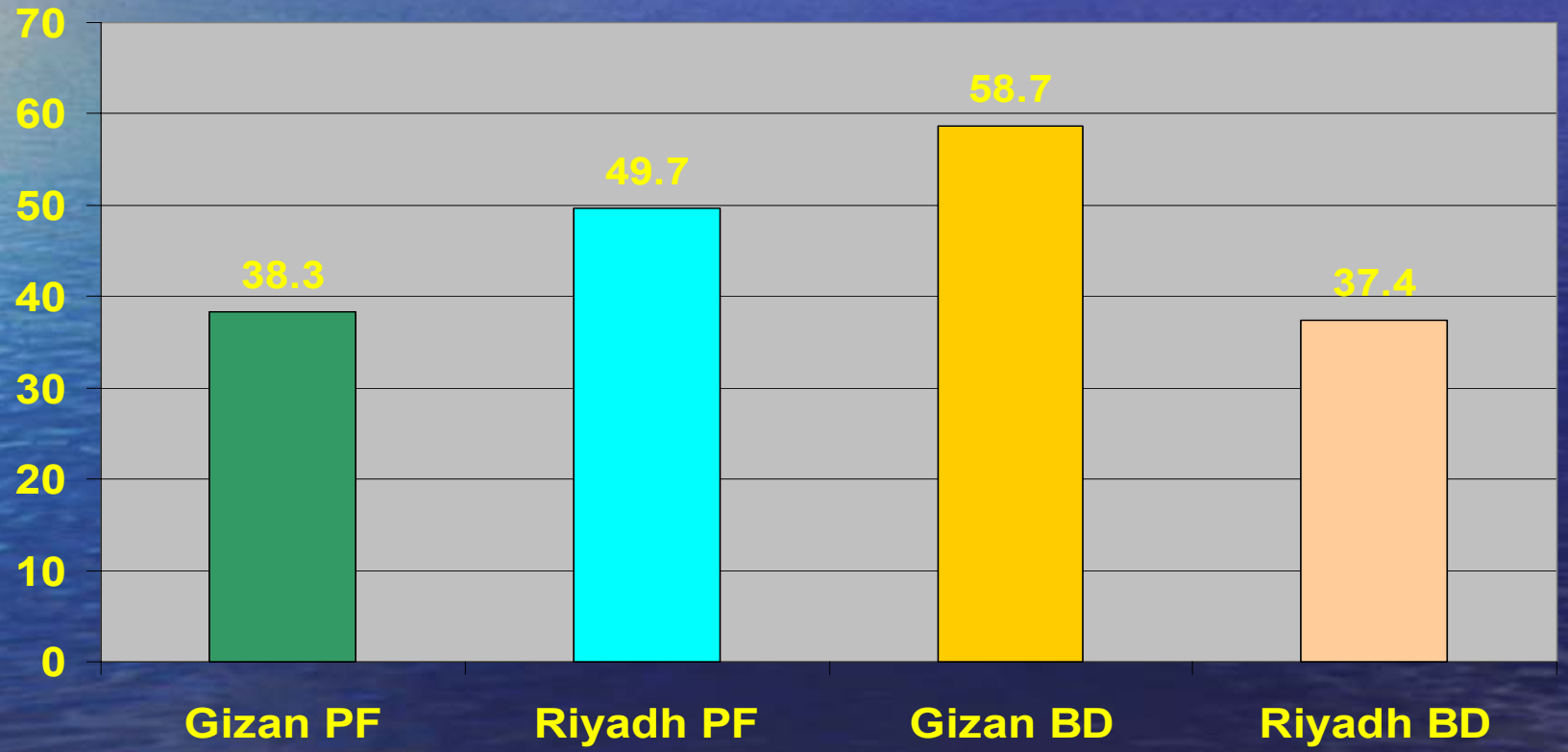
# Regional variation in the prevalence of HBsAg in Saudi Arabia.

| Provinces | Males | | Females | |
|---|---|---|---|---|
| | no tested | % pos | no tested | % pos |
| Central | 2155 | 6.9 | 4494 | 4.1 |
| South west | 1593 | 13.8 | 5642 | 3.9 |
| Eastern | 7838 | 11 | 462 | 8.2 |

[pooled data]*

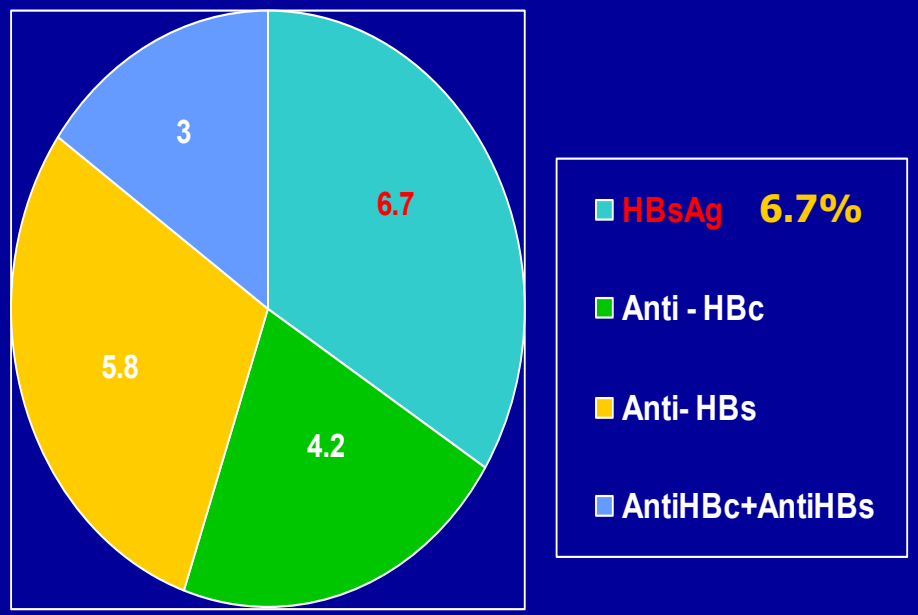
*Faleh 1988

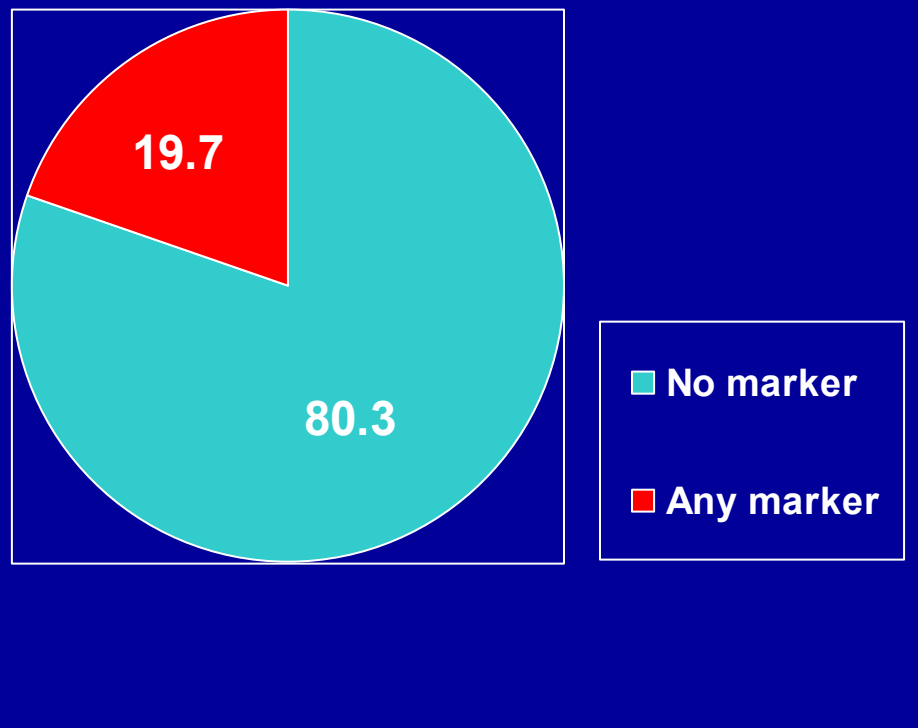
## HBV markers [presence of any marker] in male blood donors [BD] and pregnant females [PF] in the 1980's



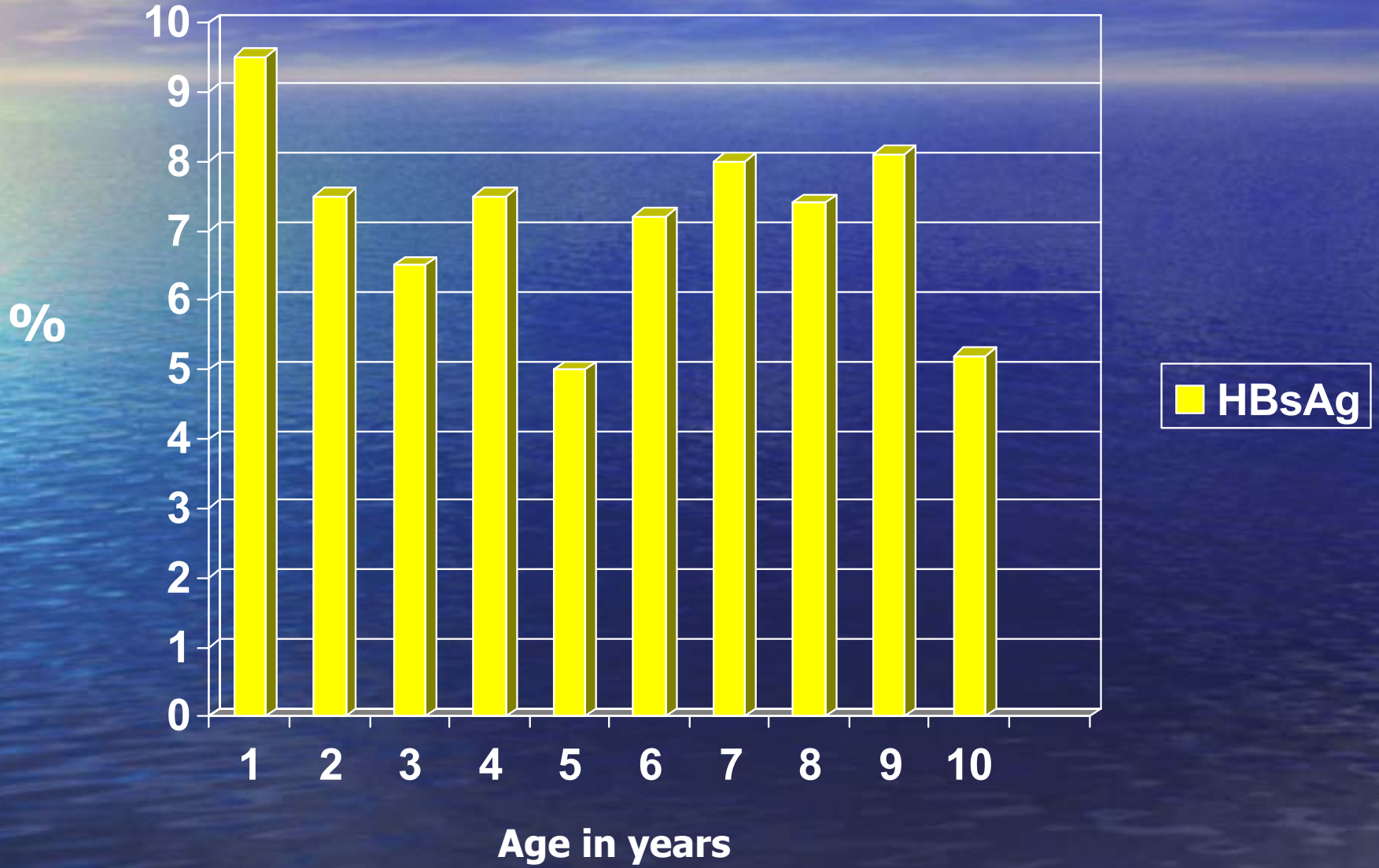
# Base – line; community – based survey in Saudi children [1989]

Cluster sampling of 4575 children [2458 males and 2117 females; age < 10y]
Urban (n = 2225) and Rural (n =2350)

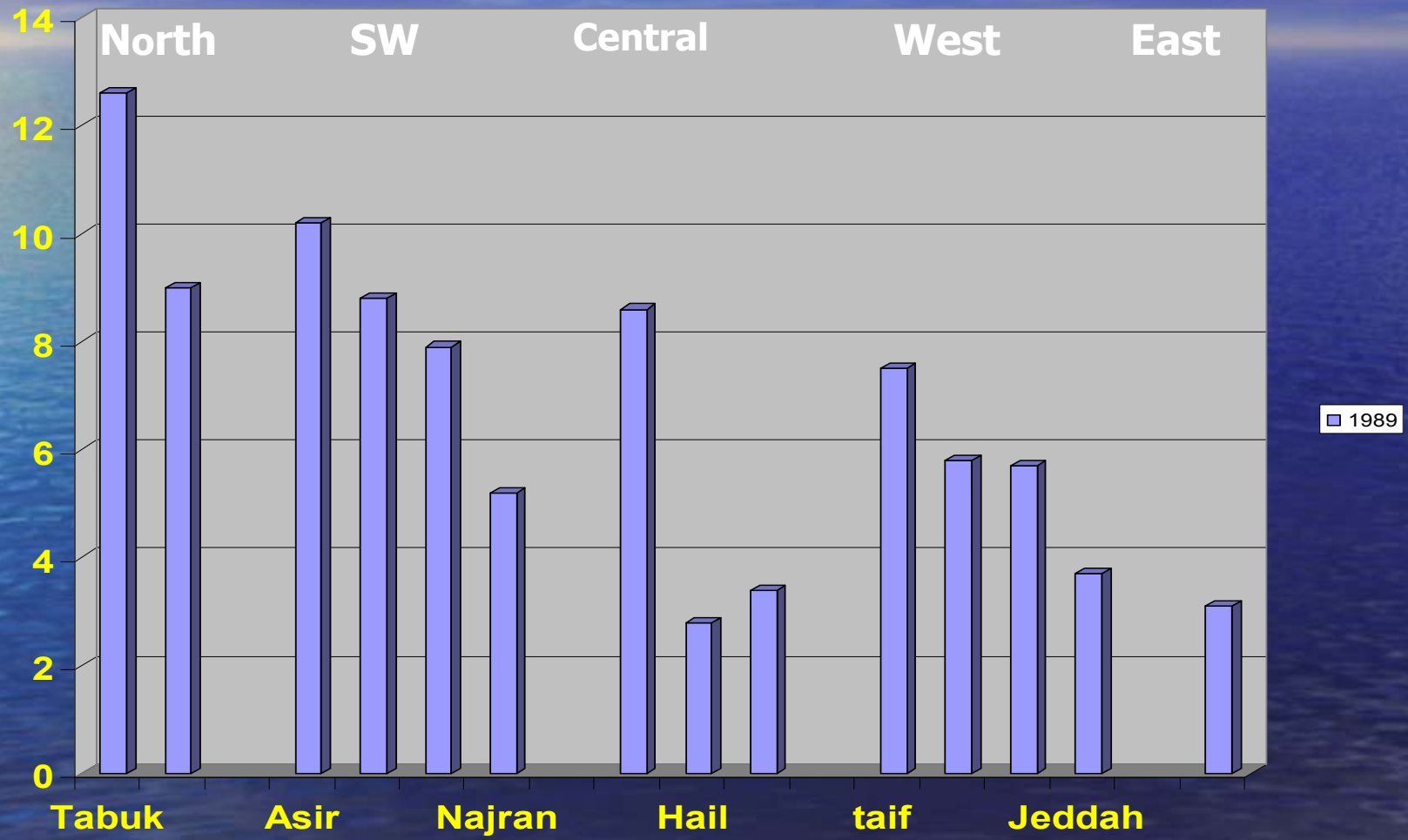


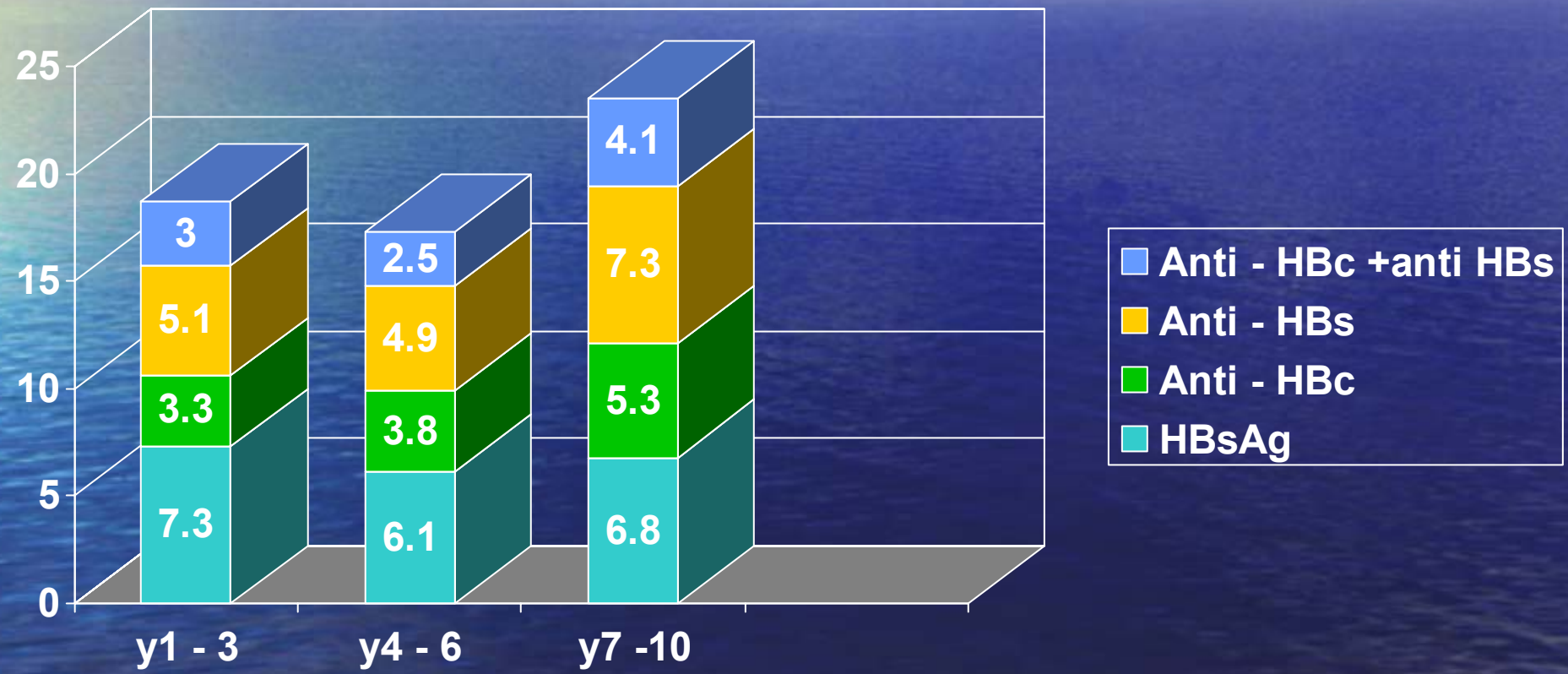
# HBsAg in Saudi children in 1989



# Regional variation in the prevalence of HBsAg among Saudi children [1989]:



# Profile of HBV markers in Saudi children [1989 survey]

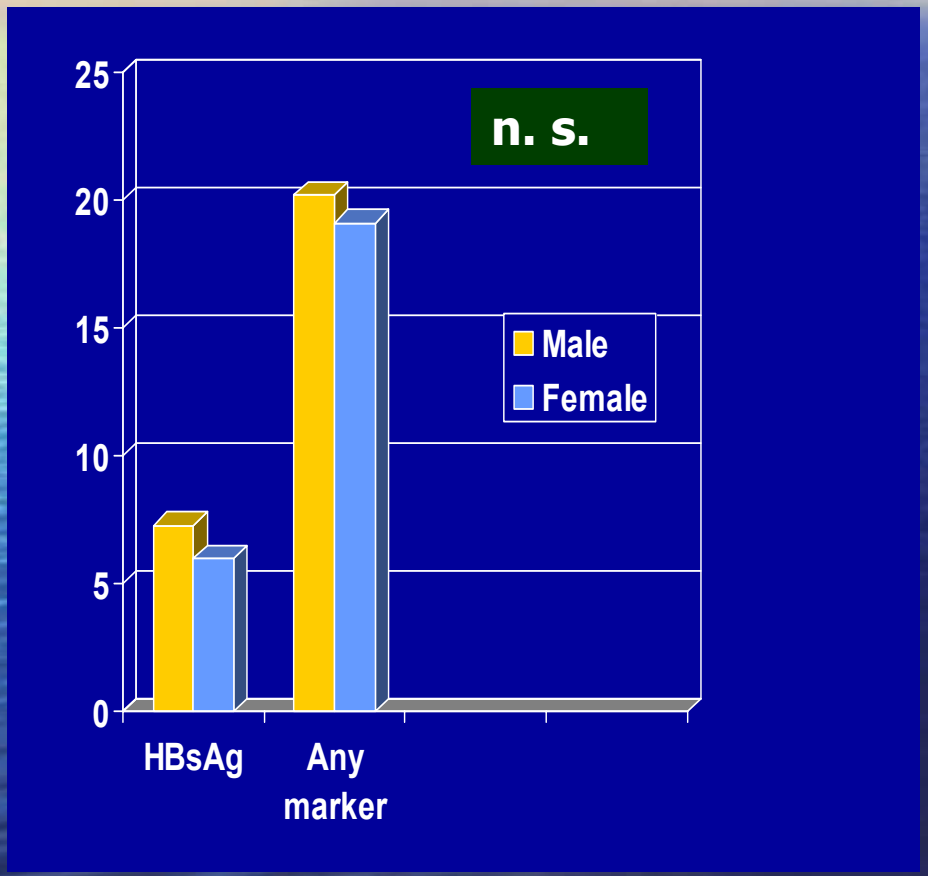


# HBsAg in Saudi children [1989]

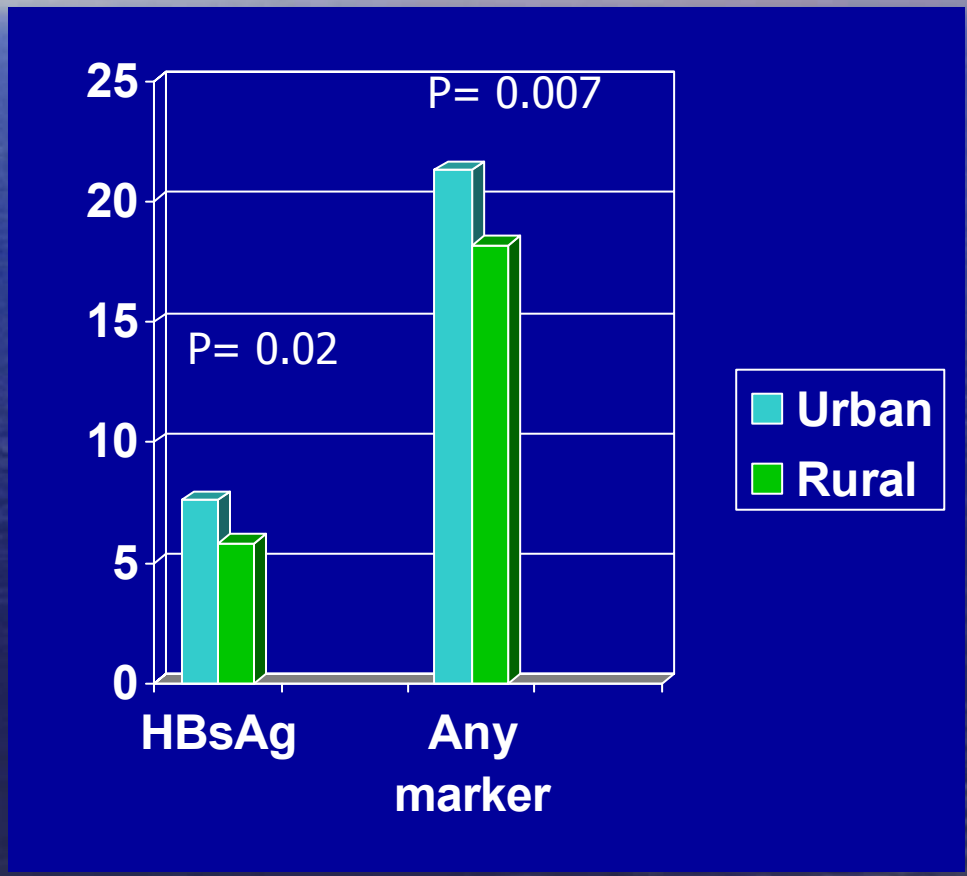
- Socio – economic class
  - Upper [80 of 1071] 7.5%
  - Middle [92 of 1541] 6.0%
  - Lower [133 of 1911] 7.0%
- Family size
  - Small [1 -5] [n = 2102] 6.0%
  - Medium [6 -10] [n = 1983] 7.2%
  - Large [>10] [n = 292] 8.2%

# HBV profile in Saudi children [1989]

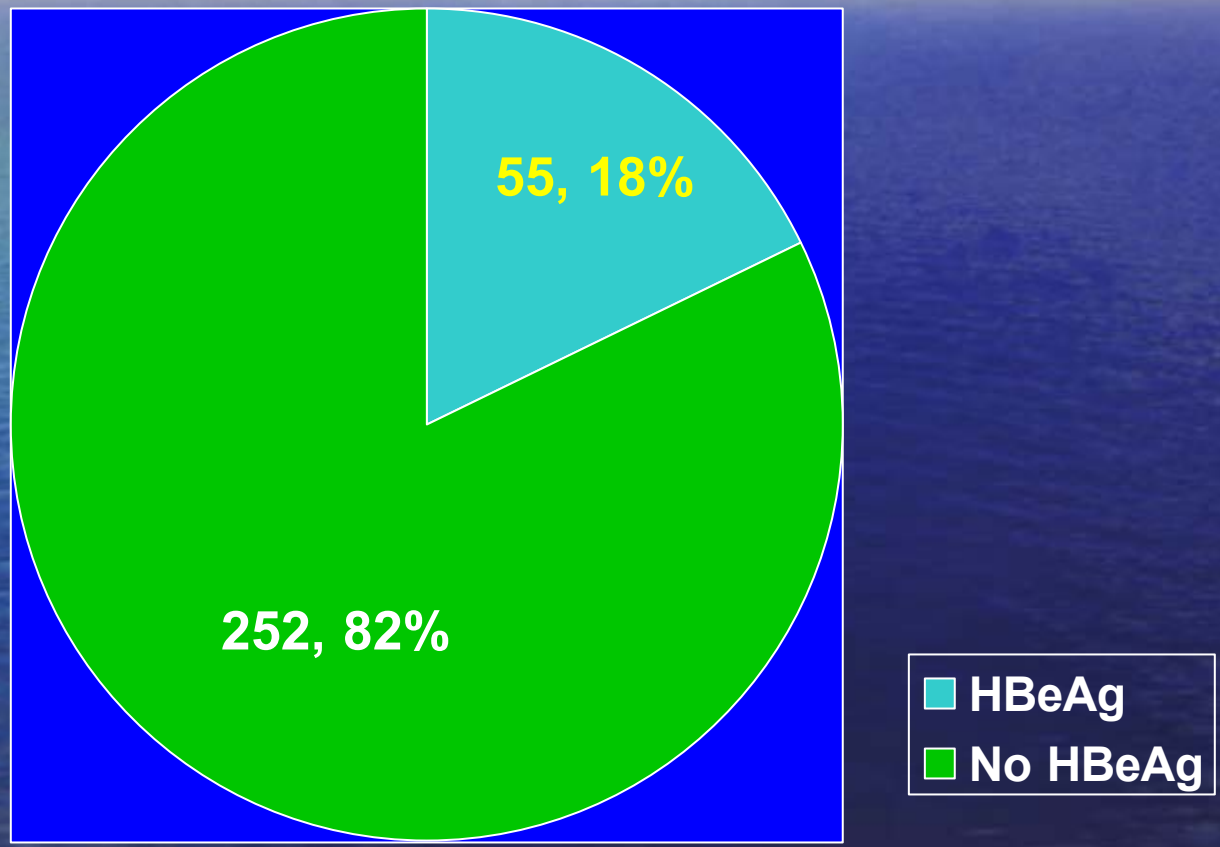
**Gender**




**Residency**



# HBeAg in HBsAg - positive Saudi children : The status in 1989



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# In 1989,HB vaccine was integrated into the EPI [as the 7th immunogen]

The goal of the program

was to reduce the prevalence of chronic HBV infection,
thereby reducing the reservoir of HBV
and cause a decline in the incidence and prevalence of HBV – related diseases

- Mandatory
  - All newborns [0 -1y] 1989
  - Children at school entry[6 -7y] 1990
- Voluntary
  - "Pre –schoolers" [1 -5] 1990/1991
  - Health personnel [adults] 1990
  - Others 1989

All Saudi citizens < 18y should have been vaccinated by the year 2002

# Evaluation of Hepatitis B vaccination program 2 years after the commencement of the program:

- Coverage
  - In the first year [1st dose 90%; 3rd dose 73%]
  - In the second year [1st dose 95%; 3rd dose 90%]

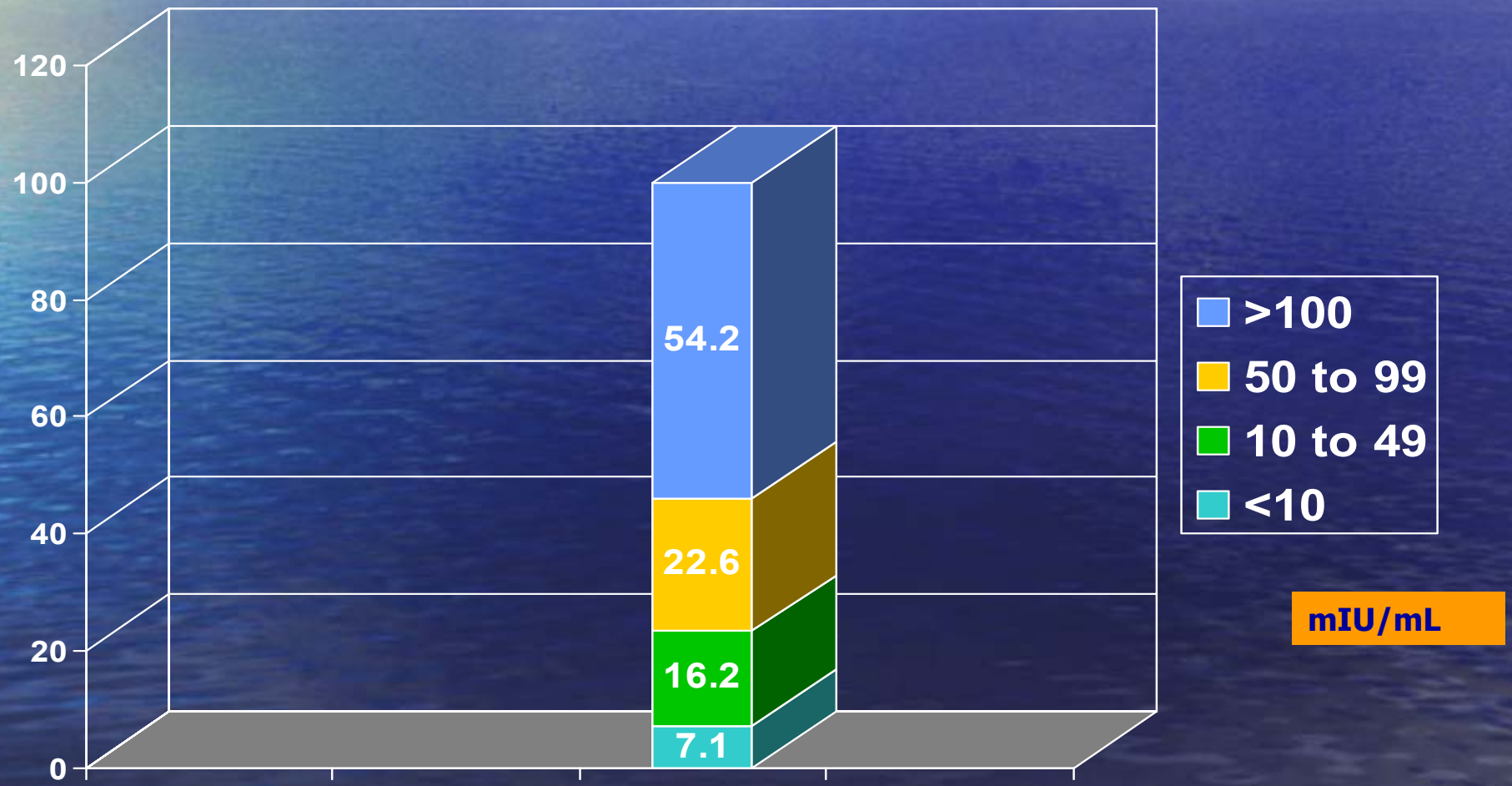
- **Sero -conversion study:**
  - 637 vaccinated children [aged 1 and 2 y] compared with
  - 617 unvaccinated children [similar age group]
  - from 5 regions of different HBV endemicity

  - High [Tabouk, Gizan] Medium [Riyadh] Low [Hail, Gassim]

# Response to Hepatitis B vaccination in Saudi infants

| Regions | No. pos/tested | % anti- HBs positive |
|---|---|---|
| Gizan | 57/64 | 89% |
| Tabouk | 103/106 | 97% |
| Hail | 118/120 | 98% |
| Riyadh | 187/200 | 94% |
| Qassim | 138/147 | 93% |

# Anti HBs in children vaccinated against HBV



# Comparison of the HBV profile between vaccinated and unvaccinated children

| | **Vaccinated** | Unvaccinated |
|---|---|---|
| No tested | 637 | 617 |
| Anti HBs + | **94%** | 5.3% |
| HBsAg + | 0% | **8.3%** |
| Anti HBc + | 0.02% | 3.1% |
| Anti – HBs & anti HBc | 0% | 2.1% |

**Efficacy 99.1%**

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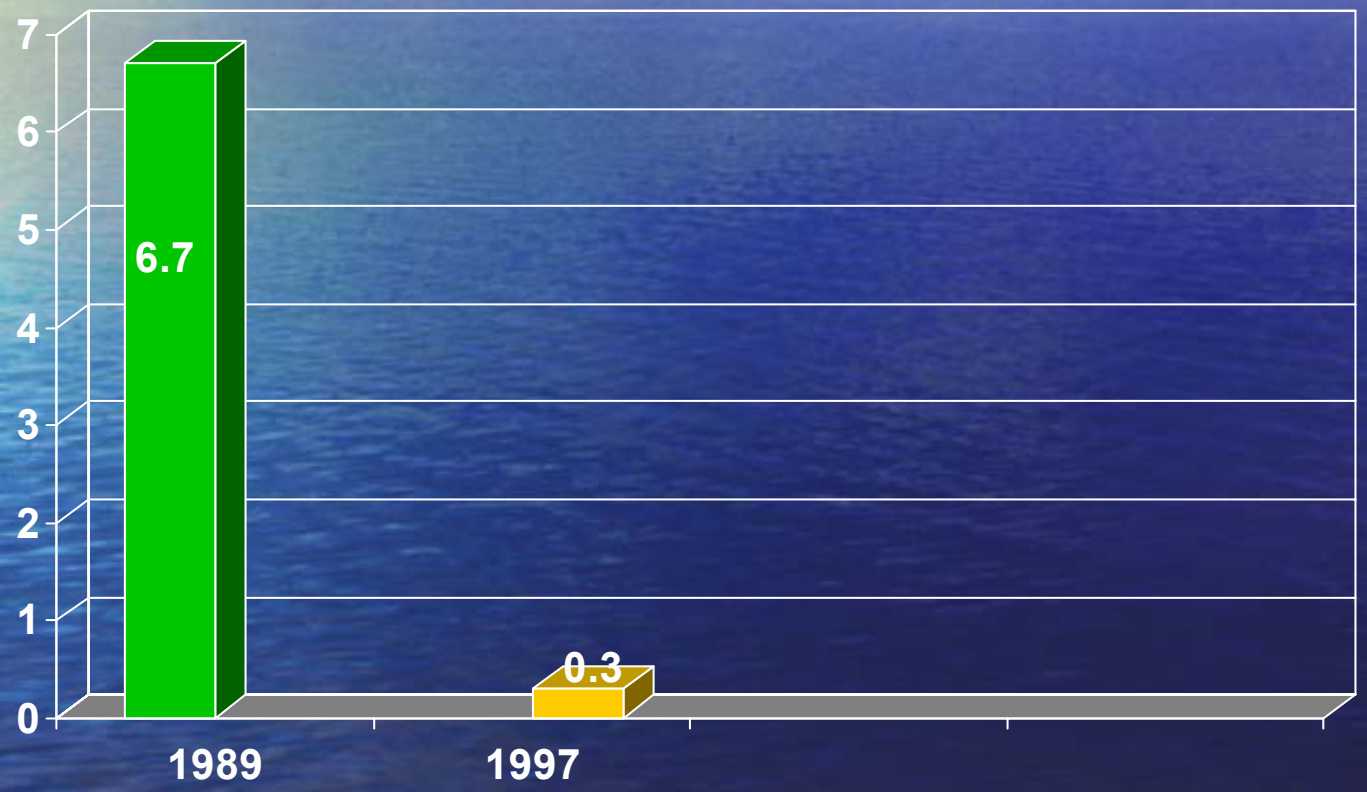
In 1997 a national survey was repeated

….. to determine whether the prevalence of HBV had declined among Saudi children, 8 years after the integration of HB vaccine into the national EPI

No of children = 5355

J Infect 1999; 38: 167

# Prevalence of HBsAg….. 8 years after



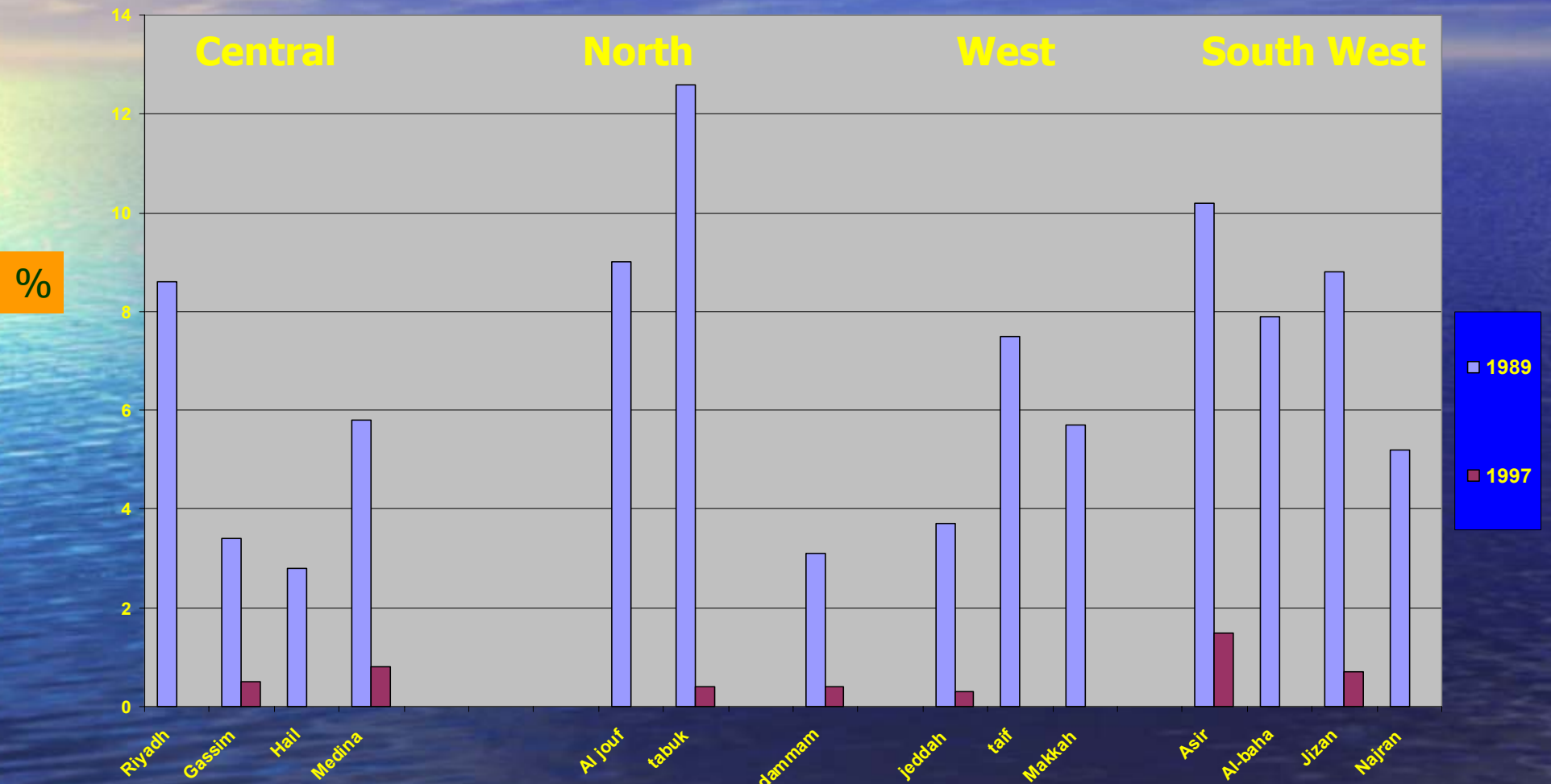

1989 N = 4575

1997 N = 5355

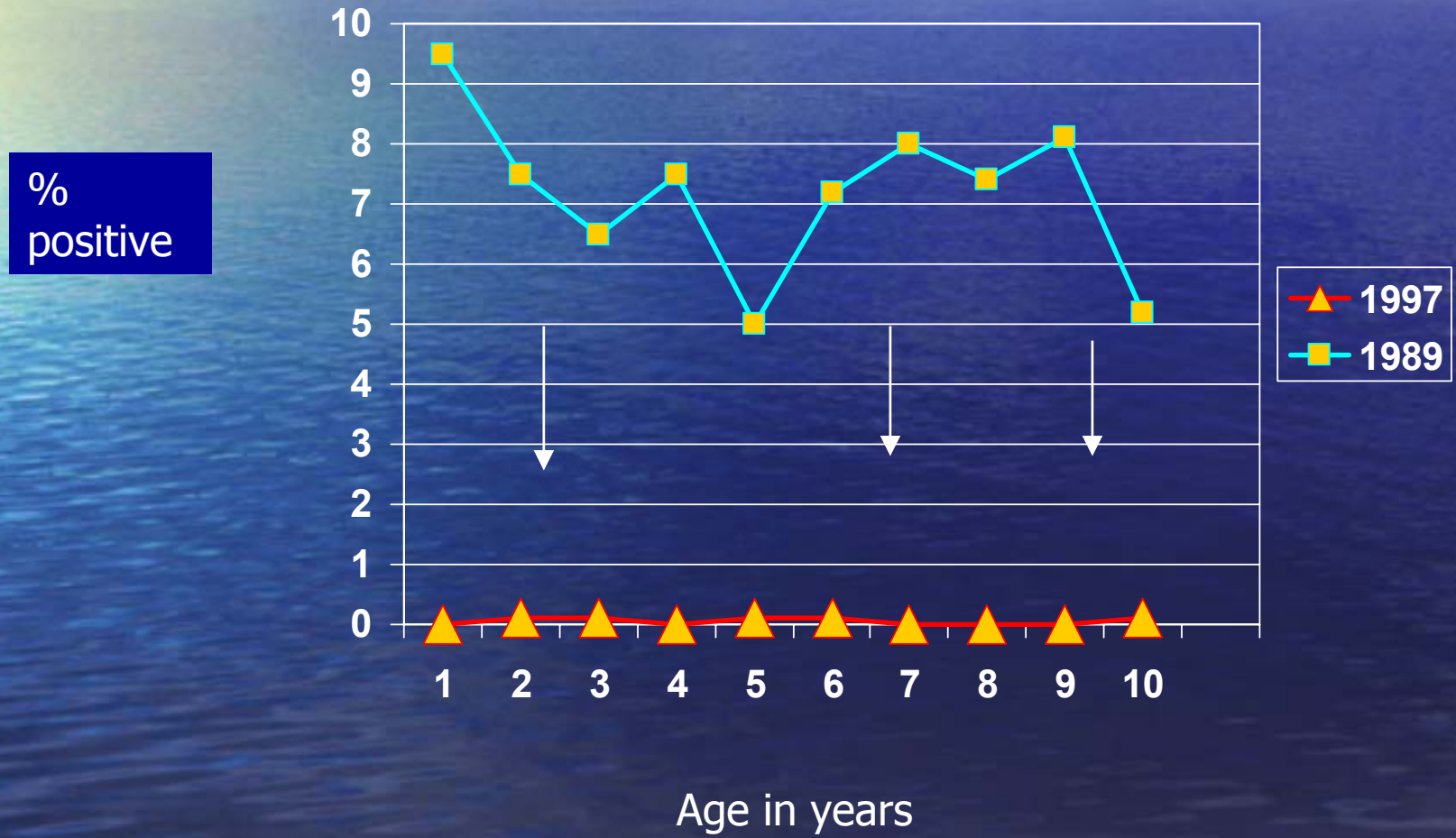
HBsAg prevalence in Saudi children declined in all areas of the country

| | 1989 | 1997 |
|---|---|---|
| Riyadh | 8.6 | 0 |
| Gassim | 3.4 | 0.5 |
| Hail | 2.8 | 0 |
| Medina | 5.8 | 0.8 |
| Mekkah | 5.7 | 0 |
| Asir | 10.2 | 1.5 |
| Al-baha | 7.9 | 0 |
| Jizan | 8.8 | 0.7 |
| Najran | 5.2 | 0 |
| Al jouf | 9 | 0 |
| tabuk | 12.6 | 0.4 |
| dammam | 3.1 | 0.4 |
| jeddah | 3.7 | 0.3 |
| taif | 7.5 | 0 |

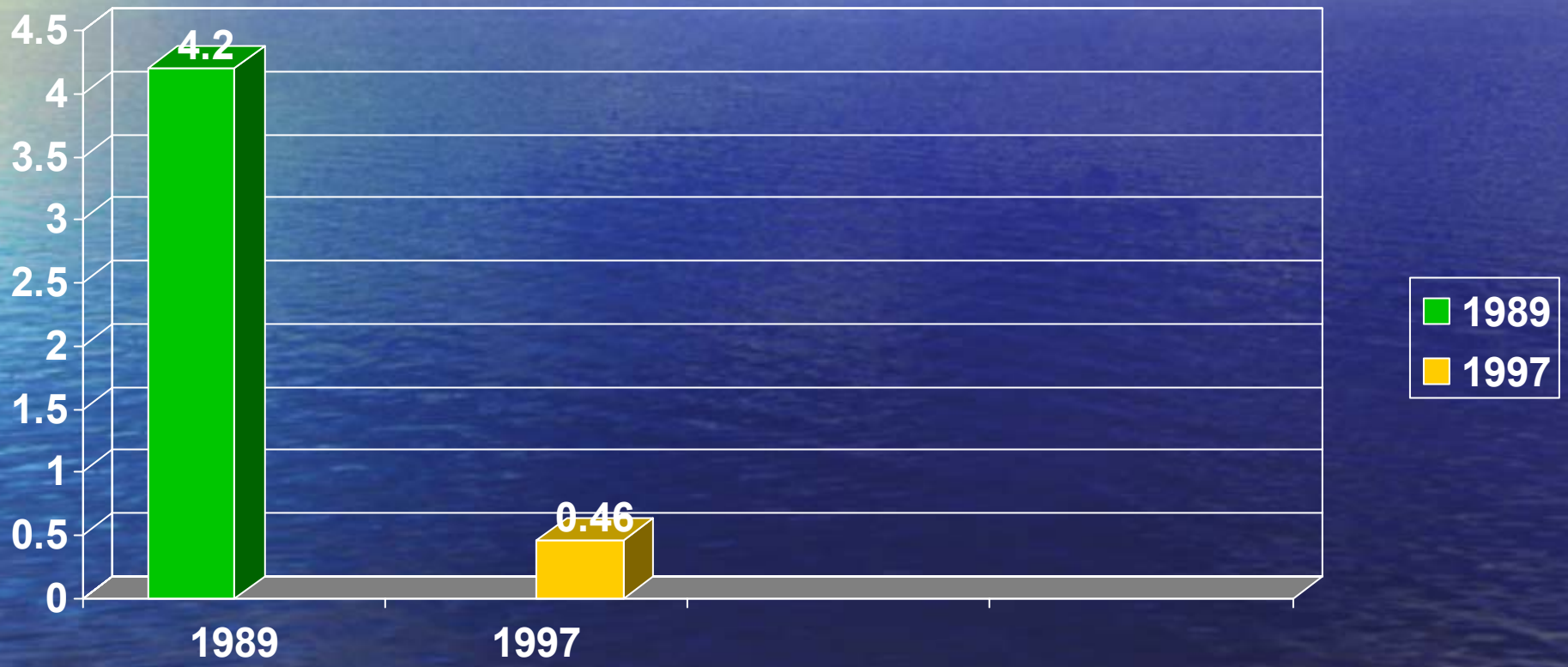
# Decline in the prevalence of HBsAg in Saudi children in different regions



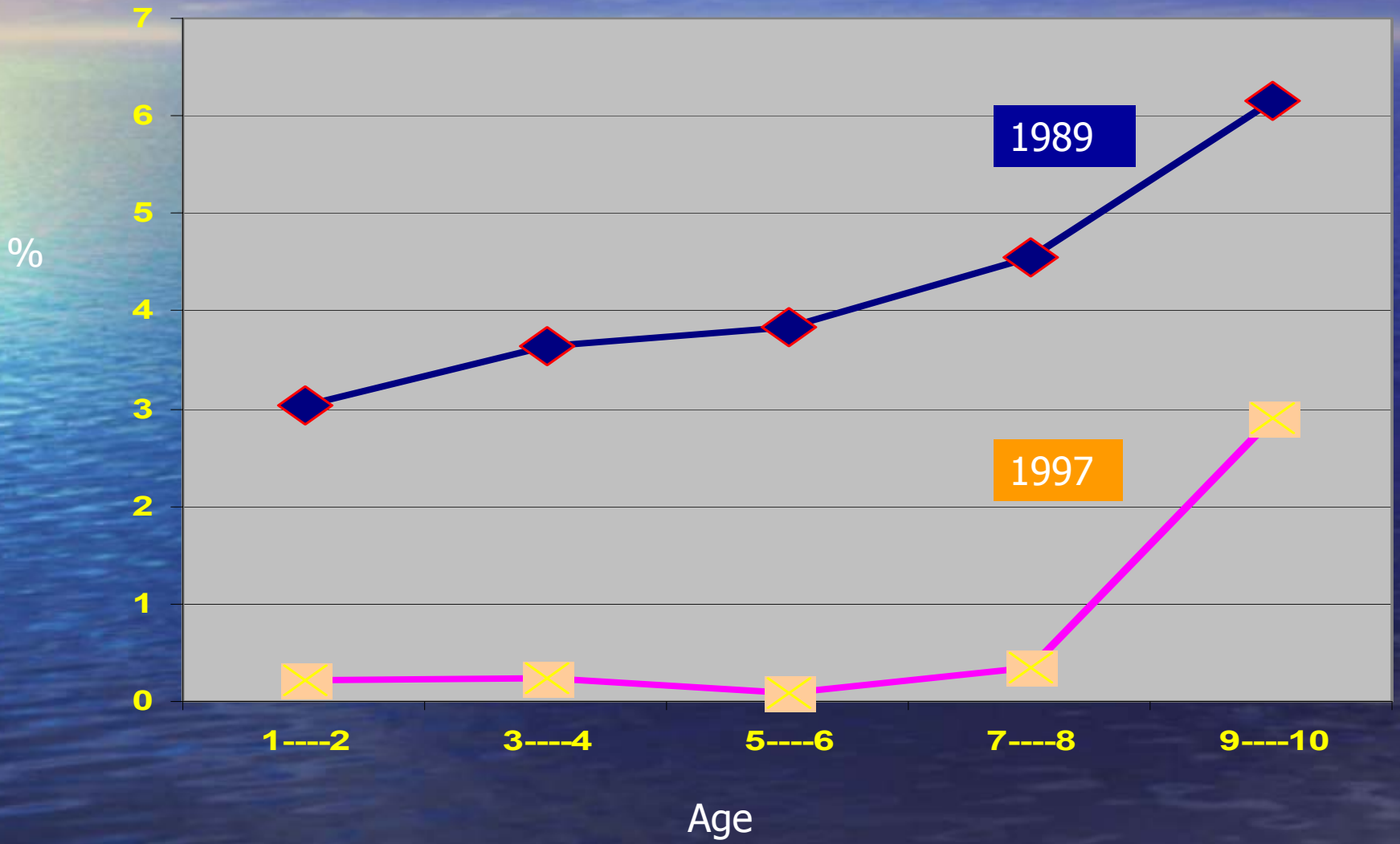
# Age – related prevalence of HBsAg: 1989 vs. 1997



# Decline of anti- HBc among children 8 years after vaccination program



# Decreased prevalence of anti – HBc in children



# What about the other viruses?

- HAV
- HCV

# The decline of HBsAg among children in the South - Western region: 8 years after commencement of HB Vaccination program

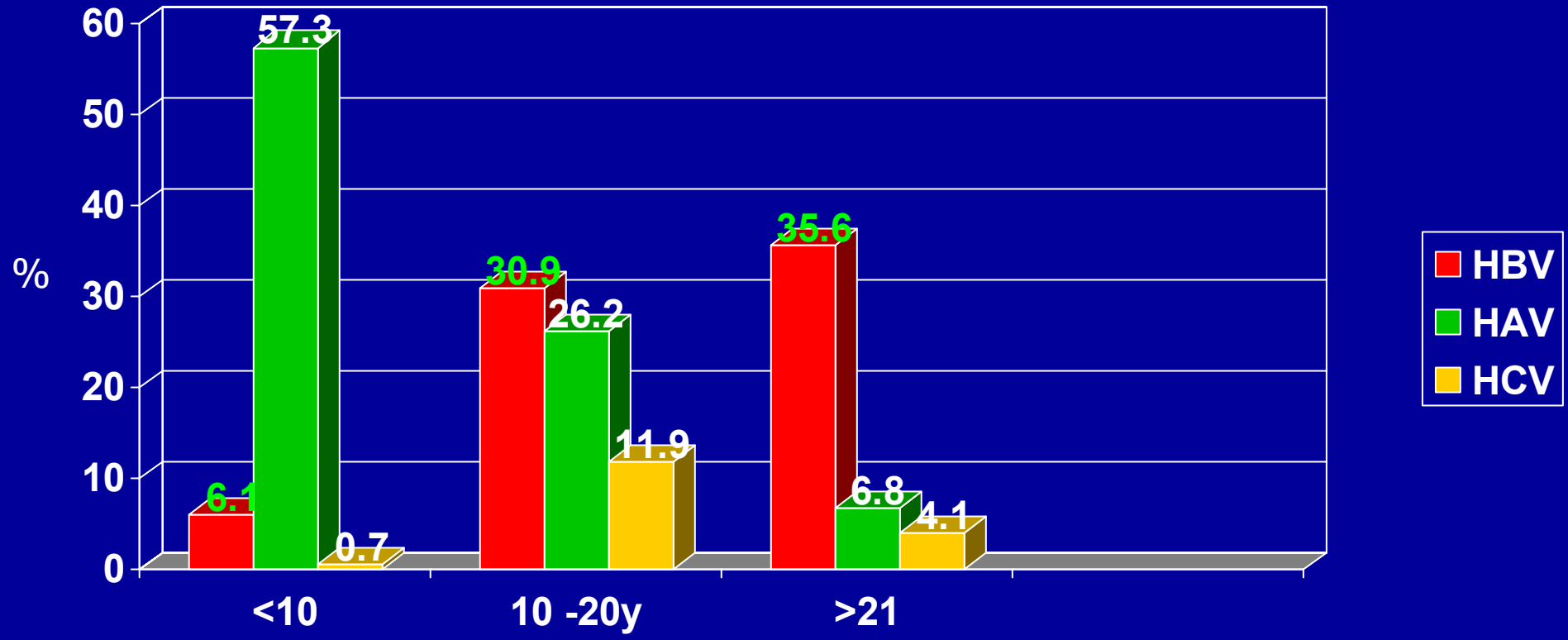
C/f HCV and HAV

| | HBsAg | | Anti - HCV | | Anti - HAV | |
|---|---|---|---|---|---|---|
| | 1989 | 1997 | 1989 | 1997 | 1989 | 1997 |
| Asir | 10.2 | 1.5 | 0.4 | 0 | 44.5 | 19 |
| Al-baha | 7.9 | 0 | 0.7 | 0 | 40.6 | 22.1 |
| Jizan | 8.8 | 0.7 | 5.6 | 0 | 80 | 82 |
| Najran | 5.2 | 0 | 0 | 0 | 79.1 | 50.3 |

# The decline of HBsAg among children in the Central region: 8 years after commencement of HB Vaccination program

| | HBsAg | | Anti - HCV | | Anti - HAV | |
|---|---|---|---|---|---|---|
| | 1989 | 1997 | 1989 | 1997 | 1989 | 1997 |
| Riyadh | 8.6 | 0 | 0.8 | 0.1 | 39 | 16 |
| Gassim | 3.4 | 0.5 | 0 | 0 | 62.7 | 31.6 |
| Hail | 2.8 | 0 | 0 | 0 | 56 | 20.4 |
| Medina | 5.8 | 0.8 | 0 | 0 | 59.5 | 28.2 |

# HBV as a cause of acute hepatitis in children and adults 10 years after universal vaccination [1999]




N = 131

N = 42

N =73

# Successful Integration of HB vaccine into the National EPI

- Strong national policy
- Funds and funding
- Effective EPI system
- "External" monitoring and auditing

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# Trend in Saudi adults: Studies in Gizan, South – Western region

The south – western regions, particularly Gizan Had very high prevalence rates of HBV infection

Cross – sectional studies in 1985 and 1986….. 12% to 32% in "healthy" persons were HBsAg positive.

In 1992 and 1997 we conducted community – based studies with larger number of subjects

# HBV and HCV in Gizan, Saudi Arabia [1992]

## Anti - HCV

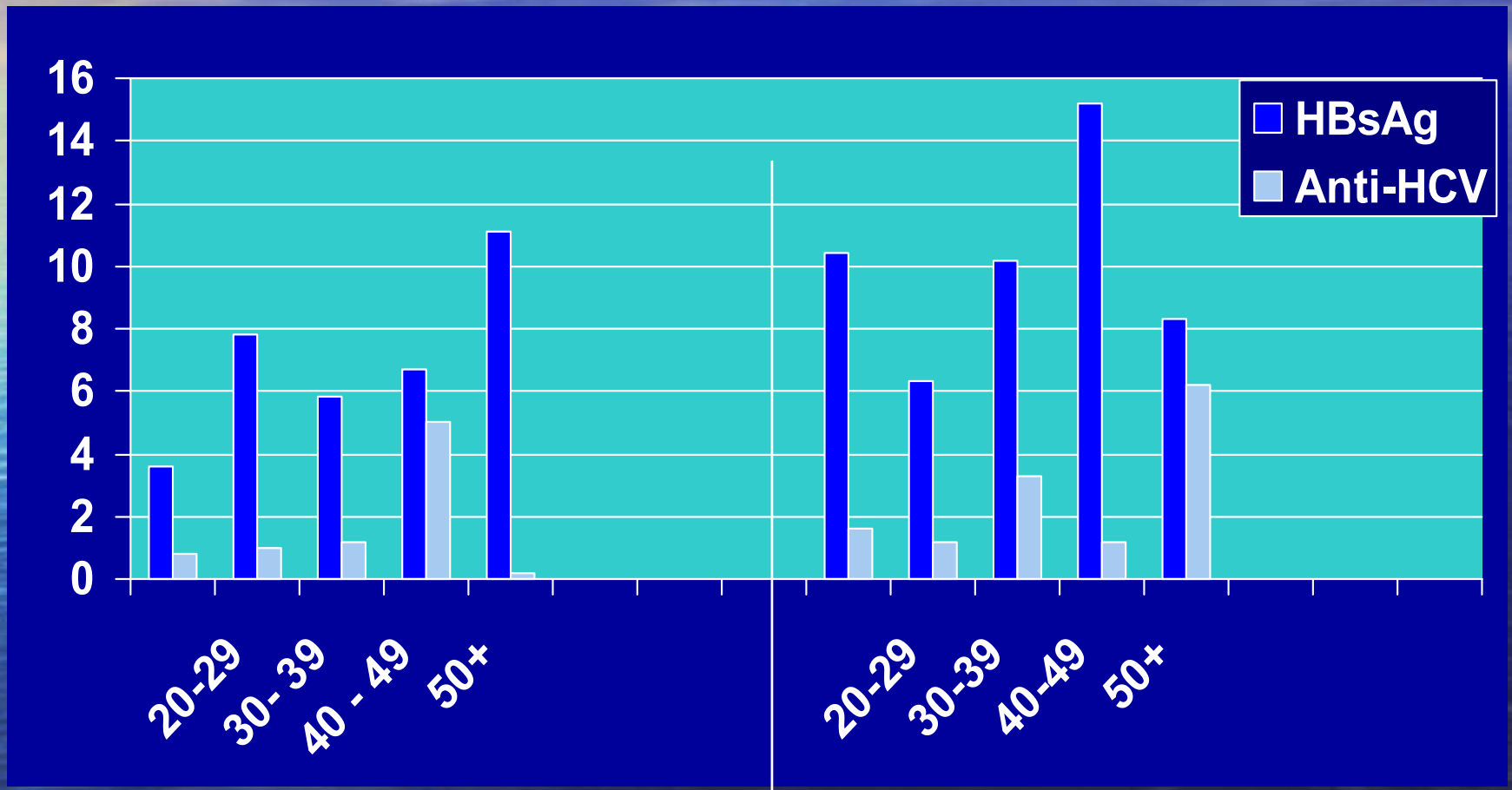
- Males ... 2.3 % [n=705]
- Females 1.4 % [n=777]
- All..... 1.8 % [n=1482]

## HBsAg

- Males ..... 9 .4% [n=371]
- Females ... 6 .1% [n=424]
- All ..... 7 .7% [n=795]

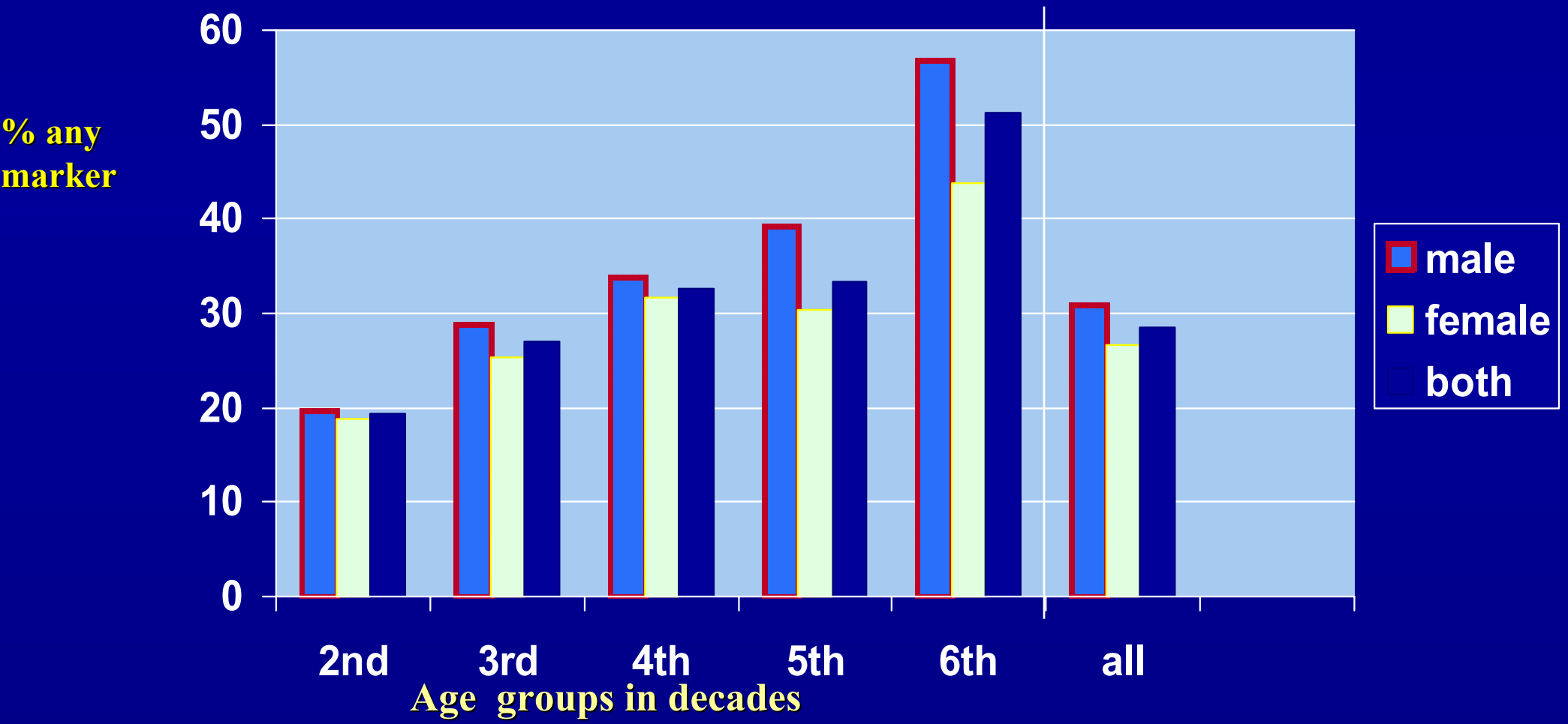
Faleh/Ayoola et al

# Prevalence of HBsAg and anti-HCV among adult populations of the Gizan region of Saudi Arabia [1992]




Faleh..and Ayoola et al

# Prevalence of HBV [any marker] in South - Western Region of Saudi Arabia [1992]

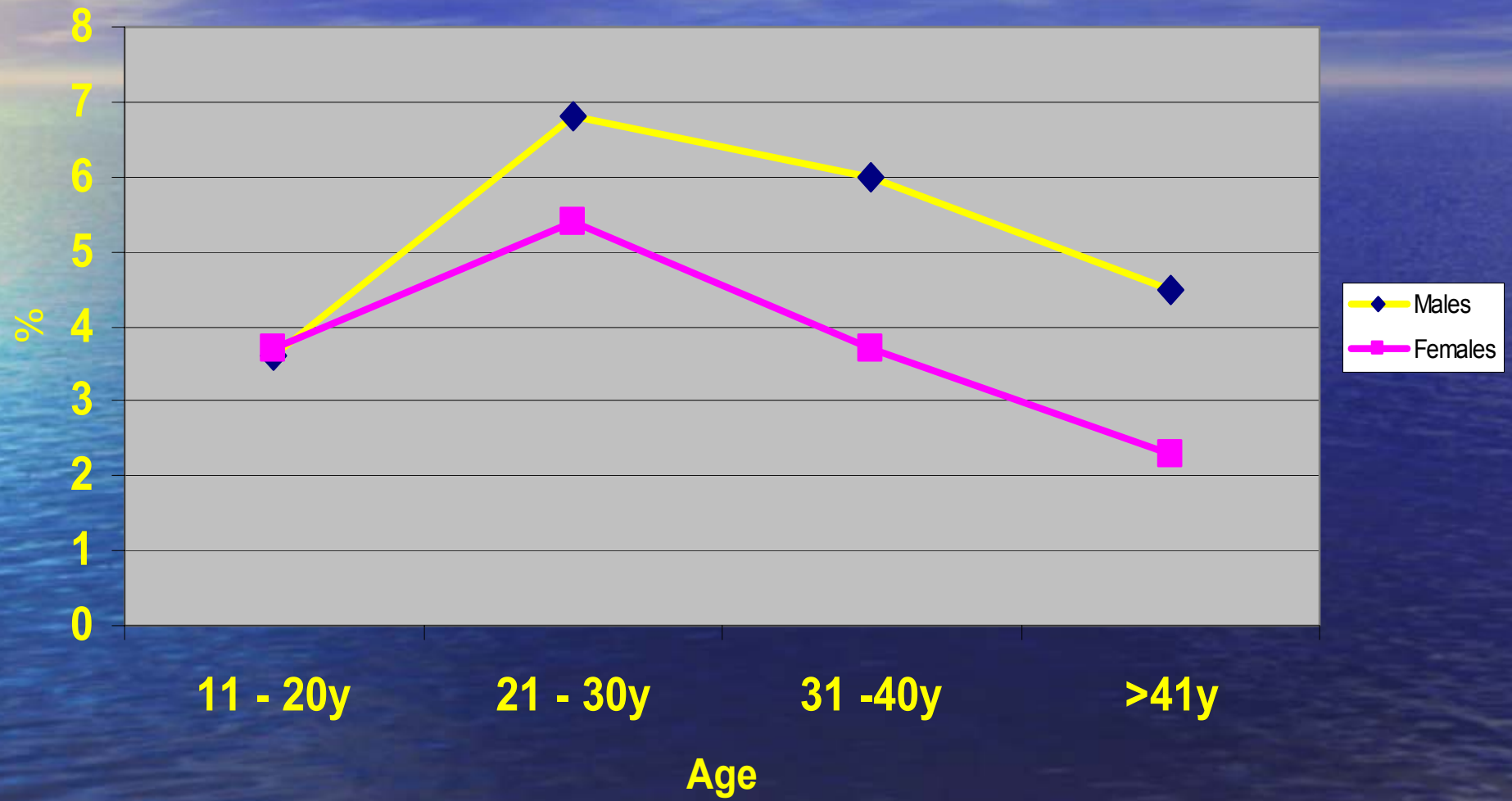


# Further studies in Gizan 1995 to 1998

- Blood donors [14883 males] tested June 1995 to June 1997
  - **HBsAg 5.4%**
- Subjects [males and females ] from community [ n = 1172] in 1997
  - **HBsAg = 5.1%**
- Hospitalized patients [n = 4692] from June 1995 to June 1996
  - **HBsAg = 9.4%**
- Children [<10y; n = 229] in 1997/98
  - **HBsAg = 0.9% [2 children]**

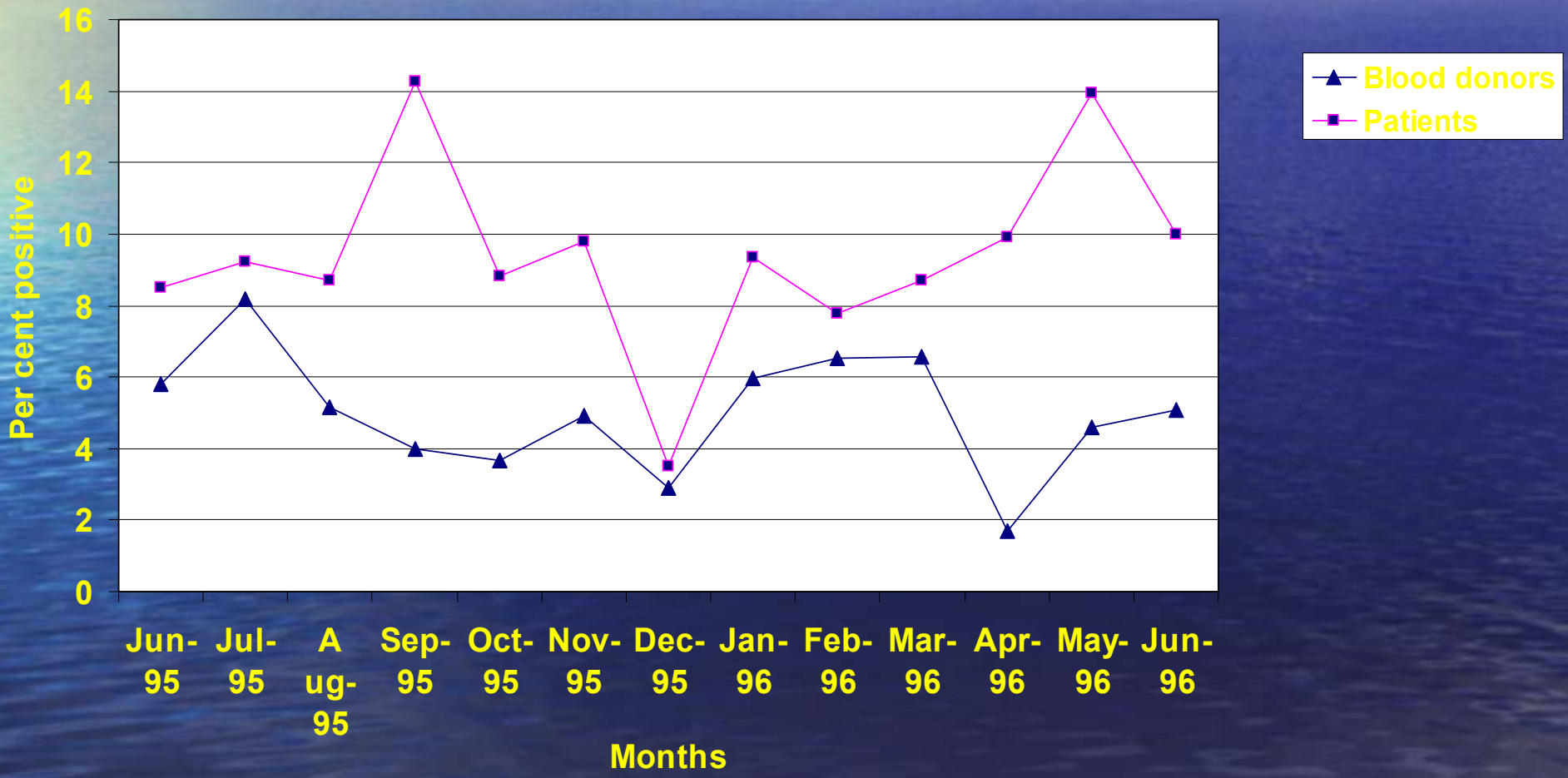
Ayoola et al SMJ 2003

# HBsAg in Gizan adults [1997]



# Prevalence of HBsAg in the Gizan region of Saudi Arabia:

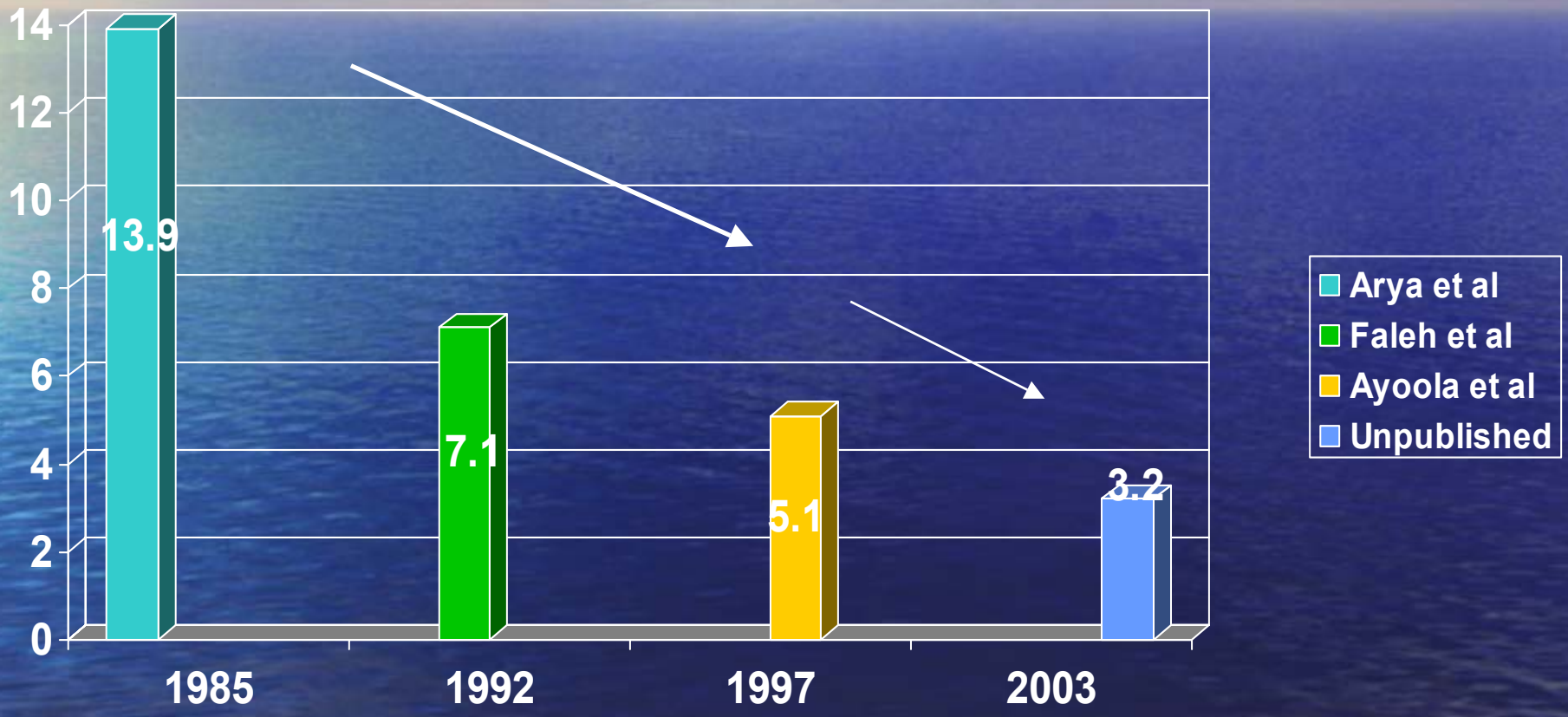
## Analysis of blood donors [n=6927] and patients [n = 4692]



# The decline of HBV in the apparently healthy population of Gizan

| | 1985 [Arya] | 1992[Faleh] | 1997 [ Ayoola ] |
|---|---|---|---|
| Males | 57/286 [19.9%] | 35/371 [9.4%] | 23/398 [5.8%] |
| Females | 34/366 [9.3%] | 26/424 [6.1%] | 13/306 [4.2%] |
| All | 91/652 [13.9%] | 61/795 [7.7%] | 36/704 [5.1%] |

# Trend in the prevalence of HBsAg in asymptomatic Saudi adults in Gizan

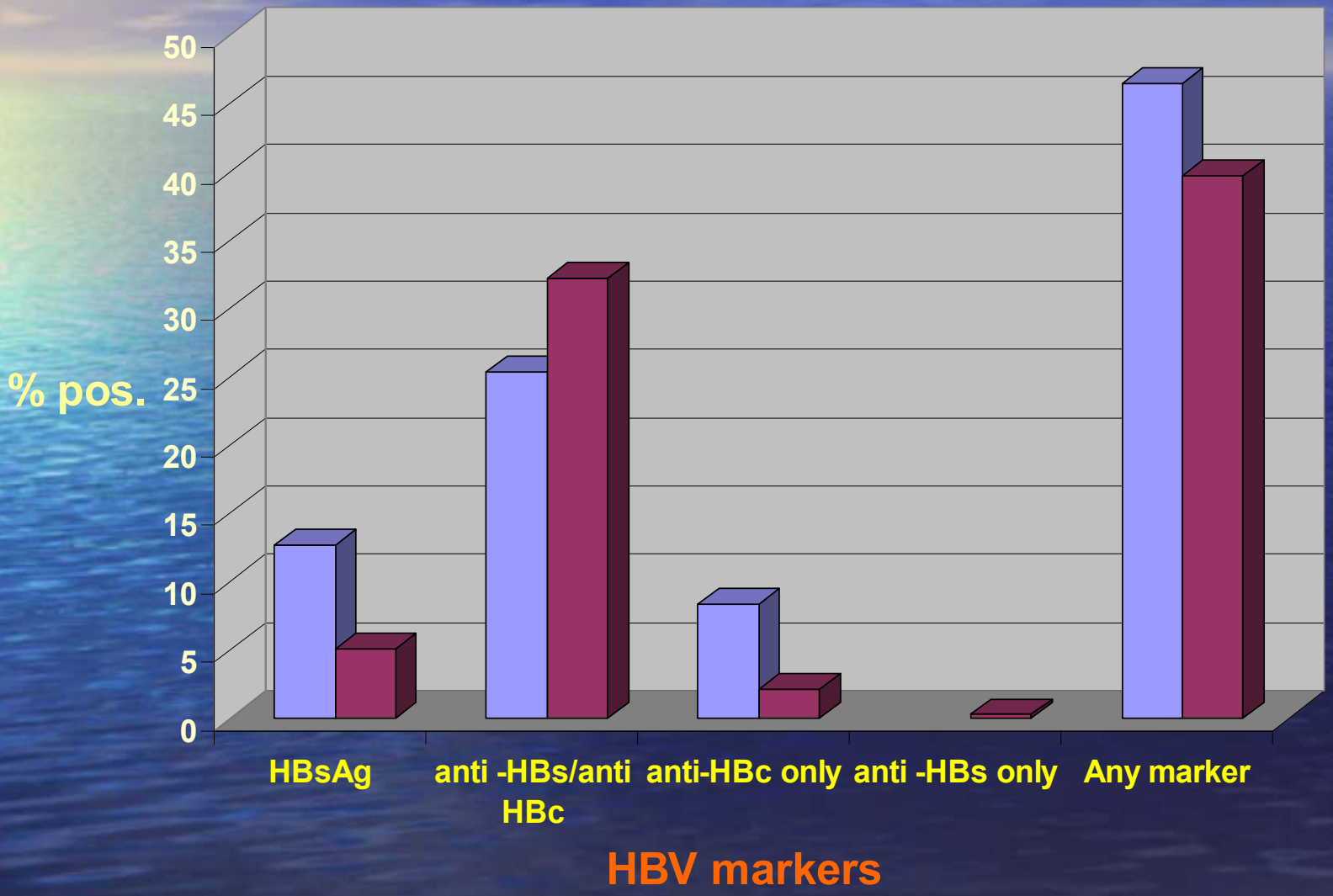



N = 652

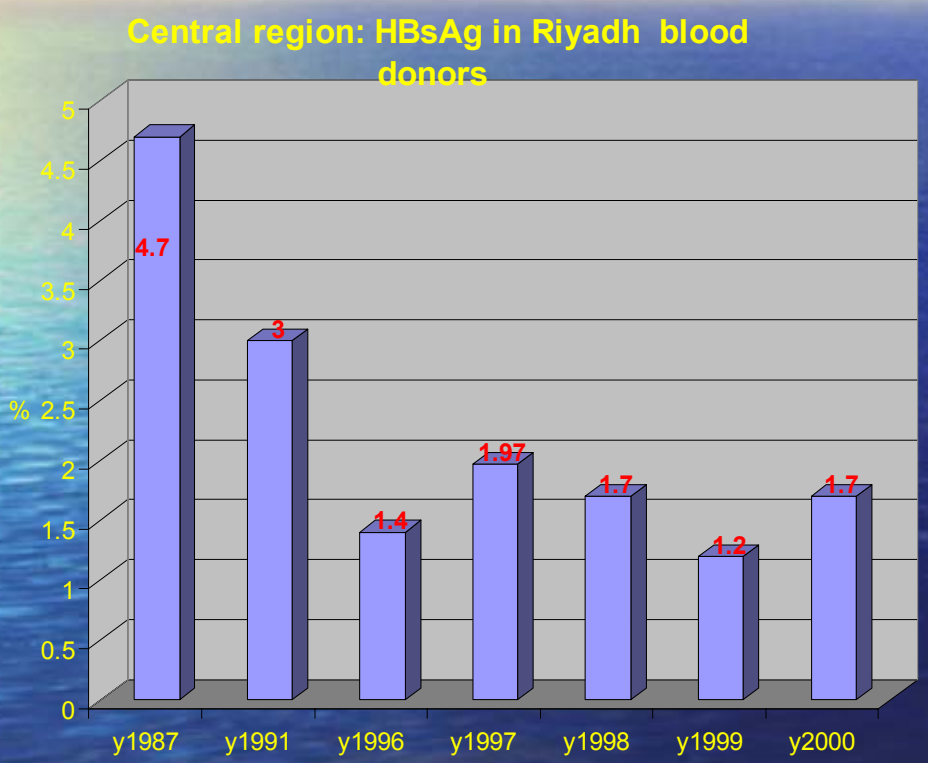
N =795

N= 705

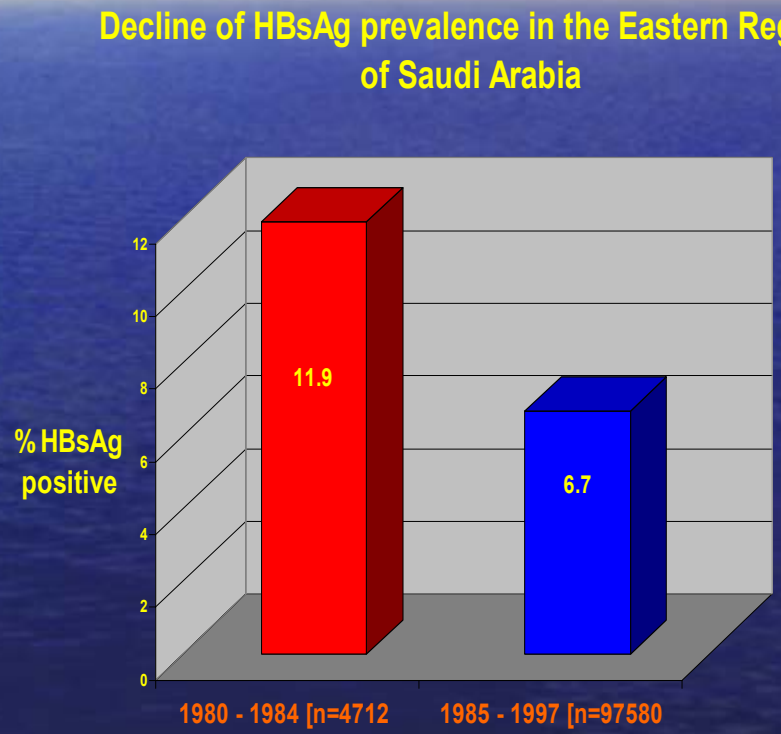
# HBV markers in Gizan, Saudi Arabia: Comparison of rates in adults [1985 and 1997]



# Similar trend in other regions .....




Faleh et al 2004




Fathala et al

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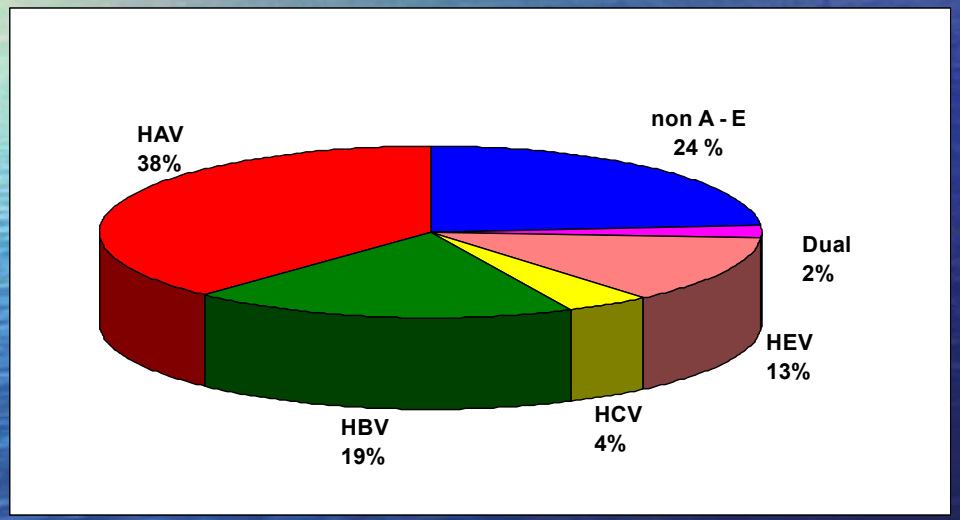
# HBV and liver diseases

The ultimate goal of preventive intervention is to reduce the incidence and prevalence of

- Chronic carriage of HBV
- Acute hepatitis
- Chronic hepatitis and Liver cirrhosis
- Hepatocellular carcinoma

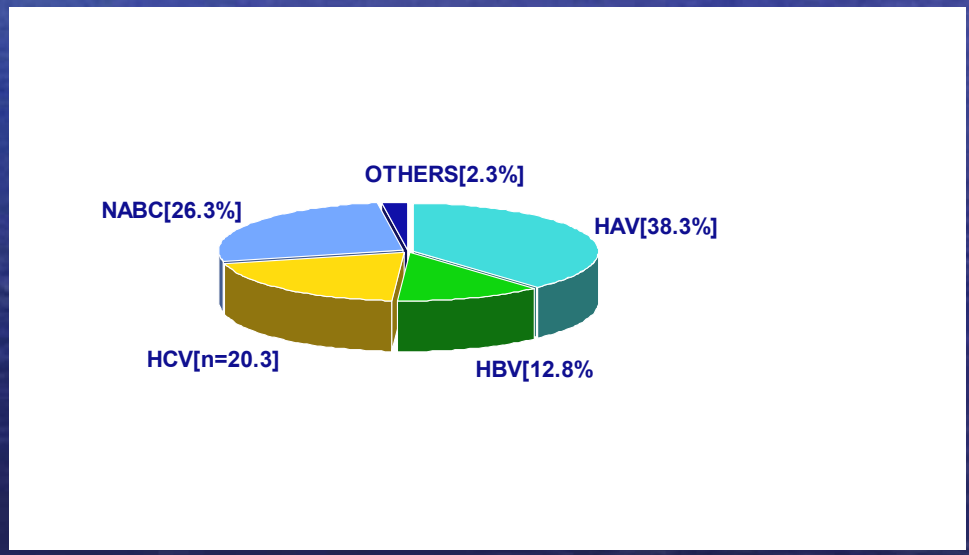
# Etiology of Viral Hepatitis

in Gizan




Ayoola et al SJG 2001

In Riyadh




Arif et al 1998

# The role of HBV and HCV in hepatocellular carcinoma [HCC] in Saudi Arabia

Case – control study 1997 -1998

Ayoola et al  JGH 2004

# 50% improvement in health indicators in a community can be attributed to EDUCATION [WHO]

- Literacy rates in Saudi population
  - 1950 -60 < 20%
  - 1970 : 40 -50%
  - 1990:  80 -90%
- Socio – economic progress
  - Housing
  - Sanitation
  - Awareness

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Hepatitis B vaccination exerted the greatest impact on HBV infection in Saudi Arabia

# Summary and conclusions

- HBV was endemic in Saudi Arabia
- Major reduction in HBV infection and its transmission has occurred as a result of the universal HB vaccination
- A secondary effect of HB vaccination most likely, contributed to the decline of the HBV prevalence observed among largely unvaccinated adult population
- Do we need booster dose?
  - Preliminary analysis of children [14 – 15 y] and [19 – 20y]

Thank you