



SERO SURVEY OF HEPATITIS B AMONG 1-TO-5-YEAR CHILDREN IN MAYURBHANJ DISTRICT, ODISHA (INDIA)

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Hepatitis B impacts millions each year, causing severe liver issues. Despite the availability of an effective vaccine, the disease remains widespread, particularly in low- and middle-income countries where healthcare access is limited. Most infections are transmitted from *mother to child at birth or through close household contact*. Vulnerable groups, such as *tribal communities*, experience higher infection rates due to inadequate healthcare and sanitation. In our study, we tested **2,700 children aged 1-5 years for HBV prevalence**. Among them, **0.6% tested positive for HBsAg**, and **0.26% were positive for anti-HBc**. Of those vaccinated, 73.7% (1686/2287) retained Anti-HBs antibodies, while 66.6% (269/404) of those incompletely vaccinated retained Anti-HBs antibodies.

BACKGROUND

Research Question: What is the sero-prevalence of Hepatitis B among 1 to 5 years children of Mayurbhanj district, Odisha?

- HBsAg Positivity in General Population:** In India, HBsAg positivity ranges from 1.1% to 12.2%, with an average prevalence of 3-4%.
- Chronic HBV Infection Burden:** An estimated 40 million people in India are chronically infected with HBV.
- HBV-Related Health Impact:**
 - Chronic HBV infection accounts for 40-50% of hepatocellular carcinoma (HCC) cases.
 - It also accounts for 20-30% of cirrhosis cases.
- Chronic HCV-Related Health Impact:**
 - Chronic HCV infection is responsible for 12-32% of HCC cases.
 - It causes 12-20% of cirrhosis cases.
- Childhood Vaccination Impact:** In 2018, 882,000 deaths occurred among children under five years, with 500,000 of these deaths estimated to have been preventable through childhood vaccination.

Prevalence among Children Under 5 in India:

- Scarcity of Studies:** Research on Hepatitis B among children under five is limited in India.
- HBsAg Positivity in Children Under Five:** Reported positivity ranges from 2.14% to 2.25%.
- HBsAg Positivity in Children Up to 12 Years:** Prevalence ranges from 4.3% to 7.2%.
- Earliest Findings (1973):** Dhatt et al. found 40% (8/20) of hospitalized children with cirrhosis were HBsAg positive.
- Nicobar Newborn Study (2004):**
 - HBsAg prevalence was 5%.
 - By age five, 25% of children had been exposed to HBV, and 13.5% were chronic carriers.
- Other Regional Studies:**
 - In the tribal region of Anami, Arunachal Pradesh, HBsAg prevalence was 19.2% in children aged 2-5 years.
 - A study in Spiti, Himachal Pradesh, reported 5% prevalence among children aged 0-4 years.
- Odisha Study:**
 - A recent study found a 1.14% prevalence among under-five children.
 - Another study in Odisha's primitive tribal population reported no HBsAg prevalence among under-five children.

METHODS

A community-based cross-sectional sero-epidemiological survey was conducted among children aged 1-5 years in the Mayurbhanj district. This survey measured the prevalence of Hepatitis B surface antigen positivity, (HBsAg), anti-HBs antibodies and anti-HBc positivity.

Population: This study was conducted on a representative sample of children aged 1-5 years in Mayurbhanj district; Odisha. The sample size for seroprevalence was calculated to be 2700 assuming the approximate population size is 2,02,212 (Ref: CDMO, Baripada), 2.1% seropositivity, absolute precision +/-0.7%, with confidence level of 95 and 10% non-response). The Institutional Ethics Committees of ICMR-RMRC and the State Ethics Board of Directorate of Health Services, Government of Odisha, approved the study protocol.

Laboratory Testing

The sera was screened for the markers of HBV infection: Hepatitis B surface antigen(HBsAg), Hepatitis B surface antibody (anti-HBs) and Total Hepatitis B core antibody (anti-HBc) by Enzyme Linked Immunosorbent Assay (ELISA). HBsAg ELISA was done with Sandwich method (J.MITRA & CO. PVT.LTD INDIA), Anti HBs ELISA (DIAPRO, Diagnostics Bio probes, ITALY) and anti HBc ELISA (DIAPRO, Diagnostics Bio probes, ITALY) was done with Sandwich method and Competitive method respectively.

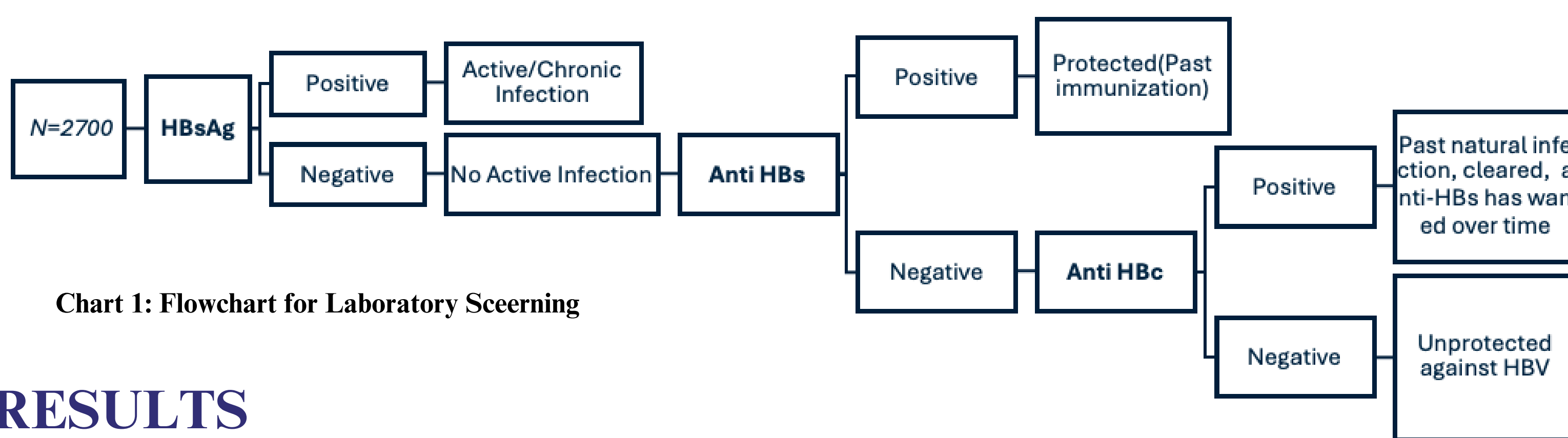


Chart 1: Flowchart for Laboratory Screening

RESULTS

Table 1: Demographic Details of Study participants

Characteristics	Frequency (n)	Proportion (%)
Age in months		
12 - 24	684	25.34
25 - 36	707	26.18
37 - 48	625	23.14
48 - 60	684	25.34
Gender		
Male	1438	53.3
Female	1262	46.7
Per Capita Monthly Income as per B G Prasad Scale in Rs.		
Upper (≥10000)	45	1.67
Upper Middle (5000-9999)	1108	41.04
Middle (3000-4999)	522	19.34
Lower Middle (1500-2999)	822	30.45
Lower (<1500)	203	7.5
Family Type		
Joint	2557	94.7
Nuclear	142	5.3
Residence		
Urban	249	9.2
Rural	2450	90.8
Ethnicity		
General	333	12.33
Other Backward Castes	439	16.25
Schedule Caste	319	11.81
Schedule Tribe	1546	57.25
Minorities	63	2.33
Mother's Occupation		
Farming	192	7.1
Daily Labor	826	30.59
Housewife	1610	59.6
Private Job	28	1.03
Govt. job	44	1.62

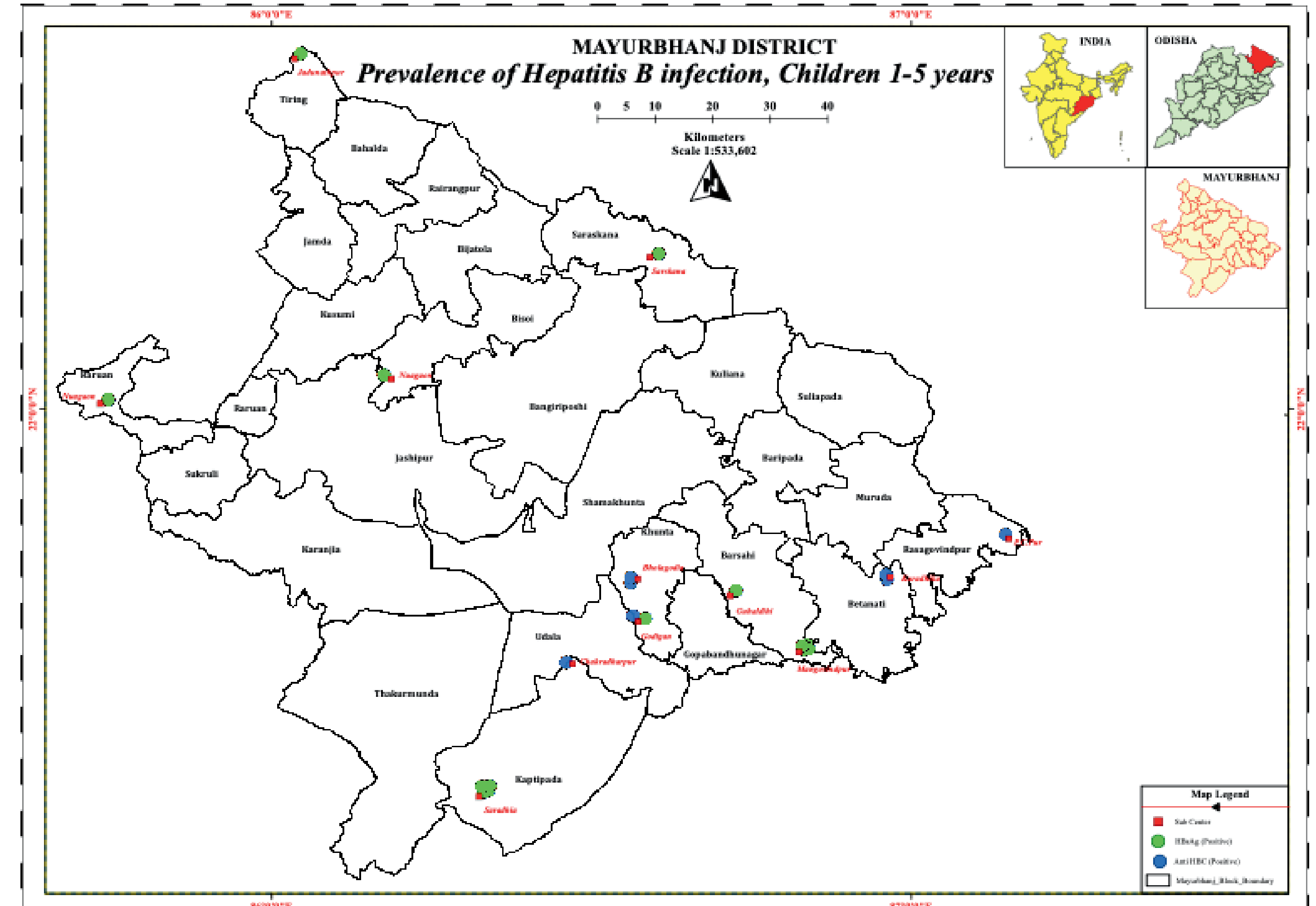
Table 2: Results of HBsAg and Anti HBc Results

HBsAg	Frequency (n)	Proportion (%)
Negative	2685	99.4
Positive	15	0.6
Anti HBc		
Negative	2693	99.7
Positive	7	0.3

Table 3: Immunization Status of Different Age Groups with Anti HBs Titre

Age group	Completely Vaccinated			Incompletely Vaccinated			
	Anti HBs below 10 mIU/ml	Anti HBs 10mIU/ml to 100 mIU/ml	Anti HBs above 100 mIU/ml	Age group	Anti HBs below 10 mIU/ml	Anti HBs 10mIU/ml to 100 mIU/ml	Anti HBs above 100 mIU/ml
12 - 24 Months	114	215	252	12 - 24 Months	31	35	32
25 to 36 Months	117	227	251	25 to 36 Months	34	48	30
37 to 48 Months	141	219	166	37 to 48 Months	30	40	28
49 to 60 months	229	220	136	49 to 60 months	40	42	14

RESULTS Cont..



Map 1: Map showing Prevalence of Hepatitis B infection in Mayurbhanj District, Odisha (India)

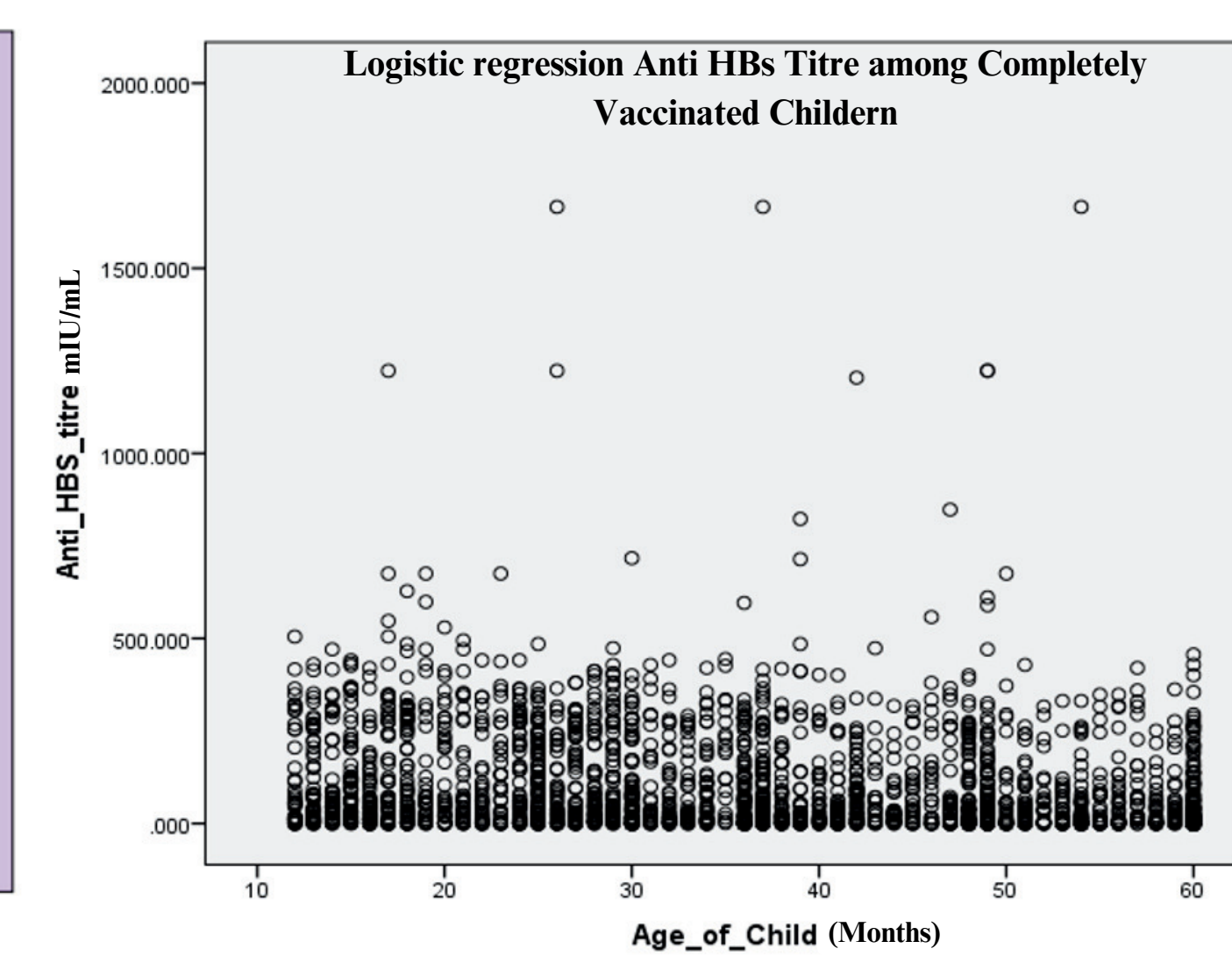
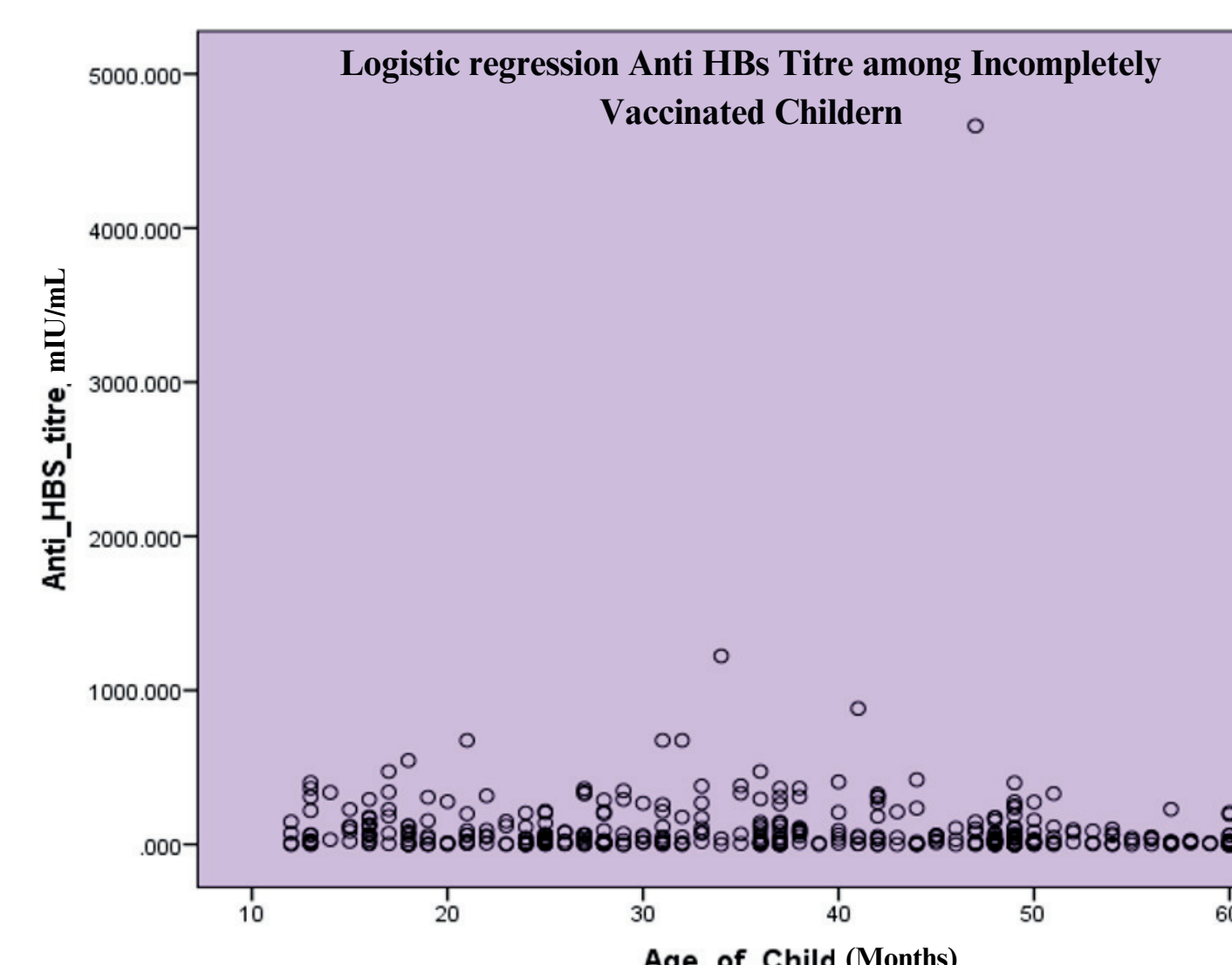
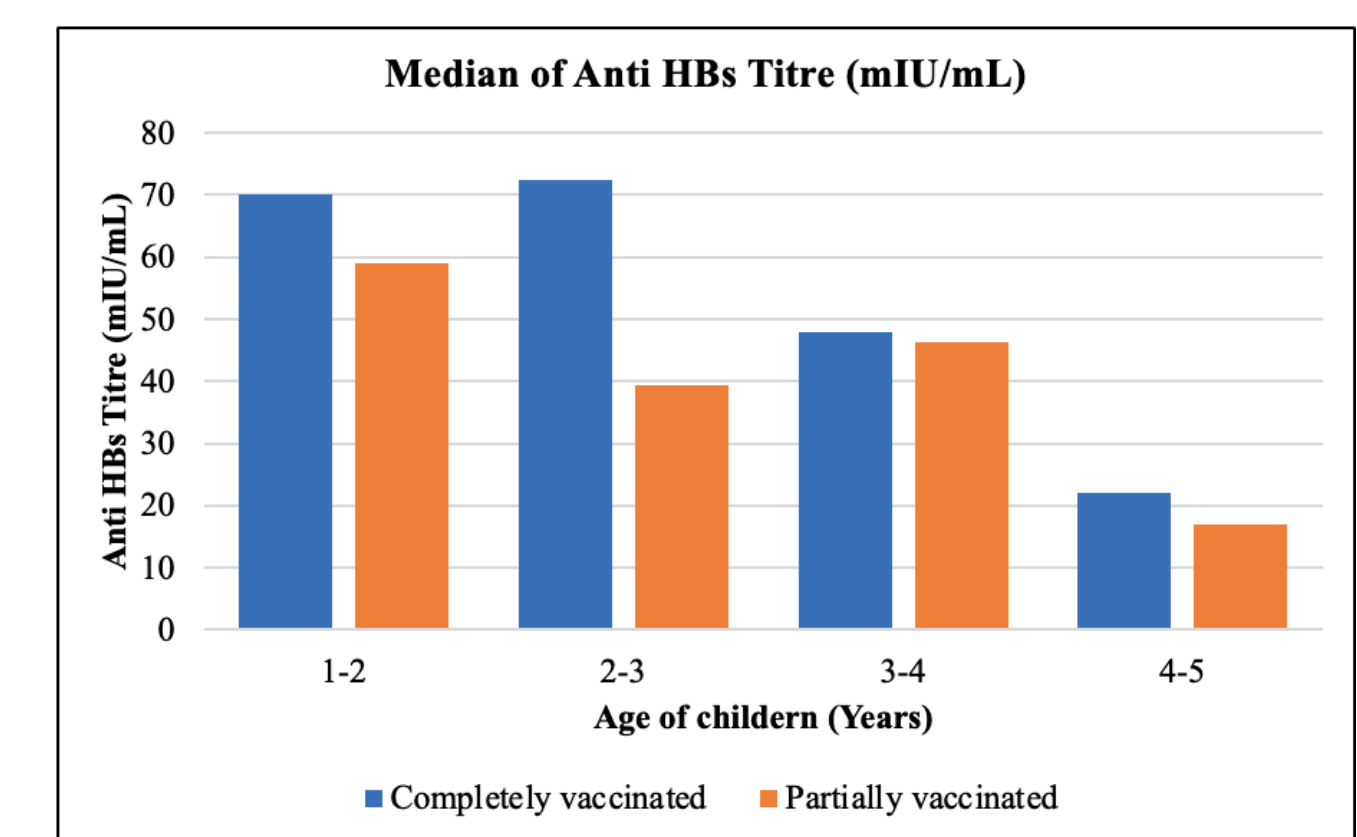
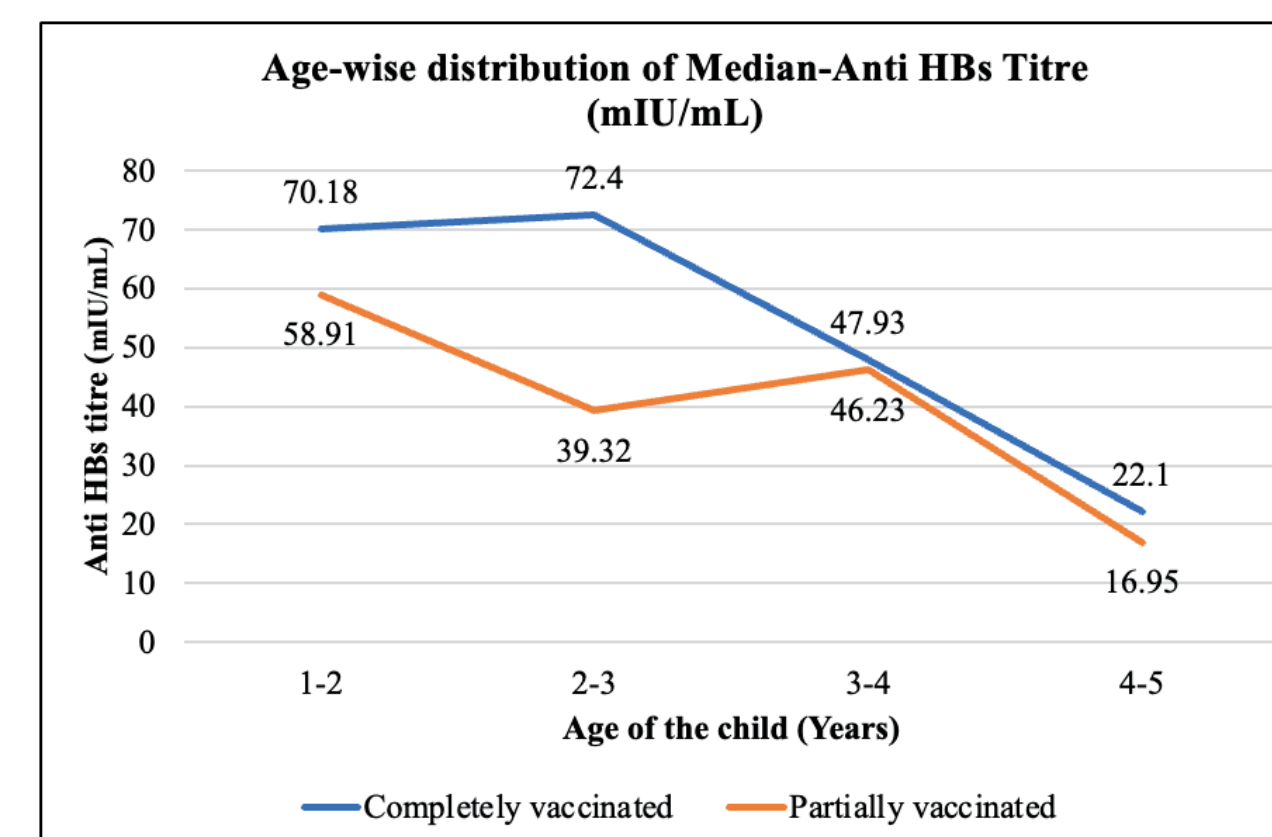


Figure 1-4 (Clockwise) : Age-wise Distribution of Median Anti HBs Titre; Median of Anti-HBs Titre; Logistic regression Anti-HBs Titre among incompletely vaccinated and completely vaccinated children

DISCUSSION

HBsAg Positivity Rate:

- This study reports an HBsAg positivity rate of 0.6% (15/2700).
- The rate is slightly below the 1% prevalence reported by the WHO for the South-East Asia Region among children under five.

Impact of Vaccination Coverage:

- The lower HBsAg positivity rate suggests that expanded vaccination efforts are effective, contributing to a decline in new infections compared to the global average.

No Active Viral Replication:

- None of the HBsAg-positive samples tested positive for HBV DNA, suggesting no active viral replication.
- This may indicate controlled infection or low-level occult infection.

Isolated Anti-HBc Positivity:

- Among 7 samples that tested positive for anti-HBc alone, 5 were fully vaccinated, while 2 were incompletely vaccinated.
- These cases may indicate Resolved infection, "Low level" of chronic infection, partial or waning immunity, Resolving acute infection.

Loss of Anti-HBs Antibodies:

- 736 children (out of 2700) did not retain adequate level of Anti-HBs antibodies (mIU/ml), raising concerns about the durability of immunity post-vaccination.
- The loss of antibodies over time is a common phenomenon, as seen in other studies, indicating the potential need for booster doses in high-risk populations.

CONCLUSION

The findings of this study demonstrate encouraging progress in the fight against Hepatitis B, particularly through expanded vaccination coverage. With an HBsAg positivity rate of 0.6%, which is below the WHO-reported 1% average for the South-East Asia Region. The data suggests that India's Universal Immunisation Program (UIP) is contributing to a meaningful reduction in new HBV infections. India's efforts, in alignment with WHO's strategy to eliminate Hepatitis B by 2030, are yielding positive outcomes. Continued vigilance through surveillance, and strategic enhancements such as booster doses will be critical to achieving long-term immunity in children who did not retain adequate level of antibody protection and regular monitoring of children tested positive for both Anti HBs and HBsAg, improvement of awareness among population, thus further reducing the burden of HBV in high-risk regions.

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