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EVALUATING THE EFFECTIVENESS OF MEASLES VACCINATION CAMPAIGN IN CONTROLLING DISEASE OUTCOME IN HYDERABAD SINDH

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Abstract

Background:
Vaccination against contagious diseases is one of the most significant public health tackles that can be implemented quickly during the inter-epidemic period and which results in major decline of mortality and morbidity. Measles is commonly recognized as an infectious and dangerous disease.

Objectives: *To evaluate the effectiveness of the measles vaccination campaign in improving coverage and reducing measles incidence among children aged 6–59 months in Hyderabad, Sindh. To identify socio-demographic and behavioral factors influencing vaccination uptake and non-compliance during the campaign. To examine the barriers and facilitators affecting caregivers' decisions regarding measles immunization and retention of vaccination documentation.*

Material & Method: *The study employed a Descriptive cross-sectional design and was carried out between March and August 2025 at Qasimabad Hyderabad. Using Non Probability Convenience sampling, 353 Parents / Care givers of children 06-59 were Surveyed. The data were obtained through an interviewer-administered structured questionnaire focusing on socio-demographics, and immunization status. The data were coded and analyzed with SPSS 26, descriptive statistics, Chi-square test.*

Results: *Findings of this study revealed that vaccination coverage increased modestly from 48.7% before the campaign to 51.3% afterwards, indicating a 2.6% improvement. Although the campaign contributed to increased uptake, the overall coverage remained far below the WHO-recommended 95% threshold required for herd immunity. The study also found high knowledge of the Expanded Programme on Immunization (EPI) among caregivers (83.9%), yet practical barriers prevented universal uptake. Socio-demographic factors such as parental*

education, relation with the child, and gender of the child were strongly associated with immunization rates, underscoring inequities in vaccination access and outcomes. Furthermore, poor vaccination card retention (only 15.3%) points to gaps in monitoring and documentation.

Conclusion: *This study evaluates the effectiveness of the measles vaccination campaign in Hyderabad, Sindh, by the specific objectives of assessing its impact on coverage, identifying reasons for non-vaccination, and determining socio-demographic factors influencing uptake. The findings provide valuable insights into both the successes and shortcomings of the campaign, as well as the persistent challenges facing measles control in Pakistan.*

INTRODUCTION

Vaccination against contagious diseases is one of the most significant public health tackles that can be implemented quickly during the inter-epidemic period and which results in major decline of mortality and morbidity. Measles is commonly known as highly infectious disease.[1]

Measles is caused over more than 142,000 deaths worldwide in 2018. [2] It remains a common and deadly illness, especially among children in low-income countries. The vast majority of measles-related deaths, over 95%, occur in countries with limited resources and fragile healthcare systems.[3]

Four of six WHO geographical regions saw big increases in measles outbreaks.[4] The measles vaccine is administered at nine months as part of routine immunization. However, coverage for the first dose (MCV1) remains incomplete, with WHO and UNICEF estimating only 65% of children received it between 2016-2018.[5]

Globally, various measles vaccination campaigns have been conducted over the years to control and reduce measles incidence.[6]

A joint report by the WHO and CDC revealed that measles cases surged to a 23-year high in 2019, driven by outbreaks in several countries due to low vaccination coverage, declining vaccine confidence, and undetected immunity gaps.[7] Measles eradication has been a goal for all WHO regions, since it remains a preventable but life-threatening disease for children and unborn babies. More than half of the measles cases in South-East Asia are reported from India.[8]

The World Health Organization (WHO) has prioritized vaccination as a cornerstone of its global measles eradication plan, launched in 2012. This initiative aims to eliminate measles and rubella in five out of six WHO regions by 2020, with each region and country developing its own tailored elimination plans.[9]

Pakistan faces significant challenges in controlling measles, with 2.1 million children contracting the disease annually and 19,000-20,000 suffering complications or fatalities. With 58 daily child deaths, Pakistan has one of the highest numbers of unvaccinated children, exacerbating the outbreak, according to the World Health Organization (WHO).[10] The United Nations' Millennium Development Goals indeed aimed to reduce child mortality by two-thirds between 1990 and 2015. Specifically, Goal 4 of the MDGs focused on reducing the under-five mortality rate globally. While the world made significant progress, falling from 90 deaths per 1,000 live births in 1990 to 43 in 2015, the goal wasn't fully achieved, with a decline of just under half. Vaccination campaigns, particularly those targeting measles, played a significant role in achieving this goal.[11]

Presently, Pakistan reported 1,978 confirmed measles cases in November 2019, which surged to 8,500 in 2020 and jumped to 17,000 in 2021. Predicted cases for November 2022 to April 2023 were estimated at 6,426.[12]

METHODOLOGY

A Descriptive Cross-Sectional survey was conducted in Qasimabad, Hyderabad, with data collected from various villages, neighborhoods, and communities within the taluka of Qasimabad, Sindh.

The study sampled parents of children aged 6-59 months from households that participated in the measles campaign. Parents/caregivers were

interviewed about various aspects of the campaign to evaluate their children's immunization status.

The research, conducted between March and August 2025, was initiated following authorization from the Ethical Review Committee (ERC) of LUMHS, Jamshoro. This timeframe allowed adequate opportunity for participant recruitment, data collection, and data analysis.

Sample size is about 353 calculated according to least prevalence was about 64%.[12] A non-probability Convenience sampling technique was employed to select 353 parents or care givers of children 06 – 59 months from Qasimabad Hyderabad, based on their relevance to the study objectives.

Statistical Analysis: SPSS version 26 was used for data analysis. Mean ± SD, frequencies, and percentages described the data. Chi-square tests evaluated associations between socio-demographics, and Vaccination coverage before and after vaccination campaign, Significance was set at $p<0.05$.

RESULTS

The Comparative cross-sectional survey will be taken place in Qasimabad Hyderabad, overall 353 sample will be selected from parents and households covered by the measles campaign.

Table: I

Frequency & Percentage of Age Wise Distribution of Respondent of Children aged 06 – 59 Months (n = 353)

AGE OF RESPONDENT	FREQUENCY (%)	
Age (Years)		
<20 Years	40	11.3%
21 – 30 Years	125	35.4%
31 – 40 Years	117	33.1%
40 Years >	71	20.1%
TOTAL	353	(100%)
Mean & ± SD	Mean	31.83
	SD	±8.76

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The table presents the age distribution of parents/caregivers of children aged 6-59 months, revealing that the majority (35.4%) fall within the 21-30-year age range. The average age is 31.83 years, with a standard deviation of 8.76 years.

Table: II

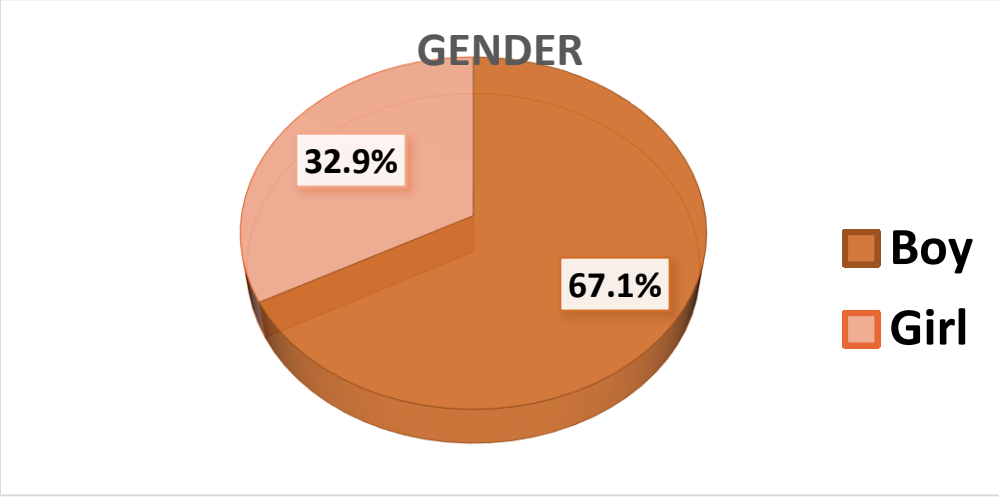
Frequency & percentage of socio-demographic characteristics of study participants (n = 353)

Socio-demographic Characteristics	Frequency (%)	
Relation with Child		
Father	155	43.9%
Mother	191	54.1%
Guidance	7	2.0%
Educational status of Father		
Un Educated	103	29.4%
Primary	48	13.6%
Secondary	40	11.3%
Graduate	44	12.5%
Post Graduate	116	32.9%
Gender		

Male	166	47.0%
Female	187	53.0%
Occupation of Father		
Student	10	2.8%
Unemployed	148	41.9%
Self Employed	148	41.9%
Govt Employed	47	13.3%
Educational status of Mother		
Un Educated	96	27.2%
Primary	59	16.7%
Secondary	56	15.9%
Graduate	55	15.6%
Post Graduate	87	24.6%
Occupation of Mother	**Frequency (%)**	
Un employed	70	19.8%
Self-Employee	57	16.1%
Govt employee	20	5.7%
House wife	206	58.4%

This table shows the frequency and percentage of socio-demographic characteristics of study participants. Mostly mothers (54.1%) participated compared to fathers (43.9%). Post-graduates were the highest (32.9%), followed by uneducated (29.4%). More females (53%) than males (47%). Unemployed and self-employed fathers were equally high (41.8% and 41.5%). Post-graduates were the least (24.8%), and uneducated were 27.2%. Most of mother were housewife's as 58.4%.

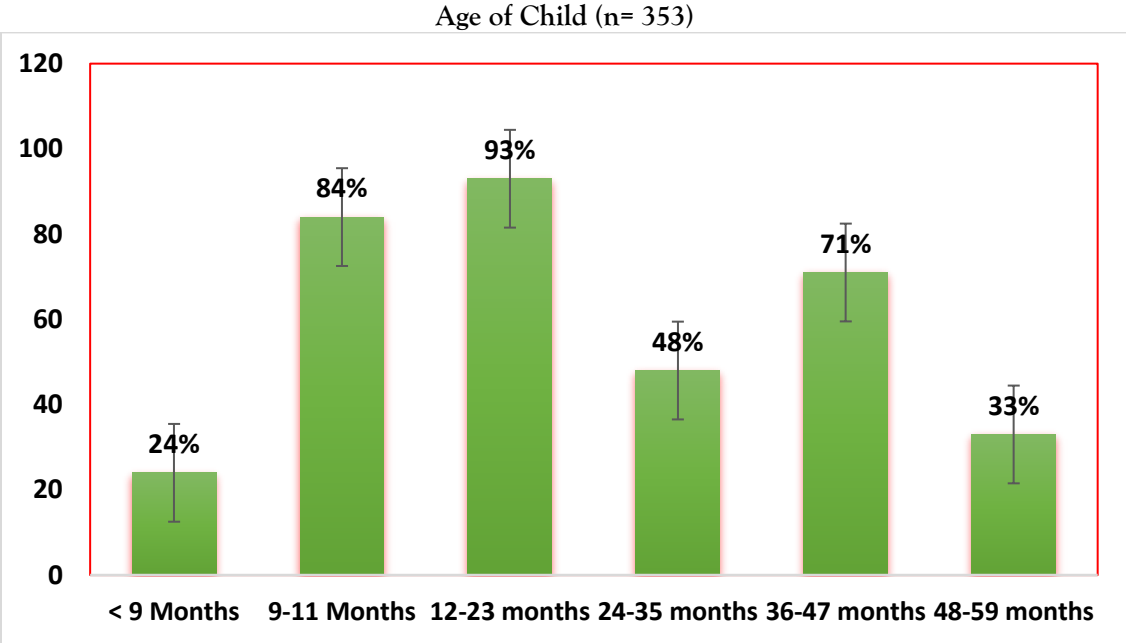
Figure: II



Gender of Child (n=353)

This Pie Chart Shows the Gender distribution of children Boys 67.1% and Girls about 32.9%. this indicates that boys make up the majority of the children in the data with almost twice as many boys as girls.

Figure: III



This graph shows the distribution children across different age groups. - The percentage starts low at 24% for children under 9 months. It jumps to 84% for 9-11 months and peaks at 93% for 12-23 months, After the peak, the percentage drops 48% for 24-35 months, then rises again to 71% for 36-47 months, finally drops to 33% for 48-59 months

Table: III
Distribution of Immunization characteristics of Children 06 – 59 (n =353)

CHARACTERITICS	FREQUENCY	(%)
Immunization Status of Children		
Yes	326	92.4%
No	22	6.2%
Vaccination Card Retention		
Yes	54	15.3%
NO	144	40.8%
Missing	155	43.9%
Vaccination Status		
Not Vaccinated	28	7.9%
Partially Vaccinated	61	17.3%
vaccinated According to age	232	65.7%
Fully Vaccinated	32	9.1%
Vaccine Received		
BCG+ OPV 0	46	13.0%
OPV I+ Penta I + Pneumo I + PCV	96	27.2%

OPV II + Penta II + Pneumo II + Rota I	97	27.5%
OPV III + Penta III + Pnemo III (PCV) + Rota II + IPV	114	32.3%

This chart provides an overview of immunization characteristics for children aged 6-59 months. Most children (92.4%) are immunized, Vaccination Card Retention Data is missing for a significant portion (43.9%), with 15.3% having cards retained. Majority (65.7%) are vaccinated according to age, most children (52.3%) received OPV II + Penta III + Pneumo II + Rota I + IPV and (83.9%) have knowledge about the Expanded Programme on Immunization.

The data suggests a high immunization rate among the children surveyed, with most being vaccinated according to their age and having knowledge about EPI. Do you need help analyzing a specific part of this data or want to ask something about immunization in Pakistan.

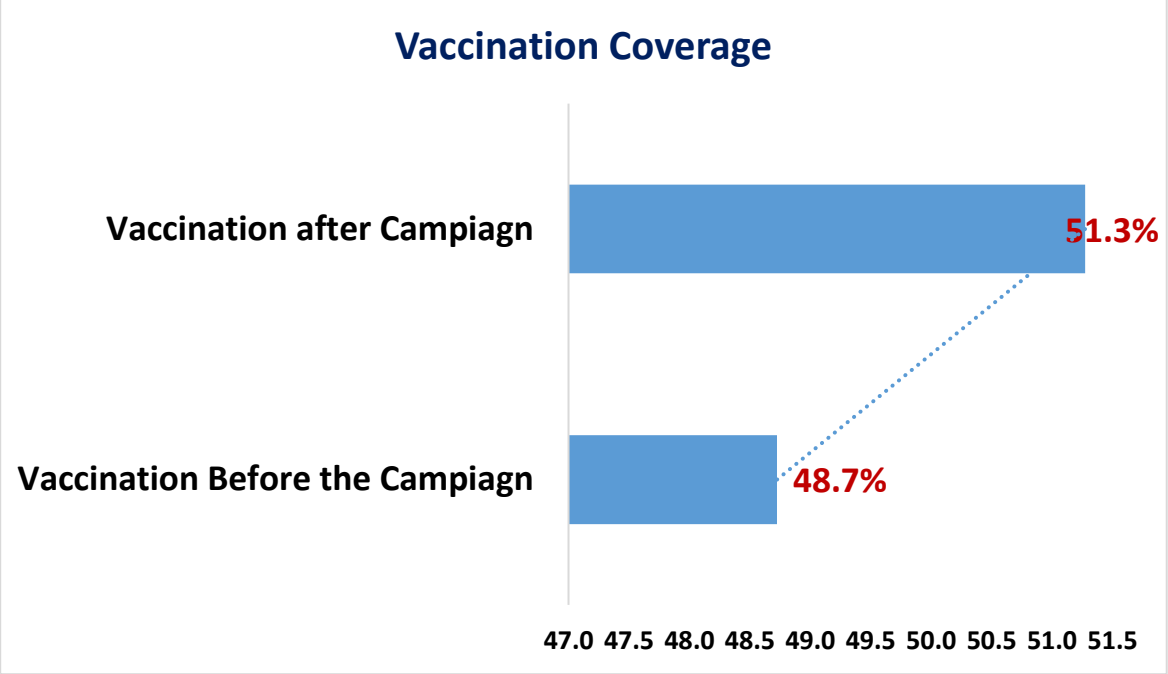
Table: IV

Measles Vaccine Received During MR Campaign (n=353)

CHARACTERITICS	FREQUENCY	(%)
Measles Vaccine Dose Received		
Yes	338	95.8%
No	15	4.2%
How Many Dose Received		
0 Dose	162	45.9%
MV Dose 1	111	31.4%
MV Dose 2	80	22.7%
Measles Vaccine Dose given at		
EPI center	172	48.7%
During MR Campaign	181	51.3%
Measles Vaccine Given at 9 Months		
Yes	326	92.4%
No	20	5.7%
Not applicable	6	1.7%
Measles Vaccine given at 15 months		
Yes	280	79.3%
NO	57	16.1%
Not applicable	16	4.5%

The data shows a high percentage (95.8%) of children received the measles vaccine during the MR campaign. Most vaccines were given during the MR Campaign (51.3%) slightly more than at EPI centers. Most of the children 45.9% receive O dose ,31.4% received MV Dose 1, 22.7% received MV Dose 2.

Figure: IV

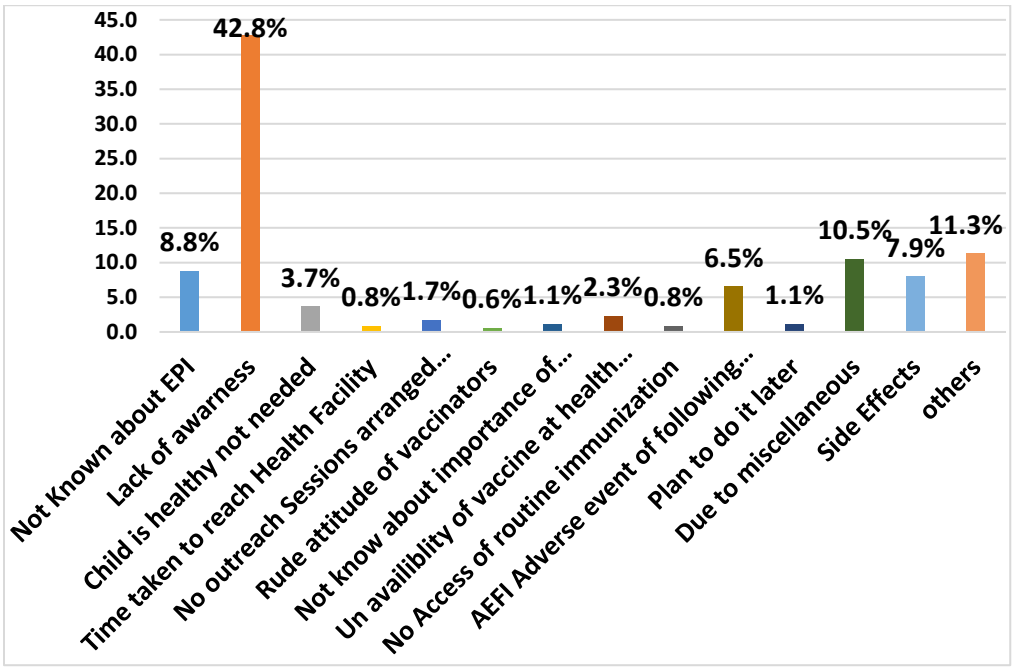


Vaccination Coverage of Children's Before and After Measles Vaccination campaigns. (n=353)

This graph shows the Vaccination Coverage of Children's Before and After Measles Vaccination campaign. Vaccination Before the Campaign: 48.7% and 51.3% of children were vaccinated after the campaign

In the above facts the vaccination coverage increased by 2.6 percentage points after the measles vaccination campaign (from 48.7% to 51.3%). This indicates a slight boost in vaccination coverage following the campaign.

Figure: V



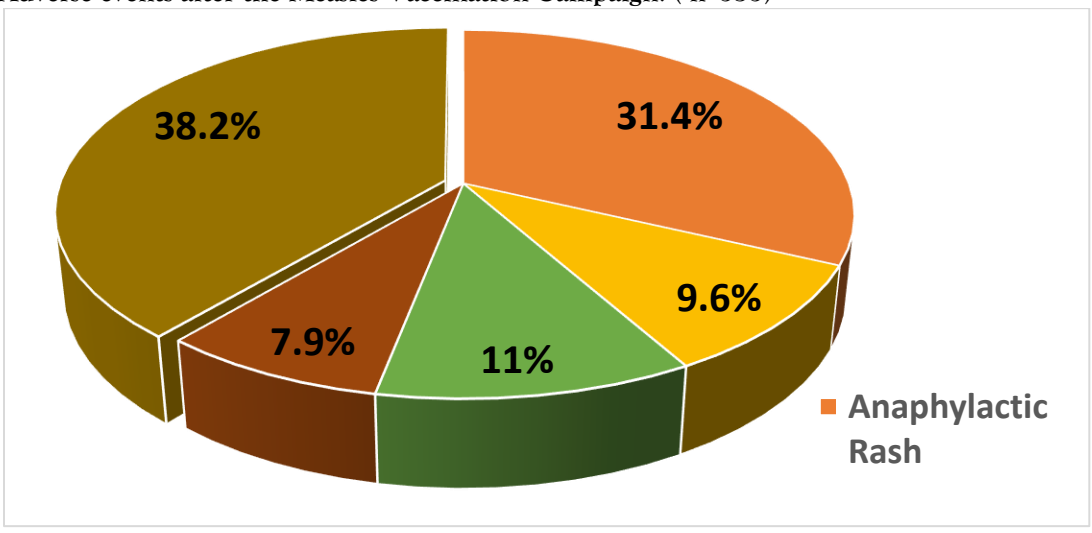
Reasons for not receiving Vaccination through Routine Health Services or Campaign (n =353)

This graph shows the "Reasons for not receiving Vaccination through Routine Health Services or Campaign." The main reasons include:
- Lack of awareness (42.8%)
- Others (11.3%)
- Side Effects (10.5%)
- Plan to do it later (6.5%)

Other reasons like not knowing about EPI, child being healthy/not needed, and various logistical or attitudinal issues make up smaller percentages.

Figure: VI

Reported Adverse events after the Measles Vaccination Campaign. (n=353)



This pie chart shows the distribution of reported adverse events after a Measles Vaccination Campaign. Overall, the chart highlights that fever and anaphylactic rash are the most frequently reported adverse events following the measles vaccination campaign.

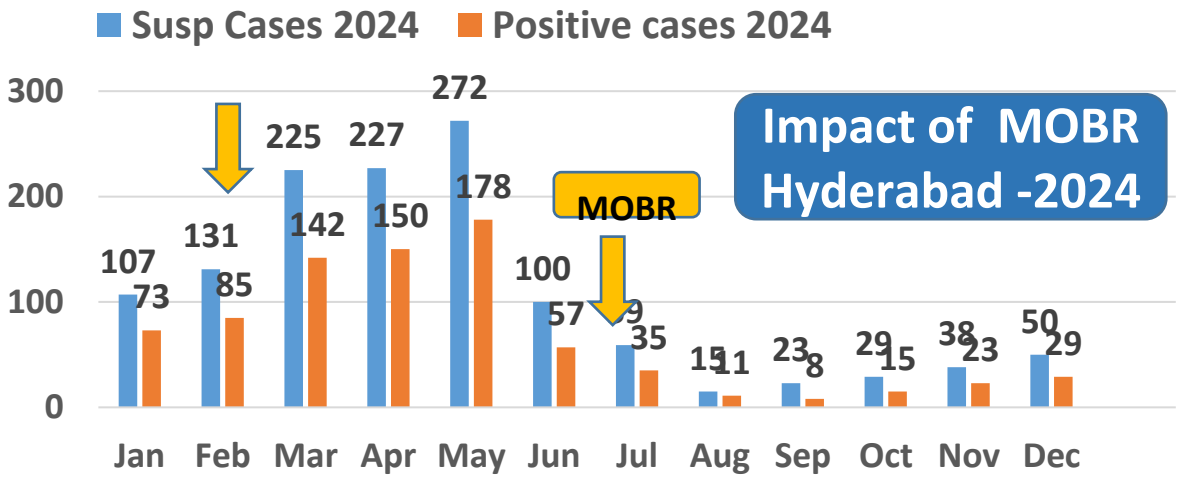
Table: V
Relationship Between Demographic Characteristics and Vaccination Coverage Before and after campaign with Pearson Chi – Square Value.

Demographic Characteristics	Vaccination Coverage		Pearson Chi-square p – value
Age of Respondent	Vaccination Before the Campaign	Vaccination After the Campaign	P – Value
			.029
Relation with Child			P – Value
			.023
Education of Father			P – Value
			.003
Education of Mother			P – Value
			.047
Occupation of Father	48.7%	51.3%	P – Value
			.084
Occupation of Mother			P – Value
			.067
Income of Parents			P – Value
			.765
Age of Child			P – Value
			.053
Gender of Child			P – Value
			.012

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From the table, we can see the relationship between demographic characteristics and vaccination coverage before and after a campaign using Pearson Chi-square values (p-values).
Most demographic characteristics like age of respondent, relation with child, education of parents, occupation of parents, and gender of child have a statistically significant relationship with vaccination coverage changes after the campaign, except for income of parents which doesn't show significance.

Figure: VII



Impact of Measles Integrated Outreach Activity (IOA) and Measles Outbreak Response (MOBR) January 2024 to December 2024. IOA

This graph shows the "Impact of Measles Integrated Outreach Activity (IOA) and Measles Outbreak Response (MOBR) January 2024 to December 2025" specifically for Hyderabad in 2024. The graph compares the number of suspected and positive measles cases per month. Two yellow arrows mark the timing of IOA and MOBR.

Integrated Outreach activity IOA (January-February): Suspected and positive cases were relatively high initially. Post-IOA to MOBR (March-May): Cases spiked in April (272 suspected, 150 positive). Post-MOBR (June-December): Cases dropped significantly after MOBR in May, staying low for the rest of the year.

In short, the graph suggests that MOBR after May 2024 had a noticeable impact on reducing measles cases in Hyderabad in 2024.

DISCUSSION

Overview and Interpretation of Findings

This study evaluated the effectiveness of the measles vaccination campaign in Hyderabad, Sindh, revealing a modest increase in vaccination coverage—from 48.7% to 51.3%—following the campaign. Although this 2.6% improvement indicates incremental progress, the overall coverage remains far below the 95% threshold recommended by the World Health Organization (WHO, 2023) for herd immunity. Similar findings have been reported in Pakistan's Demographic and Health Survey (2018), which noted persistent suboptimal measles coverage (MCV1: 73%; MCV2: 67%).

The limited improvement in this study suggests that while short-term campaigns can address immediate immunity gaps, their standalone impact is minimal unless integrated with sustained **routine immunization (EPI)** services and strong community mobilization strategies.[21]

Comparison with Other Studies

Comparable trends have been observed in South Asia and Sub-Saharan Africa, where post-campaign improvements ranged from 2–5%, primarily due to logistical limitations and vaccine hesitancy.[9-23] In contrast, countries with high-performing immunization systems—such as those in the WHO European Region—achieved >90% coverage by

combining routine EPI strengthening with mass campaigns.[44]

In Pakistan,[10-11] found that caregiver education and trust in vaccines significantly influenced uptake, mirroring this study's findings on the strong association between parental education and vaccination status ($p < 0.05$).

Socio-Demographic Factors and Gender Disparities

This study revealed a statistically significant association between both parents' education and the likelihood of child vaccination, confirming prior research emphasizing education as a predictor of vaccine acceptance.[50-20] Additionally, male children were more likely to be vaccinated than females, reflecting persistent gender biases in healthcare-seeking behavior—an issue widely documented in South Asia.[43] Addressing gender disparities through community-level advocacy and inclusive health communication remains critical to improving coverage.

Barriers to Immunization and Vaccine Hesitancy

Lack of awareness (42.8%) and fear of side effects (10.5%) emerged as leading causes of non-vaccination. These results align with global systematic reviews identifying misinformation, distrust, and cultural beliefs as primary drivers of **vaccine hesitancy**.[53-55] Additionally, poor vaccination card retention (15.3%) undermines both follow-up and program accountability. Similar documentation issues were highlighted in Bangladesh's MR campaign, where poor recordkeeping limited accurate monitoring.[25]

The findings imply that awareness alone (83.9% knowledge of EPI) does not guarantee behavioral change. This "knowledge–practice gap" underscores the importance of community engagement strategies rooted in behavioral and communication sciences rather than purely biomedical approaches.[54]

Programmatic Implications

The effectiveness of the **Measles Outbreak Response (MOBR)** in May 2024 demonstrates that targeted outbreak interventions can produce measurable reductions in case incidence. However, sustainability requires institutionalizing outbreak response within broader surveillance and immunization frameworks.[35] Integrating **Integrated Outreach Activities (IOA)** with local health services can bridge routine and emergency immunization efforts, especially in urban-peri urban areas like Hyderabad.

Limitations and Future Directions

As a cross-sectional study using convenience sampling, causal inference is limited, and the results may not generalize beyond the study area. Recall bias due to poor documentation remains a concern. Future research should incorporate **longitudinal follow-up** and **geospatial analysis** to identify persistent immunity gaps, complemented by **qualitative inquiry** into household decision-making and health communication effectiveness.

Conclusion of Discussion

In summary, while the measles vaccination campaign in Hyderabad achieved incremental progress, systemic barriers—educational, gender-based, and operational—continue to constrain success. To achieve measles elimination, Pakistan must strengthen **routine immunization infrastructure**, enhance **community trust through participatory communication**, and implement **data-driven microplanning** to identify and target under-immunized clusters (WHO, 2024).

5.8 Limitations of Study:

This study employed a convenience sampling technique, limiting generalizability of results. Data collection relied heavily on caregiver recall due to poor card retention, which may have introduced recall bias. Additionally, the cross-sectional study design restricts the ability to establish causal relationships between demographic factors and vaccination uptake.

CONCLUSION

This study set out to evaluate the effectiveness of the measles vaccination campaign in Hyderabad, Sindh, with the specific objectives of assessing its impact on coverage, identifying reasons for non-vaccination, and determining socio-demographic factors influencing uptake. The findings provide valuable insights into both the successes and shortcomings of the campaign, as well as the persistent challenges facing measles control in Pakistan.

The analysis revealed that vaccination coverage increased only marginally after the campaign, from 48.7% to 51.3%, amounting to a modest improvement of 2.6 percentage points. Although the campaign succeeded in reaching a segment of the population, this increase falls far short of the 95% coverage threshold recommended by the World Health Organization (WHO) to achieve herd immunity. The data suggest that while campaigns can provide short-term gains, they are insufficient to drive the substantial increases needed for elimination of measles unless accompanied by stronger routine immunization programs.

Disclaimer: The present study was undertaken for academic thesis purposes. This abstract is original and has not been published or presented elsewhere.

Conflict of interest: None
Funding disclosure: None

Authors' Contributions

MK: Conception and design, data collection, drafted the manuscript.
GU: Supervision, data interpretation, and critical revision of the manuscript.
PAM: Statistical analysis, interpretation of results.
AK: Literature review, data interpretation.
AWL: Data Collection, tables and figures, discussion.
SA: Statistical Analysis, discussion.

REFERENCES

Khan AI, Islam MT, Khan ZH, Tanvir NA, Amin MA, Khan II, Bhuiyan AT, Hasan AM, Islam MS, Bari TI, Rahman A. Implementation and delivery of oral cholera vaccination campaigns in humanitarian crisis settings among Rohingya Myanmar nationals in Cox's bazar, Bangladesh. Vaccines. 2023 Apr 14;11(4):843.

Lang P, Zens KD, Bally B, Meier C, Martin B, Fehr J. Evaluation of a measles vaccination campaign at the universities in the city of Zurich, 2019. Public Health. 2021 Jun 1; 195:51-3.

Peng ZQ, Chen WS, He Q, Peng GW, Wu CG, Xu N, Zhao ZJ, Shu J, Tan Q, Zheng HZ, Lin LF. Evaluation of the mass measles vaccination campaign in Guangdong Province, China. International Journal of Infectious Diseases. 2012 Feb 1;16(2):e99-103.

Jean Baptiste AE, Wagai J, Luce R, Masresha B, Klinkenberg D, Veldhuijzen I, Oteri J, Dieng B, Ikeonu OC, Meleh S, Musa A. Measles outbreak in complex emergency: estimating vaccine effectiveness and evaluation of the vaccination campaign in Borno State, Nigeria, 2019. BMC Public Health. 2021 Dec;21:1-0.

Babakura B, Nomhwange T, Baptiste AE, Dede O, Taiwo L, Abba S, Soyemi M, Idowu AM, Richard MT, Braka F, Oteri J. The challenges of insecurity on implementing vaccination campaign and its effect on measles elimination and control efforts: a case study of 2017/18 measles campaign in Borno state, Nigeria. Vaccine. 2021 Nov 17;39:C66-75.

Varma A, Thysen SM, Martins JS, Nanque LM, Jensen AK, Fisker AB. Overall effect of a campaign with measles vaccine on the composite outcome mortality or hospital admission: A cluster-randomized trial among children aged 9-59 months in rural Guinea-Bissau. International Journal of Infectious Diseases. 2023 Sep 1;134:23-30.

Kumar SS, Hartner AM, Chandran A, Gaythorpe KA, Li X. Evaluating effective measles vaccine coverage in the Malaysian population accounting for between-dose correlation and vaccine efficacy. BMC Public Health. 2023 Nov 28;23(1):2351.

Thangaraj JW, Prosperi C, Kumar MS, Hasan AZ, Kumar VS, Winter AK, Bansal AK, Chauhan SL, Grover GS, Jain AK, Kulkarni RN. Post-campaign coverage evaluation of a measles and rubella supplementary immunization activity in five districts in India, 2019–2020. Plos one. 2024 Mar 29;19(3):e0297385.

Salami L, Glele-Ahanhanzo Y, Nimpa MM, Sossa CJ, Danovaro-Holliday MC, Saleh J, Yapi MD, Otomba JS, Mukamba EM, Makoutode CP, Ouendo EM. Contributions of the Measles Follow-Up Vaccination Campaign to Improving the Vaccination Coverage of Children Aged 6-59 Months in the Democratic Republic of the Congo in 2019. Open Journal of Epidemiology. 2023 Jul 3;13(3):151-66.

Zahidie A, Wasim S, Fatmi Z. Vaccine effectiveness and risk factors associated with measles among children presenting to the hospitals of Karachi, Pakistan. Journal of the College of Physicians and Surgeons Pakistan. 2014;24(12):882.

Fazal S, Hafeez A, Ahsan S, Chaudhry TA, Khan MS. Effects of Measles Vaccine and Its Associated Risk Factors Among Children Presenting in a Tertiary Care Hospital, Rawalpindi/Islamabad. Annals of PIMS-Shaheed Zulfiqar Ali Bhutto Medical University. 2024 Jun 9;20(3):277-82.

Muzzamil M, Fatima F, Baloch R, Hashmi S, Malikzai A. Under-5 children in Pakistan are disproportionately affected by the alarming increase in measles cases. IJS Global Health. 2023 Sep 1;6(5):e0334.

Mere MO. Progress toward measles elimination—Pakistan, 2000–2018. MMWR. Morbidity and Mortality Weekly Report. 2019;68.

Burak Kay, Serkan Demir, Leyla Çelik. Assessing The Effectiveness Of Vaccination Campaigns In Controlling Infectious Diseases. IJHM [Internet]. 2024 Jan. 31 [cited 2025 Apr. 22];1(1):18-22.

Murhekar, M.V., Gupta, N., Hasan, A.Z., Kumar, M.S., Kumar, V.S., Prosperi, C., Sapkal, G.N., Thangaraj, J.W.V., Kaduskar, O., Bhatt, V. and Deshpande, G.R., 2022. Evaluating the effect of measles and rubella mass vaccination campaigns on seroprevalence in India: A before-and-after cross-sectional household serosurvey in four districts, 2018–2020. *The Lancet Global Health*, *10*(11), pp.e1655-e1664.

Varma A, Thysen SM, Martins JS, Nanque LM, Jensen AK, Fisker AB. Overall effect of a campaign with measles vaccine on the composite outcome mortality or hospital admission: A cluster-randomized trial among children aged 9-59 months in rural Guinea-Bissau. International Journal of Infectious Diseases. 2023 Sep 1;134:23-30.

Yitbarek K, Mahimbo A, Bobo FT, Woldie M, Sheel M, Frawley J, Hayen A. Impact of measles vaccination strategies on vaccination rates in low-income and middle-income countries: a systematic review and meta-analysis. BMJ Global Health. 2025 Feb 10;10(2).

Ghosh S, Kappara D, Majumder N, Nath-Sain S, Roy AD, Mukhopadhyay S. A systematic review and modelling insights of factors impacting measles vaccine effectiveness. medRxiv. 2024 Aug 29:2024-08.

Endalamaw D, Nibret E, Munshea A, Mekonnen F, Tadesse S, Zeru T, Tefera M, Yismaw G. Measles vaccine effectiveness in African children: a systematic review and meta-analysis. BMC Infectious Diseases. 2024 Nov 21;24(1):1330.

Utazi CE, Olowe ID, Chan HT, Dotse-Gborgbortsi W, Wagai J, Umar JA, Etamesor S, Atuhaire B, Fafunmi B, Crawford J, Adeniran A. Geospatial Variation in Vaccination Coverage and Zero-Dose Prevalence at the District, Ward and Health Facility Levels Before and After a Measles Vaccination Campaign in Nigeria. Vaccines. 2024 Nov 21;12(12):1299.

Cutts FT, Ferrari MJ, Krause LK, Tatem AJ, Mosser JF. Vaccination strategies for measles control and elimination: time to strengthen local initiatives. BMC medicine. 2021 Dec;19:1-8.

Winter AK, Lambert B, Klein D, Klepac P, Papadopoulos T, Truelove S, Burgess C, Santos H, Knapp JK, Reef SE, Kayembe LK. Feasibility of measles and rubella vaccination programmes for disease elimination: a modelling study. The Lancet Global Health. 2022 Oct 1;10(10):e1412-22.

Memon M, Siddiqi DA, Dharma VK, Shah MT, Iftikhar S, Setayesh H, Chandir S. Coverage, timeliness of measles immunisation and its predictors in Pakistan: an analysis of 6.2 million children enrolled in the Provincial Electronic Immunisation Registry. BMJ Global Health. 2025 Mar 3;10(3).

Rana MS, Usman M, Alam MM, Ikram A, Salman M, Umair M. The world's largest measles-Rubella vaccination campaign in Pakistan: time to invest in routine immunization. Human Vaccines & Immunotherapeutics. 2022 Nov 30;18(5):2080444.

Sarma H, Budden A, Luies SK, Lim SS, Shamsuzzaman M, Sultana T, Rajaratnam JK, Craw L, Banwell C, Ali MW, Uddin MJ. Implementation of the World's largest measles-rubella mass vaccination campaign in Bangladesh: a process evaluation. BMC Public Health. 2019 Dec;19:1-0

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