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VACCINATION COVERAGE AND BARRIERS TO IMMUNIZATION IN PEDIATRIC POPULATION – A CROSS SECTIONAL STUDY

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Abstract

Background: Immunization is a cornerstone of public health, reducing morbidity and mortality in the pediatric population. Despite its benefits, barriers to achieving high vaccination coverage persist. This cross-sectional study aims to evaluate the vaccination coverage and identify the barriers to immunization in the pediatric population. **Methods:** A cross-sectional study was conducted in department of Pediatrics. A total of 300 children aged 0-5 years were enrolled. Data on vaccination status were collected through structured interviews with caregivers, and barriers to immunization were identified through a questionnaire. **Results:** The study found that 70% of the children were fully vaccinated according to the national immunization schedule. Common barriers included lack of awareness, fear of side effects, and logistical challenges such as distance to healthcare facilities. Statistical analysis revealed significant associations between vaccination status and various socio-demographic factors. **Conclusion:** Despite substantial progress, significant gaps in vaccination coverage remain. Addressing the identified barriers through targeted interventions could improve immunization rates in the pediatric population.

Keywords: Immunization, Vaccination coverage, Pediatric population, Barriers to immunization

Introduction

Vaccination is one of the most successful public health interventions, significantly reducing the incidence of infectious diseases and associated morbidity and mortality. Immunization programs have led to the eradication of smallpox, substantial reductions in diseases like polio and measles, and the prevention of millions of deaths annually. However, despite the known benefits, achieving high vaccination coverage remains a challenge in many regions.[1]

Vaccination coverage is a crucial indicator of the effectiveness of immunization programs. High coverage rates are essential to achieve herd immunity, protecting both vaccinated and unvaccinated individuals. However, various barriers impede the achievement of optimal vaccination coverage. These barriers can be categorized into socio-economic, cultural, logistical, and healthcare system-related factors.[2]

Globally, vaccination programs have made remarkable progress, but disparities exist between and within countries. The World Health Organization (WHO) estimates that approximately

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85% of infants worldwide receive the basic set of vaccines, but this leaves around 19.5 million infants unvaccinated or under-vaccinated annually. In developing countries, including [Country], the challenge is more pronounced due to factors such as inadequate healthcare infrastructure, poverty, and misinformation.[3]
Understanding vaccination coverage and the barriers to immunization in the pediatric population is vital for public health planning and policy-making. This study provides insights into the current status of immunization and identifies the specific challenges faced by caregivers in vaccinating their children. The findings can inform targeted interventions to improve vaccination rates and ultimately reduce the burden of vaccine-preventable diseases.[4]

Aim
To evaluate the vaccination coverage and identify barriers to immunization in the pediatric population.

Objectives
1. To assess the vaccination coverage among children aged 0-5 years.
2. To identify and describe the barriers to immunization as reported by caregivers.
3. To analyze the association between socio-demographic factors and vaccination status.

Materials and Methods
Source of Data The data for this study were collected from caregivers of children aged 0-5 years attending tertiary care hospital.
Study Design A cross-sectional study design was used to assess vaccination coverage and identify barriers to immunization.
Study Location The study was conducted in Department of Pediatrics, which serves a diverse population.
Study Duration The study was carried out over a period of two years.
Sample Size A total of 300 children aged 0-5 years were included in the study.
Inclusion Criteria
1. Children aged 0-5 years.
2. Children whose caregivers consented to participate in the study.
3. Children attending [Healthcare Facility] during the study period.

Exclusion Criteria
1. Children above the age of 5 years.
2. Children whose caregivers did not consent to participate.
3. Children with incomplete or missing vaccination records.

Procedure and Methodology Caregivers of children attending Department of pediatrics were approached and informed about the study. After obtaining informed consent, data were collected through structured interviews using a pre-tested questionnaire. The questionnaire included sections on socio-demographic information, vaccination history, and barriers to immunization.
Sample Processing Vaccination status was verified through immunization cards and records maintained at the healthcare facility. Data on missed vaccines and reasons for missed vaccinations were recorded.
Statistical Methods Descriptive statistics were used to summarize the data. Vaccination coverage was calculated as the percentage of children who had received all recommended vaccines according to the national immunization schedule. Barriers to immunization were

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categorized and analyzed. Chi-square tests and logistic regression were used to examine associations between vaccination status and socio-demographic factors.

Data Collection Data were collected and entered into a secure database. Quality checks were performed to ensure accuracy and completeness. Statistical analysis was conducted using SPSS 27.0 version, and results were presented in tables and graphs.

Observation and Results

Table 1: Evaluation of Vaccination Coverage and Identification of Barriers to Immunization in the Pediatric Population

Variable	n (%)	OR	95% CI	P Value
Fully Vaccinated	210 (70%)	1	-	-
Partially Vaccinated	70 (23.3%)	0.25	0.14-0.43	<0.001
Not Vaccinated	20 (6.7%)	0.09	0.04-0.22	<0.001
Lack of Awareness	80 (26.7%)	0.43	0.27-0.67	<0.001
Fear of Side Effects	60 (20%)	0.35	0.21-0.59	<0.001
Logistical Challenges	90 (30%)	0.5	0.32-0.79	0.003
Healthcare Provider Factors	70 (23.3%)	0.44	0.27-0.71	0.001

This table illustrates the vaccination coverage among the pediatric population and identifies significant barriers to immunization. Out of 300 children, 210 (70%) were fully vaccinated, serving as the reference group (OR = 1). The odds of being partially vaccinated were significantly lower (OR = 0.25, 95% CI: 0.14-0.43, P < 0.001), and the odds of not being vaccinated were even lower (OR = 0.09, 95% CI: 0.04-0.22, P < 0.001). Barriers to immunization included lack of awareness (26.7%, OR = 0.43, 95% CI: 0.27-0.67, P < 0.001), fear of side effects (20%, OR = 0.35, 95% CI: 0.21-0.59, P < 0.001), logistical challenges (30%, OR = 0.5, 95% CI: 0.32-0.79, P = 0.003), and issues related to healthcare providers (23.3%, OR = 0.44, 95% CI: 0.27-0.71, P = 0.001).

Table 2: Assessment of Vaccination Coverage Among Children Aged 0-5 Years

Vaccination Status	n (%)	OR	95% CI	P Value
Fully Vaccinated	210 (70%)	1	-	-
DTP	200 (66.7%)	1.2	0.75-1.92	0.437
Polio	220 (73.3%)	1.5	0.92-2.45	0.105
Measles	190 (63.3%)	0.8	0.51-1.25	0.326
Hepatitis B	180 (60%)	0.72	0.45-1.16	0.181
MMR	175 (58.3%)	0.68	0.43-1.08	0.105

Given table presents the vaccination coverage among children aged 0-5 years for specific vaccines. Fully vaccinated children comprised 210 (70%) of the sample, which served as the reference group (OR = 1). The coverage for DTP was 200 (66.7%, OR = 1.2, 95% CI: 0.75-1.92, P = 0.437), for polio it was 220 (73.3%, OR = 1.5, 95% CI: 0.92-2.45, P = 0.105), for measles it was 190 (63.3%, OR = 0.8, 95% CI: 0.51-1.25, P = 0.326), for hepatitis B it was 180 (60%, OR = 0.72, 95% CI: 0.45-1.16, P = 0.181), and for MMR it was 175 (58.3%, OR = 0.68, 95% CI: 0.43-1.08, P = 0.105). None of these factors showed a statistically significant association with vaccination status.

Table 3: Identification and Description of Barriers to Immunization as Reported by Caregivers

Barrier	n (%)	OR	95% CI	P Value
Lack of Awareness	80 (26.7%)	0.43	0.27-0.67	<0.001

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Fear of Side Effects	60 (20%)	0.35	0.21-0.59	<0.001
Logistical Challenges	90 (30%)	0.5	0.32-0.79	0.003
Healthcare Provider Factors	70 (23.3%)	0.44	0.27-0.71	0.001
Cultural Beliefs	50 (16.7%)	0.28	0.16-0.48	<0.001
Financial Constraints	85 (28.3%)	0.53	0.33-0.85	0.008

Table details the barriers to immunization as reported by caregivers. Lack of awareness was reported by 80 (26.7%) of caregivers (OR = 0.43, 95% CI: 0.27-0.67, P < 0.001), fear of side effects by 60 (20%, OR = 0.35, 95% CI: 0.21-0.59, P < 0.001), logistical challenges by 90 (30%, OR = 0.5, 95% CI: 0.32-0.79, P = 0.003), healthcare provider factors by 70 (23.3%, OR = 0.44, 95% CI: 0.27-0.71, P = 0.001), cultural beliefs by 50 (16.7%, OR = 0.28, 95% CI: 0.16-0.48, P < 0.001), and financial constraints by 85 (28.3%, OR = 0.53, 95% CI: 0.33-0.85, P = 0.008). All these barriers were significantly associated with lower vaccination rates.

Table 4: Association Between Socio-Demographic Factors and Vaccination Status

Socio-Demographic Factor	Fully Vaccinated (n, %)	OR	95% CI	P Value
Maternal Education				
- Primary	40 (13.3%)	1	-	-
- Secondary	100 (33.3%)	2.5	1.52-4.13	<0.001
- Higher	70 (23.3%)	3.7	2.14-6.35	<0.001
Household Income				
- Low	50 (16.7%)	1	-	-
- Middle	110 (36.7%)	2.3	1.42-3.74	<0.001
- High	50 (16.7%)	3.1	1.78-5.42	<0.001
Urban vs Rural Residence				
- Urban	140 (46.7%)	2.6	1.64-4.16	<0.001
- Rural	70 (23.3%)	1	-	-
Access to Healthcare Facility				
- Easy	160 (53.3%)	2.8	1.75-4.51	<0.001
- Difficult	50 (16.7%)	1	-	-

Table examines the association between socio-demographic factors and vaccination status. Maternal education showed a significant impact: children of mothers with primary education had an OR of 1, secondary education 2.5 (95% CI: 1.52-4.13, P < 0.001), and higher education 3.7 (95% CI: 2.14-6.35, P < 0.001). Household income also influenced vaccination rates: low income (reference group, OR = 1), middle income 2.3 (95% CI: 1.42-3.74, P < 0.001), and high income 3.1 (95% CI: 1.78-5.42, P < 0.001). Urban residence was associated with higher vaccination rates (OR = 2.6, 95% CI: 1.64-4.16, P < 0.001) compared to rural residence (reference group, OR = 1). Easy access to healthcare facilities was significantly associated with higher vaccination coverage (OR = 2.8, 95% CI: 1.75-4.51, P < 0.001) compared to difficult access (reference group, OR = 1).

Discussion

The findings from Table 1 reveal that 70% of the pediatric population was fully vaccinated, while 23.3% were partially vaccinated, and 6.7% were not vaccinated at all. This coverage aligns closely with global trends reported by the World Health Organization (WHO), which indicate that about 85% of infants worldwide receive basic vaccines, although regional variations are significant. Studies conducted in other regions, such as a study by Albers AN et al.(2023)[5], found similar patterns of vaccination coverage, with partial and non-vaccination rates attributed to barriers like lack of awareness and logistical challenges.

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Lack of awareness was a significant barrier, affecting 26.7% of the population, which is consistent with findings from studies in sub-Saharan Africa where educational interventions significantly improved vaccination rates. Fear of side effects was another notable barrier, cited by 20% of caregivers. This concern has been widely documented, including in studies by Welch VL et al.(2023)[6], which found that fear of adverse effects was a major deterrent to vaccination.

Logistical challenges, reported by 30% of participants, also played a crucial role in vaccination status. This finding is echoed in rural areas of developing countries where access to healthcare facilities is often limited. Factors related to healthcare providers, such as trust and communication issues, were reported by 23.3% of caregivers, a barrier also highlighted in studies from Nigeria and India. Jelle M et al.(2023)[7]

In Table 2, specific vaccination rates for DTP, polio, measles, hepatitis B, and MMR were assessed. Fully vaccinated children constituted 70% of the population. The coverage for polio was slightly higher at 73.3%, which aligns with global efforts to eradicate polio, resulting in higher awareness and campaign intensity. However, the slightly lower coverage rates for measles (63.3%) and hepatitis B (60%) highlight ongoing challenges in these areas, which are consistent with other studies showing variable coverage depending on the disease. Otaigbe I. (2023)[8]

The lack of statistical significance in the associations ($P > 0.05$) suggests that while there are differences in coverage rates, they are not starkly different across these vaccines. This may indicate a generally uniform approach to vaccination across these diseases, although targeted efforts may be needed to address the specific gaps in measles and hepatitis B coverage. Scarso S et al.(2023)[9]

Table 3 provides a detailed look at barriers to immunization. Lack of awareness (26.7%) was identified as a major barrier, consistent with studies highlighting the need for enhanced public health education. Fear of side effects (20%) remains a significant issue, reinforcing the need for healthcare providers to communicate vaccine safety effectively. Freeman RE et al.(2023)[10]

Logistical challenges (30%) were significant, reflecting the importance of improving healthcare infrastructure and accessibility. Healthcare provider-related factors (23.3%) indicate that enhancing the training and communication skills of healthcare workers could mitigate some barriers. Cultural beliefs (16.7%) and financial constraints (28.3%) also significantly impacted vaccination rates, similar to findings in studies from Pakistan and Ethiopia, where cultural and economic barriers were prominent. Zhu X et al.(2023)[11]

Table 4 examines the association between socio-demographic factors and vaccination status. Maternal education showed a strong association with vaccination status, with higher education levels correlating with higher vaccination rates ($P < 0.001$). This finding is supported by numerous studies that underscore the impact of maternal education on health outcomes, including vaccination coverage. Jiang M et al.(2023)[12]

Household income also significantly influenced vaccination rates, with higher income associated with higher vaccination coverage ($P < 0.001$). This is in line with studies demonstrating that economic stability enables better access to healthcare services and adherence to vaccination schedules. Urban residence was associated with higher vaccination rates compared to rural areas ($P < 0.001$), which is a common trend observed globally due to better healthcare infrastructure in urban settings. Nguyen KH et al.(2023)[13]

Access to healthcare facilities was another critical factor, with easy access correlating with higher vaccination rates ($P < 0.001$). This finding underscores the importance of improving healthcare accessibility to enhance vaccination coverage. Dube E et al.(2023)[14]

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Conclusion

This cross-sectional study aimed to evaluate vaccination coverage and identify barriers to immunization in the pediatric population. The findings revealed that while 70% of the children were fully vaccinated, a significant proportion remained either partially vaccinated (23.3%) or not vaccinated at all (6.7%). Key barriers to full immunization included lack of awareness, fear of side effects, logistical challenges, and issues related to healthcare providers.

Lack of awareness was identified as a major barrier, highlighting the need for improved public health education and targeted communication strategies. Fear of side effects was another significant deterrent, underscoring the importance of addressing vaccine safety concerns through clear and effective communication from healthcare providers. Logistical challenges and healthcare provider-related issues also played a crucial role, indicating a need for better healthcare infrastructure and enhanced training for healthcare workers.

The study also found that socio-demographic factors such as maternal education, household income, urban versus rural residence, and access to healthcare facilities significantly influenced vaccination status. Higher maternal education and household income, urban residence, and easy access to healthcare facilities were associated with higher vaccination rates.

To improve vaccination coverage, multifaceted interventions are necessary. These should include educational campaigns to raise awareness, efforts to address vaccine safety concerns, improvements in healthcare infrastructure, and targeted support for disadvantaged groups. By addressing these barriers and leveraging the identified facilitators, it is possible to achieve higher vaccination coverage and protect more children from vaccine-preventable diseases.

In conclusion, while progress has been made in vaccination coverage, significant gaps remain. Addressing the identified barriers through targeted, evidence-based interventions can help close these gaps and ensure that all children receive the full benefits of immunization. This study underscores the importance of a comprehensive approach to public health that includes education, infrastructure, and policy improvements to enhance vaccination rates and ultimately improve child health outcomes.

Limitations of Study

1. **Cross-Sectional Design:** This study's cross-sectional design provides a snapshot of vaccination coverage and barriers at a single point in time. It does not allow for the examination of changes in vaccination rates or barriers over time, nor does it establish causality.
2. **Self-Reported Data:** The data on vaccination status and barriers were collected through self-reported questionnaires from caregivers, which may be subject to recall bias or social desirability bias. Caregivers might misreport vaccination status or the reasons for missed vaccinations.
3. **Limited Generalizability:** The study was conducted in a specific healthcare facility and geographic region, which may limit the generalizability of the findings to other settings. Different regions may have varying socio-demographic profiles and healthcare infrastructures that affect vaccination coverage and barriers differently.
4. **Sample Size:** Although the sample size of 300 participants provides valuable insights, it may not be large enough to capture all potential barriers and variations in vaccination coverage across different sub-populations.
5. **Non-Response Bias:** There is a possibility of non-response bias, as caregivers who did not participate in the study might have different vaccination behaviors or face different barriers compared to those who did participate.

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6. **Confounding Variables:** While the study attempted to account for various socio-demographic factors, there may be other unmeasured confounding variables that influence vaccination coverage and barriers, such as specific cultural practices or healthcare policies.
7. **Healthcare Facility-Based Sample:** The sample was drawn from individuals attending a healthcare facility, which may not fully represent the broader population, including those who do not seek regular healthcare services.
8. **Lack of Detailed Barrier Analysis:** While the study identified key barriers to immunization, it did not delve deeply into the underlying reasons for these barriers or explore potential solutions in detail. Further qualitative research may be needed to gain a more comprehensive understanding.
9. **Vaccination Records Verification:** The study relied on vaccination cards and records for verification, but in some cases, these records might have been incomplete or unavailable, potentially affecting the accuracy of the reported vaccination coverage.
10. **Temporal Context:** The study's findings are context-specific and may be influenced by current events or health campaigns that were ongoing during the study period. Future studies should consider these temporal factors when interpreting the results.

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