Original Article

Relationship between Mothers' Education Level and Age-Appropriate EPI Vaccination of Children Attending Pediatric OPD at Lahore General Hospital

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ABSTRACT

Background & Objectives: The Expanded Program on Immunization (EPI) prevents vaccine-preventable diseases and reduces childhood morbidity and mortality. Maternal education is often cited as a determinant of vaccination uptake, but its local role is unclear. This study was conducted to see the association between mothers' education level and knowledge about EPI with EPI vaccination uptake amongst children attending the Pediatric OPD at Lahore General Hospital.

Methodology: A cross-sectional study was conducted over six months at the pediatric OPD, Lahore General Hospital. A total of 186 mothers with children under two years were recruited using convenience sampling. Data were collected through a structured questionnaire and vaccination cards. Variables included maternal education, knowledge about EPI, and vaccination status. Data was analyzed using SPSS v23. Chi-square test was applied; $p < 0.05$ was considered statistically significant.

Results: Mean maternal age was 27.5 years (range: 19–45). More than half (54.8%) had matric education or higher, and 90.9% reported EPI knowledge. Overall, 79.6% of children had up-to-date vaccination. Maternal education level was not significantly associated with vaccination status ($p = 0.05$), whereas maternal knowledge of EPI was strongly associated ($p < 0.001$).

Conclusion: Maternal education level alone was not linked to vaccination status, whereas EPI knowledge showed a strong association. Strengthening maternal awareness may improve vaccination coverage more effectively than focusing solely on formal education.

KEY WORDS: EPI, immunization, maternal education, vaccination coverage, child health

INTRODUCTION

Immunization is one of the most successful and cost-effective public health interventions, preventing an estimated 2–3 million deaths annually worldwide. Since the launch of the Expanded Program on Immunization (EPI) by the World Health Organization (WHO) in 1974, vaccines against tuberculosis, polio, measles, diphtheria, pertussis, and tetanus have been made available globally, with new vaccines added over time.[1] Pakistan adopted the EPI in 1978 to protect children from vaccine-preventable diseases. Despite these efforts, vaccination coverage in Pakistan remains suboptimal compared to global targets.[2] Maternal factors, particularly education, have been consistently linked with child health outcomes.[3] Studies from low- and middle-income countries suggest that higher maternal education is associated with better knowledge of health practices, improved utilization of preventive services, and reduced infant mortality.[4] Maternal education is also thought to improve uptake of child immu-nization by enhancing decision-making capacity and awareness of disease prevention.[5] However, evidence from Pakistan is mixed. Some studies in urban and peri-urban areas have reported significant associations between maternal education and vaccination coverage, while others found maternal knowledge about EPI to be a stronger predictor than formal education.[6] Given the persistent burden of vaccine-preventable diseases in Pakistan and the variability of evidence regarding the role of maternal education, it is important to examine this relationship in different settings. This study was conducted to determine whether maternal education level is associated with age-appropriate vaccination status of children attending the pediatric outpatient department (OPD) at Lahore General Hospital.

METHODOLOGY

Study design and setting: A cross-sectional study was conducted at the pediatric outpatient department (OPD) of Lahore General Hospital, Lahore, over a period of six months in 2023.

Study population: Mothers attending the pediatric OPD with children under two years of age were eligible. Children with medical conditions contraindicating vaccination including those with severe immunodeficiency due to any cause, moderate or severe acute illness, or temporary immuno-suppression due to any cause were excluded.

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* Received: October 1, 2025
* Revised: October 18, 2025
* Corrected & Edited: December 10, 2025
* Accepted: December 18, 2025

Sample size: The minimum required sample size was 186, calculated using Daniel's formula[7] with a prevalence of incomplete vaccination of 20%[8], a 95% confidence level, a 5% margin of error, with unknown population size.

Sampling technique: Convenience sampling was applied, and 186 mothers were enrolled after obtaining informed consent.

Data collection: A structured, pre-tested questionnaire was administered. Vaccination status was verified using EPI vaccination cards. Information included maternal age, education, number of children, knowledge about EPI, and vaccination status.

Operational definitions: Maternal education level was categorized into two categories i.e uneducated or from grade 1 to and including matriculation was category 1 and mothers who had education of above matriculation level was category 2.

Mothers' knowledge about EPI was assessed by asking 3 questions namely if they knew about the EPI program, if they knew about importance of vaccination and if they knew about the vaccination schedule. If they answered yes to any of the two questions they were categorized as having knowledge about vaccination. If they answered yes to only one or no to all three, they were categorized as having no knowledge about vaccination.

Age-appropriate vaccination status was defined as being up to date with the National EPI schedule. Children with up-to-date vaccination status in line with the EPI according to age were categorized in one group and those whose vaccination status was lagging behind even by a single vaccine were placed in the second group.[8]

Data analysis: Data were analyzed using SPSS version 23. Descriptive statistics were computed. Chi-square test was applied, with $p < 0.05$ considered statistically significant. Mean, range and standard deviation was calculated for age in years of the mothers. Frequencies and percentages were calculated for categories of education level and EPI knowledge and for the presence or absence of up-to-date age-appropriate vaccination status. Chi square test was used to see the association between age-appropriate vaccination status and mothers 'education level and EPI knowledge categories.

Ethical considerations: The study was approved by the Institutional Review Board of Ameer-ud-Din Medical College/ PGMI, Lahore (IRB letter no. 00-26-A-2023 Informed consent was obtained from all participants.

RESULTS

A total of 186 mothers participated. The mean age was 27.5 ± 5.6 years (range: 19–45).

Maternal characteristics: 102 (54.8%) had education matriculation or higher, while 84 (45.2%) had below matric education. Knowledge about EPI was reported by 169 (90.9%) mothers.

Vaccination coverage: 148 (79.6%) children had up-to-date vaccination, while 38 (20.4%) were not fully vaccinated.

Association: No significant association was found between maternal education and vaccination status (p = 0.05). Maternal knowledge of EPI showed a strong association with vaccination (p <0.001).

Table I: Maternal education status of participants (n=186)

Education Status	Frequency (n)	Percentage (%)
Below matric	84	45.2
Matric and above	102	54.8
Total	186	100.0

Table II: Maternal knowledge of EPI (n=186)

Knowledge of EPI	Frequency (n)	Percentage (%)
Yes	169	90.9
No	17	9.1
Total	186	100.0

Table III: Vaccination status of children (n=186)

Vaccination Status	Frequency (n)	Percentage (%)
Up to date	148	79.6
Not up to date	38	20.4
Total	186	100.0

Table IV: Association between maternal education, EPI knowledge, and vaccination status of children (n=186)

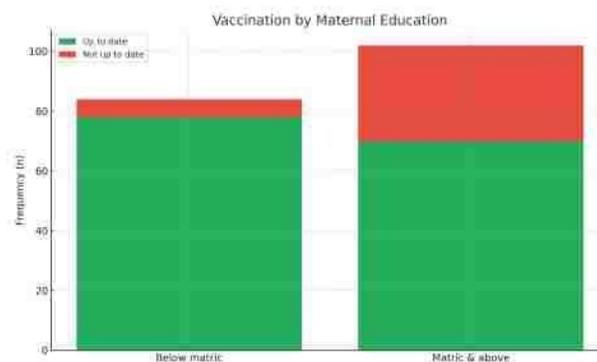| Variable	Category	Up-to-date n (%)	Not up-to-date n (%)	p-value
Maternal education	Below matric	78 (92.9)	6 (7.1)	0.05
	Matric & above	70 (68.6)	32 (31.4)	
Knowledge of EPI	Yes	144 (85.2)	25 (14.8)	<0.001
	No	4 (23.5)	13 (76.5)	

Figure 1. Vaccination by maternal education (stacked bar chart).

DISCUSSION

This study assessed the relationship between maternal education and age-appropriate EPI vaccination status of children attending a tertiary-care pediatric OPD in Lahore.

While more than three-quarters of the children had up-to-date vaccinations, maternal education level was not significantly associated with vaccination status. In contrast, maternal knowledge of EPI showed a strong positive association with vaccination uptake.

Our findings are consistent with a study from peri-urban Karachi, which reported that maternal knowledge of immunization was more predictive of vaccination status than formal education.[9] Similarly, studies from Madagascar[10] and Nigeria[11] highlighted that awareness and health literacy directly influence immunization practices, regardless of educational attainment. On the other hand, some studies have demonstrated the opposite trend. For instance, a Karachi-based study found that maternal education was significantly associated with vaccination coverage, while knowledge of EPI was not.[12] This divergence suggests that the impact of education may be context-specific, influenced by access to health services, cultural norms, and the effectiveness of health communication strategies.

The finding that education alone was not sufficient to ensure vaccination coverage may reflect that formal schooling does not necessarily translate into awareness of child health programs. In Pakistan, EPI information is often disseminated through Lady Health Workers, healthcare providers, and mass campaigns.[13] Mothers with limited formal education may still acquire adequate knowledge from these sources, which could explain why knowledge rather than education emerged as the stronger determinant in our study.

Strengths and limitations: A key strength of this study is its focus on a tertiary-care setting in Lahore, adding local evidence to a relatively under-explored area. Standardized operational definitions and verification of vaccination status from cards improved reliability. However, limitations include the use of convenience sampling, which may reduce generalizability, and the cross-sectional design, which precludes causal inferences. Social desirability bias in self-reported knowledge may also have influenced responses.

Implications: The results suggest that public health programs should prioritize improving maternal awareness of the EPI schedule rather than relying solely on formal education levels as a proxy for vaccination uptake. Strengthening counseling at OPDs, mobilizing Lady Health Workers, and using community-based awareness campaigns could enhance coverage.

CONCLUSION AND RECOMMENDATIONS

Maternal education was not significantly associated with vaccination coverage, while maternal knowledge was strongly associated. Awareness interventions may be more effective than relying on formal education alone.

Recommendations

Strengthen health education interventions in OPDs. Community-based awareness campaigns by Lady Health Workers should be undertake. Integrate maternal education sessions in antenatal/postnatal care. Conduct further large-scale studies across Pakistan.

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