

# Frequency and Factors Leading to Low Vaccination Coverage in Children Visiting a Tertiary Care Facility

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## ABSTRACT

**Introduction:** Immunization is the most important and effective preventive health tool. Expanded Programme of Immunization (EPI) was launched in Pakistan in 1976 with the aim to control six childhood diseases: Tuberculosis, Diphtheria, Pertussis (whooping cough), Tetanus, Polio and Measles. World Health Organization (WHO) and United Nations International Children Education Fund (UNICEF) added vaccination against Hemophilus Influenza b, Hepatitis B and Pneumococcus later in the regimen. Efforts in term of surveys regarding immunization coverage are needed to monitor the vaccination coverage and to identify problems leading to low rates of vaccination coverage.

**Objective:** To determine the frequency of vaccination coverage and factors leading to low vaccination coverage in children visiting a tertiary care hospital.

**Methodology:** This cross sectional study was conducted at out-patient department of National Institute of Child Health (NICH) Karachi over a period of six months. Children of ages 2 months to 5 years of either gender attending OPD irrespective of their attending complaint were included. As per EPI schedule, partial to unvaccinated child was labeled as low vaccination coverage confirmed by Vaccination Card.

**Results:** A total of 136 children were enrolled with mean age of  $2.83 \pm 1.08$  years out of which 52% were male. 34.60% patients were fully vaccinated, 60.30% patients were partially vaccinated and 5.10% patients were unvaccinated. There were 65.4% patients with low vaccination status. Analysis of factors leading to low vaccination showed that the maternal illiteracy (41.9%), perception of no benefit from vaccination (39%), and distant vaccination centers (36%) were the most prevalent reasons. This was followed by absence of mobile teams (8.8%), improper knowledge of EPI schedule (18.4%), non-availability of vaccine (8.1%), and pain due to vaccine (3.7%).

**Conclusion:** We found 65.4% patients with low immunization status with poor maternal education as the leading risk factor resulting in low immunization.

**Key words:** Expanded Programme on Immunization (EPI), Immunization, Risk factors

**How to cite this article:** Hina B, Rizwani GH. Need of innovative research in herbal pharmacotherapy for better therapeutic efficacy and safety- a review. Ann Jinnah Sindh Med Uni 2019; 5 (2):83-86

عنوان: تیسرے درجے کے اعلیٰ ہسپتال میں اطفال میں حفاظتی ٹیکے لگانے کے رجحان میں کمی کے عوامل اور تعدد کی جانچ:

مقصد: اس تحقیق کا مقصد کراچی میں اطفال کے تیسرے درجے کے اعلیٰ ہسپتال میں اطفال میں حفاظتی ٹیکے لگانے کے رجحان میں کمی کے عوامل اور تعدد کی جانچ کرنا ہے۔

طریقہ: یہ کراس سیکشنل مطالعہ کراچی میں موجود ہسپتال قومی ادارہ برائے صحت اطفال (NICH) کی او۔ پی۔ ڈی میں چھ ماہ کے دورانیے میں کیا گیا جس میں 2 ماہ سے 5 سال تک کی عمر کے بچوں کے او۔ پی۔ ڈی میں حفاظتی ٹیکوں کے غیر تسلسل انداز میں حاضری بچوں کے صحت کارڈ کے گزشتہ ریکارڈ سے ثابت ہوئی یعنی بچوں کو حفاظتی ٹیکے لگوانے میں بے احتیاطی کا مظاہرہ کیا گیا۔

نتائج: مجموعی طور پر 136 بچے جن کی اوسط عمر  $2.83 \pm 1.08$  سال تھی اس تحقیق میں شامل کئے گئے۔ جس میں 34.60% بچے مکمل طور پر اور 60.30% بچے جزوی طور پر لگوائے گئے۔ جبکہ 5.10% بچے کو کوئی حفاظتی ٹیکہ نہیں لگوائے گئے۔ 65.5% بچے حفاظتی ٹیکوں کا شماراتی اندراج پست تھا۔ ویکسینیشن میں کمی کی وجوہات میں جو عوامل سرفہرست ہیں ان میں 41.9% بچے غیر تعلیم یافتہ والدین، حفاظتی ٹیکوں کی اہمیت سے ناواقفیت اور 36% بچے دُور مقامات پر واقع مراکز کا فاصلہ زیادہ ہونا شامل ہیں۔ جبکہ کم وجوہات میں 8.8% بچے موبائل ٹیم کی غیر حاضری، 18.4% بچے حفاظتی ٹیکوں کے اوقات کار سے ناواقفیت ہونا، 8.1% بچے مراکز میں حفاظتی ٹیکوں کی عدم دستیابی اور 3.7% بچے ٹیکہ لگاتے وقت بچوں کو درد کی وجہ سے مزید کورس کو ادھورا چھوڑنا شامل ہیں۔

حاصل مطالعہ: حاصل ہونے والے نتائج سے معلوم ہوتا ہے کہ 65.4% بچے ویکسینیشن کی تکمیل نہ ہونے کی وجہ سے قوت مدافعت کی کمی پائی گئی۔ جس کی سب سے بڑی وجہ والدین میں اس حوالے سے تعلیم کی کمی ہے۔

## INTRODUCTION

Vaccination is the process by which child can be made immune to certain infectious diseases<sup>1</sup>. Vaccines

stimulate the immune system of the body so that the future infections with the same organisms can be prevented as during vaccination, a killed or inactivated micro organism, its toxin, or surface protein is injected to stimulate the body's immune system<sup>2,3</sup>. Immunization is called as the most important and effective health intervention in the existence<sup>2</sup>.

The basic objective of health sector is to improve the vaccination coverage and is a gateway towards the

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reduction of childhood mortality<sup>4</sup>. Many developed countries have eliminated several vaccine preventable infectious diseases which are amongst the major causes of childhood morbidity and mortality in children under 5 years through widespread routine immunizations programmes<sup>5,6</sup>.

Expanded Programme on Immunization (EPI) was launched in Pakistan 1976 with the aim to control six childhood diseases: Tuberculosis, Diphtheria, Pertussis (whooping cough), Tetanus, Polio, and Measles by World Health Organization (WHO) and United Nations International Children Education Fund (UNICEF). Vaccination against Hemophilus influenza b, Hepatitis B and Pneumococcus was added in this regimen later on<sup>7</sup>. By the surveys conducted in different cities of Pakistan, it is estimated that over all 66% of the children are improperly vaccinated<sup>8</sup>. For the prompt improvement in the current vaccination status, the counseling done by health care providers including lady health workers (LHW), dispensers, lady health visitors (LHV), doctors and nurses is considered a major factor. Regarding cost of vaccination, around US \$ 500 are spent to fully vaccinate a child but it is still less than the cost of disease treatment and hence it provides opportunities of poverty reduction and economy stabilization of a country<sup>7</sup>.

Accelerated efforts in terms of surveys regarding immunization coverage are needed to monitor the vaccination coverage at present and to identify problems hindering the increase in vaccination coverage.

Overall, EPI coverage in Pakistan according to different surveys is 44.8%-65%<sup>9</sup>. Regarding the different risk factors identified as reasons of improper vaccination, these include perception of no benefit (37.5%), vaccination centers distance more than 10 km (32.3%), lack of mobile teams (6%), lack of awareness of EPI schedule (13.7%), non-availability of vaccines at vaccination center (10%), fear of pain due to vaccination (12.5%), and maternal illiteracy (36.6%)<sup>9,10</sup>.

The objective of our study was to estimate the current vaccination status and to identify the risk factors for low vaccination coverage.

## METHODOLOGY

This cross sectional study was conducted in National Institute Of Child health (NICH) for a period of six months. Sample size was calculated using formula of Least Proportion of factors leading to low vaccination coverage=6%<sup>14</sup>, Confidence level=95%, Margin of error=4% and sample size of 136 children was calculated<sup>9</sup>. Children of 2 months to 5 years of age of both genders, who visited outpatient department (OPD)

of NICH along with the parents irrespective of their visiting complaints were enrolled for the study. The purpose and procedure of the study was explained to the parents, informed consent was taken and confidentiality was ensured. Parents who refused to participate in the study were excluded. History was taken for the vaccination of the child and vaccination card was reviewed for confirmation of vaccination coverage. Parents who gave history of vaccination but vaccination card was not available were also excluded from the study. Fully vaccinated child was defined as a child who had received all doses of vaccination as per age specific EPI schedule confirmed by his vaccination card. Partially vaccinated child was defined as a child whose vaccination was not complete according to age specific EPI schedule. Unvaccinated child was defined as a child who did not receive any dose of the EPI scheduled vaccine. Low vaccination coverage was defined as inclusion of both partially vaccinated and unvaccinated children as per EPI schedule and was confirmed by Vaccination Card.

In addition to this, the factors leading to low vaccination coverage were inquired from the parents. These included perception of no benefit from vaccination by parents, distant vaccination centers where vaccination center was more than 10 km from the residence, absence of mobile teams, where no visits were routinely made by the mobile vaccination teams in the residing area, improper knowledge of EPI schedule, where mothers were unaware of EPI schedule, non-availability of vaccine at the center, where non-availability of vaccines was present on visiting center for 2 or more times, fear of pain due to vaccine by mother and maternal illiteracy, where illiterate meaning no school education at all.

Partial to unvaccinated child as per EPI schedule was labeled as low vaccination coverage, confirmed by Vaccination Card. Factors leading to low vaccination coverage were assessed and labeled as positive/negative. This information along with the demographics was entered in the proforma by the researcher.

Data was entered and analyzed using SPSS version 17.  $\pm$  Mean and standard deviation was calculated for age of the child and maternal age. Frequency and percentage was calculated for gender, low vaccination coverage and factors leading to low coverage, including place of birth of child, educational status of mother, awareness of EPI Programme, and distance from vaccination center. Stratification was done with regards to child age, gender, maternal age, economic status of the family to see the effect of these on outcomes. Chi square test was applied and p value less than or equal to 0.05 was considered as significant.

## RESULTS

A total of 136 children were enrolled. Mean age of the children was 2.83+1.08 years and males were 52%. There were 72.10% children of age <3 years and 27.90% children of age > 3 years. Mean maternal age + standard deviation was 34.58+1.5 years. Maternal age of >35 years was seen in (52.90%). There were 50% patients with poor economic status, 25.70% with middle and 24.30% patients with upper middle economic status. Place of birth of 79.41% children was Karachi (Table 1).

Table 1: Demographic Features (N=136)

Age (yrs)	Mean+sd	Demographics	%
Age of children	2.83+1.08	Place of birth	
< 3yrs	72.1%	Karachi	79.4
> 3yrs	27.9%	Outside Karachi	20.6
Maternal age	34.58+1.5	Socioeconomic status	
> 35 yrs	52.9%	Poor	50
< 35 yrs	47.1%	Middle	25.7
		Upper middle	24.3
		Gender	
		Male	52
		Female	48

34.6% patients were fully vaccinated while 60.3% patients were partially vaccinated and 5.1% patients were unvaccinated.

There were 65.40% patients with low vaccination status (Figure 1).

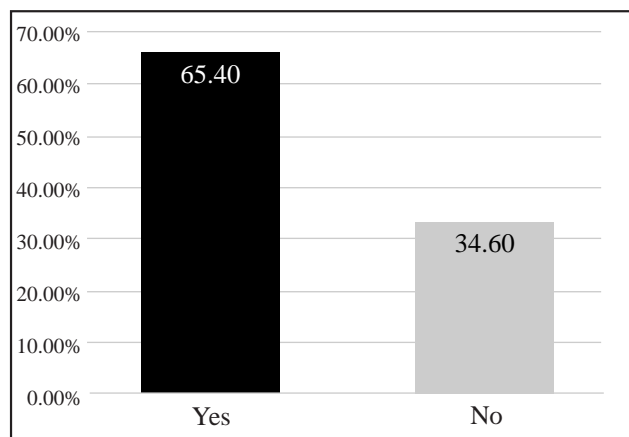


Figure 1: Low Vaccination Coverage in Children (n=136)

Factors leading to low vaccination showed that maternal illiteracy was the leading cause of poor vaccination (41.9%) followed by the perception of no benefit from vaccination (39%) and distant vaccination centers (36%). This was followed by other factors as shown in Table (Table 2).

Table 2: Factors Leading to Low Vaccination Coverage (n=136)

Factor	No.	%
Illiterate maternal educational status		
Factors leading to low vaccination coverage	57	41.9
Perception of no benefit from vaccination	53	39
Distant Vaccination Centers	49	36
Improper knowledge of EPI schedule	25	18.4
Absence of mobile teams	12	8.8
Non-availability of vaccine at the center	11	8.1
Pain due to vaccine	5	3.7

Stratification was done with regards to child age, gender, maternal age, economic status of the family to see the effect of these on outcomes. Chi square test was applied and significant result was observed for child age group and economic status. (Table 3)

Table 3: Stratification of Low Vaccination (n=136)

		Low Vaccination		p-Value
		No.	%	
Child Age Group (in years)	< 3	70	71.4	0.038
	> 3	20	52.6	
Maternal Age Group (in years)	< 35	46	71.9	0.185
	> 35	44	61.1	
Gender	Male	44	62	0.279
	Female	46	70.8	
Economic Status	Poor	45	66.2	0.001
	Middle	12	34.3	
	Upper Middle	33	100	

## DISCUSSION

Mission of EPI coverage is to eradicate, eliminate, or to reduce the disease burden, however these objectives are yet to be achieved completely<sup>1</sup>. A lot of challenges still persist for complete immunization coverage as has been evidenced by outbreak of measles in 2014<sup>11</sup>.

In our study we have found low vaccination coverage in 65.4% children visiting in OPD of a tertiary care hospital which is correlating with previous studies of findings of low vaccination coverage rate in Pakistan.<sup>12</sup> We found maternal illiteracy in 41.9% cases where children had low vaccination coverage. Other studies have also supported parents' education as amongst the major factors for improved vaccination coverage<sup>13,14</sup>.

Other major finding of low vaccination coverage was the perception of parents that there is no benefit from vaccination. This and parental literacy are inter related and many myths and misconceptions about vaccination hazards are common due to lack of awareness. One study in this regard was conducted in Uganda which showed that the decreases participation on national polio day was partly due to misconception that polio vaccine may contain contraceptives<sup>15</sup>.



Health education regarding awareness of EPI is the need of time by health workers and by electronic and print media. Effective educational Programmes should be designed for health care workers to alleviate the myths prevailing regarding vaccination.

In our study, we did not find any gender association with vaccination coverage. Same is reported in study by Naeem et al.<sup>1</sup> while contradictory to this, several studies have reported higher rate of no immunization in female children than their male counterparts<sup>11,16</sup>. We found 8.1% of children or parents complaining about the non-availability of vaccine at the vaccination center. This is contradictory to study by Haider et al, where complaint of non-availability of vaccination was cited by 80% of the respondents as a cause of poor adherence to the vaccination schedule<sup>12</sup>. Yet in our study, cited proportion of 8% is still a high number and needs to be addressed for future legislation designs and for implementation Programmes of EPI. We found distant vaccination center as a factor of low immunization in 36 % of the cases and absence of mobile vaccination teams in 8.8% cases. This issue as a factor of non-immunization has also been found in other studies<sup>17-19</sup>. There were certain limitations in our study. It was a single centered study so its effect cannot be generalized. Further multicentre studies are needed with larger sample size to have generalization.

## CONCLUSION

A high percentage of children was partially or completely unimmunized. Main barriers to vaccination were found to be maternal illiteracy and lack of awareness regarding importance of vaccination. Frequency of vaccination was not related to gender.

**Authors' contribution:** Dr Mohammad Hayat conceived the study, searched for literature, contributed in data collection and data analysis. Dr Sadaf Asim reviewed literature, contributed to discussion and edited the manuscript. Dr Misbah Anjum contributed in literature search, and worked on introduction and discussion writing. Dr Zubair Khoso contributed in data collection. All authors contributed to the final article.

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