Original Article

Mothers' knowledge about EPI and its relation with age-appropriate vaccination of infants in peri-urban Karachi

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Abstract

Objectives: To evaluate the relation between the knowledge of mothers about EPI vaccinations and their infant's coverage. Effect of other socio-demographic variables on mothers' knowledge and child's coverage was also assessed.

Methods: A cross-sectional survey was conducted, utilizing World Health Organization's thirty-cluster sampling strategy. All households with at least one infant were considered eligible. After obtaining verbal consent, the mother was interviewed to assess her knowledge and attitudes towards EPI vaccination. Infant's coverage status was verified by checking EPI card or verbal inquiry. A knowledge score was developed by summing all correct answers.

Results: A total of 210 mothers (7 per cluster) were identified and interviewed. The number and proportion of mothers correctly identifying the seven EPI diseases were as follows; Tuberculosis 57 (27.1%), Diphtheria 53 (25.2%), Pertussis 71 (33.8%), Tetanus 70 (33.3%), Measles 85 (40.5%), Polio 91 (43.3%) and Hepatitis B 65 (31.0%). Only ninety four (44.8%) children were appropriately vaccinated for their age. In the multivariate model, mothers' knowledge was not significantly associated with appropriate vaccination of their children ($p = 0.22$), however, mothers' education was found to be significant ($p < 0.001$).

Conclusion: Mothers' knowledge about EPI vaccination in peri-urban Karachi was quite low and not associated with their children's EPI coverage. Mothers' educational status, however, was significantly associated with Child's coverage. This finding depicts a better health seeking behaviour of a more educated mother (JPMA 60:940; 2010).

Introduction

Immunization has been regarded as the most cost-effective intervention for child health promotion by the World Health Organization.[1] Immunizing a child significantly reduces costs of treating diseases, thus providing a healthy childhood and reducing poverty and suffering.[2] In the past few decades, immunization coverage rates have improved sufficiently in the developed countries, thereby conferring herd immunity, whereas most of the developing countries are still struggling with faltering rates.[1-3]

EPI target diseases are one of the leading causes of high childhood morbidity and mortality, as evidenced by high Infant Mortality Rates (IMR) in developing countries.[4] In Pakistan, the reported EPI coverage is still way below the herd immunity threshold.[4-6] Reasons underlying poor coverage have been studied by researchers worldwide and besides other factors, parental knowledge and beliefs have been documented to influence immunization uptake.[7,8] The challenge for immunization service providers, therefore, is to offer parents balanced and comprehensive information about the risks as well as the benefits of immunization during counseling sessions.

A Knowledge, Attitudes and Practices (KAP) study conducted in China to determine mothers' knowledge about immunizations, found that both the knowledge and coverage were low and were influenced by the mothers' education, age, county's economy, household size and ethnicity.[8] Another study in two provinces of China found positive association between parents' knowledge and child's coverage.[9] In Italy, positive attitude of the mothers about immunization and having received adequate information was associated with better coverage of their children.[10]

Another emerging issue that threatens immunization coverage, especially in developed countries is 'Concerns about vaccine safety'. Owing to disease eradication, the memory of immunizable diseases is fading; therefore, parents feel more threatened by the side effects of vaccines, which are being observed and reported more frequently than the actual disease itself. A study in the United States looked at parental perceptions regarding vaccine safety and their relation with immunization status of the child. Children of parents who had specific concerns regarding side effects or who believed that their child was getting too many shots had significantly lower coverage than children of parents who had no such concern.

This study concluded that in order to sustain adequate coverage in the future, additional research about vaccine safety, as well as effective strategies to combat parental concerns are needed.[11]

A KAP study conducted in an urban population of northern Pakistan depicted that there was a gap between knowledge and practice. This study reported that 88% of the parents were knowledgeable about the EPI programme, 77% of the mothers perceived vaccination to be beneficial, more than 90% had a positive attitude and were ready to pay for services but only 71% had immunized their children. Reasons for not immunizing the children were parents' laziness (72%), uncooperative husband and perceived poor quality of services.[12] In another study in Peshawar, Pakistan, Tetanus Toxoid (TT) coverage was assessed in women of reproductive age. The overall coverage was 65% and was influenced by the extent of information about TT vaccination, lady health worker's home visits and antenatal care visits.[13]

The study was carried out to test the hypothesis, that better knowledge of mothers on EPI is associated with better vaccination status of their children in a periurban setting?

Methods

This study was conducted in Gadap town, Karachi, which has a total population of 287,564, as per census of 1998, comprising of both urban and semi-urban residential areas.[14] A cross-sectional survey was conducted utilizing World Health Organization's recommended thirty-cluster sampling strategy, with inclusion probability proportionate to the size of the cluster.[15] Gadap town is administratively divided into eight Union Councils (UCs) which were used as a reference for selecting these thirty clusters.[16] From each of the six most populated UCs, four clusters were randomly selected, whereas from each of the two least populated UCs three clusters were selected, adding up to the total count of thirty clusters. Seven mother-infant pairs were selected per cluster, which came to a total of 210 mother-infant pairs.

Households were considered eligible to participate if at least one infant lived there. Following identification of such a household, the mother of the eligible child was interviewed after obtaining verbal consent. A structured questionnaire was utilized to collect information on basic demographic characteristics, socio-economic status, reproductive history, health service utilization, EPI coverage of the child and the mother (TT), and mothers' knowledge and attitude towards the EPI programme.

The data was analyzed using the SAS software version 9.1. Initially, descriptive statistics of the demographic characteristics of the sample were run, followed by summarization of the main outcome variable, the knowledge score. Vaccination status of each child was compared against the recommended EPI schedule for his or her age and each child was labeled as either appropriately vaccinated or not. Further details of the computation of age appropriate vaccination variable and the methodology of this study is documented in our previously published work.[17]

Time since marriage of mothers was recorded in number of years with one year increments. Socio-economic status was assessed by the surrogate variable 'house type', which classified each house according to the material used in its construction, such as concrete, mud, metal sheets etc. For the purpose of our analysis we dichotomized this information into two categories, concrete construction vs. others. Number of years since marriage also served as a surrogate variable for mothers' age because of the relatively poor accuracy of self-reported age by the interviewees.

The educational attainment of both parents was recorded as separate variables, as the number of years of formal education they received. A separate code was assigned to those interviewees and their husbands who had received no formal education but were able to read and write simple text like newspapers. As there were a large number of interviewees and their husbands who had not received any formal education, all interviewees and their husbands, for the purpose of analysis, were categorized into two main groups, literate and illiterate. The literate categories for both parents therefore, consisted of all those who could read and write (even if they had no formal education). This definition of literacy is consistent with that used by census bureau of Pakistan.[18] To enable us to evaluate the joint effect of the education status of both parents, the two-level education variables were combined into one. The resultant variable had four levels (1) both parents illiterate, (2) father literate mother illiterate, (3) father illiterate mother literate, and (4) both parents literate.

Main outcome variable, the knowledge score was developed from a set of questions that mothers were required to answer. These questions sought to establish if the mothers knew what the EPI target diseases are, which vaccine is given to mothers during pregnancy under the EPI programme, mothers' perception of the benefits of vaccines and their knowledge about the side effects of vaccines. For side effects, mothers were asked to name as many side effects of vaccines as they could think of. Regarding tetanus vaccination during pregnancy, mothers were asked if they knew the name of the disease for which vaccine is given during pregnancy. Each correct answer was given a score of '1', and incorrect answer '0'. The final score was computed by summing all correct answers. Thus a scaled variable was created with a range of 0 to 11, with higher score representing better knowledge. After evaluating categorization using several cutoffs that yielded similar results, the knowledge score was used as a continuous variable in the analysis.

Results

The sample for this study was drawn primarily from periurban areas of greater Karachi that mostly house low income families. The sample consisted mostly of mothers, who had 10 years or less of schooling (80.0%), were mainly housewives (94.3%), who lived in a joint family system (50%) and had a total household income of less than 5,000 Pakistani Rupees per month (72.9%) (Table-1). The mean knowledge score of the mothers was 3.8 ± 3.3. Only four mothers (1.9%) scored the maximum possible 11, whereas 48 (22.9%) scored 0 (Table-2).

Table-1: Socio-demographic characteristics of the study population.

Characteristic	Number of subjects n (%)
Fathers' occupation	
Unskilled labor	57 (27.1)
Government service	40 (19.1)
Private service	22 (10.5)
Driving	21 (10.0)
Business	20 (9.5)
Skilled labour	20 (9.5)
Unemployed	13 (6.2)
Farming	9 (4.3)
Landlord	8 (3.8)
Fathers' education	
Illiterate	69 (32.9)
1 to 10 years schooling	99 (47.1)
Greater than 10 years schooling	42 (20)
Fathers' ethnicity	
Sindhi	88 (41.9)
Urdu speakers	44 (21.0)
Balochi	36 (17.0)
Punjabi	26 (12.4)
Pathan	6 (2.9)
Others	10 (4.8)
Mothers' occupation	
Housewives	198 (94.3)
Skilled labour	6 (2.9)
Government service	5 (2.4)
Labour	1 (0.4)
Mothers' education	
Illiterate	117 (55.7)
1 to 10 years schooling	73 (34.8)
Greater than 10 years schooling	20 (9.5)
Mothers' ethnicity	
Sindhi	86 (41.0)
Urdu speakers	45 (21.4)
Balochi	38 (18.0)
Punjabi	26 (12.4)
Pathan	6 (2.9)
Afghan	6 (2.9)
Others	3 (1.4)
Monthly income	
Less than 5000 rupees	153 (72.9)
Greater than or equal to 5000 rupees	57 (27.1)
Family composition	
Nuclear	88 (41.9)
Joint	105 (50)
Extended joint	17 (8.1)
House construction	
Mud structure	33 (15.7)
Concrete	177 (84.3)

Table-2: EPI related knowledge of mothers with infants, residing in Gadap town Karachi.

Question	Number of subjects n (%)
Which vaccine is given in pregnancy	
Tetanus	42 (20.0)
Didn't know	168 (80)
Is TT vaccination important in pregnancy	
Very important	59 (28.1)
Important	108 (51.4)
Neutral	25 (11.9)
Not important	17 (8.1)
Not important at all	1 (0.5)
Are seven EPI vaccines important for children	
Very important	67 (31.9)
Important	114 (54.3)
Neutral	16 (7.6)
Not important	13 (6.2)
Ability to name seven EPI diseases	
TB	57 (27.1)
Diphtheria	53 (25.2)
Pertussis	71 (33.8)
Tetanus	70 (33.3)
Polio	91 (43.3)
Measles	85 (40.5)
Hepatitis B	65 (31.0)
Couldn't name a single disease	98 (46.7)
Named all 7 correctly	36 (17.1)
Knowledge about side-effects of EPI vaccines	
Fever	112 (53.3)
Pain	23 (11.0)
Pustules	6 (2.9)
Weakness	1 (0.5)
Swelling	1 (0.5)
Diarrhoea	1 (0.5)

In univariate (unadjusted) logistic regression analysis the knowledge score was found to have an statistically significant association with age appropriate vaccine coverage of children (Odds Ratio (OR) 1.19, 95% Confidence Interval (CI) 1.09 - 1.29). However, since mother's knowledge is strongly associated with her educational status, which in turn is associated with father's educational status; to assess the independent effect of mother's knowledge score on age appropriate vaccination of their children, it was evaluated in a multiple logistic regression model that adjusted for both, mother and fathers', educational status along with other variables.

After adjusting for other important variables, knowledge about EPI failed to show a significant association with age appropriate coverage of the child. Though the adjusted effect size was small, it was in the expected direction, i.e. better the knowledge of mother, greater the likelihood that child would be appropriately vaccinated.

A significant association was found between children's vaccination status and parents' education. As

Table-3: Final multivariate model from the logistic regression analysis association between mothers' knowledge and their children's vaccination status.

Associated Factors	Adjusted Odds Ratio	9 5 % Confidence Interval
Knowledge score	1.09	0.98 - 1.21
Years since marriage	0.93	0.87 - 0.98
Mother received appropriate TT coverage during last pregnancy		
Yes	1.90	0.99 - 3.65
No	Reference	
Type of house construction		
Brick	2.51	0.90 - 6.98
Mud	Reference	
Parents' education		
Both parents literate	2.62	1.13 - 6.10
Literate mother, illiterate father	1.74	0.34 - 9.0
Literate father, illiterate mother	1.76	0.75 - 4.12
Both parents illiterate	Reference	

compared to children of illiterate parents, children with one literate parent were more likely to be adequately vaccinated (Only mother literate, adjusted odds ratio (AOR) 1.74, 95% CI 0.34 - 9.0: Only father literate, AOR 1.76, 95% CI 0.75 - 4.12), though neither gained significance. Significantly better vaccination status was found among children with both parents literate as compared to children with both parents illiterate (AOR 2.62, 95% CI 1.13 - 6.10).

Numbers of years since marriage had a significant inverse relationship with appropriate vaccination of children. In addition, mothers who received appropriate TT vaccination during their index pregnancy were twice as likely to have appropriately vaccinated children as compared to mothers who did not (Table-3).

Information on the type of construction of the respondent's house was also recorded. This served as a proxy for socio-economic status. Respondents residing in brick houses were more likely to have children appropriately vaccinated than respondents who lived in mud houses or camps.

Discussion

Assessment of the knowledge of the infants' mothers about EPI vaccination revealed serious deficiencies. On a scale of 1 - 11, the mean knowledge score was 3.8 ± 3.3, with only about 2 percent of the mothers scoring the maximum possible. Almost one quarter of the mothers scored zero. Assessment of factors associated with knowledge revealed some interesting findings. It was observed that education, and income was correlated to knowledge score which was also associated with socio-economic status. This relation of knowledge with education and income has also been reported by other investigators.[7-9,19]

One of the objectives of this research was to determine if mothers obtaining a higher knowledge score were more likely to have appropriately vaccinated children. In crude (unadjusted) analysis, knowledge was found to have a positive association with appropriate vaccination of children. However, better knowledge did not have an independent effect on vaccination status of the children, once education was introduced in the model. Educational status of the parents was significantly associated with children's vaccination status; this association has also been reported by other investigators.[20,21] A child with one educated parent had an increased likelihood of being appropriately vaccinated. This increased significantly if both parents were educated. In Pakistan where most of the health care is self-financed, the role of parents' ability to pay for vaccination of their children could also help explain significantly better age-appropriate vaccination status of children of such parents.

Among children where only one parent, either mother or father (but not both) was literate, they were equally likely to be appropriately vaccinated. In a male-dominated society like Pakistan, where women are considered to have a very limited role in making decisions about the family and the household,[22] effect of the presence of a literate mother alone, as strong as the presence of a literate father alone is pleasantly surprising.

'Years since marriage' was found to have a negative association with children's vaccination status as it was inversely proportional. The years since marriage also served as a proxy for the age of the mother. Women who had been married for a longer duration were likely to be older and thus less likely to be literate. Also older women who had been married for a shorter duration were more likely to be literate or better educated, since it is well established that educated women tend to marry at a later age than women with no education.[23,24] This explains why women who had been married longer were less likely to have appropriately vaccinated children.

One of the major strengths of our study is that it is community based. By obtaining information on EPI coverage of Gadap town and factors influencing this coverage, it can be presumed that similar periurban settlements will have a low coverage. As this study encompasses both vaccinated and unvaccinated subjects, it allows the comparison between two distinct groups and can therefore help in devising ways to improve coverage.

One of the limitations of the study was that a brief nested questionnaire was used to assess knowledge rather than a more detailed tool. Nonetheless, since this was not the primary objective of the study, and since little is known about the knowledge of mothers regarding EPI vaccination in this

population, we conducted this research as a pilot project nested within a larger study,[17] to provide a baseline for conducing future research in this area. This limitation, however, does not compromise the validity of the study.

The study concluded that the knowledge of Gadap town mothers regarding EPI is inadequate. However, their children's vaccination status is influenced more by their educational attainment rather than by their knowledge.

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