Int. J. Pharm. Investigation, 2025; 15(2):573-582.
https://www.jpionline.org

Original Article

Factors Effecting Parental Knowledge Regarding their Child Immunizations: An Observational Study from Lahore, Pakistan

Sara Shahid[1], Maryam Ayesha[1], Muhammad Fahad[1], Maryam Mughal[1], Areej Kainat[1], Hamda Shakir[1], Muhammad Ali Tahir[1], Ansa Ijaz[1], Qurat-ul-Ain[1], Saad Saeed Alqahtani[2], Muhammad Zahid Iqbal[2,*]

[1]Department of Pharmacy Practice, Faculty of Pharmaceutical Sciences, Lahore University of Biological and Applied Sciences, Lahore, PAKISTAN.
[2]Department of Clinical Pharmacy, College of Pharmacy, King Khalid University, Abha, SAUDI ARABIA.

ABSTRACT

Background: A significant number of parents lack knowledge about vaccine-preventable diseases and hold misconceptions regarding the components, side effects and effectiveness of vaccines. A lack of understanding regarding childhood vaccinations was thought to be the main factor contributing to the return of vaccine preventable diseases. The study's objective was to evaluate parents' awareness of children vaccinations and to access the factors effecting parental knowledge regarding their child immunizations. **Materials and Methods:** A multi-centered, cross sectional observational study was conducted to evaluate the knowledge of the parents regarding their child immunization in Lahore, Pakistan. The data for this research project was collected from parents living in the regions of Lahore, Punjab. Study population was 353 parents belong to urban and rural areas of Lahore having children of different ages. Population was recruited for this study from Lahore. The population from which data was collected belongs to the Urban and Rural areas of the Lahore. **Results:** Out of 353 parents surveyed, majority of the study subject were mothers i.e., 56.1% with age 25-29 years (30.0%), stating that majority of the parents i.e., 64.0% have inappropriate knowledge. It is observed through statistical analysis that the occupation, number of children, residency, living class and health care providers in respondent family shows highly significant statistical association (p<0.001) with patient knowledge regarding their child immunizations. **Conclusion:** This study showed that parents with lower levels of education were less informed about vaccinations, the majority lack particular understanding about vaccinations and how long they provide protection. The immunization status was significantly influenced by sociodemographic characteristics. In order to increase their understanding, efforts should be made to improve them in addition to educating people about vaccinations. It is imperative to guarantee that parents possess comprehensive knowledge on the safety and effectiveness of vaccines.

Keywords: Child immunization, Knowledge, Parents, Sociodemographic characteristics, Vaccine-preventable diseases.

Correspondence:
Dr. Muhammad Zahid Iqbal
Department of Clinical Pharmacy, College of Pharmacy, King Khalid University, Abha, SAUDI ARABIA.
Email: mailto:drmmziqbal@gmail.com

Received: 16-10-2024;
Revised: 25-11-2024;
Accepted: 17-01-2025.

INTRODUCTION

Vaccination is the most economical method to prevent many infectious diseases that cause morbidity or mortality (Dumpa *et al*., 2019). However, the instability of vaccines limits their utilization in many developing countries where adequate storage facilities are unavailable (Lahariya, 2014). Most vaccines have poor thermostability; they require uninterrupted storage at 2-8°C from the manufacturing of the vaccine until it is administered to a patient (Dumpa *et al*., 2019).

The history of vaccines and vaccination starts with the first effort to prevent diseases (Dumpa *et al*., 2019). Smallpox (like many other infectious diseases including measles) was well known since ancient times and believed to have originated in India or Egypt, over 3,000 years ago (Lahariya, 2014). Historians and physicians have sometimes referred smallpox as 'Indian Plague', which suggests that the disease might be widely prevalent in India in the earlier times (Lahariya, 2014). The goal of a vaccine is to induce immunity to an infectious disease without having to suffer the pathogenesis associated with natural infection (Payette and Davis, 2001). Vaccines have traditionally been classified into

DOI: 10.5530/ijpi.20250152

three broad categories: live attenuated, whole killed, and subunit vaccines (Dumpa *et al.*, 2019). Live attenuated vaccines are based on the attenuation of pathogenic organisms to the point that they no longer cause disease but are still capable of inducing immunity (Lahariya, 2014). Whole killed vaccines are based on the inactivation of pathogenic organisms through processes such as formalin fixation (Abdullahi *et al.*, 2014). Finally, subunit vaccines are based on the isolation and purification of components from microorganisms, or their synthetic production, that can be used to induce protective immunity (Lahariya, 2014). Throughout the history of vaccinology, scientists have strived to combine experience with knowledge in an effort to develop new weapons in the fight against infectious disease (Payette and Davis, 2001).

Most nations have high vaccination rates for infants (Dumpa *et al.*, 2019). Nonetheless, certain vaccinations result in transient immunity (Payette and Davis, 2001). In these situations, it is advised that booster shots for the vaccinations previously given during childhood or infancy be given later in life (during adolescence, for example) in order to preserve immunity conferred by the vaccine (Lahariya, 2014). Ensuring appropriate coverage of both primary and booster vaccination doses is imperative (Dumpa *et al.*, 2019). The childhood immunization programs have, on the whole, succeeded in achieving a high vaccination rate (Abdullahi *et al.*, 2014).

The healthcare system in Pakistan is incredibly dynamic and lively, consisting of 1,279 public sector hospitals, 5,527 Basic Health Units, 686 Rural Health Centers, and 5671 dispensaries (Abbas *et al.*, 2023). In the nation, there are 108,474 nurses, 22,595 dentists, and 220,829 doctors (Abdullahi *et al.*, 2014). For the 2019-20 fiscal year, the government would spend PKR 203.74 billion on public healthcare services, 3.29% more than in prior years (Abbas *et al.*, 2023). Indicators for the nation's health revealed the opposite situation, with neonatal mortality of 42 deaths per 1,000 live births, infant mortality of 62 deaths per 1,000 live births, and under-5 mortality of 74 deaths per 1,000 livebirths, in spite of the substantial healthcare infrastructure that is still being developed (Abdullahi *et al.*, 2014). The rates of infant and child mortality are shown to be greater in rural than in urban settings (Abbas *et al.*, 2023).

Most developed nations worldwide have put in place programs to vaccine at least part of the high-risk segments of society because to the convincing research supporting influenza vaccination for high-risk groups (Abdullahi *et al.*, 2014). In two significant investigations looking at the worldwide usage of influenza vaccines, it was found that, with Japan being the exception, 21 out of 22 developed nations advised immunization for those with high-risk medical conditions (Poland *et al.*, 2001).

Pakistan is still reporting wild poliovirus cases in 2016, which made up the majority of cases reported worldwide (Abbas *et al.*, 2023). The situation in Pakistan is still concerning even though the caseload is less than it was in prior years (Payette and Davis, 2001). Pakistan continues to be the sole source of endemic poliovirus transmission worldwide and the only obstacle to the eradication of polio worldwide (Abdullahi *et al.*, 2014). In Pakistan, polio has been reported in the Federally Administrative Tribal Areas, Quetta, Northern Sindh, and Karachi (Habib *et al.*, 2017).

Demographic and Health Surveys, which are carried out on a national sample of households, offer important data on immunization coverage and timeliness at the individual level as well as a variety of factors that may affect immunization practices (Abdullahi *et al.*, 2014). Prior research conducted in the nation has examined factors associated with immunization in narrow geographic areas, frequently as a component of interventional studies with limited potential for generalization (Payette and Davis, 2001). This paper's objectives are to examine factors that contribute to vaccine completion and to characterize immunization coverage rates and timeliness based on DHS data (Zaidi *et al.*, 2014).

Parents' KAPs on their children's vaccines have been linked to sociodemographic characteristics as family size, income, and parents' age and educational attainment.[7] For instance, parents who lived in towns, had more educational attainment, and were older tended to have more negative sentiments (Zaidi *et al.*, 2014). In 16 studies that directly asked parents about their intentions, the highest report (98% of the 54 participating parents from Canada) and the lowest (75% in a study including 200 parents from the United States) measured parents' intentions to vaccinate their children for one or more antigens (Nassar *et al.*, 2023). This systematic review of parental vaccine attitudes and beliefs measured parents' intentions to vaccinate their children for one or more antigens (Zaidi *et al.*, 2014; Nassar *et al.*, 2023).

The Expanded Program on Immunization (EPI) was launched by world health organization in 1974 (Hasan *et al.*, 2010). It stands as a global endeavor to ensure equitable access to life saving vaccines for every child regardless of their location or socioeconomic status (Zaidi *et al.*, 2014). It has a greatest impact on regional and global immunization indicators such as maternal and neonatal tetanus, poliomyelitis eradication (Habib *et al.*, 2017). Despite a lot of efforts by government Pakistan's immunization has benchmarks (Abbas *et al.*, 2023). The EPI program in Pakistan annually targets 5.8 million children aged below 1 year to protect them against vaccine preventable diseases and around 5.9 million pregnant women to protect them and their newborns from tetanus through routine immunization services (Nassar *et al.*, 2023). Private sector in Pakistan provides 3% of immunization injections through 6000 fixed centers and it involves almost 10000 vaccinators that includes paramedics who are trained in EPI, 6000 lady health visitors and other paramedics. On a pilot scale EPI program was started in Pakistan and was expanded country wide by 1978 (Hasan *et al.*, 2010). Now new vaccines and

Table 1: Demographics Characteristics of study subjects (*n*=353).

Sl. No.	Variables	Categories	Frequency (*N*)	%
1	Parent Age	15-19	20	5.7
		20-24	46	13.0
		25-29	106	30.0
		30-34	88	24.9
		35-39	93	26.3
2	Child Age	< 1 Month	17	4.8
		1-4 Month	47	13.3
		5-8 Month	83	23.5
		9-12 Month	67	19.0
		> 1 Year	139	39.4
3	Relationship with Child	Mother	198	56.1
		Father	152	43.1
		Guardian	3	0.8
4	Gender of Child	Male	182	51.6
		Female	171	48.4
5	Occupation	Health Care Provider	119	33.8
		Non-healthcare Provider	234	66.3
6	No. of Children	1-2	111	31.4
		3-4	196	55.5
		5-6	46	13.0
7	Residency	Rural Area	234	66.3
		Urban Area	119	33.7
8	Living Class	Lower	46	13.0
		Middle	196	55.5
		Upper	111	31.4
9	Marital Status	Married	306	86.7
		Divorced	35	9.9
		Widow	12	3.4
10	Religion	Muslim	330	93.5
		Non-Muslim	23	6.5
11	Health Care Professional in your family	Yes	119	33.7
		No	234	66.3

technologies are invented to increase more parental awareness about immunization (Hasan *et al*., 2010).

Cost of vaccine is a major factor in child immunization (Lahariya, 2014). If cost of vaccine manufacturing is high it will lead to less potential profit (Payette and Davis, 2001). For low- and middle-income countries, majority of equipment, consumables and personnels will need to import for years and this will further low benefits to country (Abbas *et al*., 2023). Low- and middle-income family parents especially benefit their children just with low price vaccines and they do not vaccinate their children with high-cost vaccine (Plotkin *et al*., 2017). Child vaccinations are highly influenced by the parental knowledge, attitude and practices. Therefore, the present study was conducted to evaluate the knowledge of parents regarding child immunizations as well as the factors affecting the parental knowledge.

MATERIALS AND METHODS

Study Design and Study Subjects

A multi-centered, cross sectional observational study was conducted to evaluate the knowledge of the parents regarding their child immunization in Lahore, Pakistan. Quantitative research methodology involving validated questionnaires and

research tools were utilized in order to evaluate the knowledge of the parents regarding their child immunization. Study population was 353 parents belong to urban and rural areas of Lahore having children of different ages were recruited for this study. The incomplete responses were excluded from the final study. Ethical approval from Institutional Ethical Review Board and Bio-Ethical Committee (BEC) of Lahore university of Biological and Applied Sciences was attained for this research project.

Inclusion and exclusion criteria

The inclusion criteria for this research included parents or guardians from different rural and urban areas of Lahore who willingly participated in the current study by signing the Informed Consent Form (ICF). However, the parents whose children were above 4 years and do not provide full information and do not complete the questionnaire were excluded.

Study duration and sample size

Sample size was calculated according to the convenient sampling technique. Approximately 353 parents were approached for the data collection. Study settings of this research were the rural and urban areas of Lahore. Study duration was of 6 months approximately.

Questionnaire Development

The data collection form contained demographic section involving information on age of parents and child, relationship of parents with child, gender of child, occupation of parents, number of children, living class, residency, marital status, religion and healthcare provider in family. The questionnaire contained 10 knowledge related questions about child immunization, effectiveness of vaccination, schedule of vaccination, parent's belief regarding their child immunization, benefits of EPI program, side effects of vaccination, diseases prevented by vaccination, child immunity, mortality rate and disability. The questionnaire was designed after an extensive literature review of the published research. Afterwards, it was reviewed to ensure it aligned precisely with our objectives, and any questions that elicited unnecessary or sensitive information were removed. Content validity was attained by sending it to 3 academicians who were expert, as the result of their suggestions the questionnaire was modified and face-validated by checking on small number of respondents. The pilot study was conducted on small number of parents and Cronbach's alpha value of 0.76 was attained for knowledge questions. The results of pilot study were not included in the study's results. Each correct answer by the respondent was scored 1. The cut off points were decided on 60% scores for appropriate knowledge.

Statistical analysis

The data collected from the study subjects was analyzed and interpreted by using SPSS v21, IBM. Descriptive and inferential statistics were applied to summarize the variables. Categorical variables were presented as frequencies and percentages. To find factors regarding associations between independent variables, chi square tests (Pearson chi square) were applied and where assumptions of chi-square analysis requirements were not met, Fisher exact tests were applied to calculate *p*-values. *p*-values less than 0.05 were considered as statistically significant values.

RESULTS

The current study recruited 353 parents from different private and government hospitals. Demographic details of the respondent are represented in Table 1.

Table 2: Time utilized for immunization.

Sl. No.	Variables	Categories	N (%)
1	Waiting Time Before Immunization Process	< 15 min	171 (48.4)
		15-29 min	149 (42.2)
		30-60 min	22 (6.2)
		>60 min	11 (3.2)
2	Time Spent on Immunization	< 15 min	190 (53.8)
		5-10 min	158 (44.8)
		>10 min	5 (1.4)

Table 3: Knowledge of parents regarding their child immunization.

Sl. No.	Variables	Categories	*N* (%)
1.	Knowledge	Appropriate	127 (36.0)
		Inappropriate	226 (64.0)

Most of the parents were had to wait for about less than 15 min i.e. 48.4% and time spent on their child immunization were less than 15 min i.e. 53.8% to get their child immunized as presented in Table 2.

Table 3 demonstrates knowledge of parents regarding their child immunization stating that majority of the parents have inappropriate knowledge (64.0%), graphically represented in Figure 1.

According to questionnaire session, the parent's knowledge of effectiveness of vaccines against infectious diseases was 17.8% appropriate and 82.2% inappropriate. The study subject's response to knowledge related question items is summarized in Table 4 and graphically represented in Figure 2.

Table 5 provides the association of demographics variable with parent's knowledge. It is observed through statistical analysis that the occupation, no of children, residency, living class and health care providers in respondent family shows highly significant statistical association ($p<0.001$) with patient knowledge regarding their child immunization.

DISCUSSION

Child immunization is a nationwide program in Pakistan. There are many factors contributing to the effectiveness of immunizations programs and this study has tried to look upon some of aspects. Diseases like pneumonia, measles and pertussis that can be prevented by vaccination continue to be the major contributors. During present study, the questionnaire about knowledge survey was given to 353 parents who had children below 2 years of age in rural and urban areas of Lahore, Pakistan. The source from where the participants get information about immunization plays a pivotal role in adherence to child immunization schedule (Payette and Davis, 2001).

The results of our study regarding parental knowledge shows the effectiveness of vaccine against infectious diseases was only 17.8% appropriate and 82.2% inappropriate, knowledge about vaccination schedule was 22.7% appropriate and 77.3% inappropriate. Furthermore, only 24.9% of parents believed in the necessity of vaccination for a healthy child while 75.1% do not believe. 21.0% understood the benefits of the Expanded Program on Immunization while 79.0% did not understand. The parent's perception that vaccination causes side effects was 13.9% appropriate and 86.1% inappropriate. The parent's knowledge about the diseases that can be prevented by vaccination was 20.1% appropriate and 79.9% inappropriate. The parent's knowledge about type of vaccines that should not be given during a medical condition of sickness is 19.0% appropriate and 81.0% inappropriate. The parent's perception about strengthening the child immune system was 17.8% appropriate and 82.2% inappropriate. The knowledge regarding decrease in mortality rate was 21.0% appropriate and 79.0% inappropriate. The parent's perception about vaccination does not causes disability was 22.4% appropriate and 77.6% inappropriate. The high percentages indicate lack of awareness and knowledge specifically in rural areas (66.3%) with high percentage comparable to urban areas (33.7%). The low percentages (appropriate%) indicates a pressing need for educational intervention to improve parent's knowledge regarding child immunization.

The study assessed parental knowledge regarding child immunization revealing concerning statistics. Our results indicate that only 36.0% of parents had appropriate knowledge while a significant 64.0% had inappropriate knowledge. The result of our current study is due to the low level of awareness, lack of educational programs in rural areas, low human resource management, low staff training, less use of digital platforms for monitoring and reporting. The similar results were noted in peri-urban slums of Karachi, Pakistan which is mixed method study consists of a baseline cross-sectional coverage survey

Table 4: Response of parents to knowledge related question items.

Sl. No.	Questions	Correct	Incorrect
		N (%)	*N* (%)
1	Is vaccination effective against infectious diseases?	63 (17.8)	290 (82.2)
2	Do you know about the schedule of vaccination?	80 (22.7)	273 (77.3)
3	Do you believe that even healthy children need vaccination?	88 (24.9)	265 (75.1)
4	Do you know about the benefits of EPI (Extended Program of Immunization)?	74 (21.0)	279 (79.0)
5	Do you think vaccination causes side effects?	49 (13.9)	304 (86.1)
6	Do you know about those diseases that can be prevented by vaccination?	71 (20.1)	282 (79.9)
7	Is there any type of vaccine that should not be given during a medical condition or sickness?	67 (19.0)	286 (81.0)
8	Do vaccines strengthen your child's immune system?	63 (17.8)	290 (82.2)
9	Do vaccinations decrease the mortality rate?	74 (21.0)	279 (79.0)
10	Vaccination does not cause disability?	79 (22.4)	274 (77.6)

Table 5: The association of demographic variables with parent's knowledge.

Sl. No.	Variables	Categories	Knowledge Category		*p*-value	η^2
			Appropriate	Inappropriate		
1	Parent Age	15-19	7 (35.0%)	13 (65.0%)	0.197	-
		20-24	23 (50.0%)	23 (50.0%)		
		25-29	32 (30.2%)	74 (69.8%)		
		30-34	34 (38.6%)	54 (61.4%)		
		35-39	31 (33.3%)	62 (66.7%)		
2	Child Age	<1 Month	4 (23.5%)	13 (76.5%)	0.683	-
		1-4 Month	16 (34.0%)	31 (66.0%)		
		5-8 Month	30 (36.1%)	53 (63.9%)		
		9-12 Month	22 (32.8%)	45 (67.2%)		
		>1 Year	55 (39.6%)	84 (60.4%)		
3	Relationship with Child	Mother	73 (36.9%)	125 (63.1%)	0.472	-
		Father	52 (34.2%)	100 (65.8%)		
		Guardian	2 (66.7%)	1 (33.3%)		
4	Gender of Child	Male	63 (34.6%)	119 (65.4%)	0.582	-
		Female	64 (37.4%)	107 (62.6%)		
5	Occupation	Healthcare Provider	118 (99.2%)	1 (0.8%)	<0.001	0.939
		Non-Healthcare Provider	9 (3.8%)	225 (96.2%)		
6	No of Children	1-2	110 (99.1%)	1 (0.9%)	<0.001	0.779
		3-4	15 (7.7%)	181 (92.3%)		
		5-6	2 (4.3%)	44 (95.7%)		
7	Residency	Rural Area	9 (3.8%)	225 (96.2%)	<0.001	0.939
		Urban Area	118 (99.2%)	1 (0.8%)		
8	Living Class	Lower Class	2 (4.3%)	44 (95.7%)	<0.001	0.779
		Middle Class	15 (7.7%)	181 (92.3%)		
		Upper Class	110 (99.1%)	1 (0.9%)		
9	Marital Status	Married	114 (37.3%)	192 (62.7%)	0.077	0.029
		Divorced	7 (20.0%)	28 (80.0%)		
		Widow	6 (50.0%)	6 (50.0%)		
10	Religion	Muslim	117 (35.5%)	213 (64.5%)	0.438	-
		Non-Muslim	10 (43.5%)	13 (56.5%)		
11	Healthcare Professional in your family	Yes	118 (99.2%)	1 (0.8%)	<0.001	0.939
		No	9 (3.8%)	225 (96.2%)		

of a representative sample of 840 caregivers of children aged 12-23 months, held in 2017, that revealed 49% of children were fully vaccinated, 43% were partially vaccinated and 8% were unvaccinated, the main reason behind these results are lack of parent knowledge, awareness and misconception about vaccines and socioreligious factors (Yazdani *et al.*, 2021).

The similar cross-sectional survey was conducted in immunization clinic at Vanivilas hospital, a government tertiary care center attached to Bangalore Medical College and Research Institute and a private pediatric clinic in Bengaluru (Joseph *et al.*, 2015). Data were collected from 200 parents/guardians (100 from each set up) using structured questionnaire administered by the investigators that revealed that 86% of total children were vaccinated, out of them only 28% parents were aware about vaccination, 70% didn't know why vaccinations are given and 2% of total think that these are just nutritional supplements (Joseph *et al.*, 2015). The reason behind these results were unawareness, inaccessibility, in-convenience (Joseph *et al.*, 2015).

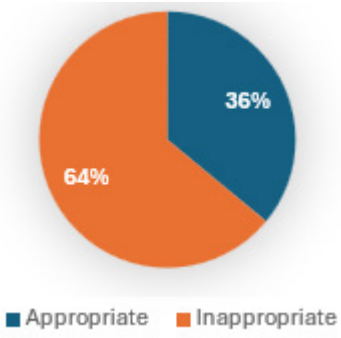

Figure 1: Parental knowledge regarding child immunization.

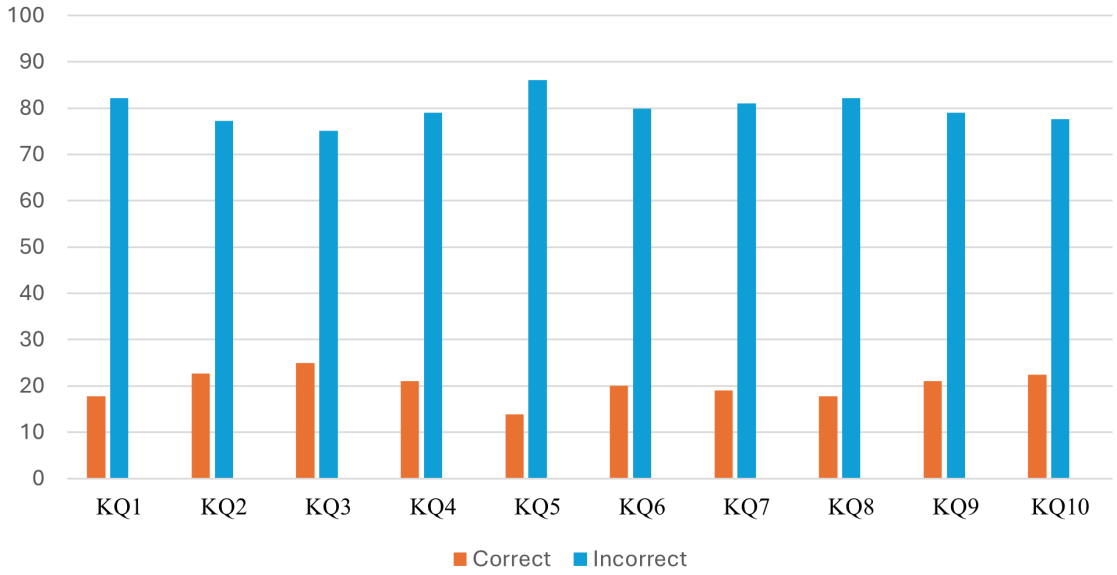

Figure 2: Response of parents to knowledge related questions.

A study conducted in Georgia shows similar outcomes in which the research is a cross-sectional study, 188 mothers with children from three to five years of age, were surveyed in 7 kindergartens of Tbilisi (capital city of Georgia) (Verulava *et al.*, 2019). The result in this study shows that 32% do not have sufficient information about the routine vaccination schedule. The reasons for incomplete vaccination are a lack of knowledge about a routine vaccination schedule (25.5%), limited information about the necessity of the second or the third dose of vaccination (18.6%), fear of post-vaccination side effects (16%) and fear of a child illness (9.6%) (Verulava *et al.*, 2019).

In contrast some studies show good knowledge of parents about child immunization. As stated in this study which is held in Iraq, A mixed method has been utilized in this study: a retrospective cohort study was used to evaluate immunization completeness; a prospective cross-sectional study was used to evaluate immunization knowledge of parents (Qutaiba *et al.*, 2014). 528 children born between 1 January 2003 and 31 June 2008 were randomly selected from five public health clinics in Mosul, Iraq (Qutaiba *et al.*, 2014). Immunization history of each child was collected retrospectively from their immunization record/card showing 66.1% of the parents was found to have adequate knowledge scores. The main reason is the parents' good perception of vaccination benefits and risks; the parents thought that the immunization was mandatory; and/or the parents knew that immunization was required for school registration or day care attendance (Qutaiba *et al.*, 2014).

Another cross-sectional study from Bangalore, India opposes our results and show that parents have better knowledge about child immunizations (Patel *et al.*, 2017). The was a prospective study carried out on 110 parents residing in rural areas of Bangalore who had children below 5 years of age (Patel *et al.*, 2017). The sociodemographic details of the parents were collected, and they were made to fill a KAP Questionnaire (Patel *et al.*, 2017). Assessment of the extent of knowledge about child vaccination showed that a majority of them 72.7% had good knowledge score

(Patel *et al*., 2017). The level of knowledge about child vaccination amongst parents is often determined by their education level and several studies have tried to find association between these two variables (Patel *et al*., 2017).

Similar study from the Kingdom of Saudi Arabia, also gives appropriate parent's knowledge about child immunization (Alagsam and Alshehri, 2019). The study is a cross-sectional online survey study that was carried out in 500 parents having at least one child in Saudi Arabia for 2 months from October and November 2018 (Alagsam and Alshehri, 2019). The questionnaire included four different parts i.e., the first part involved questions about the demographics as age, education, working status, and a number of children (Alagsam and Alshehri, 2019). The higher knowledge level was significantly related to female gender, urban area residence, and higher educational degree (Alagsam and Alshehri, 2019).

According to the association of knowledge with demographic factors reveal significant trends. The study revealed that there was a significant relation with occupation, number of children, residency, living class and health care professional in family, showing highly statistical association (p<0.001) with parent knowledge of child immunization. The association of knowledge with occupation is (p<0.001) having health care providers (99.2%) appropriate knowledge and (0.8%) inappropriate and non-health care providers (3.8%) appropriate and (96.2%) inappropriate knowledge. The health care providers are more likely to have access to medical knowledge, making them more informed about immunization compared to non-health care providers. Similarly, the number of children shows highly significant statistical association (p<0.001) with the parents having 1-2 children had appropriate knowledge (99.2%) and (0.8%) inappropriate knowledge. The parents having 3-4 children had only (7.7%) appropriate knowledge and (92.3%) inappropriate knowledge. The parents having 5-6 children had (4.3%) appropriate knowledge and (95.7%) inappropriate knowledge, the results shows that parents with fewer children have more time and resources to learn about health care practices while those with more children are less informed. The association of knowledge with residency is highly significant (p<0.001) which includes urban area with (99.2%) appropriate knowledge and (0.8%) inappropriate knowledge and rural area with (3.8%) appropriate knowledge and (96.2%) inappropriate knowledge, showing that urban areas have better access to health education resources compared to rural areas where the resources may be scarce. Similarly, moving towards living class, having highly statistical analysis (p<0.001), the upper class had (99.1%) appropriate knowledge and (0.9%) inappropriate knowledge, the middle class had (7.7%) appropriate knowledge and (92.3%) inappropriate knowledge and lower class had (4.3%) appropriate knowledge and (95.7%) inappropriate knowledge, stating that higher socioeconomic status correlates with better access to education and health care resources, enabling upper class parents to be well informed about immunization. The association of knowledge with health care professional in family is (p<0.001) indicating, health care professional in family had (99.2%) appropriate knowledge and (0.8%) inappropriate knowledge, and without health care professional in family had only (3.8%) appropriate knowledge and 96.2% inappropriate knowledge as, families with health care professionals are likely to receive accurate health information which enhances immunization knowledge.

The association results were similar with the study revealing parents of 7695 children 19 to 35 months of age sampled by the National Immunization Survey were administered the National Immunization Survey Parental Knowledge Module between the third quarter of 2001 and the fourth quarter of 2002 (Smith *et al*., 2006). Health care providers were defined as a physician, nurse, or any other type of health care professional stating that the association of healthcare providers in family had a positive association with knowledge among children whose parents believed that vaccines were not safe, those whose parents' decision to vaccinate was influenced by a health care provider had an estimated vaccination coverage rate that was significantly higher than the estimated coverage rate among children whose parents' decision was not influenced by a health care provider (74.4% vs 50.3%; estimated difference: 24.1%) (Smith *et al*., 2006).

Another similar cross-sectional study using a pre- and post-test intervention survey of a single group was conducted among Malaysian parents (Awadh *et al*., 2014). Changes in total knowledge score before and after the intervention were measured using a validated questionnaire which states that Parents' knowledge about childhood immunization increased significantly after the intervention compared to the baseline results (p<0.001) (Awadh *et al*., 2014). There were significant differences between parents' knowledge and their educational level and monthly income (p<0.001, p=0.005), respectively (Awadh *et al*., 2014).

Similarly, some other studies related to association is a mixed method study: a retrospective cohort study was used to evaluate immunization completeness; a prospective cross-sectional study was used to evaluate immunization knowledge of parents (Qutaiba *et al*., 2014). 528 children born between 1 January 2003 and 31 June 2008 were randomly selected from 5 public health clinics in Mosul, Iraq showing a significant association of immunization completeness with total knowledge groups (p<0.05) was found (Qutaiba *et al*., 2014).

A similar association study relating to our study is a prospective cross-sectional study design in Iran (Al-lela *et al*., 2014). Immunization knowledge and practices among 528 Iraqi parents were evaluated through validated questionnaire, showing significant associations for knowledge-practice groups with father's education level, mother's education level, mother's age at delivery, number of preschool children, parent's gender, family

income, provider types, and birth place ($p<0.05$) (Al-lela *et al.*, 2014).

The presence of healthcare professional in family is observed to be positively associated with the level of knowledge of parents, in the present study. However, a cross-sectional observational study conducted in Lahore, Pakistan upon knowledge, attitude and practices of respondents on oral health, presented similar results i.e., presence of healthcare professional in family greatly enhances the knowledge of respondents (Shahid *et al.*, 2024). Similarly, another study conducted on Pakistani population on knowledge, attitude and practices of Japanese encephalitis also presented the similar results that presence of healthcare professional is family is positively associated with the knowledge of respondents (Shahid *et al.*, 2024).

The majority of parents do not have appropriate knowledge regarding their child immunizations; this could lead to potential adverse effects on children's health, leading to increase in the incidence of vaccine preventable diseases. Public health awareness campaigns should be conducted to enhance the knowledge of parents.

CONCLUSION

The study emphasizes the critical need for educational interventions to improve parenteral knowledge regarding child immunization particularly in rural areas, where the awareness of child immunization is significantly lower compared to urban areas. A substantial percentage of parents lack appropriate knowledge about vaccination which correlates with various demographic factors such as education level, number of children, living class, residency, occupation and health care in family. It states that enhancing access to health education resources and addressing misconceptions about vaccines are essential steps to increase vaccination to ensure better health outcomes for children.

ACKNOWLEDGEMENT

The authors would like to acknowledge the Lahore University of Biological and Applied Sciences for ethically approving this research project. Moreover, the authors would like to present their sincere gratitude to all the study participants who willingly participated in this research project.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ETHICAL APPROVAL

The present study was ethically approved by Ethical Review Board (ERB) of the Lahore University of Biological and Applied Sciences, Lahore, Pakistan after reviewing the complete details and synopsis of the project.

ABBREVIATIONS

ERB: Ethical Review Board; **EPI:** Expanded Program on immunization; **BEC:** Bio-ethics committee; **KAP:** Knowledge, attitude and practices.

LIMITATIONS

The study was conducted in selected areas including house to house survey therefore the chance for knowledge of child immunization in working mothers is missed.

RECOMMENDATIONS

The immunization status was significantly influenced by socio-demographic characteristics. In order to increase their understanding, efforts should be made to improve them in addition to educating people about vaccinations. It is imperative to guarantee that parents possess comprehensive knowledge on the safety and effectiveness of vaccines.

REFERENCES

Abbas, S. R., Qadir, H., Naeem Tariq, H. M., & Iqbal, S. (2023, June 4). Determination the knowledge, attitudes and perceptions of mothers (caregiver) towards immunization of their children in South Punjab region of Pakistan. Pakistan Journal of Medical and Health Sciences, 17(5), 159–161. https://doi.org/10.53350/PJMHS2023175159

Abdullahi, L. H., Kagina, B. M., Cassidy, T., Adebayo, E. F., Wiysonge, C. S., & Hussey, G. D. (2014, December). Knowledge, attitudes and practices on adolescent vaccination among parents, teachers and adolescents in Africa: A systematic review protocol. Systematic Reviews, 3, 100. https://doi.org/10.1186/2046-4053-3-100

Alagsam, E. H., & Alshehri, A. A. (2019). Knowledge, attitude, and practice of parents on childhood immunization schedule in Saudi Arabia (years). International Journal of Medicine in Developing Countries, 20(30), 31–40. https://doi.org/10.24911/IJMDC.51-1547400699

Al-Lela, O. Q. B., Bahari, M. B., Salih, M. R. M., Al-Abbassi, M. G., Elkalmi, R. M., & Jamshed, S. Q. (2014, December). Factors underlying inadequate parents' awareness regarding pediatrics immunization: Findings of cross-sectional study in Mosul-Iraq. BMC Pediatrics, 14, 29. https://doi.org/10.1186/1471-2431-14-29

Awadh, A. I., Hassali, M. A., Al-Lela, O. Q., Bux, S. H., Elkalmi, R. M., & Hadi, H. (2014, December). Does an educational intervention improve parents' knowledge about immunization? Experience from Malaysia. BMC Pediatrics, 14, 254. https://doi.org/10.1186/1471-2431-14-254

Dumpa, N., Goel, K., Guo, Y., McFall, H., Pillai, A. R., Shukla, A., Repka, M. A., & Murthy, S. N. (2019, February). Stability of vaccines. AAPS PharmSciTech, 20(2), 42. https://doi.org/10.1208/s12249-018-1254-2

Habib, M. A., Soofi, S. B., Ali, N., Hussain, I., Tabassum, F., Suhag, Z., Anwar, S., Ahmed, I., & Bhutta, Z. A. (2017, February). Knowledge and perceptions of polio and polio immunization in polio high-risk areas of Pakistan. Journal of Public Health Policy, 38(1), 16–36. https://doi.org/10.1057/s41271-016-0056-6

Hasan, Q., Bosan, A. H., & Bile, K. M. (2010). A review of EPI progress in Pakistan towards achieving coverage targets: Present situation and the way forward [Journal]. Eastern Mediterranean Health Journal = la Revue de Sante de la Mediterranee Orientale = Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit, 16 (Suppl.), S31–S38. https://doi.org/10.26719/2010.16.supp.31

Joseph, J., Devarashetty, V., Reddy, S. N., & Sushma, M. (2015, November). Parents' knowledge, attitude, and practice on childhood immunization. International Journal of Basic and Clinical Pharmacology, 4(6), 1201–1207. https://doi.org/10.18203/2319-2003.ijbcp20151359

Lahariya, C. (2014, April 1). A brief history of vaccines and vaccination in India. The Indian Journal of Medical Research, 139(4), 491–511. https://doi.org/10.5005/jp/books/12311_2

Nassar, O., Alshahwan, S., Alshahwan, R., Halasa, S., Alashhab, S., & Alnajar, M. (2023, March 7). Determinants of parents' knowledge, attitudes, and practice toward childhood vaccination: A national study. The Open Nursing Journal, 17(1). https://doi.org/10.2174/18744346-v17-230223-2022-88

Patel Trushitkumar, B., Pathak, R., Singh, R., Alves, V., Mahesh, N. M., Chaluvaraj, T. S., Chandramouli, R., & Varghese, B. (2017, July). Assessment of Parents' Knowledge, Attitude and Practice about Child Vaccination in Rural areas. Journal of Pharmaceutical Research, 16(3), 229. https://doi.org/10.18579/jpcrkc/2017/16/3/118764

Payette, P. J., & Davis, H. L. (2001, November 1). History of vaccines and positioning of current trends. Current Drug Targets. Infectious Disorders, 1(3), 241–247. https://doi.org/10.2174/1568005014606017

Plotkin, S., Robinson, J. M., Cunningham, G., Iqbal, R., & Larsen, S. (2017, July 24). The complexity and cost of vaccine manufacturing-an overview. Vaccine, 35(33), 4064–4071. https://doi.org/10.1016/j.vaccine.2017.06.003

Poland, G. A., Rottinghaus, S. T., & Jacobson, R. M. (2001, March 21). Influenza vaccines: A review and rationale for use in developed and underdeveloped countries. Vaccine, 19 (17–19), 2216–2220. https://doi.org/10.1016/s0264-410x(00)00448-5

Qutaiba, B., Al-Lela, O., Bahari, M. B., Al-Qazaz, H. K., Salih, M. R., Jamshed, S. Q., & Elkalmi, R. M. (2014, December). Are parents' knowledge and practice regarding immunization related to pediatrics' immunization compliance? a mixed method study. BMC Pediatrics, 14, 1. https://doi.org/10.1186/1471-2431-14-20/TABLES/3

Shahid, S., Ayesha, M., Aslam, F., Riaz, J., Jamil, L., Zaman, M., Essa, S., Rauf, S. A., Chaudhry, M., Mairaj, Z., un-nisa, M., Zahid Iqbal, M., . . . Zahid Iqbal, M. (2024a);28. Evaluation of knowledge, attitude and perceptions of future health care professionals on Japanese Encephalitis. Medicine Science, 28(148), 1–11. https://doi.org/10.54905/disssi.v28i148.e57ms3365

Shahid, S., Malik, A., Javed, E., Ayesha, M., Fahad, M., Mughal, M., Qamar, A., Qamar, M., Bajwa, A., Khan, R., & Zahid Iqbal, M. Z. (2024). Evaluation of knowledge, attitude and practices of oral health and hygiene among the future health care providers. Medical Science, 28(150), 1–11, e109. https://doi.org/10.54905/disssi.v28i150.e109ms3424

Smith, P. J., Kennedy, A. M., Wooten, K., Gust, D. A., & Pickering, L. K. (2006, November 1). Association between health care providers' influence on parents who have concerns about vaccine safety and vaccination coverage. Pediatrics, 118(5), e1287–e1292. https://doi.org/10.1542/PEDS.2006-0923

Verulava, T., Jaiani, M., Lordkipanidze, A., Jorbenadze, R., & Dangadze, B. (2019, May 31). Mothers' knowledge and attitudes towards child immunization in Georgia. The Open Public Health Journal, 12(1), 232–237. https://doi.org/10.2174/1874944501912010232

Yazdani, A. T., Muhammad, A., Nisar, M. I., Khan, U., & Shafiq, Y. (2021, August). Unveiling and addressing implementation barriers to routine immunization in the peri-urban slums of Karachi, Pakistan: A mixed-methods study. Health Research Policy and Systems, 19 (Suppl. 2), 55. https://doi.org/10.1186/s12961-021-00691-4

Zaidi, S. M. A., Khowaja, S., Kumar Dharma, V., Khan, A. J., & Chandir, S. (2014, June 4). Coverage, timeliness, and determinants of immunization completion in Pakistan: Evidence from the Demographic and Health Survey (2006–07). Human Vaccines and Immunotherapeutics, 10(6), 1712–1720. https://doi.org/10.4161/HV.28621

Cite this article: Shahid S, Ayesha M, Fahad M, Mughal M, Kainat A, Shakir H, *et al*. Factors Effecting Parental Knowledge Regarding their Child Immunizations: An Observational Study from Lahore, Pakistan. Int. J. Pharm. Investigation. 2025;15(2):573-82.