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Research Article

**SOCIO-DEMOGRAPHIC DETERMINANTS OF CHILDHOOD  
IMMUNIZATION IN, PAKISTAN**<sup>1</sup>Tanzeel Ul Rahman, <sup>2</sup>Mehdi Hayat Khan, <sup>3</sup>Sumaira Bibi, <sup>4</sup>Faisal Majeed

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**Article Received:** June 2019**Accepted:** July 2019**Published:** August 2019**Abstract:**

**Objective:** The objective of this study was to assess socio-demographic factors for their association with the completion of immunization in under five year children in Pakistan.

**Methods:** Secondary analysis on data from Pakistan Demographic and Health Survey (PDHS) 2013 was performed which is cross sectional survey administered at household level. Data analysis was limited to mothers with a last-born child (youngest child) between the ages of 12 to 23 months, so Data of 7076 children regarding childhood immunization was captured from women's questionnaire of Pakistan Demographic and Health Survey. Analysis was done using SPSS 21. Frequencies and percentages were calculated for selected variables. Chi Square Test was applied to assess the association between different socio-demographic factors with the status of complete immunization of first born children.

**Results:** The study revealed that region, place of delivery, parental education status, wealth index, having access to basic needs like electricity, ownership of any transportation were significantly associated with immunization status (complete/incomplete) of under five years children in Pakistan. Moreover having exposure and access to media viz television and newspaper was also statistically significant with the completion of under five years child immunization.

**Conclusion:** Expanded Program on Immunization and concerning bodies in Pakistan should improve and developed the strategies and programs to address the social and demographic determinants of under five year immunization status in order to meet the equitable distribution of under 5 year immunization.

**Key Words:** Socio-demographic determinant, Immunization, immunization in Pakistan, Social Factors for immunization completion.

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## INTRODUCTION:

The administration of antigen containing immunizing material (The vaccine) which produces immunity against infectious disease is called immunization (Lorenz and Khalid, 2012). The data on the proportion of children who are being administered specific vaccine or have received immunization according to the standard immunization schedule is called immunization coverage for a given population. This data is valuable for planning, development, monitoring and evaluation of an immunization program. Based on this information, essential areas, groups or population that requires alteration in allocation of resources can be identified and prediction of likelihood of vaccine preventable disease epidemics made (Bramley et al., 2005). Immunization coverage is based on whether immunization is administered to a child or not which is most efficiently estimated through Expanded Program on immunization (EPI) records and somehow through history recall (Akmatov and Mikolajczyk, 2012) Timeliness of immunization means if the immunization is administered during prescribed age or not. Immunization is considered as early if it is administered before the prescribed age and late if it is administered after the prescribed age (Fadnes et al., 2011).

Vaccine is the most efficient and cost effective discovery of our age (Muraskin, 2004). Now a days immunization is frequently quoted as one of the absolute public health achievement of our ages (Control and Prevention, 2011) but standard population coverage for immunization to be effective is 90% to 95% (Bramley et al., 2005). Child is considered as fully immunized if one dose of Bacillus Calmette Guerin vaccine, polio vaccine and Three doses of Diphtheria Pertussis Tetanus vaccine each and one dose of measles vaccine are administered on prescribed intervals (Sharma et al., 2013).

Despite of all efforts put on by the international agencies around 22.4 million children are still unvaccinated globally. The Sub Saharan Africa (SSA) ports the highest burden of problem of kids who are not having access to simple vaccination services so the greatest burden is confined in developing and under developed countries (Liu et al., 2012). As infectious diseases are the major cause of morbidity and mortality, immunization programs are crucial. (Hasan et al., 2010)

Pakistan is a developing country of South Asia and it has one of the highest mortality rates for under five year children. As reported by world bank in 2013 Pakistan has under five year mortality rate of 87 per

1000 live births (Razzak et al., 2013). Mortalities of child less than 5 year of age comprise half of deaths in Pakistan while in developed countries it account for only 8-10 percent deaths (Sheikh et al., 2013). About one third of all the death of under five year old children have etiology of Vaccine Preventable Diseases (VPDs) (Usman et al., 2009). Rates of under five year old children mortality have been decreasing slowly in Pakistan over last few decades but this decreasing trend is very slow in comparison to other developing countries. . Pakistan is included in those few countries where polio is still endemic (Obregón et al., 2009).

This study identifies the factors or determinants of gaps in completion of immunization and under immunization in various clusters of Pakistan. It will also provide the pattern and association of those factors that contribute to determination of poor coverage, timeliness and are reasons of under immunization in children so that these factors can be avoided to improve and develop the immunization programs and coverage.

Examining the relationship of these variables can significantly assist in defining solutions to the gaps and problems. Effective and efficient interventions can be designed and gaps in previous interventions can be determined and can be addressed. Information acquitted by this study will help and enable for planning and improvement of cost-effective immunization programs and campaigns of vaccination and immunizations including DPT, HebB, Hib, BCG, MMR and polio for the vaccination preventable diseases like Tetanus, diphtheria, Pertussis, influenza hepatitis B, Tuberculosis(TB), measles in Pakistan.

**Objectives:** The objective of the study is to assess the socio-demographic factors including region, type of place of residence, gender of house hold head, educational attainment, wealth index, mother's education status, fathers educational status, access to electricity, ownership of radio and television, access to transportation including bicycle, motor cycle and car/truck, frequency of reading newspaper and place of delivery that may have association with immunization completion of under five year old children in Pakistan.

## METHODS:

### Study Design:

The research design used to conduct this study was analysis of secondary data derived from Pakistan Demographic and Health Survey (PDHS) 2012-2013 which is a cross sectional survey.

**Data Source:** The data used in the study was obtained from the Pakistan Demographic and Health Survey 2012-2013 conducted by the National Institute of Population Studies (NIPS), Islamabad, Pakistan, and Macro International Inc, Calverton, Maryland, between 2012 in February 2013.

**Independent Variables:** Various independent variables of the study were identified by review of public health and medical literature from national and international sources. In this study independent variables are region, type of place of residence, gender of house hold head, educational attainment, wealth index, mother's education status, fathers educational status, access to electricity, ownership of radio and television, access to transportation including bicycle, motor cycle and car/truck, frequency of reading newspaper and place of delivery. ”.

**Dependent Variables:** Dependent variable of this study was immunization status. To make data analysis convenient Statistical Package for Social Sciences (SPSS) 21 was used to recode the data of immunization received and further these variables were merged to generate single dependent variable Immunization Status.

To make analysis possible these variables were recoded as dichotomous variables in SPSS 21 as no and do not know as “No” and vaccination seen on card, reported by mother and marked on card as “Yes”. Further these four variables were merged to generate single variable named “Immunization status” which was coded as “Not completed immunization” and “Completed Immunization”

**Statistical Design:** Secondary data of Pakistan Demographic and Health Survey (PDHS) 2012-2013 was analyzed by using Statistical Package for Social Sciences (SPSS) 21. Some data was recoded in SPSS 21 to allow for analysis.

To assess the association of dependent variable (Immunization status) with various determinants of its completion including region, type of place of residence, gender of house hold head, educational attainment, wealth index, mother's education status, fathers educational status, access to electricity, ownership of radio and television, access to transportation including bicycle, motor cycle and car/truck, frequency of reading newspaper and place of delivery chi-square analysis was done.

**Ethical Consideration:** This study utilized publically available information from the Pakistan Demographic and Health Survey with no any visible personal or demographic data i.e name and identifying factor of respondent.

### RESULTS:

Total Sample of women in Pakistan Demographic and Health survey was 13,557. Table 1. given below shows the distribution of various independent variables in the sample. Majority of respondents were Rural Residents 53.2 % as compared to 46.8% urban residents.

Considering the regional distribution of respondents, Punjab was having highest percentage of 28% as compared to Sindh (21.7%), Khyber Pakhtunkhwa (19.9%), Balochistan (14.4%) and rest of 15% were from Gilgit Baltistan and Islamabad (Table 1).

Formal education attainment is a vital feature that was calculated, its analysis shows that highest percentage of respondents were having no education 56.2% while only 12.2% were having higher education, rest were only having secondary or primary education. The education level of mothers also showed the same trend as mentions above. Highest percentage of mothers (56.2%) did not attend any formal education institution, 13.5% completed their primary education, and 10.8% attended secondary school while only 12.4% went for some higher education. Based on mothers information regarding the education status of child's father indicates that most of the fathers (31.4%) were having no formal education from any institution, while 23.4% had completed their higher education (Table 1).

Higher percentages (91.5%) of households were having a male as head of family while only 8.5% females found to be household head. Conferring to the wealth index sample consisted of the 23.9% of the richest and 18.3% of poorest 19.1% to 19.6 levels in between. A very few of respondents 3.3% were reading newspaper daily while 74.3% were those who were having no habit of reading newspaper. As regard to household having electricity a significant percentage (95.1) of households were having electricity while only 4.9% was not having electricity facility. Pertaining to the ownership of radio or television, 65.5% of subjects were having ownership of television while only 20.9% owned a radio. It has been reported that 29.7% were having bicycle, 37.7% were having motorcycle or scooter while only 14.3% of household were having car or truck (Table 1).

*Table 1: Frequencies of Selected Variables in the Study N=13558*

Characteristics	Frequency	Percentage (%)
<b>Region</b>		
Punjab	3800	28.0
Sindh	2941	21.7
Khyber Pakhtunkhwa	2695	19.9
Balochistan	1953	14.4
Gilgit Baltistan	1216	9.0
Islamabad (ICT)	953	7.0
<b>Type of Place Residence</b>		
Urban	6351	46.8
Rural	7207	53.2
<b>Educational Attainment</b>		
No education	7625	56.2
Incomplete primary	681	5.0
Complete primary	1150	8.5
Incomplete secondary	1082	8.0
Complete secondary	1333	9.8
Higher	1687	12.4
<b>Mother's Educational Level</b>		
No education	7625	56.2
Primary	1831	13.5
Middle	945	7.0
Secondary	1470	10.8
Higher	1687	12.4
<b>Father's educational attainment</b>		
No education	4239	31.3
Incomplete primary	594	4.4
Complete primary	1225	9.0
Incomplete secondary	1894	14.0
Complete secondary	2407	17.8
Higher	3176	23.4
<b>Sex of Household Head</b>		
Male	12409	91.5
Female	1149	8.5
<b>Wealth Index</b>		
Poorest	2486	18.3
Poorer	2586	19.1
Middle	2589	19.1
Richer	2657	19.6
Richest	3240	23.9
<b>Frequency of Reading Newspaper or Magazine</b>		
Not at all	10068	74.3
Occasionally	2731	20.1
At least once a week	268	2.0
Daily	448	3.3
<b>Household has: Electricity</b>		
No	663	4.9
Yes	12892	95.1
<b>Household has: Radio</b>		
No	10717	79.0
Yes	2829	20.9
<b>Household has: Television</b>		
No	4669	34.4

Yes	8883	65.5
<b>Household has: Bicycle</b>		
No	9513	70.2
Yes	4030	29.7
<b>Household has: Motorcycle/Scooter</b>		
No	8435	62.2
Yes	5108	37.7
<b>Household has: Car/Truck</b>		
No	11600	85.6
Yes	1944	14.3

#### Factors Associated with complete Immunization:

Table 2 explores the association of various factors with vaccination status of children. Immunization status was measured for 1<sup>st</sup> ever born under five year of age children according to expanded program on immunization schedule. Chi-square analysis was done for these factors. Cross tabulation using chi-square for different demographic factors and immunization (Table 2):

Islamabad (56.2%) and Punjab (52.2%) have higher rates of completion of immunization ( $p < .001$ ). Being urban resident (44%) is associated with higher rates of completion of immunization ( $p < .001$ ). Parents having higher education (56.8%) of fathers (49.3%) and mothers (56.8%) having higher educations are more likely to complete the immunization schedule for their children ( $p < .001$ ). Sex of household head, being female (42.7%) is found significantly

associated with immunization completion ( $p < .05$ ). Having richer (45.6%) or Richest (53.2%) Wealth index is associated with higher rates of completion of immunization ( $p < .001$ ). Access and ownership of electronic media i.e television (45.1%) and mothers daily reading newspaper (60.6%) are found to be associated with higher rates of completion of immunization ( $p < .001$ ). While ownership of radio device (38.2%) was not found significantly associated with complete immunization status ( $P = .698$ ). Household having ownership of transport including motorcycle/ scooter (42.0%) or car/truck (45.9%) are associated with higher rates of completion of immunization ( $p < .001$ ). While ownership of bicycle (38.9%) found not to be significantly associated with complete immunization status of children ( $p = .801$ ) Child delivered in some health care facility (45.7%) have higher rates of completion of immunization ( $p < .001$ ).

Table 4.3

Association of Select Demographic Characteristics of Families and Child's Vaccination Status (N=7076)

Characteristic	Immunization Status		
	Not Complete Immunization No. (%)	Completed Immunization No. (%)	Total
<b>Region</b>	P<.001*		
Punjab	908(47.8)	993(52.2)	1901
Sindh	1136(75.5)	368(24.5)	1504
Khyber Pakhtunkhwa	864 (58.7)	608(41.3)	1472
Balochistan	838(79.2)	220(20.8)	1058
Gilgit Baltistan	393(57.8)	287(42.2)	680
Islamabad (ICT)	202(43.8)	259(56.2)	461
<b>Type of Place of Residence</b>	P<.001*		
Urban	1763(56.0)	1386(44.0)	3149
Rural	2578(65.6)	1349(34.4)	3927
<b>Educational Attainment</b>	P<.001*		
No education	2745(71.1)	1115(28.9)	3860
Incomplete primary	213(55.6)	170(44.4)	383
Complete primary	358(56.6)	275(43.4)	633
Incomplete secondary	305(51.2)	291	596
Complete secondary	338(46.9)	382(53.1)	720
Higher	382(43.2)	502(56.8)	884
<b>Mother's Education Level</b>	P<.001*		
No education	2745(71.1)	1115(28.9)	3860
Primary	571(56.2)	445(43.8)	1016
Middle	270(51.6)	253(48.4)	523
Secondary	373(47.0)	420(53.0)	793
Higher	382(43.2)	502(56.8)	884
<b>Father's Education Level</b>	P<.001*		
No education	1560(73.0)	577(27.0)	2137
Incomplete primary	213(64.2)	119(35.8)	332
Complete primary	411(65.9)	213(34.1)	624
Incomplete secondary	594(57.0)	448(43.0)	1042
Complete secondary	724(56.0)	568(44.0)	1292
Higher	828(50.7)	805(49.3)	1633
<b>Sex of Household Head</b>	P=.046*		
Male	4038(61.7)	2509(38.3)	6547
Female	303(57.3)	226(42.7)	529
<b>Wealth Index</b>	P<.001*		
Poorest	1191(79.2)	313(20.8)	1504
Poorer	926(66.3)	471(33.7)	1397
Middle	798(59.1)	552(40.9)	1350
Richer	743(54.4)	624(45.6)	1367
Richest	683(46.8)	775(53.2)	1458
<b>Frequency of Reading Newspaper or Magazine</b>	P<.001*		
Not at all	3497(66.2)	1784(33.8)	5281

Occasionally	722(48.5)	767(51.5)	1489
At least once a week	48(40.7)	70(59.3)	118
Daily	74(39.4)	114(60.6)	188
<b>Household has: Electricity</b>	P<.001*		
No	483(76.8)	146(23.2)	629
Yes	3858(59.8)	2589(40.2)	6447
<b>Household has: Radio</b>	P=.698*		
No	3581(61.2)	2266(38.8)	5847
Yes	760(61.8)	469(38.2)	1229
<b>Household has: Television</b>	P<.001*		
No	2078(70.4)	873(29.6)	2951
Yes	2263(54.9)	1862(45.1)	4125
<b>Household has: Bicycle</b>	P=.801*		
No	3259(61.4)	2046(38.6)	5305
Yes	1082(61.1)	689(38.9)	1771
<b>Household has: Motorcycle/Scooter</b>	P<.001*		
No	2997(63.0)	1762(37.0)	4759
Yes	1344(58.0)	973(42.0)	2317
<b>Household has: Car/Truck</b>	P<.001*		
No	3950(62.2)	2403(37.8)	6353
Yes	391(54.1)	332(45.9)	723
<b>Place of delivery</b>	P<.001*		
Not in Health Facility	2288(69.3)	1012(30.7)	3300
in some health care facility	2047(54.3)	1723(45.7)	3770

\* Chi-square p-Value

### DISCUSSION:

According Naeem et al., 2011 to vaccine preventable diseases are the major cause of childhood mortalities. Pakistan is facing number of important challenges about improvement of immunization status of under five year age children (Naeem et al., 2011). The objective of this study was to find out the socio-demographic factors which were associated with childhood immunization completion in Pakistan.

Previous studies on determinants of immunization in Pakistan have strongly showed the association of socioeconomic and demographic factors with the immunization status (Usman et al., 2011, Siddiqui et al., 2013).

According to results Islamabad (56.2%) and Punjab (52.2%) are associated with status of complete immunization as there are well developed health infrastructure and health care facilities while Baluchistan (20.8%) is having least association, it could be due to poor health care services. The development of a region could influence the accessibility to services. A study conducted by Bugvi et al. 2014 shows that province of residence has association with incomplete immunization. Children in less developed regions including Sindh and Baluchistan were less likely to have complete

immunization then that of Punjab. Khyber Pakhtoonkhawa showed positive association with immunization completion it could be because of special services provided by the international agencies including UNICEF, WHO, UN and USAID (Bugvi et al., 2014). Results suggests that being urban resident (44.0%) is associated with the complete status of immunization it is congruent with study conducted by Naeem et al. 2011 which reports high immunization rates in urban areas and low immunization rates in villages (Naeem et al., 2011). This positive association can be due to easy access to immunization and other health care services and better financial conditions. In rural areas mothers are less educated, they have less chance of mobility and male partner must have to accompany to health care facility.

According to this study higher the education of mother and father, higher the status of immunization completion, earlier studies reports the same association of education with immunization status (Sykes et al., 2013) it could be due to the fact that educated people have understanding of benefits of preventive strategies including immunization. Another study concludes that education of mother is positively associated with child being immunized.

Education improves awareness, insight and knowledge regarding immunization (Naeem et al., 2011). Another study states that educational status of parents particularly mother's educational attainment has significant relation with immunization (Ozcirpici et al., 2006, Phukan et al., 2009). This positive association of higher education of parents with higher level of immunization can be rationalized by the better awareness, positive health seeking behavior and behavioral modification of educated people.

It has been reported previously that low socioeconomic status of family highly affects the likely hood of childhood immunization which is similar to results of this study (Naeem et al., 2011). Although immunization facilities are provided free of cost but low wealth index determines the living area and rents for transportation are also difficult to pay by low income people (MINH THANG et al., 2007). Administration of immunization is linked with the prior contact of parents with health care system (Topuzoğlu et al., 2007, Antai, 2009). Data from PDHS, in this study revealed that children who are delivered in some health care facility are more likely to complete recommended immunization schedule. It is studied previously that children who delivered at home are less likely to have uptake of immunization (Bugvi et al., 2014). The reason behind this could be that contact with health care system is associated with awareness regarding immunization and its importance (Jani et al., 2008). Previous study by Shaikh et al. 2010 in Sindh province shows that birth of children in hospital setting is strong determinant for vaccination of child (Shaikh et al., 2010).

In this era information technology plays important part in our life. Mass media deeply influence our knowledge, attitude and practices. TV and newspaper are the major source of information now days. This study revealed positive association among Access to TV and daily reading newspaper with immunization completion of children which comply with the previous studies by Naeem et al. and Bugvi et al. (Bugvi et al., 2014, Naeem et al., 2011). These sources of information technology have deep impact on health seeking behaviors by modifying the beliefs of community by proper health education on importance of immunization. Government of Pakistan should emphasize on this important determinant of immunization.

Access and ownership of transportation is another factor found to be associated with complete immunization status of children. Previously a study from Bangladesh suggested the same result (Uddin et al., 2009). Transportation provides with ease to

access the health care facility for immunization so people having transportation facility are more likely to visit the health care setting for immunization of their child.

#### **Implications of Findings and Recommendations:**

It is hoped that results of this study will help in understanding the issues in vaccine completion in Pakistan. This study highlights the intense necessity to upsurge the awareness regarding the benefits of immunization among the people of Pakistan to increase the coverage of immunization among less than five year of age children which in turn can reduce the mortality and morbidity caused by Vaccine Preventable Diseases (VPDs) in Pakistan. The results and findings of this study make some precious recommendations which can help in increasing the immunization coverage. It limelight's the issue of rural residents for having least vaccine coverage that is concern for EPI programmers and policy makers, as rural areas are considered as areas with least health care facilities so provision of health care facilities and its accessibility should me make sure in rural areas. It points out that education of both parents is extremely important as it provides with broad vision and increases awareness. Furthermore education changes the attitudes and practices regarding health seeking behavior, so it is strongly recommended to educate people especially females which can result in revolutionary change in health seeking behavior and it can bring about transitional change in value belief system regarding immunization in families. Access to proper mean of transportation to reach the health care facility and mass media awareness campaigns are playing important role in awareness regarding immunization. In Pakistan EPI program is playing priceless role in immunization of under five year old children but unvaccinated or incomplete vaccination of under five year old child population is a challenging task for the concerned personals.

#### **Study Strengths:**

Data used in the study was obtained from Pakistan Demographic and Health Survey which is conducted on nationally representative sample so results can be generalized on Pakistani population. it is noted in past studies that data on immunization gathered through household surveys is more reliable than routine reporting system (Shaikh et al., 2010).

#### **Study Limitations and Recommendations for Further Research:**

Considering the fallacies that may occur from this type of secondary analysis of data following are the limitations to this study.



1. Analysis was restricted to 1<sup>st</sup> born child in the data that is why it cannot be generalized on the all children under five year of age in Pakistan.
2. This study has limitation of data being used from a cross-sectional survey, risk of sampling errors, selection biases and errors in history of immunization remembrance from mothers while estimating immunization status.
3. This study has the limitation that results can only be generalized to Pakistani population; data from other countries can be added and utilized to more strengthen the study.
4. This study utilizes secondary data so dimensions regarding immunization that were not available in Pakistan Demographic and Health Survey data set could not be explored
5. In this study response from only women questionnaire was included so view of male population is not there regarding immunization.
6. Lastly categorical variables were converted to binary categories which lead to loss of some data.
7. This study examined the family's characteristic that might influence the immunization seeking behavior in Pakistan, more research on sub-groups is needed. Study on the knowledge attitude and practices of parents and research can be conducted on their health seeking behavior that can give insight about the best intervention to design methods which can promote the immunization in various sub-groups and regions. I recommend the study on policy evaluation of immunization program in Pakistan which may examine the major issues in examining the issues pertaining to childhood immunization. Moreover, an in depth sight is needed on cultural practices and factors which may influence the immunization seeking behavior.

#### CONCLUSION:

Despite of all the efforts of concerning bodies, Pakistan is not having a satisfactory coverage of under five year childhood immunization. Region, place of delivery, parental education status, wealth index, having access to electricity and ownership of any transportation were significantly associated with immunization status (complete/incomplete) of under five years children in Pakistan. Moreover having exposure and access to media viz television and newspaper was also statistically significant with the completion of under five years child immunization. Conclusively, Expanded Program on Immunization and concerning bodies in Pakistan should improve and developed the strategies and programs to address the social and demographic determinants including low coverage regional areas, availability of resources

in rural areas, education of parents, availability of transportation, access to mass media and effective mass media campaigns in order to meet the equitable distribution of under five year immunization.

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