



Article

Relationship between Parental Occupation and Childhood Vaccination Coverage in Pakistan

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Abstract: Background: Pakistan Demographic and Health Survey (PDHS) was conducted in 2017-18 by the National Institute of Population Studies (NIPS) with the assistance of ICF International and the United States Agency for International Development (USAID) to measure vaccination coverage in Pakistan. PDHS reported 66% complete childhood vaccination in Pakistan. **Methodology:** This study was carried out to know the relationship between childhood vaccination coverage in Pakistan and parental occupation. The study was based on the mothers who gave birth to at least one child in five years preceding the survey. The child, who took one dose of Bacillus of Calmette and Guerin (BCG) - a tuberculosis vaccine; three doses of vaccine for diphtheria, pertussis, and tetanus (DPT); three doses of oral polio vaccine (OPV), and one dose of measles, was considered fully immunized. Logistic Regression Analysis was used to assess the relationship among variables. Results: The mothers working in professional or managerial posts were 2.4 more likely to complete childhood vaccination than unemployed mothers. Likewise, the fathers working in managerial or professional posts had 1.9 more likely to complete vaccination among their children than unemployed fathers. Conclusion: Government should focus on increasing health knowledge among women for better childhood-health outcomes, particularly in the context of vaccination coverage.

Keywords: Vaccination Coverage, Parental Occupation, Childhood, Immunization, Pakistan

1. Introduction

Expanded Program on Immunization (EPI) was introduced first by the health organization of the United Nations, which is called WHO (World Health Organization)—having the objective of controlling six communicable diseases in children: diphtheria, tuberculosis, tetanus, pertussis (whooping cough), measles and polio 1974. In 1978, Pakistan initiated its EPI under the supervision of WHO (Bugvi et al., 2014). Presently, EPI at the national level intends to vaccinate the children aged 0-23 months for eight vaccine-controllable ailments which embrace, in addition to the ailments above, hepatitis B and Haemophilus influenza type b (Hib); introduced in 2002 and 2008, respectively (Oliwa& Marais, 2017).



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Table 1: Immunization Schedule Pakistan

Age of Child	Vaccination		
At the time of birth	BCG+POLIO 0		
On the sixth week	DPT1+HBV1+POLIO1+Hib1		
On the tenth week	DPT2+HBV2+POLIO2+Hib2		
On the fourteenth week	DPT3+HBV3+POLIO3+Hib3		
On nine months	Measles		
The second year of life	Measles Booster Dose		

Source: Masud&Navaratne (2012).

Five (5) million newborns (a huge birth section of Pakistan) per annum have significant outcomes for vaccine distribution in an already constrained health structure. Profound knowledge of present challenges, policy amendments, and rational decision-making is essential to achieving 90 percent vaccination coverage at the national level and 80 percent coverage at least in each district (Zaidi et al., 2014). This aspiring goal seems complicated for most developing countries for numerous reasons. The acceptance of vaccination factors in Pakistan required thorough analysis to generate a proper evidence-based facilitation procedure.

In developing countries, health services, including vaccination, are less likely available to people belonging to low-income strata as compared to their affluent neighbors/neighborhoods (Oyo-Ita., 2016). There is a discussion about the overall significance of parental learning, orientations, and service provision elements (counting collaboration with the populace expected to be assisted) as elements of immunization rates (Jheeta & Newell, 2008). According to a few writers, parental (demand side) aspects, including information, awareness, orientations, qualification, and socioeconomic status, are vital in defining vaccine coverage, either to claim or to accept the proposal of vaccinations (Nichter, 1995; Stanton, 2004). Others highlight the part of the distribution of facilities (supply side); it incorporates the learning and orientations of workers and their collaboration with parents and accessibility of vaccination facilities (Streefland, Chowdhury& Ramos-Jimenez, 1999). A Colombian study revealed that vaccination rates are influenced by the information of vaccinators in their reporting areas (De la Hoz et al., 2005).

Ethnic discrepancies in immunization rates have been observed in America, such as racial and ethnic disparities in the treatment with the influenza vaccine (Rangel et al., 2005). Vaccination acceptance is therefore measured as extremely customarily sensitive, affected by indigenous knowledge about infant ailments and decisional courses in families (Dugas et al., 2009). Whereas some scholars stress that immunization acceptance has a social basis in few Afro societies (Cassell et al., 2006; Sanou & Bibeau 2009), others regard fewer rates of immunization as cultural disparities (Petousis-Harris et al., 2005; Ouédraogo et al., 2006) couple with few etiological deliberations about healable ailments are also defined as "cultural prejudice."

Although many studies reflect the significance of socioeconomic, topographical, and cultural aspects in child immunization, attaining requisite immunization coverage is not just associated with parental abilities and orientations. According to academics; structure, health care system functioning, and facilities, together with the conduct of health workers in doing assigned tasks, establish vital essentials in immunization coverage: it recognized that the manner how vaccination tasks are arranged and facilities are provided (Streefland, Chowdhury&Ramos-Jimenez, 1999) along with parental and health operative communication (Cassell et al., 2006), significantly affect the immunization coverage. Inappropriately, such facets do not constantly get attention from health staff or the organizers of immunization facilities.

The advantages to getting a child immunized are barely doubtful. So far, research has reflected that a substantial number of parents, typically associated with the socioeconomically underprivileged populace, combat child immunization in many developing countries (Topuzoğlu et al., 2006). The very cause for parents who do not allow their children to get vaccinated is the view that their children will not get infected with some ailments like pertussis, polio, and measles. Additionally, the parents are worried about the after-effects of immunization (Xie& Dow, 2005). Multiple factors of structure, culture and economic affairs play a role in standing Pakistan lower in the raking of vaccination coverage than many regional countries. It is reflected according to data that only some studies (Mansuri&Baig, 2003; Nisar, Mirza&Qadri, 2010) have studied the factors of non-utilization of child immunization in Pakistan, though few exposed the factors of consumption of certain vaccines (Mitchell et al., 2009; Usman et al., 2010). Several researchers have studied the determinants which influence vaccination trends among infants. However, limited quantitative evidence was found on specific aspects, e.g., pedagogy, acquaintance, orientation, and practices of mothers about vaccination exposure (Bugvi et al., 2014). Moreover, as far case of Pakistan is concerned, limited evidence of research found that explains the relative influences of parental occupation on child immunization coverage. The present research aimed to identify the relationship between vaccination coverage of all the children aged 01-23 months born in Pakistan and parental occupational attributes.

2: Materials and Methods

2.1. Study Settings

This research was based on the secondary analysis of the Pakistan Demographic and Health Survey (PDHS) 2017-18. PDHS is a nationally representative survey that includes Punjab, Sindh, Khyber Pakhtunkhwa, Baluchistan, FATA, and ICT Islamabad. The region, like Federally Administered Tribal Areas (FATA), is also included in PDHS 2017-18, which were excluded in 2012-13 PDHS.

Pakistan is spread over a large area of 7 96,096 square kilometers and is populated by more than 200 million people. The diverse demography and terrain make its inhabitants vulnerable to some epidemics. PDHS provides valuable and representative national-level data on the various health issues in Pakistan. The regional level information provided in PDHS 2017-18 benefited policymakers at the local level decision-making after the devolution of powers in the 18thconstitutional amendment.

This survey was carried out under the supervision of a globally held Demographic and Health Survey (DHS) program. The PDHS 2017-18 was the fourth Demographic and Health Survey in Pakistan, after PDHS 1990-91, PDHS 2006-07, and PDHS 2012-13. These surveys provided information on maternal and child health and important demographic indicators to public administrators and planning agencies. This survey was designed by the National Institute of Population Studies (NIPS) in collaboration with the Pakistan Bureau of Statistics (PBS) as per the policy guidelines provided by the Ministry of National Health Services, Regulations and Coordination with the financial support of the United States Agency for International Development (USAID)/Pakistan.

2.2. Sampling Design

The universe for the present study was the four provinces (Punjab, Sindh, Khyber Pakhtunkhwa, and Baluchistan) and two regions (ICT Islamabad and former Federally Administrated Tribal Areas [FATA]). The sample frames for urban and rural areas were developed separately. Thus, 16 strata were obtained.

The two-stage sampling procedure was adopted; in the first stage, 580 Enumeration Blocks (EBs) as Primary Sampling Units (PSUs) were selected from both urban and rural sampling frames by using a probability proportional sampling scheme to their sizes of EBs, the size of EBs consisted of households residing in EBs at the time of census 2017. The 19 clusters were dropped due to violent law and order situations, and 561 were surveyed successfully. Then 28 households were selected from each sampling unit using systematic random sampling in the second stage. This process yielded a total sample size of approximately 16,240 households. For obtaining PDHS data for the study "Relationship between parental occupation and childhood vaccination coverage in Pakistan: Analysis of the PDHS 2017-2018", an email was generated to concerns, and after getting the SPSS data file, data was used for said study without disclosing confidential information of respondents. Therefore, surveyed respondents did not need to get informed consent directly.

2.3. Outcome Variable

Vaccination coverage amongst the family's youngest child was this study is the outcome/dependent variable. In this context, the mothers who gave birth to at least one child in the past five years preceding the survey were selected for data analysis. The sample size of such mothers in PDHS 2017-18 was 8287, and after the application of weights and filters for the last-born child, this number corresponded to 6711 women. The child who took one dose of Bacillus of Calmette and Guerin (BCG) - a tuberculosis vaccine; three doses of vaccine for diphtheria, pertussis, and tetanus (DPT); three doses of oral polio vaccine (OPV), and one dose of measles, was considered fully immunized. The vaccines' variables were recorded from five response categories: "0" as No; "1" as vaccination date on the card; "2" as reported by mother; "3" as vaccination marked on card; and "8" as do not know(DK) into two categories: "0" as No and "1" as Yes (by computing the categories of vaccination date on the card, reported by mother and vaccination marked on the card, while "do not know" was put into system missing values. The researcher defined the complete vaccination by the previous research, which states that if a child received one dose of Bacillus of Calmette and Guerin (BCG) - a tuberculosis vaccine; three doses of vaccine for diphtheria, pertussis, and tetanus (DPT); three doses of oral polio vaccine (OPV) and one dose of measles will be considered fully immunized (Bandri P. et al., 2000).

2.5. Explanatory Variables

Fourteen independent variables were selected based on previous research (Bugvi et al., 2014; Zaidi et al., 2014) and according to the requirements of this study. The following factors were found to be significantly associated with the vaccination coverage amongst the youngest child in the family: father's(husband/partner) occupation, father's(husband/partner) education, father's(husband/partner) age, mother's age, maternal education, maternal occupation, maternal working status (all year, seasonal or occasional), maternal movement options for vaccination, distance to health facility, availability of transport, wealth index, residence (urban/ rural), region (Punjab, Sindh, Khyber Pakhtunkhwa, Baluchistan, FATA, and ICT Islamabad) and access to information. The following independent variables were also recorded, such as maternal age (15-24, 25-34, 35-44, and 45-Above) and paternal age (15-24, 25-34, 35-44, 45-54, and 55-Above), paternal and maternal occupation (not working, manual worker, clerical/sales/services, management/professional), wealth index (poor, middle and rich). Similarly, a new variable, "access to information, "was created by computing three variables: 1. Access to radio, 2. Access to television,

and 3. Access to the newspaper and if the mother has no access to any of the sources, then categorized as "no" and coded as "0", and if the mother had access to one or more of the sources as mentioned earlier, then categorized as "yes" and coded as "1".

2.6. Data Analysis

The relationship measured between all independent variables father's (husband/partner) occupation, father's (husband/partner) education, father's (husband/partner) age, mother's age, maternal education, maternal occupation, maternal working status (all year, seasonal or occasional), maternal movement options for vaccination, distance to health facility, availability of transport, wealth index, residence (urban/rural), region (Punjab, Sindh, Khyber Pakhtunkhwa, Baluchistan, FATA, and ICT Islamabad) and access to information and the dependent variable of vaccination coverage by using binary logistic regression with the help of SPSS 21 version.

4. Results

Eight thousand two hundred eighty-seven women fall under the inclusion criteria devised for data analysis. After the application of weights, this number corresponded to 6711 women. Among these 6711 women, there were 51.5% from Punjab, 23.4% from Sindh, 16.4% from KPK, 5.6% from Baluchistan, 0.8% from Islamabad, and 2.3% from Federally Administered Tribal Areas(FATA). An overwhelming majority of respondents, 82.4% of women, were unemployed. 40.9% of women fall under the poor wealth quintile compared to 38.7% under the affluent wealth quintile. The majority of women, 55.5% included in the weighted analysis, were from 25-34 years of age. The majority of women, 66.5%, belong to rural areas. 47.9% of women had no education, 16.3% had primary school education, 22.2% had secondary school education, and 13.6 had higher education (Table.2).

Table 2: Univariate analysis of "Vaccination Coverage" outcome variable and significantly associated predictors with weighted percentages

Variables	f	%
Region of Respondents		
Punjab	3453	51.5
Sindh	1571	23.4
KPK	1101	16.4
Baluchistan	377	5.6
IT	54	.8
FATA	156	2.3
Mother Occupation		
Not working	5528	82.4
Manual work	901	13.4
Clerical/sales/services	147	2.2
Professional/Management	132	2.0
Mother Employment Nature		
All year	707	59.8
Seasonal	358	30.3
Occasional	118	10.0
Wealth index		
Poor	2743	40.9
Middle	1371	20.4
Rich	2597	38.7
Mother Age		
15-24	1545	23.0
25-34	3725	55.5
35-44	1330	19.8
44-above	111	1.7

Residence		
Urban	2248	33.5
Rural	4463	66.5
Mother Education	2212	47.0
No education	3212	47.9
Primary	1097	16.3
Secondary	1492	22.2
Higher	911	13.6
Birth Order		
1-3	3908	58.2
4-6	2174	32.4
7-9	512	7.6
9-15	117	1.7
Father Occupation		
Not working	173	2.6
Manual work	4296	65.2
Clerical/sales/services	1341	20.4
Professional/Management	778	11.8
Father Age		
15-24	477	7.2
25-34	3008	45.6
35-44	2385	36.1
45-54	647	9.8
55-above	86	1.3
Father Education		
No education	1889	28.7
Primary	1085	16.5
Secondary	2316	35.2
Higher	1293	19.6
Transport Availability		
Not a problem	3024	45.1
A big problem	3683	54.9
Not wanting to go alone for self-healthcare		
Big problem	4194	62.5
Not a big problem	2514	37.5
Information Access		
No	2454	36.6
Yes	4254	63.4

f = freuency, % = percntage

Mothers working at sales/services or clerical posts had 1.8 times more chances of complete immunization, and mothers working at professional or managerial posts had 2.4 times more chances of complete immunization among their last born child in five years preceding PDHS 2017-18 as compared to unemployed mothers. On the other hand, fathers working in sales/services

or clerical posts had 1.8 times more chances of complete immunization, and fathers working in professional or managerial posts had 1.9 times more chances of complete immunization among their last born child in the five years preceding PDHS 2017-18 as compared to unemployed fathers.

Mothers of the ages between 15 and 24 years had two times more chances of complete immunization, while mothers of ages between 25 and 44 years had three times more chances of complete immunization among their last born child in five years preceding PDHS 2017-18 as compared to 45 years and above mothers. On the other hand, fathers of the ages between 25 and 34 years had three times more chances of complete immunization while fathers of ages between 35 and 54 years had more than 3.5 times chances of complete immunization among their last born child in the five years preceding PDHS 2017-18 as compared to 55 years and above fathers.

Mothers with primary, secondary, and higher education had two times more chances of complete immunization among their last born child in five years preceding PDHS 2017-18 than uneducated mothers. On the other hand, fathers with primary school education had 1.3 times more chances of complete immunization, and fathers with secondary school education and higher education had two times more chances of complete immunizations than uneducated fathers. The women belonging to Punjab, Sindh, KPK, and Islamabad had 4.5 times, 2.2 times, 2.4 times, and 3.9 times respectively, more chances of complete immunization among their last born child in five years preceding PDHS 2017-18 as compared to the women belongs to Federally Administered Tribal Areas (FATA).

The urban mothers had 1.5 times more chances of complete immunization among their last born child in five years preceding PDHS 2017-18 than the rural mothers. The mothers of the rich and middle wealth quintile had 1.5 times and twice the chances of complete immunization respectively among their last born child in five years preceding PDHS 2017-18 compared to the mothers of the poor wealth quintile.

The children born at 7_8thbirthorder had one time more chances of complete immunization while children born at 4-6th and 7-9th birth order had 1.7 times more chances of complete immunization than those born at 9-15th birth order. Mothers who had access to various sources of information had two times more chances of complete immunization among their last born child in five years preceding PDHS 2017-18 than mothers who had no access to information (Table 3).

Table 3: Bivariate analysis of vaccination coverage among last born children in five years preceding PDHS 2017-18 and explanatory factors using simple binary logistic regression

Variables	OR	95% CI		P-value
		Lower	Upper	
Mother Occupation				
Manual Working	.822	.688	.982	.031
Services, Clerical, Sales	1.842	1.213	2.798	.004
Managerial Work, Professional	2.423	1.524	3.850	.000
Not Employee	Ref			
Father Occupation				
Manual Working	1.396	.953	2.044	.087
Services, Clerical, Sales	1.800	1.212	2.673	.004
Managerial Work, Professional	1.926	1.279	2.901	.002
Not Employee	Ref			
Mother Age in Year				
15-24	2.408	1.116	5.197	.025
25-34	3.659	1.703	7.864	.001
35-44	3.579	1.650	7.765	.001
45-Above	Ref			
Father Age in Years				
15-24	1.570	.776	3.176	.210
25-34	2.641	1.339	5.208	.005
35-44	2.833	1.433	5.601	.003
45-54	2.582	1.273	5.238	.009
55-Above	Ref			
Mother Education				
5 Years Education	2.364	2.002	2.791	.000
10 Years Education	2.586	2.230	3.000	.000

Higher Educated	2.343	1.967	2.790	.000
No Formal Education	Ref			
Father Education				
5 Years Education	1.332	1.109	1.600	.002
10 Years Education	2.081	1.795	2.413	.000
Higher Educated	1.982	1.674	2.348	.000
No Formal Education	Ref			
Region				
Punjab	4.520	2.867	7.126	.000
Sindh	2.209	1.388	3.515	.001
Khyber Pakhtunkhwa	2.370	1.480	3.797	.000
Balochistan	1.065	.616	1.842	.822
Islamabad	3.863	1.795	8.314	.001
FATA	Ref			
Residential Area				
City	1.496	1.326	1.688	.000
Village	Ref			
Wealth Index				
Middle	1.814	1.553	2.119	.000
Rich	2.316	2.030	2.643	.000
Poor	Ref			
Birth Order				
1-3	1.760	1.093	2.832	.020
4-6	1.699	1.050	2.751	.031
7-9	1.099	.652	1.854	.723
9-15	Ref			
Access to Information				
Yes	2.055	1.819	2.322	.000
No	Ref			
Respondent does not want to go Alone for Self Health Care.				
Not a Big Problem	.688	.612	.775	.000
Big problem	Ref			
Distance to Health Care				
Not a big problem	.668	.595	.750	.000
Big problem	Ref			
Mother Employment Nature				
The whole year	1.912	1.120	3.264	.018
Seasonal worker	.777	.440	1.371	.383
Occasional worker	Ref			

5. Discussion

Incomplete vaccination coverage is considered a crucial problem for child health in Pakistan, like in most other developing countries. Current analysis of the study showed that parental occupation, socio-demographic and economic factors did affect vaccination coverage among last-born children in the five years preceding PDHS 2017-18 as children of unemployed, less educated, marginalized poor. Rural mothers who had no access to information were more bent on incomplete vaccination than the children of the mothers and fathers, who were employed, relatively better educated, and had good socioeconomic status, and urbanized mothers who had better access to information. As in an earlier study that also supports our findings, vaccination coverage varies across the socioeconomic as well as demographic factors: It is higher among mothers in the low age group than mothers in the high age group, urban resident mothers than rural resident mothers, having accessing to information than no access to information and educated parents than uneducated parents (Khowaja et al., 2015).

Access to information by different mediums might play a crucial role in shaping the behaviors of individuals about their health. This study found that mothers lacking access to information and unemployment were more likely to have incomplete vaccination coverage among their children. A study from literature supported this finding in this manner as educational intervention (vaccine-related target education) for the low-literate population can improve vaccination coverage among children of 0-23 months. Mother knowledge about the importance of vaccination and its schedule is directly related to high vaccination coverage rates among children (Salmon, Dudley, Glanz& Omer, 2015).

This study confirmed the results of previous studies that Punjab has far better vaccination coverage than the other four provinces. In Pakistan, parental employment and occupational segregation are directly related to complete immunization among children. The parents involved in professional or managerial positions and working at clerical/sales or service positions had more chances of complete immunization among their children. Young and educated parents had better vaccination coverage among their children. Urban and well-off mothers have more chances of complete immunization among their children. The birth order of children was also a significant factor for complete vaccination coverage. Parents gave more importance to their earlier births. Access to information is also a crucial factor for complete immunization. It is imperative for better childhood vaccination coverage that awareness campaigns should be run to improve the awareness level of the public regarding the importance of immunization from various diseases and motivation for timely vaccination among children. Another study described that for creating awareness of complete vaccination coverage among children between the age of 0-23 months, the public should be targeted, especially with low education levels and low social status (Khan, Zaheer &Shafique, 2017).

Similarly, the availability of preventive health care for children and themselves is significantly influenced by the level of social development. Our study also illustrated that place and region of parental residence have a relationship with complete and incomplete vaccination coverage in childhood. For instance, urban mothers have higher adaption to vaccination coverage than mothers living in rural areas. Our study also reveals that the Poor class tends to avoid vaccination. In contrast, the middle and wealthy classes have a higher tendency toward vaccination coverage, and the findings are also supported by an earlier study conducted in India titled education of women and childhood vaccination (Subhani et al., 2015).

6. Conclusions

In Pakistan, childhood vaccination coverage is considerable for further increasing the complete vaccination coverage rate because incomplete childhood vaccination is still an alarming situation. Parental occupation, nature of work and duration of work, access to health services, education, economic resource, and information access are significant factors to complete or incomplete vaccination coverage among Pakistan's children. There is also a relationship between an area of residence, region of residence, and distance to health services, independency in accessing health services and parental education, and childhood vaccination coverage. Social development, such as residence in less developed areas like rural areas and no or less access to health information, also affect the complete coverage of vaccination among children in Pakistan. Despite different limitations, this study suggests that rigorous measures should be taken to available-complete childhood vaccination coverage for all the regions and areas of Pakistan. So, a wide range of access to information regarding vaccination source availability and health care knowledge of the causal relation between coverage of vaccinations among children and disease prevention is necessary for provoking the rates of childhood vaccination coverage for ages between 0-23 months in Pakistan.

The findings, as mentioned above, have to be measured with some limits: First, the study was determined to be the last child of mothers conceived in the past five years. Second, information on childhood vaccination coverage is based on either vaccination cards or the reports provided by mothers of children. The data provided by mothers might be subjected to evoke desired social prejudices. So, the complete childhood vaccination coverage might be overstated because the infor-mation obtained by vaccination cards and provided by the mother cannot be treated in the same manner. Lastly, the frequency of visits to the home by designated vaccinators also was ignored, which may lead to inconvenient facts.

8. Limitations and Recommendations

The Pakistan Demographic and Health Survey (PDHS) is a nationally representative survey that collects information on various health indicators, including childhood vaccination. This study was based on secondary data from the PDHS 2017-18. However, like any other study, there are some limitations to consider. Although the PDHS is designed to be nationally representative, the survey may not capture specific subpopulations or regions. So, the present study also carried with this limitation. Furthermore, this study analyzed only the parental demographic attributes of in-

complete childhood vaccination but did not collect detailed information on the reasons why some children could not receive certain vaccinations. This information could provide valuable insights into barriers to vaccination and inform targeted interventions. The PDHS is conducted every few years, so the data of the present study may need to reflect current vaccination coverage rates. As a result, it is critical to keep these limitations in mind when conducting future researches studies in Pakistan.

Supplementary Materials: Data was collected from Pakistan Demographic and Health Survey and secondary analysis was performed.

Author Contributions: Author Contributions: Zahid Hussain conceptualized the study, Iftikhar Ahmad analyzed data, Ghulam Yaseen conducted the literature review, Muhammad Irfan Ahmed interpreted the results, and Muhammad Bilal made the discussion on results

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