ORIGINAL ARTICLE

COMPLIANCE TO THE NATIONAL IMMUNIZATION PROGRAM: A REVIEW OF IMMUNIZATION RECORDS OF GRADE 1 STUDENTS IN A PUBLIC ELEMENTARY SCHOOL IN MANILA FOR THE ACADEMIC YEAR 2017-2018

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The authors declare that the data presented are original material and has not been previously published, accepted or considered for publication elsewhere; that the manuscript has been approved by all authors, and all authors have met the requirements for authorship.

ABSTRACT

BACKGROUND: Vaccination is a cost-effective primary preventive measure against infectious diseases. However, protection for specific diseases may wane over time. The National Immunization Program was launched to improve vaccine coverage but despite this, some countries including the Philippines have erratic vaccine coverage.

OBJECTIVE: To determine the compliance to the National Immunization Program of Grade 1 students in a public elementary school

METHODOLOGY: The study utilized a descriptive cross-sectional design. Simple random sampling of students enrolled in first grade for A.Y. 2017-2018 was done to determine the study respondents. Primary and secondary data were obtained through a pretested structured questionnaire with interview of the students' caregiver and verification via the students' immunization records. Compliance to immunization was correlated with the subjects' age, birth rank, primary caregiver and socio-demographic profile of the caregiver, place of birth and place of vaccination. Data were analyzed using descriptive statistics and logistic regression was used to assess factors for increased vaccination compliance.

RESULTS: Most respondents had their mothers as primary caregivers. Majority were institutional deliveries and immunized at a health center. Mean compliance to vaccination was 69%. Among the factors, only place of birth, specifically, hospital delivery, was associated with increased compliance to vaccination (OR = 0.3312, 90% CI 0.1496 to 0.7333, p value 0.0064). Subjects whose primary caregivers were the mothers and whose parents had higher educational attainment or were both employed were shown to have higher vaccination compliance, although this was not statistically significant. Vaccination coverage was observed to decrease over time as the subjects grew older. Most common reasons cited for missing vaccinations were vaccine unavailability (68%), financial constraints 46%, and lack of information (40%).

CONCLUSION: Compliance to vaccination in this study was 69% and is affected by multiple factors. Policymakers and stakeholders should address these barriers to improve vaccination coverage and overall health status.

KEYWORDS: *immunization, vaccine, children, national immunization program, school-based immunization, EPI*

INTRODUCTION

Vaccination is a cost-effective and proven primary preventive measure against a number of childhood infections. It prevents more than 2.5 million child deaths yearly with an additional 2 million deaths that could be prevented with the utilization of currently available vaccines. In spite of this, universal vaccination coverage has not been fully achieved [1,2,3]. In the Philippines, the Expanded Program on Immunization (EPI) was established in 1976 to ensure access of infants and children, as well as mothers to routinely recommended vaccines. Initial vaccine-preventable diseases included in the program were tuberculosis, poliomyelitis, diphtheria, tetanus, pertussis and measles. As new studies and epidemiological data emerged, additional vaccines were added to the program including the pentavalent DPT-HepB-HiB vaccine in 2010 and rotavirus and pneumococcal vaccines in 2012 – 2014. The expanded program on immunization was updated to the National Immunization Program (NIP) in 2016. This included immunization of school-aged children, adolescents, and senior citizens. Under the NIP, the Department of Health together with the Department of Education issued guidelines on the implementation of school-based immunization. This program provided free catch-up doses for Grade 1 and 7 students in public schools against measles, rubella, tetanus and diphtheria. The future of the NIP is dynamic, with additional recommended vaccines being introduced into the program. However, these vaccines are not always readily available due to inadequate supply. [4,5,6,7]

National Immunization Programs are great public health achievements in our history. In the Philippines, the NIP includes the following vaccines: 1) Bacille-Calmette Guérin (BCG) vaccine as a single dose at birth or prior to the first month of life, 2)Hepatitis B (HepB) vaccine at birth, 3) Three doses of DPT-HiB-HepB vaccines, 4) Three doses of oral polio vaccine (OPV) and a single dose of inactivated polio vaccine (IPV) with the third dose of OPV, 5)Three doses of pneumococcal conjugate vaccine

(PCV), 7) A dose of measles containing vaccine at 9 months old (MCV1), 8) Measles-mumps-rubella vaccine at 12 months old (MMR), and 9) Two or three doses of Rotavirus vaccine. It also recommends booster doses as part of the school-based immunization program which include 1) Measles-Rubella (MR) and Tetanus-diphtheria (TD). This immunization program follows the recommended routine immunizations for children by the World Health Organization. Although closely patterned to the WHO routine recommended vaccines for age, the vaccine coverage in the country has been erratic. [3,7,8,9]

A report released by WHO and UNICEF shows that although some of the immunization trends have remained stable throughout the years – such as in the case of BCG – there is still a long way to go to achieve the ideal global coverage in certain vaccines. [9,10] Around 19.4 million infants globally are not receiving the full complement of vaccines recommended in the Expanded Program on Immunization and 60% of these infants live in 1 of 10 countries which include the Philippines. According to the Department of Health, 69% of the target population of the EPI have been fully immunized through the National School-Based Immunization Campaign vaccinating 60% of Grade 1 students with Measles Rubella (MR) vaccine and 73% with Tetanus-diphtheria (TD). [6]

This study aims to assess the immunization coverage in grade 1 students in one public elementary school in Manila and to determine factors that affect vaccination compliance.

METHODS

Study Design:

This study utilized a descriptive cross-sectional design.

Study Population and Sampling:

Grade 1 students from Aurora A. Quezon Elementary School, a public elementary school in Manila comprised the study population. Based on a 90% level of confidence corresponding to a normal z-deviate of 1.645 and assuming an immunization rate

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of 69% from the Department of Health's Performance Report for 2016, a sample size of 58 study participants is needed to assure validity and reliability of study results.[6]

Simple randomized sampling using an online randomizer was done to determine the study respondents. Parental consent was obtained prior to data collection. Students with no immunization records were excluded from the study.

Definition of Study Terms

a. **National Immunization Program (NIP)** - An update on the Expanded Program on Immunization, NIP was instituted in 2016 and includes immunization of school-aged children, adolescents, and senior citizens.

b. **Fully immunized child (National Immunization Program)** - Children who received one dose of BCG, three doses each of OPV, DPT, and Hepatitis B vaccine, Hib-containing vaccine, Pneumonia conjugate vaccine, two or three doses of rotavirus vaccine, rubella containing vaccine and booster doses of measles-rubella and tetanus-diphtheria vaccine.

c. **Compliance**

Compliance to the NIP is defined by the percentage of vaccines acquired by the participant. However, since pneumonia conjugate vaccine and rotavirus vaccine were only included in the EPI in 2012 and 2014, respectively, provision for not acquiring these vaccines were given as these two vaccines were introduced after the average age of the study population were eligible for these vaccines.[7]

Compliance is defined in this study as follows:

Table 1. Study Definition of Compliance Level

Level	Remarks
100% (23 out of 23 vaccines)	Excellent compliance
83%-99% (19-22 out of 23 vaccines)	Very good compliance
69% - 82.9% (16-18 out of 23 vaccines)	Good compliance
56%-68.9% (13-15 out of 23 vaccines)	Satisfactory compliance
43%-55.9% (10-12 out of 23 vaccines)	Fair compliance
30%-42.9% (7-9 out of 23 vaccines)	Poor compliance
< 30% (6 or less out of 23 vaccines)	Very poor compliance

DATA COLLECTION AND ANALYSIS

Data Collection

This study utilized primary and secondary data obtained through a pretested structured questionnaire with interview of the students' primary caregiver and verification via the students' immunization records. The interview tool that was used has been pretested and is available in both English and Filipino. The interview was conducted by the researcher followed by review of the subjects' vaccine records.

Data Analysis

Upon collection, data was encoded and tabulated. Descriptive statistics including frequency and percentage, were used to ascertain the population profile distribution.

Compliance to immunization was correlated with the subjects' age, birth rank, primary caregiver and socio-demographic profile of the caregiver, place of birth and place of vaccination. Data was then statistically analyzed using logistic regression analysis with Stata software.

Ethical Considerations

Prior to data collection, the research protocol was reviewed and approved by the Hospital Ethics Review Board. Appropriate permissions from respective agencies were also acquired.

RESULTS AND DISCUSSION

Out of the 719 grade 1 students enrolled at the study area, 58 were randomly chosen to be study participants. As shown in Table 2, most of the respondents were between 6-7 years old (86%, n = 54) with majority being female (54%, n = 34) and Roman Catholic (83%, n = 52). Birth rank was distributed more heterogenously with majority being first-born (37%, n = 23), followed by second- born children (24%, n = 15) and third-born (21% n = 13).

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Table 2. Socio-Demographic Profile of Grade 1 Students in a Public Elementary School in Manila

Profile	Number of Subjects (n = 58)	Percentage (%)
Gender		
Male	24	38
Female	34	54
Age (years)		
6 – 7	54	86
8 – 10	2	3
11 and above	2	3
Birth rank		
1	23	37
2	15	24
3	13	21
4	4	6
5 and above	3	5
Religion		
Roman Catholic	52	83
Christian	2	3
Islam	3	5
Iglesia ni Cristo	1	2

Table 3 shows that most subjects have their mothers as the primary caregiver (70%, n = 44) and most caregivers were young adults aged 20-39 (62%, n = 39). Most primary caregivers were married (44%, n = 28), graduated or reached high school level (46%, n = 29) with at least one parent employed (48%, n = 30).

Table 3. Socio-Demographic Profile of the Primary Caregivers of Grade 1 Students in a Public Elementary School in Manila

Profile	Number of Subjects (n = 58)	Percentage (%)
Primary Caregiver		
Mother	44	70
Father	0	0
Grandparent	8	13
Other	6	10
Age of Caregiver		
13-19	0	0%
20-39	39	62%
40-64	18	29%
65 and above	1	2%
Civil Status of Caregiver		
Married	28	44
Single	10	16
Widow	2	3
Common-in-law	18	29
Educational attainment		
College graduate	7	11
College level/ Vocational	20	32
High school level	29	46
Elementary level	2	3
No formal education	0	0
Employment status		
Both employed	18	29
One caregiver is employed	30	48
No fixed employment	4	6
Unemployed	6	10

As shown in Table 4, majority of the respondents were born institutionally, with 65% (n=41) born in a hospital and 13% (n = 8) born in a lying-in clinic. Majority also had their vaccinations at their local health center (78%, n = 49).

Table 4. Place of Birth and Place of Vaccination Distribution of Grade 1 Students in a Public Elementary School in Manila

| Profile	Number of Subjects (N = 58)	Percentage (%)
Place of Birth		
Hospital	41	65
Lying-in clinic/Health center	8	13
Non-institutional (Home)	9	14
Place of vaccination		
Health center or hospital	49	78
Private practitioner	3	5
Both of the above	6	10

In terms of vaccination compliance, only 1 of the respondents completed the immunizations recommended by the National Immunization Program (1.7%, n = 1). However, it should be emphasized that the rotavirus vaccine and pneumococcal vaccine were included in the national program in the years 2012 and 2014 only, past the age of eligibility of the respondents. As seen in Table 5, 22% (n = 14) of the respondents had excellent compliance, having at least 19 of the 23 vaccines, followed by 35% who received 16 to 18 of the recommended vaccines and 24% (n = 15) who received 13 to 15 of the recommended vaccines. The mean compliance to vaccination was 69%.

Table 5. Vaccine Compliance Distribution of Grade 1 Students in a Public Elementary School in Manila

Remarks	Compliance	Number of Respondents (n = 58)	Percentage (%)
Excellent compliance	83% and above (19 and above out of 23 vaccines)	14	22
Very good compliance	69% - 82.9% (16-18 out of 23 vaccines)	22	35
Satisfactory compliance	56%-68.9% (13-15 out of 23 vaccines)	15	24
Fair compliance	43%-55.9% (10-12 out of 23 vaccines)	4	6
Poor compliance	30%-42.9% (7-9 out of 23 vaccines)	3	5

Among the 23 recommended vaccinations, most respondents were able to receive BCG (98%, n = 57) as well as the first dose of Hepatitis B vaccine, DTP1, and Pol1 (97%, n = 56). The trend of immunization coverage with age is shown below (*see Figure 1*).

Figure 1. Trend of Immunization Coverage with Age in Grade 1 Students in a Public Elementary School in Manila
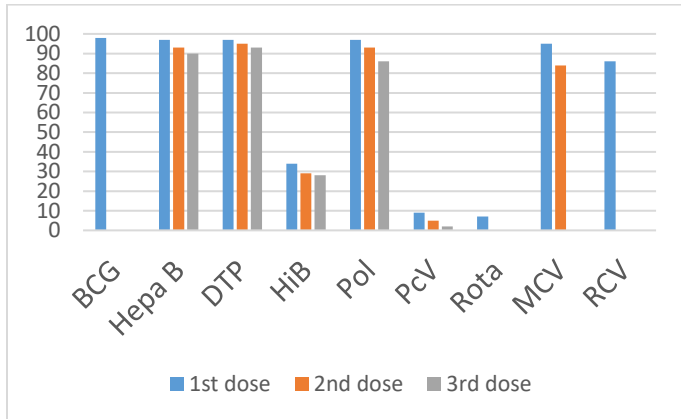
The respondents' average compliance to the expanded program on immunization, school-based immunization program and overall compliance to the national immunization program are shown in Table 7 below.

Table 7. Average Compliance to the Expanded Program on Immunization, School-based Immunization Program and National Immunization Program of Grade 1 Students in a Public Elementary School in Manila

Program	Average Compliance (%)
Expanded Program on Immunization	67%
School-based Immunization Program	95%
National Immunization Program	69%

The primary caregivers had varying reasons for missed vaccinations as shown in Table 8. Among these, the most common cited were vaccine unavailability, lack of funds for vaccines not given for free, and lack of information regarding other recommended vaccines.

Table 8. Percentage Distribution of Reason for Missed Vaccinations of Grade 1 Students in a Public Elementary School in Manila

Reason for missed vaccination	Number of respondents (n = 58)	Percentage %
Vaccine unavailability	43	68%
Lack of time to visit vaccine provider	4	6%
Lack of funds for vaccines not given for free	29	46%
Forgot to bring child to follow-up	8	13%
Change of location	6	10%
Lack of information	25	40%
Sickness	6	10%
Caregiver opted not to have the child vaccinated	0	0%
Other reason	0	0%

Using logistic regression analysis with a confidence interval of 90% and p < 0.05, only the place of birth was statistically significant in the outcome of compliance to vaccination. Children born in hospitals were more compliant to vaccination compared to children born in health centers, lying-in clinics and non-institutional births. Mothers as primary caregivers who were married and those belonging to the young adult age group (20-39 years old) were found to be more compliant to vaccination, but this was not statistically significant. Data also show that as the birth rank increases, the compliance to vaccination decreases. Vaccinations of the subjects were primarily given at the local health center. The odds of compliance to vaccination is higher in parents with higher educational attainment with both parents employed but this was also not statistically significant.

Table 9. Correlation of Various Sociodemographic and Health Related Factors with Compliance to Immunization of Grade 1 Students in a Public Elementary School in Manila

Factor	Odds Ratio	90% CI	P
Birth Rank	1.0364	0.6549 to 1.6403	0.8786
Gender	0.5216	0.1718 to 1.5833	0.2506
Religion	0.6562	0.3103 to 1.3880	0.2704
Place of Birth	0.3312	0.1496 to 0.7333	**0.0064**
Place of Vaccination	3.1627	0.6377 to 1.568	0.1587
Primary Caregiver	0.8757	0.5369 to 1.4282	0.5948
Age of Caregiver	1.0067	0.9556 to 1.0606	0.8019
Civil status of Caregiver	0.8032	0.5369 to 1.2017	0.2854
Educational attainment of Caregiver	1.2761	0.6270 to 2.5970	0.5013
Employment of Caregiver	1.2384	0.6676 to 2.2971	0.4976

DISCUSSION

A mean compliance rate to immunization of 69% was shown in the study. This is congruent with the national data from the Department of Health 2016 Progress Report.[4] Although there were several factors that could affect vaccination compliance, this study showed that only place of birth was significant. Children born in hospitals had higher vaccination compliance compared to children born in health centers, lying-in clinic and non-institutional settings. Although children whose primary caregivers were the mothers who were married and belonged to the age group 20-39 years and whose parents had higher educational attainment or were both employed had higher vaccination compliance, this was not shown to be statistically significant.

In a local study conducted in a private hospital in a city outside of Manila, it was shown that children with higher birth order (first or second-born) and those whose parents are the primary care takers had a higher compliance rate to vaccination.[11] However, in that study, the subjects' place of birth was not shown to have an effect on vaccination compliance because immunization coverage was similar regardless of place of delivery, whether in an institutional or non-institutional setting [11]. This is in contrast to the results of a large-scale study

conducted in India which determined place of delivery to be a predictor for vaccination. The researchers noted that children born in private institutions were at higher risk of non-vaccination than those born in government institutions. This was attributed to stricter policies for government institutions to ensure that children receive appropriate and timely immunizations [12].

In this current study, most subjects were able to obtain booster doses for measles, rubella, tetanus, and diphtheria as part of the school-based program. Those who were not able to obtain these vaccines were usually ill or absent during the scheduled vaccination. School-based vaccination was instituted by the Department of Health in collaboration with the Department of Education and Department of Interior and Local Government in 2015 due to the need for booster doses for certain vaccines whose protections wane over time. The higher compliance rates in school-based immunization program compared to the expanded program on immunization may be due to the convenience of the location for vaccination as well as availability of vaccines [5, 6.]

Although statistically not significant, the odds of having better compliance to vaccination were found to be higher in children whose primary caregivers had higher educational attainment or those with both parents employed. This may be due to increased understanding of the importance of vaccination, as well as extra finances to cover vaccine costs. This is in congruence with a survey conducted in local health departments in Georgia which found that noncompliance was higher in children whose parents had low educational attainment [13].

A study conducted in 2014 showed that respondents agreed that they do not have enough money allocated for health concerns, including vaccination. Other factors contributing to non-compliance in the above study were lack of time and forgetting to return on scheduled follow-up.[14] Other reasons given for missed immunizations were lack of information regarding immunization. Most

caregivers were unaware that not all of the recommended childhood vaccinations were available at their local health center. Furthermore, some were not aware that they could avail of these vaccines through a private practitioner.

The study results also showed a progressive decline in the trend of vaccination coverage with age. This was also seen in both studies conducted by Lim and Shrivasta. This was mainly attributed to difficulty in accessing health services, lack of information regarding the need for subsequent vaccination, lack of time or loss of motivation to bring the child to the vaccine provider [11, 12]

Considering the study results, compliance to vaccination can still improve to achieve the national goal of 95% coverage. Barriers to immunization compliance should be addressed, especially at the local level. Reliable supply and timely distribution of vaccines, enhanced access to vaccination services, reduced financial barriers to families and increased funding for vaccines as well as continued health education regarding vaccination should be emphasized to the stakeholders.

CONCLUSION

Several factors have been studied as to compliance and non-compliance to vaccination, with the most commonly noted associations including place of delivery, caregiver education and employment status, as well as birth rank.

Drop-out rates have also been noted, and is an area of concern as the protection of certain vaccines wane over time. Often, there is a progressive decline in vaccine coverage as the subjects grow older. The low immunization coverage of 69% in the respondents is disconcerting. However, the good coverage for school-based immunization of 95% suggests that the convenience and availability of vaccines have a positive impact on compliance. Therefore, this practice should be continued and strengthened.

The common reasons for missed vaccinations – namely unavailability of vaccines, lack of funds for vaccines not given for free, and lack of information regarding other vaccines – should be addressed. Adequate health education and provision of affordable vaccines should be a priority of the government and healthcare force to achieve the national goal of vaccine coverage.

LIMITATIONS

The comparison of immunization coverage of urban and rural communities, and among different socioeconomic groups are not within the scope of this study.

RECOMMENDATIONS

The author recommends a larger scale study which may include other variables including private or public schooling, rural vs urban living, as well as monthly income. Multivariate analysis of data with a larger sample will be useful to determine additional factors affecting compliance at the national level.

A prospective study utilizing different methods to improve compliance, either via reminders using SMS or social media, incentives to caregivers, etc. may also be done as these could help the government in increasing compliance to immunization.

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