

2021

Prenatal factors associated with breach of the basic vaccination scheme in under 5 years of age

Trinidad L. Isidro-Ríos

Instituto de Investigación en ciencias biomédicas. Facultad de medicina. Universidad Ricardo Palma, Lima-Perú., libe.isidro.14@gmail.com

Alfonso Gutiérrez-Aguado

Follow this and additional works at: <http://inicib.urp.edu.pe/rfmh>

Recommended Citation

Isidro-Ríos, Trinidad L. and Gutiérrez-Aguado, Alfonso (2021) "Prenatal factors associated with breach of the basic vaccination scheme in under 5 years of age," *Revista de la Facultad de Medicina Humana*: Vol. 21 : Iss. 2 , Article 16.

Available at: <http://inicib.urp.edu.pe/rfmh/vol21/iss2/16>

This Article is brought to you for free and open access by INICIB-URP. It has been accepted for inclusion in Revista de la Facultad de Medicina Humana by an authorized editor of INICIB-URP.



PRENATAL RISK FACTORS ASSOCIATED WITH THE NON-FULFILMENT OF THE BASIC ESQUÉMA OF VACCINATION IN CHILDREN UNDER 5 YEARS FROM THE ENDES OF THE YEAR 2018

FACTORES PRENATALES ASOCIADOS AL INCUMPLIMIENTO DEL ESQUEMA BÁSICO DE VACUNACIÓN EN MENORES DE 5 AÑOS

Trinidad L. Isidro-Ríos^{1,a}, Alfonso Gutiérrez-Aguado^{1,b}

ORIGINAL PAPER

ABSTRACT

Objectives: To determine the prenatal risk factors associated with the failure to comply with the basic vaccination scheme in children under 5 years of age, based on the Demographic and Family Health Survey (ENDES) of 2018. **Methods:** It is an observational, retrospective, analytical and transversal study. We study the sample of the National Demographic and Health Survey (ENDES) for 2018 that includes 18 104 children between 1 and 5 years with health card seen in the interview, finding the results in the INEI surveys. The files containing the vaccination scheme questionnaires are selected and the data processed with SPSS version 25. The statistical processing is analytical and descriptive, bivariate and multivariate with the help of STATA v16 and Excel 2016. **Results:** There was a final sample of 18,104 children between 1 to 5 years old in 2018. The multivariate analysis found the association of non-compliance with the vaccination schedule with the mother's age (p value = <0.01, PR = 1.20, CI = 1.13 - 1.28), the number of controls inadequate (p value = <0.01, PR = 1.28, CI = 1.23 - 1.33) and the pregnant woman did not receive the tetanus vaccine during pregnancy (p = <0.01, RP = 1.16, CI = 1.12 - 1.20). No such association was found with the place of residence, wealth index and natural region. **Conclusions:** The prenatal risk factors associated with the failure to comply with the basic vaccination scheme in children under 5 years of age were maternal age, the number of inadequate prenatal check-ups and the pregnant woman who had not received the tetanus vaccine.

Key words: Immunization schedule; Vaccination and risk factors (source: MeSH NLM).

RESUMEN

Objetivos: Determinar los factores de riesgo prenatales asociados al incumplimiento del esquema básico de vacunación en menores de 5 años a partir de la encuesta demográfica y de salud familiar (ENDES) del año 2018. **Métodos:** Es un estudio observacional, retrospectivo, analítico y transversal. Se estudia la muestra de la Encuesta Nacional Demográfica y de Salud (ENDES) del año 2018 que comprende a 18 104 niños entre 1 a 5 años con tarjeta de salud vista en la entrevista, encontrándose los resultados en las encuestas del INEI. Se selecciona los archivos que contienen los cuestionarios del esquema de vacunación y se procesan los datos con SPSS versión 25. El procesamiento estadístico es de tipo analítico y descriptivo, bivariado y multivariado con ayuda de STATA v16 y Excel 2016. **Resultados:** Se contó con una muestra final de 18 104 de menores entre 1 a 5 años el 2018. En el análisis multivariado se encontró la asociación del incumplimiento de esquema de vacunación con la edad de la madre (valor p = <0,01, RP = 1,20, IC = 1,13 – 1,28), el número de controles no adecuados (valor p = <0,01, RP = 1,28, IC = 1,23 – 1,33) y la gestante no haber recibido la vacuna antitetánica en el embarazo (valor p = <0,01, RP = 1,16, IC = 1,12 – 1,20). No se encontró dicha asociación con el lugar de residencia, índice de riqueza y región natural. **Conclusiones:** Los factores de riesgo prenatales asociados al incumplimiento del esquema básico de vacunación en menores de 5 años fueron la edad materna, el número de controles prenatales inadecuados y la gestante no haber recibido la vacuna antitetánica.

Palabras clave: Esquema de inmunización; Vacunación y factores de riesgo (fuente: DeCS BIREME).

¹ Instituto de Investigación en ciencias biomédicas. Facultad de medicina. Universidad Ricardo Palma, Lima-Perú.

^a Bachelor of Human Medicine.

^b Magister in Public Health. Surgeon.

Cite as: Trinidad L. Isidro-Ríos, Alfonso Gutiérrez-Aguado. Prenatal risk factors associated with the non-fulfilment of the basic esquema of vaccination in children under 5 years from the ends of the year 2018. Rev. Fac. Med. Hum. April 2021; 21(2):354-363. DOI 10.25176/RFMH.v21i2.3656

Journal home page: <http://revistas.urp.edu.pe/index.php/RFMH>

Article published by the Magazine of the Faculty of Human Medicine of the Ricardo Palma University. It is an open access article, distributed under the terms of the Creative Commons License: Creative Commons Attribution 4.0 International, CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>), that allows non-commercial use, distribution and reproduction in any medium, provided that the original work is duly cited. For commercial use, please contact revista.medicina@urp.pe





INTRODUCTION

Vaccines are biological products that encompass one or multiple antigens that are supplied with the purpose of performing a respective immune stimulus, which seeks to mimic the natural infection, developing immune replication with the purpose of safeguarding it in the following presentations to the respective microorganism⁽¹⁾. They constitute one of the most efficient public health interventions in terms of cost reduction and morbimortality of preventable infectious and contagious diseases⁽²⁾. Systematic vaccination programs have led to the disappearance of smallpox, reduction of the spread of poliomyelitis in practically the whole world and the surveillance of diseases such as measles, tetanus, diphtheria, rubella or massive Haemophilus influenzae disease⁽¹⁾.

The World Health Organization indicates that organized vaccination covers four out of five children where all three doses of diphtheria, tetanus and pertussis vaccine (DTP3) have been administered, in order to safeguard them against dangerous infectious diseases that can lead to severe disorders and disabilities up to mortality⁽³⁾.

Globally according to WHO, immunization coverage remains around 86% since 2010. A 95% coverage is needed globally covering countries and communities to ensure protection against vaccine-preventable disease outbreaks⁽⁴⁾.

In Peru, there is a national vaccination scheme which has a succession of the organization and the way vaccines are provided formally accepted by the Ministry of Health with the purpose of cooperating to increase the quality of health of the inhabitants by controlling preventable immune diseases being seventeen vaccines incorporated in the national scheme up to the year of age 4. There are vaccination indicators that allow monitoring the access, follow-up, results and impact of "The National Sanitary Strategy of immunizations" where the percentages that measure the performance and coverage for the fulfillment of the complete vaccination in a child are calculated⁽⁴⁾. In Peru, vaccination percentages are obtained through the Demographic and Family Health Survey (ENDES)⁽⁴⁾. Therefore, it is of vital importance to determine the main risk factors in our environment that generate non-compliance with the basic vaccination schedule and thus detect them in order to generate recommendations for adequate compliance and expand national coverage⁽⁵⁾.

METHODS

Design and study area

The present is an Observational, retrospective analytical and cross-sectional study of a secondary analysis of data from the National Demographic and Health Survey (ENDES) of 2018.

Population

It is constituted by minors aged one to five years old in Peru in the year, registered according to the 2018 Demographic and Family Health Survey database.

Sample

The type of sample is Bi-stage self-weighted, in the first stage the Primary Sampling Unit is selected by clusters and the second stage the Secondary Sampling Unit is selected to dwellings resulting in 18 104 participants. The statistical and cartographic information from the National Population Census XI and Housing Census VI of 2007 and the SISFOH Update 2012-2013, and the cartographic material updated for this purpose in the cartographic updating process carried out for the execution of the DHS. The databases are available in the "Microdata" section of the website of the Peruvian National Institute of Statistics and Informatics (<http://inei.inei.gob.pe/microdatos/>)⁽⁴⁾.

The following sample selection criteria were used;

Inclusion criteria

- Children older than one year (12 months) of age registered in the DHS 2018 data center.
- Minors whose mothers or caregivers had presented vaccination health card or given report to the interviewer.
- Children whose mothers have provided information concerning the study variables.

Exclusion criteria

- Mothers or children with missing or incomplete data concerning the study variables.

Among the study variables, non-compliance with the vaccination schedule was taken as a dependent variable and place of residence, age, wealth index, maximum level of education, prenatal controls and tetanus vaccination as independent variables.

As techniques and instruments for data collection; the questionnaire implemented in a mobile device:

Tablet was used as an instrument, and as a technique the survey conducted in the homes selected to fill out the questionnaire. The variable description section was subsequently visualized and the data files were selected (http://webinei.inei.gob.pe/anda_inei/index.php/catalog/306/vargrp/VG26)⁽⁴⁾.

The dependent variable in:

REC43; This file contains information on Immunization and morbidity: Immunizations received by the infant.

REC95; This file contains information on variables on the topic of health and immunization.

The independent variable:

REC0111; This file contains information on basic data on women aged 15-49 years.

REC41; This file contains information on pre-natal and delivery care.

RECH0; This file contains information on household characteristics such as.

REC91; This file contains information on domestic violence, as well as on Sexually Transmitted Infections during pregnancy.

Once the variable of interest for the present investigation had been identified, a data file was formed with all of them, taking into account the identifiers according to the DHS (CASEID, HHID). After this, the missing data were eliminated, leaving a sample of 18,104 children between 1 and 5 years of age.

Data processing and analysis plan; For the ordering, processing, tabulation and analysis of the results, the SPSS version 25 statistical software was used and the tables were captured in Excel 2016. To obtain the results, the SPSS complex samples module was used, for which the weighting variable V005, the conglomeration variable V001 and the stratification variable V022 were identified; the CSPLAN file was generated with them, maintaining the DHSES sample design. Subsequently, STATA V16 software was used to calculate the prevalence ratios for both the crude and adjusted prevalence ratios using the

Poisson regression model with robust variance.

For the univariate analysis, frequencies and percentages were calculated. Then, in the analytical phase, those variables with more than 2 categories were categorized in order to calculate the crude prevalence ratios (PR). Subsequently, adjusted prevalence ratios were calculated in order to identify the factors associated with noncompliance with the basic vaccination schedule.

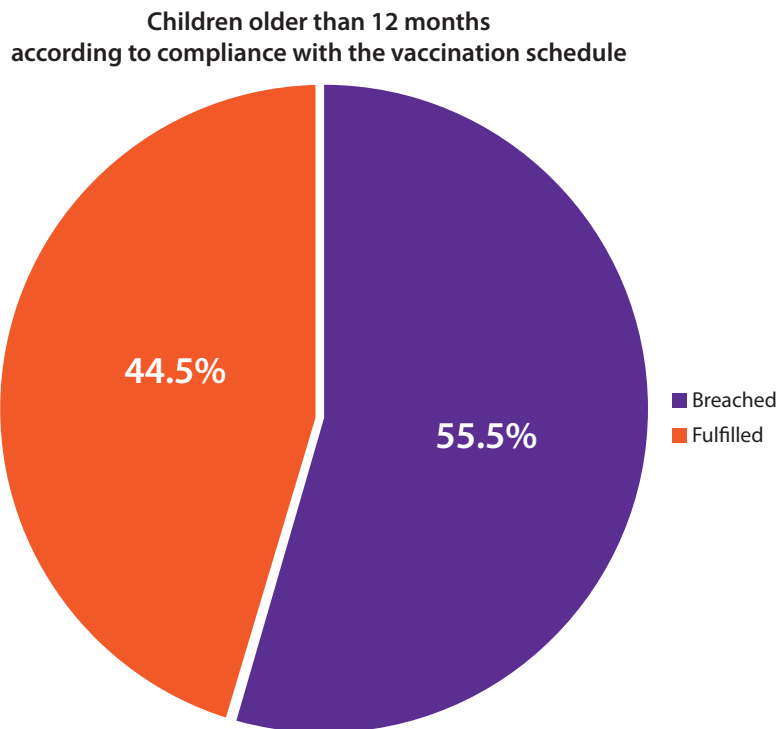
The response variable was Non-compliance with the Basic Vaccination Schedule, which was calculated based on the recoding of the variables "BCG 1, HVB , PENTAVALENT 1, ANTIPOLIO 1, ROTAVIRUS 1, PNEUMOCOCOCO1, PENTAVALENT 2, ANTIPOLIO 2, ROTAVIRUS 2, PNEUMOCOCOCO 2, PENTAVALENT 3, ANTIPOLIO 3, MMR 1, PNEUMOCOCOCO 3 and INFLUENZA 1". It should be noted that the varicella vaccine was not included in the ENDES records, so it could not be taken⁽²⁷⁾.

Ethical aspects; In the database used are of public access through the web page of the National Institute of Statistics and Census, that institution has classified each occurrence of the study with tools to safeguard the identity of each participating individual, where without diminishing its statistical benefit, it is difficult to infer what could be the profile of a precise person. The study was approved by the Institute of Research in Biomedical Sciences of the Ricardo Palma University and the registration and approval of the Faculty of Human Medicine.

Limitations of the study; The present study is limited to prenatal risk factors that influence non-compliance with the vaccination schedule, but does not take into account other factors such as biological factors, postnatal factors, underlying diseases of the mother and child.

RESULTS

Of the 18,104 children, it was found that 10,044 children did not comply with the basic vaccination schedule, 55.5% of the total (Graph 1).



Source: ENDES 2018.

ORIGINAL PAPER

Graphic 1. Niños maychildren over 12 months older according to compliance with the vaccination scheme - bcg 1, hvb , penta 1, polio 1, rota 1, pneumo 1, penta 2, polio 2, rota 2, pneumo 2, penta 3, polio 3, spr1, pneumo 3 and influenza.

In the same work with the total sample of 18 104 another analysis was performed taking to the vaccination scheme to 7 main vaccines according to previous studies; BCG, DPT1, POLIO 1, DPT2, POLIO 2, DPT3 AND POLIO 3 where it was found that 3 863 minors failed to comply with the vaccination scheme being 21.3% of the total.

Regarding the general characteristics of the mothers in this sample, it was observed that 70% belonged to urban areas and 30% to rural areas, 4.3% were between 12 and 19 years old, 65.5% were between 20 and 34 years old and 30.2% were between 35 and 49 years old. In the highest level of education 1.6% had no education at all, 20.1% had primary education, 44.7% had secondary education and 33.6% had higher education. In the level of wealth

28.4% were very poor, 26.2% poor, 19.6% medium, 14.8% rich and 10.9% very rich. According to natural region 12.4% lived in metropolitan Lima, 29.6% in the rest of the coast, 34% in the highlands and 24% in the jungle. According to prenatal checkups 89.3% had more than 6 NPC and 10.7% between 1 and 5 NPC and according to the application of tetanus vaccine 76.7% received and 23.3% did not receive it. (Table 1)

Regarding the risk factors according to non-compliance with vaccination, the p-value of area of residence 0.004, age 0.000, maximum level of education 0.345, wealth index 0.000, natural region 0.000, prenatal controls 0.000 and tetanus vaccination in pregnancy 0.000 were found. (Table 2).

Table 1. General characteristics of mothers with children older than 1 year according to ENDES 2018.

General characteristics	n	%
Place of residence		
Urban	12669	70%
Rural	5435	30%
Age		
De 12 - 19	777	4.3%
20-34	11865	65.5%
35-49	5462	30.2%
Maximum level of education		
Uneducated	292	1.6%
Primary	3634	20.1%
Secondary	8098	44.7%
higher	6080	33.6%
Wealth index		
Very poor	5145	28.4%
Poor	4749	26.2%
Middle	3557	19.6%
Wealthy	2673	14.8%
Very wealthy	1980	10.9%
Natural Region		
Metropolitan Lima	2247	12.4%
Rest Costa	5353	29.6%
Mountain range	6157	34.0%
Jungle	4347	24.0%
Prenatal check-ups		
From 6 to more PCU	16171	89.3%
From 1 to 5 PCU	1933	10.7%
Tetanus vaccine in pregnancy		
Received	13890	76.7%
Not received	4214	23.3%

Source: ENDES 2018/Authors own creation.



Table 2. Risk factors for mothers with children under 5 years of age.

Factors	Vaccination scheme				Tight F	p Value
	Breached		Met			
	n	%	n	%		
Place of residence						
Urban	2507	24.8%	2507	27.3%	8.358	0.004
Rural	7116	75.2%	5553	72.7%		
Age						
From 12 - 19	532	4.9%	245	2.9%	16.517	0.000
35-49	2892	29.9%	2570	32.0%		
20-34	6620	65.2%	5245	65.1%		
Maximum level of education						
Uneducated	166	1.5%	126	1.4%	1.104	0.345
Primary	1988	18.5%	1646	19.1%		
Secondary	4520	43.6%	3578	44.5%		
Higher	3370	36.4%	2710	35.0%		
Wealth index						
Very poor	2849	24.2%	2296	24.7%	7.095	0.000
Poor	2591	22.9%	2158	24.5%		
Middle	1979	19.7%	1578	20.4%		
Wealthy	1459	16.6%	1214	17.7%		
Very wealthy	1166	16.6%	814	12.7%		
Natural Region						
Metropolitan Lima	1385	30.0%	862	23.8%	19.239	0.000
Rest Costa	3031	26.7%	2322	27.0%		
Mountain range	3159	26.1%	2998	31.5%		
Jungle	2469	17.2%	1878	17.6%		
Prenatal check-ups						
From 6 to more PCU	1366	12.5%	567	6.7%	118.014	0.000
From 1 to 5 PCU	8678	87.5%	7493	93.3%		
Tetanus vaccine in pregnancy						
Received	2602	26.6%	1612	19.0%	101.163	0.000
Not received	7442	73.4%	6448	81.0%		

Source: ENDES 2018/Authors own creation.

ORIGINAL PAPER

The bivariate analysis

shows that among the factors analyzed, women aged 12 to 19 years have a 1.21 times (CI 1.13 - 1.28) prevalence ratio of non-compliance with the vaccination schedule compared to women aged 20 to 34 years; according to prenatal controls, pregnant women who only had at most 5 NPC have a 1.29 times (CI 1.22 - 1.32) prevalence ratio of non-compliance with the vaccination schedule compared to pregnant women with more than 6 NPC, 22-1.32) prevalence ratio of non-compliance with the vaccination schedule compared to pregnant women with more than 6 NPCs, if the pregnant woman did not receive the tetanus vaccine, she has 1.16 times (CI 1.13 - 1.20) prevalence ratio of non-compliance with the vaccination schedule compared to those

who did receive the tetanus vaccine and the natural region (PR: 0.89 IC 0.84 - 0.94). For place of residence (PR: 1.05 CI 0.99 - 1.11), level of education (PR: 1.08 CI 0.96 - 1.22) and wealth index (PR: 1.00 CI 0.93 - 1.09) no significant association was found. (Table 03)

The multivariate analysis

It is observed that there is statistical significance according to the prenatal controls that only had at most 5 NPC present 1.28 times (CI 1.23 - 1.33) prevalence ratio of non-compliance with the vaccination schedule compared to pregnant women who had more than 6 NPC and if the pregnant woman did not receive the tetanus vaccine presents 1.16 times (CI 1.12 - 1.20) prevalence ratio of non-compliance with the vaccination schedule compared to those who received the tetanus vaccine. (Table 04)

Table 3. Crude and adjusted reasons for prevalence (PR) among the factors with non-compliance with the vaccination schedule in children under 5 years according to the ENDES 2018.

Factors	Raw RP	IC95%	Tight RP	IC95%
Place of residence				
Rural / Urban *	1.06	1.02 - 1.11	1.05	0.99 - 1.11
Age				
12-19 / 20 -34 *	1.21	1.14 - 1.29	1.20	1.13 - 1.28
35-49 / 20 -34 *	0.97	0.94 - 1.00	0.96	0.92 - 0.99
Nivel de educación				
Uneducated / Higher*	1.02	0.91 - 1.15	1.08	0.96 - 1.22
Primary / Higher*	0.97	0.92 - 1.02	1.00	0.95 - 1.07
Secondary / Higher*	0.97	0.94 - 1.01	0.98	0.94 - 1.02
Wealth index				
Very poor / Very wealthy *	0.89	0.84 - 0.95	1.00	0.93 - 1.09
Poor / Very wealthy *	0.87	0.82 - 0.93	0.94	0.88 - 1.00
Middle / Very wealthy *	0.89	0.83 - 0.94	0.93	0.87 - 0.99
Wealthy / Very wealthy *	0.88	0.82 - 0.93	0.90	0.85 - 0.96
Natural region				
Jungle/ Metropolitan Lima *	0.90	0.85 - 0.95	0.89	0.84 - 0.94
Mountain range / Metropolitan Lima *	0.84	0.80 - 0.88	0.82	0.77 - 0.86
Rest Costa/ Metropolitan Lima *	0.91	0.86 - 0.95	0.91	0.87 - 0.96
Prenatal check-ups				
From 1 to 5 PCU / From 6 to more PCU *	1.29	1.24 - 1.34	1.27	1.22 - 1.32
Tetanus vaccine in pregnancy				
Not received / Received *	1.19	1.15 - 1.23	1.16	1.13 - 1.20

*Categoría de referencia / Source: ENDES 2018/Authors' own creation.



Table 4. Multivariate analysis of factors with noncompliance with the vaccination scheme in children under 5 years of age according to ENDES 2018.

Factors	Tight RP	IC95%
Age		
12 - 19 / 20 - 34 *	1.21	1.14 - 1.29
35 - 49 / 20 - 34 *	0.97	0.94 - 1.00
Prenatal check-ups		
From 1 to 5 PCU / From 6 to more PCU*	1.28	1.23 - 1.33
Tetanus vaccine in pregnancy		
Not received / Received *	1.16	1.12 - 1.20

*Reference category / Source: ENDES 2018/Authors' own creation

DISCUSSION

Non-compliance with the vaccination schedule goes hand in hand with the health of the child, which is why it is a global public health strategy since it prevents mortality in children; according to the WHO3, compliance with the vaccination schedule is 90% worldwide.

Vaccination non-compliance rates vary according to the income of the countries, with middle and low income countries having a high rate on average and higher income countries having a lower rate. The rate in China, according to Cao et al.⁽⁶⁾, reports 6.9% non-compliance in younger children. On the other hand, in Mexico, a country with similar sociocultural and demographic characteristics to our country, Palacios⁷ estimated the rate of noncompliance with the vaccination schedule in younger children at 35%.

In our study, 55.5% of children between 1 and 5 years of age did not comply with the vaccination schedule, a rate above that of middle and high income countries and far from the WHO world recommendations. Similarly, in the Peruvian population, Achuquin⁽⁸⁾ in 2017, found 22% non-compliance with the scheme, so we deduce that the percentage found in our study would not be in the expected range since the previous study did not take into account the complete scheme but only 7 main vaccines and in an analysis where the same vaccines were taken, it was found that 21.3% of children aged 1 to 5 years did not comply with the vaccination scheme in 2018 according to ENDES, which would be in the expected range according to INEI⁽⁹⁾.

Maternal age is related as risk behavior and with greater difficulty in making decisions, probably

due to hormonal changes and this development is not synchronous between the prefrontal area with respect to those related to socioemotional processes⁸. Sheikh et al.⁽³⁴⁾ in Bangladesh, found that a maternal age younger than 20 years was related to noncompliance (OR= 3.21, p < 0.05, CI= 1.02- 10.13). Likewise Ali¹¹ in 2017 showed an association between mothers between 19 to 26 and noncompliance with the scheme (OR = 9.59) and Cabrejos⁽¹²⁾ in 2017 in his study conducted in Peru, found maternal age as a factor associated with noncompliance with the scheme. Similarly, in our study it was found that maternal age between 12 and 19 years was associated 1.20 times higher than between 20 and 34 years of age of the mothers, increasing the risk of noncompliance with the vaccination schedule. Thus, maternal age was found to be a factor associated with noncompliance with the vaccination schedule.

Adequate prenatal follow-up is associated with a lower number of obstetric complications and with making the mother aware of the care and pertinent behaviors to follow during pregnancy, the main ones being compliance with immunizations and prenatal controls^(8,13). In Peru, according to MINSA, prenatal controls must be at least 6 CPN to be considered adequate follow-up and to guarantee the wellbeing of the baby, if there are fewer or no prenatal controls, this can generate a high risk for the mother and the baby, which often affects development⁽⁸⁾. In the study, non-compliance with the vaccination schedule was found to be 1.28 times higher in pregnant women with less than 6 prenatal checkups than in pregnant women with 6 or more prenatal checkups. Likewise, Ali⁽¹¹⁾ in 2017 found an association between fewer prenatal checkups and noncompliance with the

ORIGINAL PAPER

vaccination schedule (OR = 9.59), Nozaki⁽¹³⁾ found that having more than 4 checkups was associated with compliance with the vaccination schedule (OR: 1.87, 95% CI: 1.28- 2.73) and Achuquín⁽⁸⁾ in 2017 in Peru (OR= 2.19, p=<0.01, CI= 1.79- 2.51) found that prenatal checkups are a factor associated with noncompliance with the vaccination schedule.

The application of the tetanus vaccine during pregnancy serves to guarantee the wellbeing of the baby during gestation, since if it is not applied it can generate risk for the baby, which often affects its development^(18,13). The study found that not applying the tetanus vaccine was associated 1.28 times more than in children of mothers with tetanus vaccine application, increasing the risk of non-compliance with the vaccination schedule. Similarly Ali⁽¹¹⁾ in 2017 found an association between tetanus vaccination and compliance with the vaccination schedule (OR = 9.59). A similar finding was that of Nozaki⁽¹³⁾ found an association between the application of tetanus vaccine during gestation and compliance with the vaccination schedule (OR: 1.87, 95% CI: 1.28- 2.73) and Achuquín⁽⁸⁾ in 2017 in Peru obtained that not having received the tetanus vaccine (OR= 2.19, p=<0.01, CI= 1.79- 2.51). The application of vaccines in pregnant women generates awareness and adherence to the vaccination schedule in their children; therefore, not applying the vaccine is a risk factor.

The area of residence, in rural areas is related to the poor accessibility of vaccines associated with non-compliance with the vaccination schedule⁽¹⁵⁾. As well as 2017 in Colombia, Salas⁽¹⁴⁾ obtained 26% in rural areas and Achuquín⁽⁸⁾ in Peru found 23.6% in rural areas (p <0.01, OR= 0.97, CI= 0.84 - 1.12) related to non-compliance with the vaccination scheme in minors. On the other hand, Garcia⁽¹⁵⁾ in Apurímac-Peru in 2015 obtained 36.7% of children in rural areas did not comply with the vaccination schedule. In our study, it was found that 24% of children under 5 years of age did not comply with the vaccination schedule and live in rural areas; statistical significance was not found in accordance with the background.

According to the maximum level of education of the mother, incomplete or deficient training can lead to poor knowledge in basic health issues and assimilation of misconceptions causing poor judgment in mothers or caregivers which can generate non-compliance with immunizations for example, adverse reactions can generate lethality, vaccines are not necessary for the development of a child and vaccine myths^(8,16). Forshaw et al. in 2017

found that 35% of mothers with primary education did not comply with the vaccination schedule for their children. Similarly, Salas⁽¹⁴⁾ in Colombia in 2016 found that 40% of mothers with primary education at the highest level did not comply with the vaccination schedule. On the other hand, in Peru in 2017, Aguilar et al¹⁷ obtained 50.1% of mothers with primary education did not comply with the vaccination schedule in their children and Achuquín⁸ in the same year obtained 28.2% of mothers with primary or no academic degree did not comply with the vaccination schedule (p= 0.24, OR=1.07, CI 0.95 - 1.21). In our study, 18.5% of mothers with primary education did not comply with the vaccination schedule in their children, in which no statistical association was found according to our antecedents, perhaps due to the association of the variables and the sample.

The wealth index could have an association because, although vaccines are free, the condition of poverty means that mothers are often unable to take their children to the health center because they do not have the economic means such as transportation and food, among others⁽⁸⁾. Morton⁽¹¹⁾ in Australia in 2018 found that 26% of children in extreme poverty did not comply with the vaccination schedule and Sheikh et al.⁽¹⁰⁾ in Bangladesh identified extreme poverty as a risk factor associated with non-compliance with vaccination with an OR= 2.2. Likewise, Achuquín⁽⁸⁾ in Peru found 28.2% poverty (OR= 1.10, p= <0.01, CI= 1.07- 1.26) found socioeconomic status as a factor associated with noncompliance (gamma= 0.553, sig (Bilateral)= 0.003 and p= 0.01). In our study we found that 24.4% of children in the very poor quintile did not comply with the vaccination schedule, but without statistical association, in contrast to our antecedents, because the antecedents that did show an association were in other countries or with samples of minors.

According to the natural region considering the accessibility of vaccines, being better in Lima because in provinces there is difficulty in transporting and complying with the entire cold chain in vaccines⁽¹⁶⁾. According to Achuquín⁽⁸⁾ in 2017, there was no association between the natural region and non-compliance with vaccination.

As in our study, it was found that 26.1% of underage children did not comply with the vaccination schedule in the highlands. In both studies, no statistical association was found, which could be due to the sample and size.



CONCLUSION

- Through our work, it was obtained that the variable young age of the mother, prenatal controls less than 6 and the non-application of tetanus vaccine in the pregnant woman is associated as a risk factor for noncompliance with the vaccination schedule in children under 5 years of age in 2018.

Authorship contributions: The author participated in the generation, writing and final approval of the original article, as well as in data collection.

Financing: Self-funded.

Correspondence: Isidro Rios Trinidad Liberata.

Address: 33, Av. Alfredo Benavides 5440, Santiago de Surco 15039, Lima-Perú.

Telephone number: 975508857

E-mail: libe.isidro.14@gmail.com

BIBLIOGRAPHIC REFERENCES

1. Comité Asesor de vacunas. Manual de vacunas en línea .Asociación española de pediatría: 2014. [Internet]. Disponible en: <https://vacunasaep.org/printpdf/documentos/manual/cap-1>
2. Organización Mundial de la Salud. Vacunas e inmunización situación mundial [Internet]. Ginebra, Suiza: Organización Mundial de la Salud; 2010 [citado 20 de enero de 2019]. 26-28 p. Disponible en: https://apps.who.int/iris/bitstream/handle/10665/44210/9789243563862_spa.pdf?sequence=1
3. Organización Mundial de la Salud. Cobertura vacunal [Internet]. Ginebra, Suiza: Organización Mundial de la Salud; 2019. Disponible en: <https://www.who.int/es/news-room/fact-sheets/detail/immunization-coverage>
4. Ministerio de Salud. Esquema Nacional de vacunación: Documento de promoción de la Norma Técnica de Salud 080-MINSA/DGSPV.01.2010 [Internet]. Disponible en: <http://bvs.minsa.gob.pe/local/MINSA/2060.pdD>
5. Hungría et al. Factores socios - culturales que inciden en el cumplimiento del esquema de inmunización en niños menores de un año que acuden al Centro de Salud Puerto López. Dom. Cien (Ecuador):2018; 4 (3): 227-239. [Internet]. Disponible en: <https://dialnet.unirioja.es/servlet/articulo?codigo=6560187>
6. Cao L, Zheng J-S, Cao L-S, Cui J, Duan M-J, Xiao Q-Y. Factors influencing the routine immunization status of children aged 2-3 years in China. 2018. PLoS ONE 13(10): e0206566. Disponible en: <https://doi.org/10.1371/journal.pone.0206566>
7. Palacios C et al. Cumplimiento del esquema nacional de vacunación en pacientes pediátricos que acuden a consulta externa en un hospital de tercer nivel. ENF INF MICROBIOL 2018 38 (1): 17-23 Disponible en: <https://www.medigraphic.com/pdfs/micro/ei-2018/ei181d.pdf>
8. Achuquín E. Variables sociodemográficas asociadas al incumplimiento del esquema básico de vacunación en menores de 5 años en Perú durante el año 2017. [Tesis bachiller]. Perú: Universidad Ricardo Palma. Facultad de medicina humana. 2017. Disponible en: <http://repositorio.urp.edu.pe/bitstream/handle/URP/2212/ACHUQUIN.pdf?sequence=1&isAllowed=y>
9. Instituto Nacional de Estadística e Informática. Capítulo 9: Salud Infantil. En: Encuesta Demográfica y de Salud Familiar 2017 [Internet]. Perú, Lima; 2018:191-220. Disponible en: https://www.inei.gov.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1_525/pdf/cap009.pdf
10. Sheikh N, Sultana M, Ali N, Akram R, Mahumud R, Asaduzzaman M, et al. Coverage, Timelines, and Determinants of Incomplete Immunization in Bangladesh. Trop Med Infect
11. Ali Y, Ayenew F, Molla A. Poor maternal health service utilization associated with incomplete vaccination among children aged 12-23 months in Ethiopia. Hum Vaccin Immunother. 2019; 11:1-6. Disponible en: <https://www.tandfonline.com/doi/abs/10.1080/21645515.2019.1670124?needAccess=true&journal>
12. Cabrejos R. Factores Socioculturales que Influyen en el Incumplimiento del Calendario de Vacunación en los Lactantes atendidos en el Centro de Salud Pedro Pablo Atusparia, Chiclayo 2016. Perú: Universidad Señor de Sipán; 2018. Disponible en <http://repositorio.us.edu.pe/bitstream/handle/uss/3066/Cabrejos%20Villanueva%20.pdf?sequence=6&isAllowed=y>
13. Nozaki I, Hachiya M, Kitamura T. Factors influencing basic vaccination coverage in Myanmar: secondary analysis of 2015 Myanmar demographic and health survey data. BMC Public Health [Internet]. febrero de 2019 [citado 9 de abril de 2019];19(1). Disponible en: <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-019-6548-0>
14. Salas C, Ibarra I, Pabon J. Factores asociados al no cumplimiento del esquema nacional de vacunación en niños menores de 6 años [Tesis doctoral]. Colombia: Universidad del tolima, facultad ciencias de la salud. 2017. Disponible en:<http://repositorio.ut.edu.co/bitstream/001/2145/1/FACTORES%20ASOCIADOS%20A%20%20ESQUEMA%20DE%20VACUNACION%20INCOMPLETO%2018052017.pdf>
15. Chávez Y. "Factores que influyen en el abandono del calendario de vacunación en madres de niños menores de 5 años" [Tesis de maestría]. Perú: Universidad San Martín. Facultad de medicina humana. 2016. Disponible en: http://www.repositorioacademico.usmp.edu.pe/bitstream/handle/usmp/2692/morillo_yc.pdf?sessionid=C55C8CFDB0895A246555780028506720
16. García J. "Factores de riesgo asociados a una vacunación incompleta de niños entre 6 y 36 meses en una comunidad de la sierra peruana" [Tesis de especialidad]. Perú: Universidad San Martín. Facultad de Medicina. 2015. Disponible en: http://www.repositorioacademico.usmp.edu.pe/bitstream/handle/usmp/1855/Garc%EDa_ja.pdf?sequence=1
17. Aguilar Rojas SM, Machacca Agreda AM, Vásquez León DI. Sociodemographic and Cultural Characteristics of Mothers of Children Under One Year of Age Who Failed to Comply with the Vaccination Schedule in a Health Center [Internet] [Graduate thesis]. [Lima, Peru]: Universidad Peruana Cayetano Heredia; 2017. Available at: <http://repositorio.upch.edu.pe/handle/upch/3624>