



# Relationship among Socio-economic Determinants and Non-compliance with Vaccination in Children under 6 Years of Age in Guanajuato, México: A Cross-sectional Study

Edith Fernanda Villanueva-Méndez <sup>a</sup>,  
Michelle Arias-Morales <sup>a</sup>, Luis Ignacio Pérez-Velázquez <sup>a</sup>,  
Gilberto Flores-Vargas <sup>a</sup>, María de Jesús Gallardo-Luna <sup>a</sup>,  
Efraín Navarro-Olivos <sup>b</sup>, Ligia Gricelda Arce-Padilla <sup>c</sup>,  
Ma. Dolores Mabel Salgado-Hernández <sup>d</sup>,  
Laura Elena Escalera-Morales <sup>d</sup>,  
Erick Olav Duran-Arredondo <sup>e</sup>,  
Juan Carlos González-Araiza <sup>f</sup>  
and Nicolás Padilla-Raygoza <sup>a\*</sup>

<sup>a</sup> Department of Research and Technological Development, Directorate of Teaching and Research, Institute of Public Health from Guanajuato State, Guanajuato, Mexico.

<sup>b</sup> Directorate of Teaching and Research, Institute of Public Health from Guanajuato State, Guanajuato, Mexico.

<sup>c</sup> Institute of Public Health from Guanajuato State, Mexico.

<sup>d</sup> Service of Nursing, CAISES El Pardo, Institute of Public Health from Guanajuato State, Guanajuato, México.

<sup>e</sup> CAISES El Pardo, Institute of Public Health from Guanajuato State, Guanajuato, México.

<sup>f</sup> Sanitary Jurisdiction 1, Institute of Public Health from Guanajuato State, Guanajuato, México.

## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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\*Corresponding author: Email: [npadillar@guanajuato.gob.mx](mailto:npadillar@guanajuato.gob.mx);

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**ABSTRACT**

Vaccination is a quick and effective way to protect the population against harmful diseases before coming into contact with pathogens in the external environment. One-third of deaths worldwide are caused by infectious diseases caused by viruses, bacteria, or parasites. Over the years, the planet has experienced different epidemics and pandemics such as the Black Death, smallpox, measles, cholera, influenza, and the most recent SARS-CoV-2; these diseases have claimed the lives of many people.

**Aims:** Determine the social and economic factors that influence the non-compliance with the vaccination schedule at a primary health center in Guanajuato, Mexico.

**Study Design:** It is a cross-sectional, analytical, quantitative and observational study.

**Place and Duration of Study:** CAISES Pardo Guanajuato from March to May 2024

**Methodology:** The sample were 200 surveys of parents of pediatric patients under 6 years of age at CAISES El Pardo in Guanajuato, Mexico.

200 vaccination cards of children under 6 years old were reviewed to determine whether the vaccination schedule was complete or incomplete. Subsequently, a survey was conducted with the guardians or parents of the children to observe their stance on vaccines, their knowledge, and interest in vaccination.

The survey had a construct validity and an intra-observer reliability of Kappa 0.87, and the inter-observer Kappa was 0.81.

**Results:** Mothers in free union, as marital status do have the highest rate of non-compliance with their children's vaccination schedule. Although the marital status of the mother did prove to be an important factor in compliance with the vaccination schedule, various other factors affecting the child's vaccination schedule were identified.

**Conclusion:** This research shows the main causes why mothers do not vaccinate their children in a timely manner, is availability of vaccination center and distance from home to vaccination center. The socio-economic determinants did not show effect in incomplete vaccination card.

**Keywords:** *Vaccination card; vaccination schedule in pediatric patients; socioeconomic determinants; compliance.*

**1. INTRODUCTION**

In 2022, the fourth cause of death in children under 6 years of age was influenza and pneumonia, with pneumonia being the most important cause and representing 89% of cases, claiming the lives of 807 people under 6 years of age, of which 517 were under 1 year of age. Intestinal infectious diseases rank fifth in deaths in people under 6 years of age in 2022, presenting 389 cases, of which the pathology with the highest mortality was diarrhea and gastroenteritis of infectious origin (92%) of cases, 209 under 1 year of age [1].

In 1990 the number of patients under 6 years of age with deaths due to pneumonia was 11,210, by 1995 the figure had decreased to 7,771 deaths, in 2000 the figure had decreased to 4,358 deaths and by 2007 the figure was 2,732 deaths. From 1990 to 2007, 105,522 children under 6 years of age died from pneumonia in Mexico [2]. Despite the large number of deaths, it was recorded that there had been a decrease in mortality from this pathology and instead of being 11,210 deaths as in 1990, it decreased to 2,732 in 2007 due to the vaccines applied in the country [3]. In 2009, Guanajuato was the second state that registered the highest decrease in

mortality from this pathology, reporting a decrease of 83.7% [2,4,5,6,7].

In 2018 in Mexico, the following figures of vaccinated patients were obtained: children under 1 year of age, application of Bacillus Calmette and Guérin (BCG) 93.9%, Pneumococcus and Hepatitis B (HB) 90%, Pentavalent (PV) and Rotavirus (RV) 74%, with coverage of the 5 vaccines in 51.7% of children. In patients aged 12 to 23 months, 98.3% of patients were vaccinated against BCG, HB, PV, RV, triple viral (MMR) and 93% of Pneumococcus, with 53.9% of patients with the 6 vaccines applied, from 24 to 35 months of age, 98.6% of the BCG, HB, PV, RV, SPR and 96% Pneumococcal vaccines, with 6 vaccines being administered to 63.2% of patients [8].

In 2012, the main factors why mothers did not vaccinate children under one year of age were due to illiteracy, speaking another language, not having entitlement, and having less than secondary schooling [9].

A study on reasons for non-vaccination in children carried out in Colombia, carried out in 2017, the following factors were obtained: the main one was that the insecurity of the cities prevented family members from having access to vaccination services, the low availability of the biological, the unreliability in the registration of vaccines, the difficult mobilization of the family due to the distance from the health center or the lack of transportation, not being affiliated with a health system and the fear of adverse effects after the application of the vaccine [10]. A similar study was conducted in Australia; however, the most important factors were mainly families with a large number of inhabitants, the parents' educational level and the family's economic level [11].

In 2018, the same study was carried out where it was concluded that the main sociodemographic and social determinant are mothers between 16 and 22 years old, followed by single mothers and the rural sector [12].

In the previous studies, one of the factors that stands out is the marital status and age of the mother, since in the previous ones it occupies a place among the main social determinants.

The determinants to be considered in this study will be both social and economic, a comparison will be made in which it will be observed which of the two is the one with the greatest impact on the primary health center. Also, if the combination of

each of them increases the incidence of non-vaccination in minors.

The benefit of this study will be for the community of the Center for Comprehensive Care in Essential Health Services (CAISES) Pardo Guanajuato, in order to know the determinants that interfere in compliance with the vaccination schedule.

**Impact:** the research will have a great impact on society, since it will be possible to identify the determining factors of brown CAISES in Guanajuato, and in this way, in the future, measures can be applied to reduce these determinants, helping the population to have fewer patients under 6 years of age sick with preventable pathologies, helping CAISES by increasing the number of vaccines that are applied in this population and helping the state by reducing the number of vaccines. mortality in patients under 6 years of age and improving their level of health as well as reducing expenses that occur at the time these pathologies occur in the population.

**Feasibility:** there are the human and economic resources to carry out the project, as well as access to the vaccination cards of the participants

## 2. METHODOLOGY

The study design was a cross-sectional, analytical, quantitative and observational, with an universe of 1000 pediatric patients under 6 years of age and the parents, who attend the primary health center of Guanajuato. The recollection of data was in Primary Health Center CAISES Pardo Guanajuato from Institute of Public Health from Guanajuato State (IPHGS), from March to May 2024

### 2.1 Criteria of selection

Children, males or females under 6 years old and their parents, who attended to CAISES Pardo Guanajuato with vaccination card and who parents signed the consent form.

Only were non-included children without vaccination card.

### 2.2 Variables

#### 2.2.1 Socio-economic determinants

Age of respondent (mother or father), sex of respondent, marital status of respondent,

respondent schooling, number of children and status of employee. Age of children, sex.

### 2.2.2 Independent

Knowledge and attitudes on vaccination. It is a categorical binary variable. They were 24 questions about the parents on the vaccination of their children. Each question had a answer yes or not; they were presented as frequencies and percentages.

### 2.2.3 Dependent

Vaccination card. It is a categorical dichotomic variable. The card show all vaccines accord the age of the children under six years. It is measured as complete (if all vaccines were applied for the age of children), or non-complete (if there is one or more vaccines that did not be applied for the age of children); it is presented with frequency and percentages.

## 2.3 Questionnaire

Instrument created expressly for this purpose, the material used will be a questionnaire of 24 dichotomous questions about knowledge and attitudes on vaccination of their children. Construct validity was performed with two experts and two mothers. The comments they made were corrected in the questionnaire. Intra-observer reliability was Kappa 0.87, 95% CI 0.77 to 0.97. Kappa inter-observers 0.81 95% CI 0.69 to 0.93.

## 2.4 Sample Size Calculation

Assuming that single mothers have incomplete the vaccination card of their children in 33% and the rest of mothers in 67% The minimum sample size is 41 single mothers and 41 mothers in another marital status, with 95% precision and 80% power (EPI Info® 2021 version 7.2.50; CDC, Atlanta, GA, USA)

## 2.5 Statistical Analysis

Descriptive statistics were used for all variables. To determine the relationship between social and economic factors on vaccination in children under 6 years of age, Chi-square and *P*-value will be calculated; in cases where there was an

association, Odds Ratio and 95% confidence intervals were elaborated. To test hypotheses, Z was calculated for two proportions and *P*-value. The value of Alpha was set in all cases at 0.05. The statistical analysis will be performed in STATA 13.0 (Stata Corp., College Station, TX, USA).

## 3. RESULTS AND DISCUSSION

According to the results, the mean of age of the mothers is under 28 years, the mean of age of the children was 1.57 and the mean of number of children is almost 2 (Table 1).

The children were mainly men at 53.50%; however, the survey respondents were mainly women at 98%. Regarding the educational level of the survey respondent, high school education predominates, and in terms of occupation, being a housewife account for 51.5%. The top three marital statuses were living together, married, and single (Table 2).

The vaccination record was complete for the child's age in 142 (71.00%) and incomplete in 58 (29.00%) cases. There is a difference between mothers living in free union, single, and married in terms of compliance with the vaccination record. There was a statistically significant difference for mothers with secondary education, high school, bachelor's degree, and postgraduate degrees between having the vaccination record complete or incomplete; A statistically significant difference was found among mothers who have 1 to 2 children (Table 3).

It was calculated Z for two proportions because there are some cells with zero, and Chi-squared test did not to be calculated.

Although, divorced mothers have 2.5 times more likelihood of having an incomplete vaccination record, the 95% Confidence Interval (95%CI) include1, and the effect is not statistically significative; neither the mothers living in free union or married had effect on incomplete vaccination card (Table 4).

**Table 1. Distribution of quantitative variables of the participants.**

<b>Variable</b>	<b>Range</b>	<b>Mean ± S</b>
Mother's Age (years)	14 to 50	27.96 ± 6.96
Number of Children	1 to 7	1.86 ± 0.98
Child's Age (years)	0.019 to 6	1.57 ± 1.79

*S* Standard deviation  
Source: Own elaboration

**Table 2. Distribution of categorical variables of the participants**

Variable	n	%
Respondent's sex		
Female	196	98
Male	4	2
Child sex		
Female	93	46.50
Male	107	53.50
Respondent schooling		
None	1	0.50
Primary School	8	4.00
Secondary School	57	26.50
High School	70	35.00
Technical Career	8	4.00
Bachelor's Degree	48	24.00
Postgraduate	8	4.00
Employee status		
Housewife	103	51.50
Student	16	8.00
Full-time Employee	50	25.00
Part-time Employee	26	13.00
Unemployed	2	1.00
Other	3	1.50
Marital status		
Single	49	24.50
Married	57	26.50
Separated	1	0.50
Divorced	2	1.00
Free union	91	45.50

Source: Own elaboration

**Table 3. Distribution of data by marital status, education level and number of children**

Variable	Incomplete n%	Complete n%	Z	P-value
Marital status				
Single	14 28.57	35 71.43	6.64	.00001
Married	19 33.33	38 66.67	5.34	.00001
Separated	1 100.00	0 0.00	--	--
Divorced	1 50.00	1 50.00	0.00	1.00
Free union	23 25.27	68 74.73	10.86	.00001
Education level				
None	1 100.00	0 0.00	--	--
Primary School	4 50.00	4 50.00	0.00	1.00
Secondary School	17 29.82	40 70.18	6.66	.00001
High School	19 27.14	51 72.86	8.60	.00001
Technical Career	3 37.50	5 62.30	1.46	0.14
Bachelor's Degree	13 27.08	35 72.92	7.15	.00001
Postgraduate	1 12.50	7 87.50	6.41	.00001
Number of children				
1	21 24.71	64 75.29	10.81	.00001
2	21 28.77	52 71.23	8.01	.00001
3	14 41.18	20 58.82	2.09	.04
4	0 0.00	4 100.00	--	--
5	1 50.00	1 50.00	0.00	1.00
6	0 0.00	1 100.00	-- --	-- --
7	1 100.00	0 0.00	----	----

Source: Own elaboration

**Table 4. Logistic Regression of socio-economic determinants and incomplete vaccination card**

	<b>Odds Ratio Incomplete Vaccination Record</b>	<b>Confidence Intervals 95%</b>
<b>Marital Status</b>		
Single	--	--
Married	1.25	0.55 - 2.86
Separated	--	--
Divorced	2.5	0.15 – 42.80
Free union	0.85	0.39 – 1.84
<b>Education level</b>		
None	--	--
Primary School	7	0.57 – 86.32
Secondary School	2.98	0.34 – 26.08
High School	2.61	0.30 – 22.62
Technical Career	4.2	0.33 – 53.12
Bachelor's Degree	2.6	0.29 – 23.23
Postgraduate	--	--
<b>Number of Children</b>		
1	--	--
2	1.23	0.61 – 2.50
3	2.13	0.92 – 4.95
4	--	--
5	3.04	0.18 – 50.89
6	--	--
7	--	--

Source: Own elaboration

Regarding education, mothers without education or some education, did not have any effect on incomplete vaccination card; all 95% CI, include 1. (Table 4). And the same was reported for number of children, with 95% CI including 1. Also, all 95%CI are width, probably, because a little precision of the data.

Table 5 show the knowledge and attitudes of parents about vaccination of their children, and its relationship with incomplete vaccination card.

There was a significant difference observed between mothers who believe that vaccines do not cause diseases compared to those who believe they do, with greater relevance found among mothers with vaccination records who do not believe vaccines cause more diseases.

A statistical association was observed between the knowledge of disease prevention by vaccines and compliance with the basic vaccination schedule.

There was no statistical association observed between the mother's information-seeking behavior and compliance with the vaccination record.

Based on the responses obtained, it was observed that the majority of mothers consider

vaccines to be safe for their children, and most of them have their children's vaccination schedules completed.

It was observed that 100% of the mothers consider vaccines to be important for their children's health; however, despite all of them answering the same, there is a difference in vaccination compliance.

A statistical association was observed among mothers who said whether or not to vaccinate their children, as only those who said no to vaccination, however, had a complete vaccination record.

The majority of mothers prefer to vaccinate their children before they get sick; however, some of them prefer that they get sick. Despite this, only 4 of the mothers who mention this have incomplete vaccination records.

The results showed that many mothers believe that vaccines cause greater vulnerability to diseases.

A statistical association was observed between a healthy child not requiring vaccines in both complete and incomplete vaccination records.

Fourteen out of 200 mothers have no idea why they do not vaccinate their children; however, 10 of them still complete the vaccination record.

In a few mothers, it was observed that they do not vaccinate their children due to the adverse effects that vaccines can cause; only 13 of the mothers who fear the adverse effects of vaccines did not have their vaccination records complete.

There was no observed relevance between mothers who work full-time and cannot take their children to get vaccinated with non-compliance with the vaccination record, as only 21 out of the 55 mothers who mentioned working full-time and not having anyone to take their children had an incomplete schedule.

The survey results showed that nearly half of the mothers do not know when vaccines arrive at the health center; however, only 58 out of the 200 mothers do not have their schedule complete, and of these 58, half of them are unaware of when vaccines arrive at the health center.

No statistical association was observed between mothers who consider the health center to be far away compared to those who do not live far away, compared to complete vaccination records.

Almost half of the mothers agreed that when they take their children to be vaccinated, the health center does not have a sufficient quantity of vaccines. Out of these, 58 mothers do not have their vaccination records complete.

The majority of mothers responded that they administer all vaccines to their children; however, 15 of them stated that they only administer the vaccines they deem appropriate. Despite this,

only 4 of them had incomplete vaccination records for their children.

170 of the mothers claimed to know the dates when their children should receive vaccinations, although 50 of them had incomplete vaccination records.

In this question, the vast majority of mothers responded that they do not administer booster doses to their children; however, only 43 out of the 164 of them have incomplete vaccination records.

A statistical association was observed between mothers who claim not to forget to take their children for vaccination and those who do forget, however, the majority are mothers who have complete vaccination records for their children.

The result obtained was that the majority of mothers always carry their vaccination card; only 3 out of the 200 mothers said they do not always carry their vaccination card. Of the 197 mothers who said they always carry their card, only 57 have an incomplete schedule.

Only 2 of the surveyed mothers responded that they have no interest in vaccinating their children; however, 1 of them has her child's schedule complete. Out of the 198 who said they were interested in vaccinating their children, 57 of them did not complete the schedule.

The majority of mothers said they vaccinate their children on the dates they are supposed to; however, out of the 165 who mentioned this, 44 of them have incomplete vaccination schedules. Out of the 35 who said they do not vaccinate their children on the corresponding dates, 21 of them have their children's schedules complete.

**Table 5. The knowledge and attitudes of parents about vaccination of their children, and its relationship with incomplete vaccination card**

Question	Incomplete record n	Complete record n	Chi-square	Degrees of freedom	P value
<b>Knows what vaccines are for</b>			0.10	1	.8
No	3	9			
Yes	55	133			
<b>Vaccines cause more diseases</b>			12.38	-- --	00001
Yes	0	5			
No	58	137			
<b>Vaccines prevent diseases</b>			1.8	1	.17
No	1	9			
Yes	57	133			
<b>I have researched vaccines on</b>			004	1	.9

Question	Incomplete record n	Complete record n	Chi-square	Degrees of freedom	P value
<b>government websites</b>					
No	38	95			
Yes	20	47			
<b>Vaccines are safe</b>			13.33	-- --	0.00001
No	1	0			
Yes	57	142			
<b>Vaccines are important for health</b>			13.09	-- --	.00001
Yes	58	142			
<b>I vaccinate my children</b>			12.94	-- --	.00001
No	0	1			
Yes	58	141			
<b>I prefer my children to get sick before vaccinating them</b>			0.46	1	.5
Yes	4	125			
No	54	17			
<b>Vaccinating them makes them more vulnerable to diseases</b>			0.46	1	.5
Yes	49	125			
No	17	17			
<b>They are healthy to be vaccinated</b>			1.66	1	.2
Yes	9	13			
No	49	128			
<b>I don't know why I don't vaccinate my children</b>			0.001	-- --	0.97
No	4	10			
Yes	54	132			
<b>I do not vaccinate my children because of the effects of vaccines.</b>			0.0003	-- --	0.99
Yes	13	32			
No	45	110			
<b>Full-time job and no one to take my children for vaccination</b>			3.106	-- --	0.078
Yes	21	34			
No	37	108			
<b>I never find out when vaccines arrive at the health center</b>			1.88	-- --	0.170
Yes	29	56			
No	29	86			
<b>I do not get the vaccines because the health center is far away from me</b>			0.529	-- --	0.467
Yes	15	30			
No	43	112			
<b>When I take my children to get vaccinated, there are not enough vaccines.</b>			0.825	-- --	0.364
Yes	29	61			
No	29	81			
<b>I only administer to my children the vaccines I consider appropriate</b>			0.042	-- --	0.836
Yes	54	131			
No	4	11			



Question	Incomplete record n	Complete record n	Chi-square	Degrees of freedom	P value
Yes <b>I know the dates when I have to vaccinate my children</b>			0.093	-- --	0.760
Yes	50	120			
No	8	22			
<b>I vaccinate my children, but I do not give them booster shots.</b>			3.421	-- --	0.064
Yes	43	121			
No	15	21			
<b>I forget to bring my children for vaccination</b>			10.469	-- --	0.001
No	37	120			
Yes	21	22			
<b>I always bring my vaccination card when I vaccinate.</b>			0.027	-- --	0.868
Yes	57	140			
No	1	2			
<b>I'm interested in vaccinating my children.</b>			0.432	-- --	0.511
Yes	57	141			
No	1	1			
<b>I vaccinate my children on the dates they are supposed to receive the vaccines.</b>			2.493	-- --	0.114
Yes	44	121			
No	14	21			

Source: Own elaboration

### 3.1 Discussion

The parents participating in the study were 200, mainly the mother of children. The data on the vaccination card were divided into two categories: complete vaccination cards, which accounted for 71%, and incomplete vaccination cards, which accounted for 29%. This division ensured the integrity of the results, as mentioned in Cochancela-Pesantez et al. [13].

#### 3.1.1 Risk factors for mothers

In this research, the age range of the surveyed mothers was between 14 and 50 years, compared to studies conducted by Alemán Sánchez D. et al. and Cochancela-Pesantez C. L. et al., where the age range of the mother or caregiver was between 15 and 75 years [14]. In another study, the age range of the mothers was from 16 to 44 years, similar to the study conducted in Aguascalientes by Muñoz Trinidad et al., which was between 20 and 40 years of age [13,15]. In all the aforementioned cases, the age ranges of the mothers cover the years in which they can have a significant influence on the research outcomes.

Marital status of the mothers is a factor relevant to compliance with the vaccination schedule. In this research, it was demonstrated that married mothers had the highest non-compliance with the vaccination card at 33%, followed by single mothers at 28.57%, and those in a free union at 25.27%. The study by Alemán Sánchez D. indicated that the marital status with the highest non-compliance with the vaccination schedule were mothers in a free union, followed by single mothers and married mothers. In the investigation carried out in the city of El Naranjal, the order of marital status with the highest non-compliance were single mothers, those in a free union, and divorced mothers. Single and cohabiting mothers were the ones with the highest incidence in the previous research, making it one of the main factors affecting compliance with the vaccination card [13,16].

The mother's education level is another main factor affecting compliance with the child's vaccination schedule. Muñoz Trinidad et al. reported that the surveyed mothers in their study had an educational level between primary and secondary school [15]. In the study conducted at the University of Córdoba, it was identified that

participants with the highest non-compliance with the vaccination schedule had primary and secondary education [16]. In the research conducted in the city of El Naranjal, most participants with an incomplete schedule were mothers with no educational level, followed by those with primary education [15]. Schargrodsky et al. reported in the study conducted at the Children's Hospital Dr. Ricardo Gutiérrez that the majority of surveyed mothers had primary and secondary education [14]. In this research, 29.8% of mothers had secondary education, followed by 27.1% with education up to high school, and 27.08% with a bachelor's degree. Compared to other studies, an incidence can be observed in mothers with education up to secondary level and non-compliance with the vaccination schedule.

The mother's employment status is considered another social determinant that directly influences the child's immunization schedule. The study from the University of Córdoba reported that the mothers' employment status included housewives, employees, and students [14]. According to Cochancela Pesantez C., the employment status of mothers with non-compliance with the vaccination schedule are mothers with their own business and agricultural workers [17]. The Children's Hospital "Dr. Ricardo Gutiérrez" reported that socioeconomic aspects affect the child's vaccination schedule by 89% [18]. In this research, we observed that the main employment statuses were housewives, full-time workers, and part-time workers. In this study, we could see that even though mothers work full-time, it often does not influence non-compliance with the vaccination schedule.

### 3.1.2 Vaccine knowledge

Many of the answers given by the participants in the questionnaire are incongruent if compared to the status of their children's vaccination schedule, it was already observed that in some items there was a disapproval for the vaccine, however they had the complete schedule or had total approval for the vaccines and follow-up, but their children's schemes are incomplete. In item number 3 of the applied survey, the answers of the 200 consultants were evaluated, to know their perception about "do vaccines prevent diseases?", in which some inconsistencies were shown, for example, 10 respondents answered negatively to the question, but these results are not consistent since 9 of them had the complete vaccination schedule and only 1 participant had

faults in the child's vaccination record. This tells us about a lack of knowledge on the part of the caregiver about vaccines, which is considered an extremely important factor why participants have an incomplete vaccination schedule. In the research carried out in a rural community in Aguascalientes, the knowledge deficit is one of the main factors affecting the vaccination sector [15], the study carried out by the University of Córdoba reported that some of the parents have false beliefs about vaccines [16],

Cochancela Pesantez C. reported in his study that more than half of the participants who dropped out of the vaccination schedule were due to ignorance of the vaccine, despite this 56.2% responded that the vaccines prevented future diseases in children [13]. The lack of knowledge on the part of parents can be identified as a social determinant that directly influences compliance with the child's vaccination schedule.

In item number 5 "Do I consider the vaccines safe?" most of the participants answered yes, however, a large number of them had non-compliance with the vaccination schedule, in Aguascalientes one of the determinants mentioned by the respondents was the fear of vaccines [2], on the contrary the study carried out by the University of Córdoba more than half of the respondents responded that they considered the vaccines to be safe [10], the city of El Naranjal reported that a main factor was that parents considered that vaccines were harmful to children's health [9]. There is an inconsistency in terms of knowledge of the safety of vaccines since it is a factor that varies greatly in the different studies analyzed.

In question number 6 the importance of vaccinating their children is questioned in which 100% of the participants consider that it is important, in the study carried out in Aguascalientes one of the main factors of the mother was the lack of interest in vaccinating her children [15], in the research of the University of Córdoba more than half of the participants answered that they did consider it important to vaccinate their children [16], despite the inconsistencies that arise when answering this question in the different studies, it can be inferred that awareness of the importance of vaccines is present in the community of CAISES El Pardo, despite the fact that the participants have this awareness, that does not mean that they have complete schemes.

Less than 25% of participants responded that they do not vaccinate their children due to the adverse effects that vaccines have on them, according to Muñoz Trinidad, et al. I report that one of the main factors that have an impact on non-compliance with the vaccination schedule is the fear of adverse effects of vaccines [15], despite the fact that a small number of the population are those who responded that they do not vaccinate their children due to adverse effects, there is still a significant number of participants. It can be observed that misinformation or false information continues to harm compliance with the vaccination schedule of minors.

### 3.1.3 Other factors

The distance from the health center is one of the most common problems that arise when guardians want to take their children to be vaccinated, in the community of Aguascalientes it was reported that the means of transportation was one of the difficulties that mothers present when they want to take their children to be vaccinated [15], in the research carried out by the University of Córdoba, it was reported that 5.1% of the reasons why they do not take their children to be vaccinated is the distance from the health center, as mentioned in Schargrotsky L. et al [16]. The distance from the vaccination center represented 13.5% in the reasons why parents do not go to these centers [14]. In this study, less than 25% of the participants reported that distance was an impediment to taking their children to be vaccinated, of these only 15 of these participants had non-compliance with the vaccination schedule, therefore, it is not considered a main social determinant that affects compliance with the vaccination schedule.

The lack of inputs is a factor that is repeated in the different studies carried out by Muñoz-Trinidad, et al. He states that the main factor at the institutional level for non-compliance in the vaccination schedule is the lack of the biological [15], Mongua-Rodríguez et al. It states that there was an insufficient supply, being one of the main reasons why many of the minors' schemes were not completed [17], in the research of the city of El Naranjal the lack of biological was not the main factor, however it was relevant [13], in the children's hospital "Dr. Ricardo Gutiérrez" 40.5% of the children who were not immunized were due to the shortage of the biological [14], as Romero M, et al. comments. 34.7% of the parents commented that they did not have

supplies and 47.7% that there were some biological, but not the biological that their children needed [18]. At the El Pardo health center, almost half of the participants mentioned that the lack of supplies is one of the causes for non-compliance with the vaccination schedule, 90 of the 200 participants responded that there was a lack of supplies, however, of those 90 participants only 29 had non-compliance with their schedule.

## 4. CONCLUSION

It can be concluded that although the OR's for civil status, schooling of mothers, and number of children, were important the 95%CI show there are no effect, mainly by the sample size. It should be good increase the sample size in a future research.

One of the main determinants that were observed in the research is associated with the lack of knowledge or misinformation about vaccines, since a large part of the mothers responded that the vaccines make them more vulnerable to diseases or that they do not apply the boosters, some are concerned about the adverse effects that the vaccines have on their children and this becomes a reason why the which do not apply all vaccines. The conditions of the health centers affected compliance with the vaccination schedule in various ways, since mothers have no way of knowing when the vaccines arrive at the health center, as well as the lack of the biological vaccine in the unit.

As for the direct social determinants of the mother, many of them work full-time and do not have the support of someone to take their children to be vaccinated. Others simply commented that they forget to take their children to the vaccine application. To increase the number of minors with complete vaccination cards, it is of utmost importance to address the aforementioned factors by involving the health center staff and the community. Expand the information given to parents about vaccines, debunking false beliefs about vaccines or the effects they have. Improve population monitoring in order to estimate population coverage and ensure biologicals for all minors.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models and text-to-image generators have been used during writing or editing of manuscripts.

## CONSENT

All participants, parents of children, signed the consent form.

## ETHICAL APPROVAL

The protocol was approved by Ethics Committee for Research from Hospital General Salamanca. All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. National Institute of Statistics, Geography and Informatics. Registered death statistics 2020; 2023. Available: <https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2023/edr/edr2022.pdf>
2. General Directorate of Epidemiology, Sub secretary of Prevention and Health Promotion. Health Secretary. Epidemiological and statistical overview of mortality in Mexico 2009; 2011. Available: [https://www.gob.mx/cms/uploads/attachment/file/267596/Mortalidad\\_2009.pdf](https://www.gob.mx/cms/uploads/attachment/file/267596/Mortalidad_2009.pdf)
3. Fernández-Cantón SB, Perdigón-Villaseñor G. Evolution of mortality from pneumonia in Mexico 1990-2007. *Bol Med Hosp Infant Mex.* 2010;67(1):81-3. Available: <https://www.medigraphic.com/pdfs/bmhim/hi-2010/hi101k.pdf>
4. Gabriel-Job N, Yaguo Ide LE. Tetanus toxoid status and determinants of uptake among women in etche local government area, Rivers State, Nigeria: A Community Based Study. *Asian Journal of Medicine and Health.* 2020;17(4):1-7. Available: <https://doi.org/10.9734/ajmah/2019/v17i430171>
5. Oladeji, Olusola, Natalia Largaespa Beer, Angella Baitwabusa, Lilia Middleton, Alison Parker, and Melissa Diaz-Musa. Integration of COVID 19 vaccination into routine immunization services in Belize. *Journal of Advances in Medicine and Medical Research.* 2023;35(19):66-74. Available: <https://doi.org/10.9734/jammr/2023/v35i195141>.
6. Esposito S, Principi N, Cornaglia G, ESCMID Vaccine Study Group (EVASG). Barriers to the 17vaccination of children and adolescents and possible solutions. *Clinical Microbiology and Infection.* 2014 May;20:25-31.
7. Rainey JJ, Watkins M, Ryman TK, Sandhu P, Bo A, Banerjee K. Reasons related to non-vaccination and under-vaccination of children in low and middle income countries: findings from a systematic review of the published literature, 1999–2009. *Vaccine.* 2011 Oct 26;29(46):8215-21.
8. Diaz- Ortega JL, Cruz- Hervert LP, Ferreira-Guerrero LD, Delgado- Sánchez G, García- García ML. Vaccination coverage and proportion of incomplete schedule in children under seven years of age in Mexico. *Salud Publica Mex.* 2018;60(3):338-46. Available: <https://doi.org/10.21149/8812>
9. Díaz-Ortega JL, Ferreira-Guerrero E, Trejo-Valdivia B, Téllez-Rojo MM, Ferreyra-Reyes L, Hernández-Serrato MI, et al. Vaccination coverage in children and adolescents in Mexico: complete, incomplete and non-vaccination schedule. *Salud Public Mex.* 2013;55(Suppl.2): S289-S299. Available: <http://repositorio.insp.mx:8080/jsui/bitstream/20.500.12096/7013/1/com-5318437.pdf>
10. Escobar-Díaz FA, Osorio-Merchán MB, de la Hoz-Restrepo F. Reasons some children under 5 do not get vaccinated in four Colombian cities. *Rev Panam Public Health.* 2017;41:e123. Available: <https://doi.org/10.26633/rpsp.2017.123>
11. Lim C, Currie GE, Waddington CS, Wu Y, Setija S, Leask J, et al. Identification of the determinants of incomplete vaccination in Australian children. *Vaccine: X.* 2019;1:100010. DOI: <https://doi.org/10.1016/j.jvacx.2019.100010>
12. World Medical Association. Declaration of Helsinki: Ethical principles for research in humans; 2013.

- Available:<https://www.wma.net/es/policiest/declaracion-de-helsinki-de-la-amm-principios-eticos-para-las-investigacionesmedicas-en-seres-humanos/>
13. Cochancela-Pesantez CI. Health determinants that influence the abandonment of the vaccination program in children from 12 to 23 months of age, from the Orangel health center in the city of Orangel 2018. *Más Vita*. 2020;2(3):86–96.  
Available:<https://doi.org/10.47606/acven/mv0044>
  14. Schargrodsky L, Viola P, Tenenbaum M, Nolte F, Sabbaj L, Czerniuk P. The delay in vaccines. Highlighting a reality in health. Experience at the children's hospital "Dr. Ricardo Gutierrez." *Rev Hosp Children Baires*, 2011;(53): 154-161.  
Available:<http://revistapediatria.com.ar/wp-content/uploads/2012/03/15461.Vacunas.Schargrodsky.pdf>
  15. Muñoz-Trinidad J, Villalobos-Navarro A, Gómez-Chávez JR, de Loera-Díaz IN, Nieto-Aguilar A, Macías-Galaviz MT. Reasons for non-compliance with the basic vaccination schedule in a rural community of Aguascalientes. *Medical Lux*. 2021;16(47):3149.  
Available:<https://doi.org/10.33064/47Im20213149>
  16. Alemán-Sánchez D. Social determinants that influence non-vaccination in children under 6 years of age, Montería 2023. Master's Thesis, University of Córdoba, Colombia; 2023.  
Available:<https://repositorio.unicordoba.edu.co/server/api/core/bitstreams/d3bc20e7-eefc-4bb7-9d61-1cd98057ed99/content>
  17. Mongua-Rodríguez N, Delgado-Sánchez G, Ferreira-Guerrero E, Ferreyra-Reyes L, Martínez-Hernández M, Cenizales-Quintero S, et al. Vaccination coverage in children and adolescents in Mexico. *Salud Publica Mex*. 2023;65(Suppl. 1): S23-S33.  
Available:<https://doi.org/10.21149/14790>
  18. Romero M, Sandoval M, Tamayo K, Vivas J, Vizcaya C, D'Apollo R. Coverage and compliance with the immunization schedule in children up to 5 years old, Las Cuibas, Lara state. *Rev Venezuelan Public Health*. 2014;2(1):23-30.  
Available:<https://dialnet.unirioja.es/servlet/articulo?codigo=4769637>

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