REUFPI
Revista de Enfermagem da UFPI
ISSN 2238-7234

Original

Vaccination status of nursing and medical students against measles and associated factors

Situação vacinal de estudantes de enfermagem e medicina contra o sarampo e fatores associados

Estado de vacunación de estudiantes de enfermería y medicina contra el sarampión y factores asociados

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Abstract

Objective: To analyze the vaccination situation of nursing and medical students against measles and associated factors. **Methods**: This is a cross-sectional and quantitative study, carried out with nursing and medical students in a municipality in the semi-arid region of Piauí, through an electronic questionnaire and verification of the vaccination card. For association between variables, Pearson's Chi-Square was used and, for frequencies less than five, the likelihood test, with a significance level of 5% ($p<0.05$) and 95% Confidence Interval. **Results:** 223 students participated, with a prevalence of the nursing course (87.0%), female (74.4%), brown (53.8%), single (91.9%), Catholic (55.6%) and with a median age of 22 years. 54.7% had a vaccination card, which showed vaccination coverage of 41.7%, access to the vaccine of 49.3% and abandonment rate of the vaccination schedule of 15.6%. There was a significant association between being vaccinated, being in the nursing course ($p=0.000$; OR=25.255) and being single ($p=0.025$; OR=3.913). **Conclusion:** The students had vaccination coverage much lower than recommended, low access to the vaccine and a high rate of abandonment of the vaccination schedule, implying the need for educational institutions to carry out an evaluation of the students' vaccination card and subsequent immunization interventions for the consequent protection of the students.

Descriptors: Immunization; Health Sciences Students; Measles Vaccine; Vaccination Coverage; Cross-sectional Studies.

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Whats is already known on this?
The resurgence of measles linked to the drop in vaccination coverage exposes health students at high risk of contamination with the virus and increases its importance for immunization actions.

What this study adds?
The study identified that nursing and medical students are not properly vaccinated against measles, highlighting the need for immunization interventions at the university to protect students.

How to cite this article: Silva PP, Oliveira LB, Lima LHO. Vaccination status of nursing and medical students against measles and associated factors. Rev. enferm. UFPI. [internet] 2025 [Cited: ano mês abreviado dia];14: e5463. DOI: 10.26694/reufpi.v14i1.5463

Resumo

Objetivo: *Analisar a situação vacinal de estudantes de enfermagem e medicina contra o sarampo e fatores associados.* ***Métodos:*** *Estudo transversal e quantitativo, realizado com estudantes de enfermagem e medicina em um município no semiárido piauiense através de questionário eletrônico e verificação do cartão vacinal. Para associação entre as variáveis, utilizou-se o Qui-Quadrado de Pearson e, para frequências menores que cinco, o teste de verossimilhança, com nível de significância de 5% (p<0,05) e Intervalo de Confiança de 95%.* ***Resultados:*** *Participaram 223 estudantes, com prevalência do curso de enfermagem (87,0%), feminino (74,4%), de cor parda (53,8%), solteiras (91,9%), católicas (55,6%) e com idade mediana de 22 anos. 54,7% apresentaram cartão de vacinas, o que evidenciou cobertura vacinal de 41,7%, acesso à vacina de 49,3% e taxa de abandono ao esquema vacinal de 15,6%. Houve associação significativa entre estar vacinado, ser do curso de enfermagem (p=0,000; OR=25,255) e estar solteiro (p=0,025; OR=3,913).* ***Conclusão:*** *Os estudantes apresentaram cobertura vacinal muito abaixo do recomendado, baixo acesso à vacina e alta taxa de abandono ao esquema vacinal, implicando a necessidade das instituições de ensino realizarem avaliação do cartão de vacinação dos acadêmicos e posteriores intervenções de imunização para consequente proteção do alunato.*

Descritores: *Imunização; Estudantes de Ciências da Saúde; Vacina contra Sarampo; Cobertura Vacinal; Estudos transversais.*

Resumén

Objetivo *Analizar el estado de vacunación de estudiantes de enfermería y medicina contra el sarampión y factores asociados.* ***Métodos:*** *Estudio transversal y cuantitativo, realizado con estudiantes de enfermería y medicina de un municipio de la región semiárida de Piauí mediante cuestionario electrónico y verificación de la cartilla de vacunación. Para la asociación entre variables se utilizó el Chi-Cuadrado de Pearson y, para frecuencias menores a cinco, la prueba de verosimilitud, con un nivel de significancia del 5% (p<0,05) y un Intervalo de Confianza del 95%.* ***Resultados:*** *Participaron 223 estudiantes, con predominio del curso de enfermería (87,0%), femenino (74,4%), mestizo (53,8%), soltero (91,9%), católico (55,6%) y con una edad promedio de 22 años. El 54,7% presentó cartilla de vacunación, lo que arrojó una cobertura de vacunación del 41,7%, acceso a la vacuna del 49,3% y una tasa de abandono del esquema de vacunación del 15,6%. Hubo asociación significativa entre estar vacunado, estar en curso de enfermería (p=0,000; OR=25,255) y ser soltero (p=0,025; OR=3,913).* ***Conclusión:*** *Los estudiantes tuvieron coberturas de vacunación muy inferiores a las recomendadas, bajo acceso a la vacuna y alto índice de abandono del esquema de vacunación, lo que implica la necesidad de que las instituciones educativas realicen una evaluación de las cartillas de vacunación de los estudiantes y posteriores intervenciones de inmunización para proteger en consecuencia a los estudiantes.*

Descriptores*: Inmunización; Estudiantes de Ciencias de la Salud; Vacuna contra el Sarampión; Cobertura de vacunación; Estudios transversales.*

INTRODUCTION

Vaccination is a safe, effective and essential measure in the control, elimination and eradication of vaccine-preventable diseases, such as measles, a serious viral disease, which is transmitted by respiratory droplets, released when an infected person speaks, coughs, sneezes or breathes near an individual who does not have immunity against the virus.[1-3]

The World Health Organization (WHO) has set targets to eradicate measles by 2015, such as increasing vaccination coverage above 90% at the national level and reducing mortality by 95%. However, outbreaks resurfaced in 2017 due to low vaccine coverage, including in regions where the vaccine that protects against the disease is widely available, threatening the progress made and the global elimination target. As a result, measles remains one of the leading causes of child death in the world. In the region of the Americas, the Pan American Health Organization (PAHO) has defined an Action Plan for the sustainability of measles elimination in the region for the five-year period 2018-2023.[4]

In Brazil, the vaccines that protect against measles are the triple and the tetra viral, which add protection against other exanthematous diseases (mumps, rubella and varicella) and are made available free of charge in routine vaccination through the National Immunization Program (NIP), which defines that 95% of the population is immunized with two doses of these vaccines, the first with the triple viral from 12 months of age and a second dose at 15 months of life with the tetra viral vaccine or a second dose of the triple viral.[3]

By 2015, the target of 95% Vaccine Coverage (VC) established by the NIP was achieved, which culminated in the elimination of measles cases in Brazil, generating in 2016 the certification of a measles-free country, issued by PAHO. However, in the following years, the country began to register a decline in VC due to several factors. Consequently, in 2018, there were 9,325 confirmed cases of measles, leading to the loss of the certificate received.[3-7]

Then, between 2019 and 2020, about 30,000 confirmed cases of the disease were recorded, in addition to more than 20 deaths in this period, showing the active circulation of the virus in all regions of the country.[3,7-8] The re-emergence of the disease in the country was associated with some factors, such as the migration process of Venezuelans contaminated by the North of Brazil, exceptionally linked to low VC,

which were impacted by factors such as exorbitant fake news, difficulties in access and vaccine hesitancy, and thus promoted the spread of the virus to all regions of the country.[5,8-10]

Given this scenario, health professionals are fundamental for the effectiveness of vaccination strategies. However, given the possibility of a measles outbreak, the risk of contamination arises, especially for students and interns in the area who, because they have less practice in the correct use of personal protective equipment, are more vulnerable during their activities.[1,11-12]

The Ministry of Health recommends that health professionals and students be immunized, regardless of age, with a record of two doses of the triple viral vaccine, so that they are not later victims and transmitting agents of the pathogen.[5]

The study is justified due to the risk of exposure to the measles virus that unvaccinated nursing and medical students go through during the internship practices, for this reason, it becomes relevant as they will be part of the group of professionals with greater relevance, credibility and confidence in sharing information about vaccination.[10]

Therefore, the objective of the study is to analyze the vaccination situation of nursing and medical students against measles and the associated factors.

METHODS

Analytical, cross-sectional study with a quantitative approach, guided by the strategy Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), carried out in the health courses of public Higher Education Institutions (HEIs) in the municipality of Picos, south-central region of the semiarid region of Piauí. The population consisted of 509 students from the Nursing and Medical courses of the public HEIs of this municipality.[11]

The definition of the sample size was based on the formula for cross-sectional studies with finite population and qualitative variables.(13) The parameters used were a confidence level of 95%, a proportion for correct and expected error of 50%, a total population of 509 individuals and a sampling error margin of 5%. Based on these criteria, a minimum sample of 219 participants was determined, and the final sample consisted of 223 individuals.[11]

Data collection took place between 2020-2021 through an electronic form on Google forms. Previously, students were invited to participate in the research, via e-mail, provided to researchers by the course coordinators. Initially, the Informed Consent Form (ICF) was presented and students who consented to participate and met the inclusion criteria should be duly enrolled in the nursing or medical course and have access to the internet; fill out the questionnaire and then send a photograph of their vaccination records. It should be noted that the vaccination card sent could be the one in the participant's possession. Due to discontinuity criteria, those who did not complete the questionnaire in full were excluded.

The variables collected via the questionnaire address socioeconomic data related to the undergraduate course [nursing or medical course], current period, gender at birth [female or male], age [in years], self-declared skin color [yellow, white, brown or black], marital status [single, married or living with a partner], religion [Catholic, evangelical, other or no religion] and family income [in reais].[11]

The variables related to the vaccination situation investigate the indicators of students' access to the vaccine, the vaccination coverage in this population, and also the rate of abandonment of the multi dose regimen. The doses identified in the photographs of the vaccination records were counted to obtain the calculations. Students who did not have a vaccination card were considered unvaccinated because they did not have proof of vaccination.

Pearson's Chi-square test was used to verify the association between variables, while for expected frequencies less than five, the likelihood test was used, adopting a 95% Confidence Interval (95% CI) and a statistical significance level of 5% ($p<0.05$). The analyses were performed using the Statistical Package for the Social Sciences (SPSS) software version 20.0.

To calculate the VC indicator, the number of students vaccinated with two doses, regardless of age,(3) was considered over the total number of the surveyed sample. Thus, persistence is calculated as follows:

$$\textbf{Vaccination coverage} = \frac{\Sigma \text{ of vaccinated students}}{\Sigma \text{ students surveyed}} \text{ x } 100$$

After the calculation, the VC rate was classified as: very low (0 to < 50%); low (≥ 50% and < target); adequate (≥ target to < 120%); and high (≥ 120%).[14]

The students' access to the measles vaccine was calculated from the registration of the first dose on the study sample, as follows:

$$\textbf{\textit{Access}} = \frac{\Sigma \text{ of students with the 1st dose registered}}{\Sigma \text{ students surveyed}} \text{ x } 100$$

The vaccination schedule dropout rate – desertion – was calculated by taking the number of students who received the first dose of the vaccine and subtracting the number of students who received the second dose from this total.[14] Thus, the following calculation was applied:

$$\textbf{\textit{Desertion}} = \frac{\Sigma \ \textit{students with 1st dose} - \Sigma \textit{ students with 2nd dose}}{\Sigma \text{ students with 1st dose registered}} \ x \ 100$$

Métodos detalhados do artigo Métodos detalhados do artigo Métodos detalhados do artigo Métodos After the calculation, the desertion rate was classified as low vaccine abandonment (≤5%) and high abandonment (≥10%).[14]

In view of the ethical aspect of the study and in order to contemplate the guidelines and regulatory standards for research involving human beings, recommended by Resolution number 466/12 of the National Health Council, the study was submitted to the Research Ethics Committee of the Federal University of Piauí (REC/UFPI), having been approved with the number: 4,144,402 and CAAE: 33118920.2.0000.8057.detalhados do artigo Métodos detalhados do artigo Métodos detalhados do artigo Métodos detalhados do artigo.

RESULTS

Two hundred and twenty-three (223) university students participated in the study, with a profile characterized mostly by nursing students (87.0%), in the fourth year of the course (29.6%), female (74.4%), with a median of 22 years of age, brown (53.8%), single (91.9%), Catholic (55.6%) and with a median family income of R$2,000.00.

Regarding the vaccination situation, 45.3% of the students did not have a vaccination card, therefore, 54.7% of the participants presented the vaccination booklet. Among the records, 24.2% showed the adult vaccination card, 19.7% the children's booklet and 8.1% presented both booklets. 50.7% of the sample had no record of vaccine dose, while 25.1% showed a record of three doses or more (Table 1).

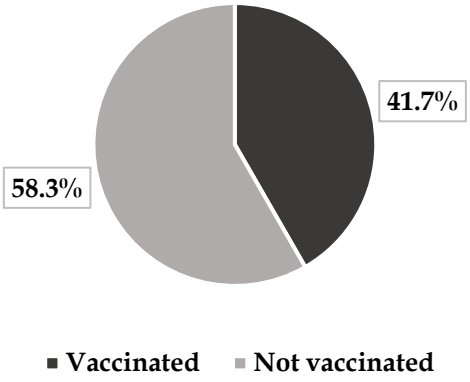
Table 1. Characterization of the vaccination situation of nursing and medical students. Picos, PI, Brazil, 2021. n=223

Variable	n	%
Vaccine Card		
Yes	122	54.7
No	101	45.3
Vaccination card viewed		
Adult only	54	24.2
Children only	44	19.7
Children and adults	18	8.1
Adolescent only	2	0.9
Pregnant women only	3	1.3
Children and adolescents	1	0.4
Number of doses recorded		
None[a]	113	50.7
One	18	8.1
Two	36	16.1
Three or more	56	25.1
Total	223	100.0

Key: [a]Included participants without proof of vaccination.
Source: Research data.

As for the indicators of vaccination status, among those surveyed, vaccination coverage was 41.70%. Therefore, it was found that 58.3% of the students were not properly vaccinated against measles. The students' access to the vaccine was 49.32%, while the rate of abandonment of the basic regimen was 15.59% (Figure 1).

Figure 1. Vaccination situation of students of nursing and medical course against measles. Picos, PI, Brazil, 2021. (N=223)



Source: research data.

The outcome for vaccinated persons was statistically associated with the variables course (p=0.000) and marital status (p=0.025). It was found that nursing students were 25 times more likely to be vaccinated (OR= 25.255), therefore, the vaccination coverage in the nursing course was 47.4%, compared to only 3.4% of vaccination coverage in medical students. In addition, being single increased the probability of being vaccinated almost fourfold (OR=3.91) (Table 2).

However, there was no association between being vaccinated with the current year of graduation (p=0.421), sex (p= 0.388) and skin color (p=0.438). Despite this, among female students, 43.4% were vaccinated, while among males the percentage was 36.8%. In addition, the percentage of vaccinated among those with yellow skin was 66.7% and 50.0% among those with black skin (Table 2).

Table 2. Analysis of the association between vaccination status and sociodemographic and economic variables. Picos, PI, Brazil, 2021.

Variables	Vaccinated	p-value	OR	95% CI
Course		0.000[a]	25.255	3.369; 189.329
Nursing	47.4 %			
Medical course	3.4 %			
Year of course		0.421[a]	-	-
1st year	28.0%			
2nd year	51.0%			
3rd year	41.5%			
4th year	39.4%			
5th year	42.5%			
Sex		0.388[a]	1.313	0.707; 2.440
Female	43.4%			
Male	36.8%			
Skin color		0.458[b]		
Yellow	66.7 %			
White	44.7 %			
Brown	37.5 %			
Black	50.0 %			
Marital Status		0.025[a]	3.913	1.099; 13.933
Single	43.9%			3.369; 189.329
Married/living with partner	16.7%			

Legend: p<0.05; a Pearson's Chi-Square Test; b Likelihood test.
Source: research data.

The median age (22 years) and family income (R$: 2,000.00) presented by the students was the same between vaccinated and unvaccinated, so there was no divergence in age (p=0.076) or income (p=0.627) between being or not immunized.

DISCUSSION

The vaccination situation of nursing and medical students against measles was analyzed based on the indicators of vaccination coverage, access and vaccination abandonment. The socioeconomic profile of the students was associated with adequate vaccination status.

The prevalence of nursing students reinforces the fact that this is the health course with the highest number of enrollments in HEIs in Brazil. This data is reiterated by the availability of the course in both HEI analyzed, while the medical course is offered in only one HEI and with a limited number of classes. In addition, the predominance of nursing students justifies the greater participation of women in the study, a scenario widely known and confirmed by the Census of Higher Education in Brazil, which ranks nursing as the fourth course with the highest number of female enrollments in public HEIs. On the other hand, among the ten courses with the highest number of male enrollments, none belongs to health, which ratifies the majority of women in the research. [11,16]

The implementation of public policies to expand higher education, such as social and racial quotas, facilitated the access of the black and low-income socioeconomic population to health courses, such as nursing and medical courses. However, there was a discrepancy between the values of the income variable, justified by the presence of medical students in the study, since the highest levels of family income remain prevalent among this group.[17-19]

Currently, the registration of immunobiologicals applied in routine vaccination, offered in public vaccination services, is carried out through the e-SUS APS system. However, due to the lack of qualification for the correct use of this system and inconsistencies in interoperability with the NIP Information System (SI-NIP), the possession of the physical vaccination booklet still represents the exceptional means of proof of vaccination. Despite this, a considerable percentage of the population analyzed does not have vaccine card. Even more worrying data were observed in a survey carried out in Brasilia, where 68% of health students reported not having an immunization booklet.[23]

The absence of the vaccine card interferes with more accurate estimates of vaccine indicators, since, without proper proof, the vaccination situation is considered inadequate, since only the dose recorded proves immunization, making it necessary to restart the vaccination schedule. The requirement of the vaccine card as an additional requirement in the process of enrollment in universities is an essential strategy to provide opportunities for vaccination regularization and the consequent protection of students against the occupational risk of exposure to vaccine-preventable diseases.(21) Private HEIs that made it mandatory to present the vaccination card for enrollment pointed out that 100% of the sample of nursing students surveyed have a vaccination card.[24]

As a result, the public HEI observed during the enrollment process that 60.5% of the newcomers had incomplete vaccination, of which 80% regularized their vaccination status after immunization actions carried out at the beginning of classes.[25] It is noted that HEIs that request the vaccine card when students enter the course tend to present VCs of their students higher than HEIs that do not perform this procedure. Still, in both cases, the VC rates identified were below the recommended target.[21-24]

Studies of the same nature estimated VC far below the established goal: private HEIs in the state of Piauí identified a VC of only 33.3% among nursing students, while another private HEI pointed out a VC of 60% among students of health courses. The same percentage was observed among medical students from public HEIs in Minas Gerais, while in private education in Minas Gerais the VC against measles, among nursing and medical students, respectively, was 75 and 80%.[12,22-23,26]

With the exception of the annual influenza vaccine campaigns, the lack of immunization strategies and a vaccination schedule aimed at students and health professionals implies difficulties in accessing the vaccine, which was evidenced by the low percentages of VC and access to the measles vaccine among the students in the present study.[25]

It is estimated that a low abandonment rate will indicate better VC and vaccine access rates. However, a low vaccination abandonment rate may also reflect a low VC when access to this vaccine is limited, because, in the context of only a portion of the population having access to the vaccine and only

this same group starting and completing the vaccination schedule, the abandonment rate will be low, however, access and vaccination coverage for this immunizer will consequently be low. Therefore, when evaluating the vaccination abandonment rate, it is essential to analyze it together with the VC and access rates in order to obtain a complete and accurate analysis of the vaccination situation of the investigated population.[15]

Nursing students are more likely to be vaccinated against measles because they are in frequent contact with the practice of vaccination.[27] In European countries, in vaccination against Covid-19, the opposite situation was identified, where students and medical professionals are the ones with the highest VC among health professionals.[28-29]

Historically, the female public is more likely to seek vaccination services, which is related to cultural and social factors, while the adherence of men to health services is culturally low, not restricted to and health students. Despite this and the higher percentage of vaccinated people in this study being women, the sex variable, when associated with the outcome of adequate vaccination, was not statistically relevant, according to national and international studies. [22,25,30]

Due to the favorable scenario of Brazil having a public, universal, comprehensive and egalitarian health system, which provides and makes the measles vaccine available free of charge, at various stages of life, the occurrence of an adequate vaccination situation was not associated with age or income. However, health students aged 18 to 22 years in the municipality of Pará were associated with the delayed vaccination schedule. [27]

The limitation of the study was related to the unavailability of the vaccination card and the absence of previous vaccination records in the information systems. Facts that culminate in the non-verification of the vaccination situation by HEIs, concomitant with the lack of a vaccination schedule for students and health professionals, result in gaps in the knowledge of the vaccination situation of students, limiting the performance of research that evaluates and analyzes the theme in this population, which restricted the discussion of the results presented here with other studies of this nature.[31]

Although the minimum sample of participants was reached, the high simultaneous number of surveys with data collection carried out online limited a greater number of participants, as it is believed that it would allow presenting more accurate results. Therefore, the creation of new methods that aim to consent to participation in studies that opt for the remote approach is encouraged, aiming at greater adherence of the researched population.

The results of the study contribute to the knowledge of the real vaccination situation of students and highlight the lack of elaboration of a routine vaccination schedule for health professionals, as well as the need for improvements in the accessibility of university students for routine vaccination.

CONCLUSION

The study identified vaccination coverage much lower than recommended, with low access of students to the vaccine, high rate of abandonment of the vaccination schedule and a significant number of students without the vaccination booklet. In addition, nursing students and singles were associated with greater chances of being immunized.

Due to the low vaccination coverage identified among students, it is suggested that HEIs and course coordinators evaluate vaccination card of university students with frequency, especially before starting activities in practice fields, as it will allow, when necessary, immunization interventions, for the consequent protection from biological risks during internships and practical classes.

CONTRIBUITIONS

Contributed to the conception or design of the study/research: Silva PP, Lima LHO. Contributed to data collection: Silva PP, Oliveira LB. Contributed to the analysis and/or interpretation of data: Silva PP, Lima LHO. Contributed to article writing or critical review: Silva PP, Oliveira LB, Lima LHO. Final approval of the version to be published: Silva PP, Oliveira LB, Lima LHO.

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Conflicts of interest: No
Submission: 2024/02/19
Revised: 2024/09/12
Accepted: 2024/10/23
Publication: 2025/01/21

Editor in Chief or Scientific: Jose Wicto Pereira Borges
Associate Editor: Chrystiany Plácido de Brito Vieira