Original Research Article

VACCINATION COVERAGE AGAINST HUMAN PAPILLOMAVIRUS (HPV) – A STUDY ON VACCINATION IN THE MUNICIPALITY OF ANANINDEUA

ABSTRACT

Objective: to analyze HPV vaccination coverage in the municipality of Ananindeua – Pará, from 2020 to 2024. Method: This is a quantitative study based on data from 2020 to 2024 collected by the Department of Informatics of the Unified System of Health (DATASUS), which allowed the analysis of HPV vaccination coverage.

Results: The study revealed low adherence and significant fluctuations in HPV vaccination coverage, identifying as the main barriers the lack of information, the stigmatization of sexual transmission and the resistance of parents to vaccinating their children.

Keywords: HPV; Sexual behavior; Communicable Diseases; Vaccination.

INTRODUCTION

The Human Papilloma Virus (HPV) is a Sexually Transmitted Infection (STI) caused by a DNA virus, from the papillomaviridae family, which has remarkable oncological potential in some of its subtypes (Freitas, 2017). These high-risk HPV subtypes encode specific proteins, known as E6 and E7, which are oncoproteins. These oncoproteins interact weakly with the tumor suppressor genes p53 and pRb, which are crucial in maintaining genome stability and correcting transcription errors.[1]

HPV is an acronym that refers to a large heterogeneous viral group that is associated with serious clinical diseases of the skin and mucosal epithelia. Infection with this virus is considered a Sexually Transmitted Infection (STI) and is the most common in the world.[2]

It is necessary to highlight the importance of understanding the epidemiology of HPV and the prevention and control strategies. HPV vaccination is one of the most effective measures to combat the spread of the virus and prevent cervical cancer. The introduction of HPV vaccines in

several countries, including Brazil, has been a crucial step in the fight against this STI. However, challenges such as vaccine uptake and awareness of the importance of vaccination remain barriers to effective HPV control.[2]

Furthermore, there is an undeniable presence of the Human Papilloma Virus (HPV) in the process of cancer development. This relevance is strongly supported by a prevalence study

prevalence study conducted in the United States, which found that HPV DNA was present in 90.6% of cervical cancer cases. This finding reinforces the central role of HPV in the etiology of this type of cancer.[3]

In addition to its marked influence on cancer pathology, HPV also plays a major epidemiological role in the Brazilian population. Comprehensive surveys reveal that the national prevalence of HPV reaches 54.6%, with a significant proportion of these cases, 38.4%, corresponding to HPV types classified as being at high risk of developing cancer. These data are alarming and indicate the urgent need for effective strategies to prevent and control HPV in the Brazilian population.[4]

As you can see, HPV is closely related to the development of almost all cases of cervical cancer in women, which makes the prevention and control of this virus a public health priority. In recent years, there has been a variation in demand for the HPV vaccine, which has contributed to an increase in the prevalence of the virus, especially among individuals who have an active sex life.

Faced with the challenging scenario presented by HPV, it has been observed that various measures have been implemented with the primary aim of preventing the spread of the virus. Among these measures, immunization plays a central role, especially through HPV vaccination. The importance of vaccination as a prevention strategy cannot be underestimated, as it has the potential to interrupt the chain of transmission of the virus and consequently reduce the incidence of cervical cancer and other diseases associated with HPV.[5]

The introduction of the HPV vaccine in 51 countries by the World Health Organization (WHO) in 2013 was a significant milestone in the fight against the virus. This initiative was part of a larger global health promotion effort aimed at improving health outcomes and reducing the burden of HPV-related diseases. The WHO, recognizing the magnitude of the problem and the impact of HPV on public health, led this movement to encourage vaccination on a global scale.

The decision to introduce the vaccine in so many countries was based on growing evidence

of its efficacy and safety.

~~of its efficacy and safety.~~ Clinical studies showed that the vaccine was capable of generating a protective immune response against the HPV types most commonly associated with cases of cervical cancer. In addition, the vaccine has been shown to be safe, with generally mild and transient side effects, making it an attractive option for immunization programmes.[6]

HPV vaccination is especially effective when administered to young people before they start sexual activity, as it offers the opportunity for protection before exposure to the virus. This makes the vaccine a powerful tool for the primary prevention of cervical cancer and other HPV-related diseases. The inclusion of the vaccine in the childhood and youth immunization schedule in many countries is a sign of the commitment of health systems to protect future generations from the consequences of HPV.

In addition, HPV vaccination also has a public health effect by reducing the circulation of the virus in the population. As more people are immunized, the likelihood of transmission of the virus decreases, benefiting not only those who are vaccinated, but also the community as a whole. This collective protective effect is known as herd immunity and is fundamental to the control of infectious diseases.

In Brazil, the Ministry of Health made the quadrivalent vaccine available on the National Immunization Calendar of the Unified Health System in 2014. In this context, for this work to be successful, it is necessary to reduce the national and international scope of prevention measures against the spread of HPV and focus more on local measures, specifically in the municipality of Ananindeua, in the state of Pará.[7]

Namely, in 2020, in the municipality of Ananindeua, according to data extracted from the official DATASUS website, in 2020, the total number of doses administered was 5,649 doses, with an increase of 84 doses from the previous year, a relatively low increase. In 2021, the number of people vaccinated against HPV was 3,869, a low level compared to previous years. However, in 2022, the number of people vaccinated increased again, surpassing the 4,000 mark, but in 2023, the current year, there was a drastic drop in the number of people vaccinated.

Furthermore, the difficulty in adhering to vaccinations is often directly associated with fear, prejudice, untrue or insufficient information on the subject, as well as total ignorance. All of this, coupled with the stigmatization of sexual transmission through cultural issues and parents' lack of conviction that the vaccine is essential, especially for males, are factors that make it difficult to

maintain high vaccination coverage. Many parents believe that HPV immunization will encourage adolescents to start sex early.[8]

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METHODS

Type of study

This quantitative descriptive epidemiological study aimed to analyze vaccination rates against the Human Papillomavirus (HPV) in the population of the municipality of Ananindeua between 2020 and 2024. The descriptive and quantitative approach was used to describe and analyze data from populations or social groups, with the aim of better understanding the phenomenon studied without directly interfering in the data. The main focus was to analyze reality objectively, using statistical processes.

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The aim of quantitative research is to measure information on a subject that is already known, providing a systematic analysis of the data obtained. Quantitative research allows valuable information to be extracted from the data collected, identifying patterns, causal relationships and trends. This study used this approach to ensure accurate and reliable results, based on evidence and data.[9]

Source of data

This study was carried out using information and data that will be provided by the Department of Informatics of the Unified Health System (DATASUS), referring to the time interval between 2020 and 2024.

The Department of Information Technology of the Brazilian Unified Health System (DATASUS) aims to obtain accurate data with guaranteed quality, which is essential for analyzing the health situation, making better decisions and programming health actions. Quality data is data that the user can interpret, is accessible and relevant.

Thus, for the sample definition, we considered all the children and adolescents) living in the municipality of Ananindeua who had been vaccinated against the human papillomavirus (HPV). Thus, data from the doses of vaccines administered for the prevention of

human papillomavirus (HPV) were used.

Data collection

The study was conducted using information and data provided by the Department of Informatics of the Unified Health System (DATASUS), covering the period between 2020 and 2024. DATASUS aims to collect accurate data and guarantee its quality, which is essential for analyzing the health situation, making effective decisions and programming health actions.

To define the sample, we considered all residents of Ananindeua, including children and adolescents, who had records of vaccination against the human papillomavirus (HPV). Thus, the data used in the study included information on the doses of vaccines administered for HPV prevention

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Sample

The sample for the study on HPV vaccination coverage in Ananindeua was defined on the basis of all the vaccination records available in the Department of Informatics of the Unified Health System (DATASUS) for the period 2020 to 2024. Adolescents of both sexes, aged 10 to 19, according to the World Health Organization (WHO) classification, who had received the first two doses of the vaccine through the Unified Health System (SUS) were included.

In order to guarantee the accuracy of the data, adolescents whose information was insufficient for correct registration were excluded from the study. This ensured that the data analyzed was complete and reliable, allowing an accurate assessment of vaccination coverage and adherence to the recommended vaccination schedule for the study population.

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Inclusion and exclusion criteria

In this study, the inclusion criterion was the total vaccination coverage reported by the coverage reported by the Department of Information Technology of the Unified Health System (DATASUS) in the municipality of Ananindeua, in the state of Pará. Adolescents of both sexes, aged between 10 and 19, according to the World Health Organization (WHO) classification, who

had received the first two doses of the vaccine through the Unified Health System (SUS) were included.

In order to define the exclusion criteria, adolescents whose information was insufficient for correct registration were removed from the study. This ensured that the data analyzed was complete and reliable, allowing an accurate assessment of vaccination coverage and adherence to the recommended vaccination schedule for the study population.

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Variables to study

In the study carried out, the variables assessed in relation to vaccination coverage were specific to human papillomavirus (HPV) types 6, 11, 16 and 18, corresponding to the quadrivalent vaccine. The doses administered during the years 2020, 2021, 2022, 2023 and 2024 were considered, which, according to the Pan American Health Organization (PAHO), are divided into two doses. The first dose is administered initially, followed by the second dose six months after the first, aimed at the target public of both sexes, aged between 9 and 14.

The procedures for obtaining and analyzing the data were carried out by extracting information from the SI-PNI (Information System of the National Immunization Program), developed by DATASUS (Department of Informatics of the Unified Health System). This system recorded the immunobiologicals applied and the number of individuals vaccinated, selected by age, specific time and specific geographical area, in this case, the municipality of Ananindeua, in the state of Pará.

Procedures for data collection and analysis

In order to obtain and analyze the data for the study on HPV vaccination coverage in Ananindeua, the researchers used information provided by DATASUS.

In Ananindeua, the researchers used information provided by the Department of Informatics of the Unified Health System (DATASUS), covering the period from 2020 to 2024. Data collection was carried out through the National Immunization Program Information System (SIPNI), which recorded the number of doses applied and the number of individuals vaccinated, selected by age, specific time and specific geographical area.

The analysis procedures involved organizing the data into tables and the application of statistical methods to identify trends and patterns in vaccination coverage. The analysis was carried out with the aim of assessing the effectiveness of vaccination campaigns and planning future public health interventions to ensure the population is protected against HPV.

Risks and benefits

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Epidemiological research plays a crucial role in the field of public health. It is a meticulous scientific study whose main objective is to investigate and analyze the occurrence and distribution of diseases in a specific population. This type of research is distinctly recognized for presenting minimal risks to participants, since it uses predominantly secondary sources of data. In this context, the research benefits from the information made available by the Department of Informatics of the Unified Health System (DATASUS), which implies that the researchers do not establish direct contact with the individuals who are the subject of the research. Instead, they use data already collected and systematized by this government agency. As such, there are no risks, not even for the subjects of the study.

By adopting this approach, the research guarantees the privacy and confidentiality of the individuals studied, as well as minimizing any possible exposure or risk to these individuals during the data collection and analysis process. This not only protects the participants, but also strengthens the ethics and responsibility inherent in scientific research. The benefits arising from this study are broad and tangible for society in general.

By providing in-depth knowledge about human papillomavirus (HPV) vaccination coverage, the study contributes to the improvement of the Unified Health System (SUS). Based on the findings, the SUS will be able to implement more effective strategies for promoting the collaboration of managers, nurses and other health and basic sanitation professionals.

This interdisciplinary collaboration is fundamental to disseminating accurate and relevant information about the importance of HPV immunization. Raising awareness and educating the population are key elements for the success of any vaccination campaign, and this study has the potential to catalyze positive changes in perception and adherence to vaccination, contributing to disease prevention and improving the community's quality of life.

Ethical aspects

In accordance with the provisions set out in Resolution 506/2016, issued by the National Health Council (CNS), this study is not required to be submitted for evaluation by a Research Ethics Committee. This is due to the fact that the research does not involve any form of direct intervention in the study population. Instead, the study is based on the use of secondary databases that are freely accessible to the general public.

This approach ensures that the privacy and rights of the individuals involved are not compromised, since the data has already been anonymized and made available for academic and research use. In addition, access to these databases is regulated by rules that protect the confidentiality of the information, ensuring that researchers handle the data responsibly and ethically.

The use of secondary data sources is a common practice in epidemiological research, allowing significant advances in knowledge without exposing participants to unnecessary risks. This not only facilitates comprehensive studies, but also promotes transparency and the availability of information to the scientific community, contributing to the continued progress of public health and collective welfare policies.

RESULTS

The following table provides a detailed overview of the application of HPV vaccine doses in Ananindeua, covering the period from 2020 to the current month of 2024. A he data contained in this table is extremely important for understanding the evolution of vaccination coverage in the region and identifying trends and challenges over the years.

The data was collected and organized from the National Immunization Program Information System (SI-PNI/CGPNI/DEIDT/SVS/MS), with additional support from information available on the Localiza SUS portal. These sources are recognized for their accuracy and reliability, ensuring that the analysis is based on official and up-to-date information. Furthermore, data analysis is crucial for assessing the effectiveness of vaccination campaigns, plan future public health interventions and ensure that the population is protected against HPV, a virus associated with various types of cancer. In the following comments, the annual data, the trends observed and their implications will be discussed in detail.

Table 1: Information table on the total number of doses of vaccine administered and percentage coverage for the years 2020 to 2024.

Year	Age/ Doses by age						Total doses	Coverage
	09	10	11	12	13	14		
JAN/2020	1.219	862	1.473	959	578	394	5.485	13,58%
JAN/2021	871	642	1.055	605	352	250	3.775	9,35%
JAN/2022	900	746	1.100	670	404	267	4.087	10,78%
JAN/2023	2.719	2.080	2.043	1.319	937	668	9.766	24,18%
JAN/2024	938	1.092	520	307	210	164	3.231	8,01%

Source: Own Authorship, (2024). Data extracted from the National Immunization Program Information System, (2024). Available at: https://localizasus.saude.gov.br.

An analysis of vaccination rates in the municipality of Ananindeua reveals a significant variation in HPV vaccination coverage over the years. In 2020, vaccination coverage was 13.58%, with a total of 5,485 doses administered. This figure reflects the initial uptake of vaccination campaigns, which may have been influenced by factors such as the availability of the vaccine and public awareness of its importance.

In 2021, vaccination coverage fell to 9.35%, with 3,775 doses administered. The decrease can be attributed to several factors, including possible failures in vaccination campaigns, logistical difficulties and even the COVID-19 pandemic, which has significantly affected public health programs around the world.

In 2022, vaccination rose slightly to 10.78%, corresponding to 4,353 doses administered. This increase may indicate a partial recovery of vaccination programs, possibly due to additional efforts to resume immunization campaigns.

The year 2023 was marked by a substantial increase in vaccination coverage, reaching 24.18%, with a total of 9,766 doses administered. This significant increase suggests a positive response to intensified vaccination campaigns and greater public awareness of the importance of the HPV vaccine. So far in 2024, vaccination coverage stands at 8.01%, with 3,231 doses administered. This preliminary figure could still change over the course of the year, as new vaccination campaigns are implemented.

Another point drawn from the data available on LocalizaSUS is the percentage fluctuation in the total number of doses of HPV vaccine administered in Ananindeua from 2020 to 2024. This data is essential for understanding vaccination trends in the region.

Table 2: Oscillation table (increase or decrease) of the total number of doses of vaccine administered between 2020 and 2024.

Year	Total Doses	Percentage oscillation
2020	5.485	-
2021	3.775	-31,18%
2022	4.087	8,27%
2023	9.766	138,90%
2024	3.231	-66,91%

Source: Own Authorship, (2024). Data extracted from the National Immunization Program Information System, (2024). Available at: https://localizasus.saude.gov.br.

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As can be seen in the table above, the total number of doses administered in 2020 was 5,485, while in 2021 there was a drop to 3,775 doses, representing a decrease of 31.18%. This significant reduction can be attributed to several factors, including possible logistical difficulties, changes in the population's perception of the importance of vaccination, or even impacts resulting from the COVID-19 pandemic, which has affected many public health programs.

In 2022, there was a partial recovery with an increase to 4087 doses administered, corresponding to a positive oscillation of 8.27% compared to the previous year. This increase may indicate a resumption of vaccination campaigns and an improvement in public awareness of the importance of HPV immunization.

The year 2023 showed significant growth, with the total number of doses administered rising to 9,766, which represents an increase of 138.90% compared to 2022. This jump can be explained by a number of factors, such as the intensification of vaccination campaigns, improvements in health infrastructure, and greater engagement by the population. In addition, public policies and specific incentives may have contributed to this high uptake.

By the current month of 2024, the total number of doses administered had dropped dramatically to 3,231, resulting in a negative swing of 66.91% compared to the previous year. This

sharp decline could be the result of several factors, including possible interruptions in vaccination campaigns, changes in public health policies, or a reduction in the population's perception of risk.

The percentage fluctuations observed over the years highlight the importance of continuous and detailed analysis of vaccination data. The significant variation in the numbers of doses administered suggests that external factors, such as the COVID-19 pandemic, and internal factors, such as the structure of vaccination campaigns, play crucial roles in vaccination uptake.

To improve vaccination coverage and ensure the population is protected against HPV, it is essential that public health authorities consider these factors and seek effective strategies to stabilize and increase uptake. Targeted interventions, educational campaigns, and the continuous improvement of health infrastructure are fundamental steps towards achieving these goals.

In order to assess adolescents' adherence to HPV vaccination, it is essential to consider those who have completed the two doses required for full immunization. Analysis of vaccination coverage data suggests significant differences in adherence over the years.

In 2020, adherence was moderate, with 13.58% coverage. This figure can be considered a starting point for the implementation of vaccination campaigns, reflecting the population's initial response to immunization initiatives.

In 2021, adherence decreased to 9.35%, indicating possible challenges faced by vaccination campaigns, such as the COVID-19 pandemic, which may have affected the population's perception and priority regarding vaccination.

In 2022, there was a recovery in adherence, with coverage rising to 10.78%. This increase suggests that efforts to resume vaccination campaigns have begun to have an effect, although there are still challenges to overcome.

The year 2023 stood out with a significantly higher uptake, reaching 24.18%. This substantial increase could be the result of more effective awareness campaigns, improvements in vaccination logistics and greater acceptance of the vaccine by the population.

So far in 2024, uptake stands at 8.01%, with preliminary data that can still be adjusted as new vaccination campaigns are carried out throughout the year.

This study shows significant variations in HPV vaccination rates in the municipality of Ananindeua between 2020 and 2023. An upward trend in vaccination coverage was identified in 2023, which may reflect intensified vaccination efforts and greater public awareness. However, the analysis also highlights fluctuations in the doses administered and in adolescents' adherence to

vaccination, suggesting the need for continued public health education and accessibility efforts.

This information is essential for building scientific knowledge about HPV vaccination and can help formulate more effective strategies to improve vaccination coverage in Ananindeua and other regions. Continuing awareness campaigns, improving vaccine distribution logistics and ensuring access to health services are fundamental to achieving and maintaining high vaccination coverage rates, thus protecting the population against HPV-related diseases.

DISCUSSION

In this study, a detailed analysis of vaccination coverage against Human Papillomavirus (HPV) was carried out in the municipality of Ananindeua, in the state of Pará, Brazil. The main conclusions of the study reveal a fluctuating trend in adherence to HPV vaccination, with a notable reduction in the number of vaccinated individuals in 2021. This finding suggests that, despite the efforts of immunization campaigns, there are numerous obstacles to achieving the global vaccination target of 90% established by the World Health Organization (WHO) by 2030. The impact of these findings is extremely relevant for public health, since HPV is the main risk factor for cervical cancer and other associated infections.[7]

Low adherence to vaccination can result in an increase in the incidence of these diseases, directly affecting the quality of life of the population and increasing costs for the health system. The main barriers identified in the study include the lack of information and understanding on the part of parents about the benefits of vaccination and the risks associated with HPV, the scarcity of specialized professionals to answer questions and combat misinformation, and the stigmatization of sexual transmission. These factors play a significant role in adolescent resistance to vaccination and low vaccination coverage.[8]

Studies indicate that to overcome these challenges, researchers suggest continuing and strengthening awareness campaigns, improving vaccine distribution logistics, and ensuring adequate access to health services. In addition, they recommend implementing effective communication strategies to address the public health crisis related to low vaccination coverage.[9]

Suggestions for future research include investigating cultural and socioeconomic factors that influence vaccination uptake, as well as developing educational models that can be implemented in schools to inform and raise awareness among young people about the importance

of HPV vaccination. In addition, subsequent studies could evaluate the effectiveness of different communication approaches in increasing vaccination coverage and reducing perceived barriers by the population.

Conclusion

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In view of all of the above, the data analyzed in the study showed a tendency for demand for the HPV vaccine to fluctuate, with a significant drop in the number of people vaccinated in 2021, which jeopardizes the global vaccination target of 90% established by the World Health Organization (WHO) by 2030. The analysis of the data revealed that, despite immunization campaigns, there are still many barriers to achieving the HPV vaccination target. Among the main findings, it was possible to identify that the lack of information and understanding on the part of parents about the benefits of vaccination and the risks associated with HPV is a significant factor in their children's resistance to getting vaccinated. The scarcity of specialized professionals who can clarify doubts and combat myths and misinformation also contributes to the public health crisis faced by the city in this regard. The research also highlighted that many parents mistakenly believe that immunization against HPV can encourage adolescents to start their sexual life early, which is a significant obstacle to adherence to vaccination. Furthermore, the stigmatization of sexual transmission due to cultural issues and the lack of conviction among parents that the vaccine is essential, especially for males, create barriers that make it difficult to maintain high vaccination coverage.

The analysis of data available in DATASUS and other relevant databases revealed negative statistics in HPV vaccination campaigns, especially when comparing the years 2020 to 2024. During this period, there was a declining trend in vaccination uptake, which is particularly worrying given the context of increasing HPV cases.

The study concluded that health education is a powerful tool to change behaviors and attitudes towards vaccination. Raising awareness about the real risks of HPV and the benefits of vaccination can help dispel fears and myths surrounding the HPV vaccine. In addition, accurate and accessible information about vaccination can empower parents and guardians to make informed health decisions for their children.[9]

To improve vaccination coverage and ensure population protection against HPV, it is

essential that public health authorities consider these factors and seek effective strategies to stabilize and increase vaccination uptake. Targeted interventions, educational campaigns and continuous improvement of health infrastructure are fundamental steps to achieve these goals and protect the population of Ananindeua against the consequences of HPV.

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